UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

January 26, 2018

Mr. Mano Nazar
President and Chief Nuclear Officer
Nuclear Division
Florida Power & Light Company
Mail Stop: EX/JB
700 Universe Blvd.
Juno Beach, FL 33408

SUBJECT: ST. LUCIE PLANT, UNIT NOS. 1 AND 2 – SAFETY EVALUATION OF ALTERNATIVE AND RELIEF REQUESTS FOR THE FIFTH 10-YEAR INSERVICE TESTING PROGRAM (EPID L-2017-LLR-0113, L-2017-LLR-0117, L-2017-LLR-0118, L-2017-LLR-0119, L-2017-LLR-0120, L-2017-LLR-0121, L-2017-LLR-0122)

Dear Mr. Nazar:

By letter dated October 6, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17279A037), as supplemented by letters dated November 9, 2017, and November 30, 2017 (ADAMS Accession Nos. ML17318A086 and ML17334B144), Florida Power & Light (the licensee) submitted to the Nuclear Regulatory Commission (NRC) seven proposed alternatives to the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), associated with pump inservice testing (IST) at St. Lucie Units 1 and 2 for the Fifth 10-year IST Program interval.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 55a(z)(2), the licensee requested to use the proposed alternative in Pump Alternative Request PR-01 on the basis that compliance with the ASME OM Code would result in hardship or unusual difficulty without compensating increase in level of quality or safety. Pursuant to 10 CFR 50.55a(f)(5)(iii), the licensee requested to use the proposed alternatives in Pump Relief Requests PR-02 and PR-03 on the basis that compliance with the ASME OM Code would be impractical for the facility. Pursuant to 10 CFR 50.55a(z)(1), the licensee requested to use the proposed alternatives in Pump Alternative Requests PR-04, PR-05, PR-06, and PR-09 on the basis that the alternatives provide an acceptable level of quality and safety.

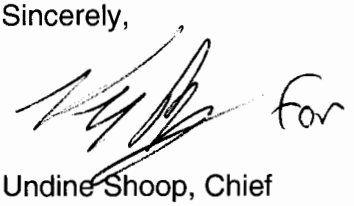
The NRC staff has reviewed the subject requests and determines, as set forth in the enclosed safety evaluation that; for alternative request PR-01, compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase of quality or safety; for Pump Relief Requests PR-02 and PR-03, it is impractical for the licensee to comply with certain testing requirements of the ASME OM Code; for Pump Alternative Requests PR-04, PR-05, PR-06, and PR-09 the proposed alternatives provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2), 10 CFR 50.55a(f)(5)(iii), and

10 CFR 50.55a(z)(1), respectively, and is in compliance with the ASME Code's requirements. Therefore, the NRC staff authorizes the use of alternative requests PR-01, PR-02, PR-03, PR-04, PR-05, PR-06, and PR-09 for St. Lucie Units 1 and 2 for the fifth 10-year IST program interval, which begins on February 11, 2018, and is scheduled to end on February 10, 2028.

All other ASME OM Code requirements for which relief has not been specifically requested and approved in these requests remain applicable.

If you have any questions, please contact the Project Manager, Perry H. Buckberg, at 301-415-1383 or Perry.Buckberg@nrc.gov.

Sincerely,



Undine Shoop, 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: Listserv

UNITED STATES
NUCLEAR REGULATORY COMMISSION
WASHINGTON, D.C. 20555-0001

SAFETY EVALUATION BY THE OFFICE OF NUCLEAR REACTOR REGULATION

REQUEST NOS. PR-01, PR-02, PR-03, PR-04, PR-05, PR-06, AND PR-09

INSERVICE TESTING PROGRAM, FIFTH 10-YEAR INTERVAL

ST. LUCIE PLANT, UNIT NOS. 1 AND 2

FLORIDA POWER & LIGHT COMPANY

DOCKET NO. 50-335 ANS 50-389

1.0 INTRODUCTION

By letter dated October 6, 2017 (Reference 1), as supplemented by letters dated November 9, 2017 (Reference 2), and November 30, 2017 (Reference 3), Florida Power & Light (FPL or the licensee) submitted to the Nuclear Regulatory Commission (NRC) seven alternatives to the requirements of the American Society of Mechanical Engineers (ASME) Code for Operation and Maintenance of Nuclear Power Plants (OM Code), associated with pump inservice testing (IST) at St. Lucie Units 1 and 2 for the Fifth 10-year IST Program interval. The St. Lucie Units 1 and 2 Fifth 10-year IST program interval begins on February 11, 2018, and is scheduled to end on February 10, 2028. The applicable ASME OM Code edition and addenda for the St. Lucie Units 1 and 2 fifth 10-year IST program interval is the 2004 Edition through the 2006 Addenda.

Specifically, pursuant to Title 10 of the *Code of Federal Regulations* (10 CFR) Part 50, Section 55a(z)(2), the licensee requested to use the proposed alternative in Pump Alternative Request PR-01 on the basis that compliance the ASME OM Code would result in hardship or unusual difficulty without compensating increase in level of quality or safety. Pursuant to 10 CFR 50.55a(f)(5)(iii), the licensee requested to use the proposed alternatives in Pump Relief Requests PR-02 and PR-03 on the basis that compliance the ASME OM Code would be impractical for the facilities. Pursuant to 10 CFR 50.55a(z)(1), the licensee requested to use the proposed alternatives in Pump Alternative Requests PR-04, PR-05, PR-06, and PR-09 on the basis that the alternatives to the ASME OM Code provide an acceptable level of quality and safety.

2.0 REGULATORY EVALUATION

Paragraph 10 CFR 50.55a(f) requires, in part, that IST of certain ASME Code Class 1, 2, and 3 pumps and valves be performed in accordance with the specified ASME OM Code and applicable addenda incorporated by reference in the regulations.

Paragraph 10 CFR 50.55a(z) states, in part, that alternatives to the requirements of paragraph (f) of 10 CFR 50.55a may be used, when authorized by the NRC, if the licensee demonstrates (1) the proposed alternatives would provide an acceptable level of quality and safety or (2) compliance with the specified requirements would result in hardship or unusual difficulty without a compensating increase in the level of quality and safety.

Paragraph 10 CFR 50.55a(f)(5)(iii) requires that if a licensee has determined that conformance with certain Code requirements is impractical for its facility, the licensee shall notify the Commission and submit information to support the determination.

Paragraph 10 CFR 50.55a(f)(5)(iv) requires that where a pump or valve test requirement by the Code or Addenda is determined to be impractical by a licensee, and is not included in the revised IST program as permitted by paragraph 10 CFR 50.55a(f)(4), the basis for this determination must be submitted to NRC for review and approval not later than 12 months after the expiration of the initial 120-month interval of operation from the start of facility commercial operation and each subsequent 120-month interval of operation during which the test is determined to be impractical.

Paragraph 10 CFR 50.55a(f)(6)(i) states, in part, that the Commission will evaluate determinations, under paragraph 10 CFR 50.55a(f)(5), that Code requirements are impractical. The Commission may grant such relief and may impose such alternative requirements as it determines are authorized by law, will not endanger life or property or the common defense and security, and are 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.

Based on the above, and subject to the following technical evaluation, the NRC staff finds that regulatory authority exists for the licensee to request and the Commission to authorize the alternatives requested by the licensee.

3.0 TECHNICAL EVALUATION

3.1 Pump Alternative Request PR-01 - Charging Pump Vibration Frequency Response Range

3.1.1 Code Requirements

ASME OM Code, ISTB-3510(e), "Frequency Response Range," states "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 alternative request are reactor coolant charging (RCC) pumps as identified in Table 1.

St. Lucie Unit	Pump Number	Description	Class	OM Code Category
1	CHG 1A	RCC Pump 1A	2	Group A
1	CHG 1B	RCC Pump 1B	2	Group A
1	CHG 1C	RCC Pump 1C	2	Group A
2	CHG 2A	RCC Pump 2A	2	Group A
2	CHG 2B	RCC Pump 2B	2	Group A
2	CHG 2C	RCC Pump 2C	2	Group A

3.1.3 Reason for Request

The RCC pumps are positive displacement pumps that operate at approximately 205 revolutions per minute, 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.

The vibration instrumentation currently being used at St. Lucie is the Computational Systems Inc. (CSI) model 2140 Machinery Analyzer with Emerson model A0760GP accelerometer probes. The CSI 2140 Machinery Analyzer response is flat to direct current (DC) for non-integrated and DC-coupled signals. The Emerson model A0760GP accelerometer probes meet the ASME OM Code ISTB-3510(a) accuracy range requirement of plus or minus (±) 5 percent (i.e., sensitivity) in the range from 0.5 -10,000 Hz.

The FPL Quality Assurance Program requires this instrumentation to be calibrated and traceable to National Institute of Standards and Technology (NIST) standards. While NIST is capable of providing a traceable calibration standard for frequencies as low as 1.0 Hz, NIST is not able to perform this calibration on the equipment used by FPL. The CSI vibration instrumentation is an industry standard utilized throughout the FPL fleet. Since FPL has not been able to locate a qualified provider of vibrational calibration services capable of calibrating to less than 2 Hz using standards traceable to NIST, the licensee proposes to use the current installed instrumentation that can only be calibrated to 2 Hz.

The licensee states that though the calibrated frequency response range of the RCC pump vibration monitoring equipment does not meet the extreme low end of the readout requirements of ISTB-3510(e), the current calibrated range adequately envelops all potential noise contributors that could indicate degradation of the RCC 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 RCC pumps, thereby providing reasonable assurance that any RCC pump degradation would not go undetected.

The licensee also states that there are no probable RCC pump failure mechanisms that would be revealed by monitoring the vibration at frequencies below those related to the shaft speed (3.41 Hz), and that any indication of pump degradation will not be masked by instrumentation that is not calibrated below 2 Hz. Hence the use of CSI model 2140 Machinery Analyzer with Emerson model A0760GP accelerometer probes, or equivalent, calibrated within the frequency range of 2 to 1000 Hz will provide adequate information for evaluating RCC pump condition and ensuring continued reliability with respect to the pumps' function. The lower calibration limit for the vibration monitoring equipment will not affect the ability to assess RCC pump operational readiness since the pumps are not susceptible to degradation mechanisms that would only manifest themselves in the non-calibrated range (1.13 to 2 Hz) without also becoming prevalent in the monitored range (2 to 1000 Hz). In addition, the St. Lucie Predictive Maintenance Group routinely performs spectral/waveform analysis of vibration data to ensure that no adverse trend toward mechanical degradation will go undetected.

3.1.4 Licensee Proposed Alternative

The licensee proposes that during testing of the RCC pumps, the vibration instrumentation used will continue to be the current CSI model 2140 Machinery Analyzer with Emerson model A0760GP accelerometer probes, or equivalent. Calibration of the instrumentation will be qualified to a minimum frequency of 2 Hz.

Note that a similar alternative request has been authorized for the St. Lucie fourth 10-year IST program by the NRC in a letter dated September 25, 2008 (ADAMS No. ML082470089).

3.1.5 NRC Staff Evaluation

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 RCC pumps 1A, 1B, and 1C, and 2A, 2B, and 2C, operate at a rotational frequency of 3.41 Hz. The one-third minimum speed frequency response required for the vibration instrumentation correlates to 1.13 Hz. The ASME OM Code required frequency response range for the RCC pumps is 1.13 Hz to 1000 Hz. The FPL Quality Assurance Program requires this instrumentation to be calibrated and traceable to NIST standards. However, FPL has not been able to locate a qualified provider of vibrational calibration services capable of calibrating to less than 2 Hz using standards traceable to NIST; meaning that the CSI-2140 and Emerson accelerometer cannot be calibrated to the required lower range of 1.13 Hz. As such, the licensee proposes to use the current installed instrumentation that would only measure the frequency response range from 2 Hz to 1000 Hz. The licensee states that though the calibrated frequency response range of the RCC pump vibration monitoring equipment does not meet the extreme low end of the readout requirements of ISTB-3510(e), the current calibrated range adequately envelops all potential noise contributors that could indicate degradation of the RCC pumps. Furthermore, the instrumentation is fully qualified to measure all expected synchronous vibration levels, and there are virtually no mechanical degradation scenarios where only a sub-synchronous vibration component would develop on the RCC pumps. Thereby, it is unlikely that any RCC pump degradation would go undetected.

The licensee also states that there are no probable RCC pump failure mechanisms that would be revealed by monitoring the vibration at frequencies below those related to the shaft speed (3.41 Hz), and that any indication of pump degradation will not be masked by instrumentation that is not calibrated below 2 Hz. Hence the use of CSI model 2140 Machinery Analyzer with

Emerson model A0760GP accelerometer probes, or equivalent, calibrated within the frequency range of 2 to 1000 Hz will provide adequate information for evaluating RCC pump condition and ensuring continued reliability with respect to the pumps' function. The NRC staff finds that the lower calibration limit of 2 Hz for the vibration monitoring equipment will not affect the ability to assess RCC pump operational readiness since the pumps are not susceptible to degradation mechanisms that would only manifest themselves in the non-calibrated range (1.13 to 2 Hz) without also becoming prevalent in the monitored range (2 to 1000 Hz). Therefore, the licensee's current instrumentation is sufficient to identify pump problems that produce high-frequency vibrations, and therefore provides reasonable assurance of the RCC pump operational readiness. In addition, the St. Lucie Predictive Maintenance Group routinely performs spectral/waveform analysis of vibration data to ensure that no adverse trend toward mechanical degradation will go undetected.

On the basis that the proposed alternative provides adequate information for evaluating the RCC pumps' condition, and that the St. Lucie Predictive Maintenance Group routinely performs spectral/waveform analysis of vibration data to ensure that no adverse trend toward mechanical degradation will go undetected, the NRC staff finds that the proposed alternative would provide reasonable assurance of pump operational readiness, and imposition of the ASME OM Code requirement would result in hardship and unusual difficulty without a compensating increase in the level of quality and safety.

3.1.6 PR-01 Conclusion

As set forth above, the NRC staff determined that the proposed alternative provides reasonable assurance that the RCC pumps are operationally ready. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(z)(2) on the basis that compliance with the ASME OM Code requirements results in hardship or unusual difficulty without a compensating increase in the level of quality and safety. Therefore, the NRC staff authorizes the proposed alternative request for the RCC pumps listed in Table 1 above for the fifth 10-year IST Interval at St. Lucie Units 1 and 2, which begins on February 11, 2018, and is scheduled to end on February 10, 2028.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests for relief remain applicable.

3.2 Pump Relief Request PR-02 - Hydrazine Pump Vibration Frequency Response Range

3.2.1 Code Requirements

The licensee requested relief from the Code requirements of ISTB-5323, "Comprehensive Test Procedure," provisions (d) and (e). 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. ISTB-5323(e) states that 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-5321-2. For example, the vibration exceeds either 6Vr or 0.7 inch/second (1.7 centimeters per second), the pump is in the required action range.

3.2.2 Component Identification

The licensee requested relief from the above ASME OM Code requirements for the pumps listed in Table 2 below:

Table 2

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

3.2.3 Reason for Request

The hydrazine pumps are reciprocating positive displacement pumps that operate at extremely slow speeds that equate 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 of this, or 0.21 Hz. The licensee stated that portable instruments satisfying this requirement (low frequency with the required accuracy) are not commercially available.

The licensee also stated that 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.

The license stated that the hydrazine 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 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 testing periods. Thus, the probability of any significant pump deterioration over the plant's lifetime is extremely small. The licensee further stated that vibrational testing at the available accuracy limits with the currently commercially available equipment would not be expected to detect degradation of these pumps.

3.2.4 Licensee Proposed Alternative

The licensee stated that, in lieu of measuring pump vibration on a comprehensive biennial frequency, the hydrazine pumps will be maintained and inspected in accordance with the St. Lucie Preventive Maintenance Program (PMP) that reflects the recommendations of the pump manufacturer (Union Pump Co.) dated May 24, 1999. 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. The licensee stated that this program is adequate for determining pump degradation that could impact operability and reliability.

3.2.5 NRC Staff Evaluation

The hydrazine pumps listed in Table 2 are classified as Group B pumps in accordance with the requirements in ISTB-2000. These hydrazine pumps are reciprocating positive displacement pumps. ISTB-5323(d) requires 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. ISTB-5323(e) requires that all deviation from the reference values shall be compared with the ranges (alert and required action ranges) of the Table ISTB-5321-2 for reciprocating positive displacement pumps, and corrective action taken as specified in ISTB-6200.

The hydrazine pumps listed in Table 2 operate at very low speeds. ISTB-3510(e) requires that the frequency response range of vibration measuring transducers and their readout system shall be from one-third minimum pump shaft rotational 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 Services 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 ASME 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 St. Lucie PMP that reflects the recommendation of the pump 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. Given the low usage factor of these pumps, the staff considers the vendor-recommended PMP adequate for determining bearing and pump degradation that could impact the pumps' operation readiness. Therefore, the licensee's proposed alternative provides adequate assurance of the operational readiness of these pumps.

3.2.6 PR-02 Conclusion

As set forth above, the NRC staff has determined that it is impractical for the licensee to comply with certain testing requirements of the ASME OM Code for hydrazine pumps listed in Table 2. The NRC staff has further determined that granting relief request PR-02, in accordance with 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. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(f)(5)(iii), and is in compliance with the requirements of 10 CFR 50.55a with the granting of the relief. Therefore, the NRC staff grants relief, pursuant to 10 CFR 50.55a(f)(6)(i), for the testing alternative

contained in relief request PR-02 for St. Lucie Unit 2 for the fifth 10-year IST interval, which begins on February 11, 2018 and is scheduled to end on February 10, 2028.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests remain applicable.

3.3 Pump Relief Request PR-03 - Hydrazine Pump Flow Testing

3.3.1 Code Requirements

The licensee requested relief from the Code requirements of ISTB-5322, "Group B Test Procedure," provision (b). ISTB-5322 (b) states that the flow rate shall be determined and compared to its reference value.

3.3.2 Component Identification

The licensee requested relief from the above ASME OM Code requirements for the pumps listed in Table 3 below:

Table 3

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

3.3.3 Reason for Request

The licensee stated that 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). Flow follows a half-oscillatory waveform, which leads to a pulsed response from the installed flow orifice. The characteristic flowrate makes it impractical to dampen using standard dampening devices.

The licensee stated that 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 cannot 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 the 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.

The licensee further stated that, 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, the licensee proposed to only perform the IST flow measurement during the comprehensive pump test that is performed on a biennial frequency, during refueling outages. The licensee proposes to measure the flowrate during each refueling outage in conjunction with the site's application of its PMP that reflects the recommendations of the pump 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. The licensee stated that 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.

The licensee stated that the 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 to 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

The licensee proposed to perform the IST flow measurement, via discharge into a known volume within a known time, 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 NRC Staff Evaluation

The hydrazine pumps listed in Table 3 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 in accordance with the requirements in ISTB-2000.

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

The hydrazine pumps listed in Table 3 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 Position 9 of NRC Generic Letter (GL) 89-04, "Guidance on Developing Acceptable Inservice Testing Programs," 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 the 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 to 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 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, and quarterly verification of developed head at rated speed, is appropriate and adequate for detecting any significant pump degradation. Therefore, the licensee's proposed alternative provides reasonable assurance of the operational readiness of the pumps.

3.3.6 PR-03 Conclusion

As set forth above, the NRC staff has determined that it is impractical for the licensee to comply with certain testing requirements of the ASME OM Code for hydrazine pumps listed in Table 3. The NRC staff has further determined that granting relief request PR-03, in accordance with 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. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(f)(5)(iii), and is in compliance with the requirements of 10 CFR 50.55a with the granting of the relief. Therefore, the NRC staff grants relief, pursuant to 10 CFR 50.55a(f)(6)(i), for the testing alternative contained in relief request PR-03 for St. Lucie Unit 2 for the fifth 10-year IST interval, which begins on February 11, 2018, and is scheduled to end on February 10, 2028.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests remain applicable.

3.4 Pump Alternative Request PR-04 - Low Pressure Safety Injection Pump Group Classification

3.4.1 Code Requirements

ISTB-1300, "Pump Categories," states, "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, "Owner's Responsibility," provision (b), states, "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."

3.4.2 Component Identification

The licensee requested an alternative to the above ASME OM Code requirements for the pumps listed below:

Table 4

Pump	Description	ASME Code Class	ASME Code Pump Group	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

3.4.3 Reason for Request

The licensee states, in part:

> The Low Pressure Safety Injection (LPSI) Pumps are used during cold shutdown and refueling conditions and can each provide approximately 3000 gpm [gallons per minute] 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.
>
> 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. 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.

This proposed alternative will result in a lower potential for pump degradation due to pump wear while still being capable of measuring/determining pump performance.

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 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.

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.

3.4.4 Licensee Proposed Alternative

The licensee states:

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 alternative 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.

3.4.5 NRC Staff Evaluation

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. During cold shutdown and refueling operation, 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 that would provide adequate data to detect degradation (i.e., they can only be operated at minimum flow). 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 during normal power operation.

The LPSI pumps will be tested as Group B pumps during normal power operation and will be tested as Group A pumps during cold shutdown and refueling outage operations. This approach is consistent with the position previously taken by the NRC staff in GL 89-04, Position 9, wherein it was recognized 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 at full or substantial flow conditions, the increased interval between full flow tests is an acceptable alternative to the Code requirements and provides reasonable assurance of operational readiness of the LPSI pumps.

3.4.6 PR-04 Conclusion

As set forth above, the NRC staff determined that for alternative request PR-04 for St. Lucie Units 1 and 2, the proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1), for alternative request PR-04. Therefore, the NRC staff authorizes the use of alternative request PR-04 for St. Lucie Units 1 and 2 for the fifth 10-year IST program interval, which is scheduled to begin on February 11, 2018, and will conclude on February 10, 2028.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests remain applicable.

3.5 Pump Alternative Request PR-05 - LPSI Pressure Instrumentation

3.5.1 Code Requirements

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

3.5.2 Component Identification

The licensee requested an alternative to the above ASME OM Code requirement for the pumps listed in Table 5 below:

Table 5

Pump	Pump Description	ASME Code Class	ASME OM Pump Group	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

3.5.3 Reason for Request

Table ISTB-3500-1, requires the instruments used to measure differential pressure for Group A and Group B tests to be accurate to ± 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 (three times the reference value).

An example of calculating indicated instrument accuracy follows (from NUREG-1482, "Guidelines for Inservice Testing at Nuclear Power Plants," Revision 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% 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 alternative request. Table PR05 below provides the calculated indicated instrument accuracies:

Table PR05: 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%

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 Table PR05, the indicated 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 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 three 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 testing).

3.5.4 Licensee Proposed Alternative

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 NRC Staff Evaluation

The licensee requests an alternative to 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 existing 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 PR-05 Conclusion

As set forth above, the NRC staff determined that for alternative request PR-05 for St. Lucie Units 1 and 2, the proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(1), for alternative request PR-05. Therefore, the NRC staff authorizes the use of alternative request PR-05 for St. Lucie Units 1 and 2 for the fifth 10-year IST program interval, which is scheduled to begin on February 11, 2018, and will conclude on February 10, 2028.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests remain applicable.

3.6 Pump Alternative Request PR-06 - Boric Acid Makeup (BAM) Pumps Quarterly Flow Test

3.6.1 Code Requirements

The licensee requested an alternative to Group A testing requirements of ASME OM Code paragraph ISTB-5121, "Group A Test Procedure," (b), which states, "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 licensee requested an alternative to the above ASME OM Code requirement for the pumps listed in Table 6 below:

Table 6

Pump	Pump Description	ASME Code Class	ASME OM Pump Group	Unit
BAM 1A	BAM Pump 1A	2	A	1
BAM 1B	BAM Pump 1B	2	A	1
BAM 2A	BAM Pump 2A	2	A	2
BAM 2B	BAM Pump 2B	2	A	2

3.6.3 Reason for Request

The BAM pumps have four available flow paths for inservice testing. These flow paths are (1) the primary flow path to the charging pumps' suction header, (2) the RWT recirculation line, (3) the volume control tank (VCT) flow path line, and (4) 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:

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, which would result in the addition of excess boron into the RCS during plant operation. The rapid insertion of negative reactivity would result in RCS cooldown and de-pressurization and could result in an unscheduled plant trip and possible actuation of the safety injection system. During cold shutdowns, the introduction of excess quantities of boric acid into the RCS via this flow path 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. Also, the waste management system would be overburdened by the large amounts of RCS coolant that would require processing to reduce boron concentration.

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 (TSs) 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 TSs, but in the case of St. Lucie Unit 2, could result in an increase of boron concentration above the RWT required concentration limit of 1900 ppm to 2200 ppm. Also, the flow path is not equipped with flow measurement instrumentation, so flow could not be readily determined.

Alignment of a BAM pump to the VCT will also result in the same issues stated above for recirculating water to the RWT in regards to the depletion of the associated BAM tank inventory. For this alignment, 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 TSs, 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 above. This flow path contains a flow element, but it is not suitable for IST measurements because the calibration consists of only a zero check. It is noted in the justifications given above that transferring the BAM tanks' 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 that could not easily be compared and trended to previous flow measurements (i.e., poor repeatability). This is because the BAM tanks' level typically varies from test to test by as much as 15 percent to 20 percent.

Alignment of a BAM pump to recirculate flow back to the BAM tanks is accomplished through the pumps' minimum flow test line, which is a fixed resistance circuit. This is the same flow path 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 flow instrumentation installed in these lines.

3.6.4 Licensee Proposed Alternative

The licensee proposes that 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 GL 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 GL 89-04, Position 9.

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

3.6.5 NRC Staff Evaluation

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 four 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, highly concentrated boric acid solution should not be pumped 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, the addition of boron 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 the RWT. The licensee states that during normal operation the TSs require the BAM tanks to be maintained with a specified volume and concentration of boric acid. Transferring borated water from either one or both of the BAM tanks could result in the loss of a required boration source as required by the TSs, and in Unit 2 there could be an increase of boron concentration above the RWT concentration limit. Also, this flow path does not have flow instrumentation.

The third flow path takes suction from the BAM tanks and recirculates water from the discharge of the BAM pumps to the VCT. Operation with this flow path will have the same consequences as aligning the pumps to the RWT. Also, highly borated water would be introduced to the suction of the charging pumps, which would result in the addition of negative reactivity into the RCS, which could produce the same results as described above. This flowpath does have a flow element, but the flow element is not suitable for IST measurements because the calibration consists of only a zero check.

The fourth 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. 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.

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. The licensee's proposed alternative testing is consistent with GL 89-04.

3.6.6 PR-06 Conclusion

As set forth above, the NRC staff determined that for alternative request PR-06, for St. Lucie Units 1 and 2, the proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(z)(1), for request PR-06. Therefore, the NRC staff authorizes the use of alternative request PR-06 for St. Lucie Units 1 and 2 for the fifth 10-year IST program interval, which begins on February 11, 2018, and is scheduled to end on February 10, 2028.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests remain applicable.

3.7 Pump Alternative Request PR-09 Comprehensive Pump Testing for Intake Cooling Water (ICW) Pumps

3.7.1 Code Requirements

The licensee requested an alternative to the Group A testing requirements of ASME OM Code 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," provides the specific requirements for the Group A test for vertical line shaft pumps.

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

ASME OM Code Case, OMN-18, "Alternate Testing Requirements for Pumps Tested Quarterly Within ± 20% of Design Flow," states, in part, that "the Group A test may be performed quarterly within ± 20 percent of pump design flow rate, with instrumentation meeting the requirements of Table ISTB-3500-1 for the Comprehensive and Preservice Tests, and no comprehensive test is required." This Code Case was published in the 2009 Edition of the ASME OM Code.

3.7.2 Component Identification

The licensee requested an alternative to the above ASME OM Code requirements for the pumps listed in Table 7 below:

Table 7

Pump	Pump Description	ASME Code Class	ASME OM Code Pump Group	Unit
ICW PP 1A	ICW Pump 1A	3	A	1
ICW PP 1B	ICW Pump 1B	3	A	1
ICW PP 1C	ICW Pump 1C	3	A	1
ICW PP 2A	ICW Pump 2A	3	A	2
ICW PP 2B	ICW Pump 2B	3	A	2
ICW PP 2C	ICW Pump 2C	3	A	2

3.7.3 Reason for Request

The pumps listed in Table 7 are vertical line shaft pumps. The licensee proposes that in lieu of the requirements of Table ISTB-3400-1, ISTB-5221, and ISTB-5223, a modified Group A test would be performed quarterly, with instrumentation meeting the instrument accuracy requirements of Table ISTB-3500-1 for the biennial comprehensive test, and the comprehensive test would not be performed. The modified Group A test will be in accordance with ASME OM Code Case OMN-18, except that the acceptable range will be tighter than the Group A test ranges listed in Table ISTB-5200-1. The acceptable range for differential pressure (ΔP) would be 0.95 to 1.06 of the reference value (r), and the alert range would be $0.93\Delta P_r$ to less than $0.95\Delta P_r$.

All of the pumps in Table 7, tested quarterly using this alternative, would be tested within ± 20 percent of pump design flow rate, as is required for the biennial comprehensive test.

Use of this alternative provides for consistent acceptance criteria for pump ΔP tests. The licensee would consistently utilize the modified Group A test acceptance criteria (discussed above) for pump IST rather than having to utilize the comprehensive test criterion for one biennial test. The acceptance criteria for vibration tests would be the same as for Group A tests shown in Table ISTB-5200-1.

3.7.4 Licensee Proposed Alternative

The licensee proposes to use a modified Group A test in accordance with ASME OM Code Case OMN-18 in lieu of the ASME OM Code required comprehensive pump test. Code Case OMN-18 was approved by the ASME OM ISTB Code ISTB Subgroup and published with the 2009 Edition of the ASME OM Code. While this code case has yet to be incorporated by reference into 10 CFR 50.55a or incorporated in to NRC Regulatory Guide 1.192, "Operation and Maintenance Code Case Acceptability, ASME OM Code," the NRC staff has stated that they have no concerns with its use provided that the Acceptable Range upper end values for flow (Q) and ΔP are greater than $1.16Q_r$ and $1.06\Delta P_r$, respectively. These Acceptable Range upper end values for the Group A test are more conservative than the $1.10Q_r$ and $1.10\Delta P_r$ criteria specified in the 2006 Addenda of the ASME OM Code, but are the same criteria specified in the 2001 Addenda to the ASME OM Code for comprehensive pump tests. IST with more accurate pressure instrumentation and tighter acceptance criteria will provide for better

trending of pump performance. The licensee stated that vibration testing will also be performed per the Group A requirements as stated in Table ISTB-5221-1.

3.7.5 NRC Staff Evaluation

The licensee is proposing to perform quarterly IST for all the pumps listed in Table 7 in accordance with a modified Group A test procedure, in lieu of a quarterly Group A test and a biennial comprehensive pump test.

Table ISTB-3400-1 of the ASME OM Code requires that for Group A pumps, a Group A test is performed every quarter, and a comprehensive test is performed biennially. Per ISTB-3300, Table ISTB-3510-1, and Table ISTB-5221-1, the Group A test is performed within ± 20 percent of the pump design flow rate (if practicable), the pressure instrument accuracy is ± 2 percent, and the upper limit for the acceptable range for differential pressure is $1.10\Delta P_r$. Also, per ISTB-3300, Table ISTB-3510-1, and Table ISTB-5221-1, the comprehensive pump test is performed within ± 20 percent of the pump design flow rate, the pressure instrument accuracy is ± 1/2 percent, and the upper limit of the acceptable range for differential pressure is $1.03\Delta P_r$. Vibration monitoring is performed during both the Group A test and the comprehensive pump test.

The licensee proposes that for the pumps listed in Table 7, a modified Group A quarterly test will be performed every quarter using ASME OM Code Case OMN-18, with modified Acceptable and Required Action ranges, and the biennial comprehensive test will not be performed. OMN-18 was published with the 2009 Edition of ASME OM, "Operation and Maintenance of Nuclear Power Plants." It has not yet been incorporated into Regulatory Guide 1.192. However, the NRC staff has reviewed OMN-18, and currently has no concerns with its usage, providing that the upper end values of the Group A test "Acceptable Ranges" for Q and ΔP are $1.06Q_r$ and $1.06\Delta P_r$ respectively, and the high values of the "Required Action Ranges" for flow and differential pressure are greater than $1.06Q_r$ and greater than $1.06\Delta P_r$ respectively. The licensee stated that these limits for the Acceptable Ranges and high values for the Required Action Ranges will be used in the modified Group A testing for the pumps listed in Table 7. The NRC staff has determined that there is no technical reason that OMN-18, with the NRC-imposed conditions, cannot be used.

The modified Group A quarterly test will be performed within ± 20 percent of the pump design flow rate and the "Acceptable Range" for the modified Group A quarterly test is tighter than the "Acceptable Range" for the normal ASME OM Group A quarterly test. More accurate pressure instrumentation that is required for a comprehensive test (± 1/2 percent, versus ± 2 percent for the Group A test) will also be used. One of these modified quarterly tests will replace the comprehensive test every two years. The licensee will use a more limiting upper bound of $1.06\Delta P_r$ for the "Acceptable Range" for differential pressure, in lieu of $1.10\Delta P_r$ that is normally required by the ASME OM Code for Group A tests. However, this proposed upper bound of $1.06\Delta P_r$ is greater than the upper bound of $1.03\Delta P_r$ for the biennial comprehensive test. The elimination of the comprehensive test (with its more limiting Acceptable Range upper bound for differential pressure of $1.03\Delta P_r$) is compensated for by using more accurate pressure gauges and a more limiting Acceptable Range during every modified quarterly Group A test. This will provide for better trending of pump performance. Instead of performing seven tests with pressure instruments with ± 2 percent accuracy and an Acceptable Range of 0.95 to $1.10\Delta P_r$, and then performing the eighth test with pressure instruments with ± 1/2 percent accuracy and an Acceptable Range of 0.95 to $1.03\Delta P_r$, all eight tests will be performed with the same ± 1/2 percent accurate instruments and an Acceptable Range of 0.95 to $1.06\Delta P_r$. Therefore, the

NRC staff determined that the proposed alternative provides an acceptable level of quality and safety for testing the pumps listed in Table 7.

3.7.6 PR-09 Conclusion

As set forth above, the NRC staff determined that for alternative request PR-09, for St. Lucie Units 1 and 2, the proposed alternative provides an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(a)(z)(1), for alternative request PR-09. Therefore, the NRC staff authorizes the use of alternative request PR-09 for St. Lucie Units 1 and 2 for the fifth 10-year IST program interval, which begins on February 11, 2018, and is scheduled to end on February 10, 2028.

All other ASME OM Code requirements for which relief was not specifically requested and approved in the subject requests remain applicable.

4.0 SUMMARY CONCLUSION

As set forth above, the NRC staff determines; for alternative request PR-01, that compliance with the specified requirement would result in hardship or unusual difficulty without a compensating increase of quality or safety; for relief requests PR-02 and PR-03 that it is impractical for the licensee to comply with certain testing requirements of the ASME OM Code; for alternative requests PR-04, PR-05, PR-06 and PR-09, that the proposed alternatives provide an acceptable level of quality and safety. Accordingly, the NRC staff concludes that the licensee has adequately addressed all of the regulatory requirements set forth in 10 CFR 50.55a(z)(2), 10 CFR 50.55a(f)(5)(iii), and 10 CFR 50.55a(z)(1), respectively. Therefore, the NRC staff authorizes the use of alternative requests PR-01, PR-04, PR-05, PR-06, and PR-09 and grants relief for relief requests PR-02 and PR-03 for St. Lucie Units 1 and 2 for the fifth 10-year IST program interval, which begins on February 11, 2018, and is scheduled to end on February 10, 2028.

All other ASME OM Code requirements for which relief has not been specifically requested and approved in this relief request remain applicable.

5.0 REFERENCES

1. Snyder, M. J., Florida Power & Light Company, letter to U.S. Nuclear Regulatory Commission, "St. Lucie Unit 1, 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," October 6, 2017 (Agencywide Documents Access and Management System (ADAMS) Accession No. ML17279A037).

2. Snyder, M. J., Florida Power & Light Company, letter to U.S. Nuclear Regulatory Commission, "Supplement for Fifth 10-Year Inservice Testing (IST) Program Interval Relief Request PR-06," November 9, 2017 (ADAMS Accession No. ML17318A086).

3. Snyder, M. J., Florida Power & Light Company, letter to U.S. Nuclear Regulatory Commission, "Response to Request for Additional Information Regarding Fifth 10-Year Inservice Testing (IST) Program Interval Relief Request PR-01," November 30, 2017 (ADAMS Accession No. ML17334B144).

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JBowen, OEDO
RidsRgn2MailCenter
JHuang, NRR
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DATE	1/26/2018	1/26/2018	1/26/2018	1/26/2018

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