UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
SAM NUNN ATLANTA FEDERAL CENTER
61 FORSYTH STREET, SW, SUITE 23T85
ATLANTA, GEORGIA 30303-8931

November 5, 2007

Florida Power and Light Company
ATTN: Mr. J. A. Stall, Senior Vice President
Nuclear and Chief Nuclear Officer
P. O. Box 14000
Juno Beach, FL 33408-0420

SUBJECT: ST. LUCIE NUCLEAR PLANT - COMPONENT DESIGN BASES INSPECTION - NRC INSPECTION REPORT 05000335/2007006 AND 05000389/2007006

Dear Mr. Stall:

On September 28, 2007, the U. S. Nuclear Regulatory Commission (NRC) completed an inspection at your St. Lucie Nuclear Plant Units 1 and 2. The enclosed inspection report documents the inspection findings which were discussed on September 28, 2007, with Mr. G. Johnston and other members of your staff.

The inspection examined activities conducted under your license as they relate to safety and compliance with the Commission's rules and regulations and with the conditions of your license. The inspectors reviewed selected procedures and records, observed activities, and interviewed personnel.

Based on the results of this inspection, the inspectors identified three findings of very low safety significance (Green). These findings were determined to involve violations of NRC requirements. However, because of the very low safety significance and because each was entered into your corrective action program, the NRC is treating the findings as non-cited violations (NCVs) consistent with Section VI.A.1 of the NRC's Enforcement Policy. If you deny these NCVs you should provide a response within 30 days of the date of this inspection report, with the basis for your denial, to the United States Nuclear Regulatory Commission, ATTN: Document Control Desk, Washington DC 20555-0001, with copies to the Regional Administrator, Region II; the Director, Office of Enforcement, U. S. Nuclear Regulatory Commission, Washington, DC 20555-0001; and the NRC Resident Inspector at the St. Lucie Nuclear Plant.

In accordance with 10 CFR 2.390 of the NRC's "Rules of Practice," a copy of this letter, its enclosure, and your response (if any) will be available electronically for public inspection in the

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Sincerely,

/RA/

Binoy Desai, Chief
Engineering Branch 1
Division of Reactor Safety

Docket Nos.: 50-335, 50-389
License Nos.: DPR-67, NPF-16

Enclosure: NRC Inspection Report 05000335/2007006 AND 05000389/2007006
w/Attachment: Supplemental Information

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x PUBLICLY AVAILABLE ☐ NONPUBLICLY AVAILABLE ☐ SENSITIVE X NONSENSITIVE

ADAMS: ☐ Yes ACCESSION NUMBER:___

OFFICE	RII:DRS	RII:DRS	RII:DRS	RII:DRS	contractor	contractor	RII:DRP
SIGNATURE	RA	RA	RA	RA	RA	RA	RA
NAME	L. R. Moore	R. Taylor	J. Hamman	C. Even	M.Yeminy	D. Jones	S. Vias
DATE	10/10/2007	10/11/2007	10/10/2007	10/10/2007	10/22/2007	11/5/2007	10/22/2007
E-MAIL COPY?	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO	YES NO

	contractor						
	RA						
	S. Kobylarz						
	10/11/2007						

U.S. NUCLEAR REGULATORY COMMISSION

REGION II

Docket Nos.:	50-335, 50-389
License Nos.:	DPR-67, NPF-16
Report Nos.:	05000335/2007006, 05000389/2007006
Licensee:	Florida Power and Light Company (FPL)
Facility:	St. Lucie Nuclear Plants, Units 1&2
Location:	6351 South Ocean Drive Jensen Beach, FL, 34957
Dates:	August 27 - September 28, 2007
Inspectors:	R. Moore, Lead Inspector M. Yeminy, Contractor R.Taylor, Reactor Inspector J. Hamman, Reactor Inspector C. Even, Reactor Inspector D. Jones, Senior Reactor Inspector S. Kobylarz, Contractor
Accompanied by:	B. Mooney, Inspector Trainee
Approved by:	B. Desai, Chief, Engineering Branch 1 Division of Reactor Safety

Enclosure

SUMMARY OF FINDINGS

IR 05000335/2007006, 05000389/2007006; 08/27/2007 - 08/31/2007, 10/10/2007 - 10/14/2007, 10/24/2007 - 10/28/2007; St. Lucie Nuclear Plant, Units 1 and 2; Component Design Bases Inspection.

This inspection was conducted by a team of five NRC inspectors and two NRC contractors. Three Green findings, all of which were non-cited violations (NCVs), were identified during this inspection. The significance of most findings is indicated by their color (Green, White, Yellow, Red) using IMC 0609, "Significance Determination Process" (SDP). The NRC's program for overseeing the safe operation of commercial nuclear power reactors is described in NUREG-1649, "Reactor Oversight Process," Revision 4, dated December 2006.

A. NRC-Identified and Self-Revealing Findings

Cornerstone: Mitigating Systems

- Green. The team identified a violation of 10 CFR 50, Appendix B, Criterion V, Instructions, Procedures, and Drawings, for an inadequate procedure used to verify operability of the Intake Cooling Water (ICW) system when high ocean temperatures occur.

  The finding was more than minor because it affected the procedure quality attribute associated with the mitigating systems cornerstone as related to the reliability, availability, and capability of the ICW system to perform the intended safety function during high ocean temperatures. The finding was of very low safety significance (Green) because it was a design deficiency determined not to have resulted in the loss of safety function. No cross cutting aspect was identified for this finding. The licensee entered this deficiency into their corrective action program. (Section 1R21.2.2)

- Green. The team identified a violation of 10 CFR 50, Appendix B, Criterion III, Design Control, for failure to use the most limiting design inputs in engineering analyses. Several examples were identified.

  The finding was more than minor because if uncorrected it would become a more significant safety concern. The finding was of very low safety significance (Green) because it was a design deficiency determined not to have resulted in the loss of safety function. No cross cutting aspect was identified for this finding. The licensee entered this deficiency into their corrective action program. (Section 1R21.2.6)

- Green. The team identified a violation of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, for inadequate corrective actions associated with the degraded performance of the Component Cooling Water (CCW) heat exchanger temperature control valve (2-TCV-14-4A).

  The finding was more than minor because it affected the equipment performance attribute associated with the mitigating systems cornerstone as related to the reliability, availability and capability of the ICW system. The finding was of very low significance

(Green) because there was no loss of system safety function. Analysis performed by the licensee during the inspection determined that at the failed valve position the ICW system was capable of removing the design base accident heat load. This finding has a cross cutting aspect in the area of Problem Identification and Resolution, specifically Corrective Action Program, because the licensee failed to take appropriate corrective actions to address safety issues and adverse trends in a timely manner, commensurate with their safety significance (MC 0305 aspect P.1(d)). The licensee entered this deficiency into their corrective action program. (Section 1R21.2.7)

B. Licensee-identified Violations

None

REPORT DETAILS

1. REACTOR SAFETY

Cornerstones: Mitigating Systems and Barrier Integrity

1R21 Component Design Bases Inspection (71111.21)

.1 Inspection Sample Selection Process

The team selected risk significant components and operator actions for review using information contained in the licensee's Probabilistic Risk Assessment (PRA). In general, this included components and operator actions that had a risk achievement worth factor greater than two or Birnbaum value greater than 1 X10-6. The components selected were primarily located within the Intake Cooling Water system (ICW), alternate ultimate heat sink, low pressure safety injection (LPSI), the reactor vessel level indication for shutdown operations, vital batteries, and electrical distribution systems. The sample selection included 17 components, five operator actions, and five operating experience items. Additionally, the team reviewed two modifications by performing activities identified in IP 71111.17, Permanent Plant Modifications, Section 02.02.a. and IP 71111.02, Evaluations of Changes, Tests, or Experiments.

The team performed a margin assessment and detailed review of the selected risk-significant components to verify that the design bases have been correctly implemented and maintained. This design margin assessment considered original design issues, margin reductions due to modification, or margin reductions identified as a result of material condition issues. Equipment reliability issues were also considered in the selection of components for detailed review. These included items such as failed performance test results, significant corrective action, repeated maintenance, maintenance rule (a)1 status, Regulatory Issue Summary 05-020 (formerly GL 91-18) conditions, NRC resident inspector input of problem equipment, system health reports, industry operating experience and licensee problem equipment lists. Consideration was also given to the uniqueness and complexity of the design, operating experience, and the available defense in depth margins. An overall summary of the reviews performed and the specific inspection findings identified are included in the following sections of the report.

.2 Results of Detailed Reviews

.2.1 Intake Cooling Water (ICW) Pumps (including expansion joints)

a. Inspection Scope

The team reviewed the design basis documentation, pump vendor manual and related vendor correspondence, drawings, and the updated final safety analysis report (UFSAR) to identify design, maintenance, and operational requirements related to pump flow and developed head, achieved system flow, net positive suction head (NPSH), vortex formation and prevention, minimum flow requirements, and runout protection. These requirements were reviewed for pump operation with the source of water originating from the intake cooling canal. Design calculations as well as documentation of in-service, periodic surveillance tests, and flow balances were reviewed to verify that design performance requirements were met. Maintenance, in-service testing, corrective action, and design change histories were reviewed to assess the potential for component degradation and resulting impact on design margins and performance. The inspectors reviewed design, analyses and test documentation to verify that appropriate design inputs and instrument uncertainties were incorporated. The inspectors reviewed the potential impact of Technical Specification (TS) allowed reduced emergency diesel generator (EDG) frequency operation on ICW pump performance. The design and condition of the pump expansion joints were reviewed to verify the design function of limiting the transmission of pump generated force to system piping.

The team reviewed the capability of the motor to perform its safety related function under normal and degraded voltage conditions by reviewing the vendor manual, motor specifications, cable specifications, and breaker specifications. Corrective action documents were reviewed to assess possible degradation of the energy supply to the pump. A walk-down of the motor and pump was performed to observe the material condition of the motor and pump and verify that the system configuration was consistent with the design basis assumptions, system operating procedures, and plant drawings.

b. Findings

No findings of significance were identified.

.2.2 Component Cooling Water (CCW) Heat Exchangers (HXs)

a. Inspection Scope

The team reviewed the heat exchanger specification information, design basis information and supporting calculations to identify the heat removal requirements and capability of the CCW HXs to remove the required heat load. This included the tube plugging limits, basis for the limits and the number of tubes presently plugged. The maintenance, inspection, and thermal performance testing were reviewed to verify the capability of the heat exchangers to remove the design heat load as well as the adequacy of flow testing for both the shell side and tube side of the heat exchangers. The calibration of instrumentation used for the CCW HX heat capacity testing was reviewed to verify that appropriately calibrated instrumentation was used. In addition, the team reviewed the proper use of instrument uncertainty and the availability of sufficient margins. The team reviewed the schedule and frequency of the thermal testing and schedule for visual inspection and cleaning. Equipment history as demonstrated by related condition reports and corrective maintenance was reviewed to verify that identified equipment problems were adequately resolved. The team reviewed the station's implementation of GL 89-13, Service Water System Problems Affecting Safety-Related Equipment, to verify that requirements applicable to the CCW HX were addressed. The team reviewed the licensee's mechanism to verify the Unit 2 CCW system operability at high heat sink temperatures because no TS maximum heat sink temperature was established for the station.

b. Findings

Introduction: The team identified a finding of very low safety significance (Green) involving 10 CFR 50, Appendix B, Criterion V, Instructions, Procedures, and Drawings, for an inadequate procedure used to verify operability of the ICW system as well as the operability of the CCW heat exchangers.

Description: Procedure 2-OSP-21.03, Shiftly ICW Operability Test, Rev. 1, regularly checks a number of parameters to determine the operability of ICW and CCW components in lieu of performing formal Operability Assessments when any one of the critical parameters (e.g., ocean temperature) is not satisfied. The procedure provided a two step process for verification of the ICW/CCW HXs when ICW intake temperature (ocean temperature) reached 86 degrees Fahrenheit (F). The first step used the following parameters in a calculation to provide an initial operability screening: ocean temperature, differential pressure (dp) across ICW strainers, dp across CCW HX, ICW pump degradation of 75 %, ICW flow rate of 8000 gpm, and 10% of tubes plugged. If the result of the calculation is favorable, i.e., the calculated ocean temperature is greater than the measured ocean temperature, the conclusion is that the ICW system and therefore the CCW system is operable, and the second step of the process is not performed. The second step is a more accurate determination using actual real time parameter values.

The team noted that the calculation in the first step did not include proper margin to account for instrument uncertainty or the potential impact on pump flows due to TS allowed under frequency tolerance of the EDG. The second step used curves and actual parameters but the curves also did not properly account for the uncertainty associated with ICW pump flow . The team reviewed a recent 2-OSP-21.03 operability verification, dated August 28, 2007, which demonstrated that virtually no margin existed in the first step of the daily operability verification. Using the calculation of step one (screening) of the process there was a 0.3 degree F margin to verifying the CCW HX could meet its design base heat removal requirements when the ocean temperature was 86.5 degrees F. The more accurate step two of the process was not required due to the result of step one.

Following identification of this issue, the licensee provided information related to recent improvements in the CCW HX thermal performance capability due to installation of improved design strainers directly upstream of the HXs. The recent improvement in thermal performance capability provided un-quantified margin which the team concluded would exceed the impact of instrument uncertainty and EDG under frequency. Based on this information the team concluded there was no loss in safety function due to this inadequate procedure. This issue was identified in CR 2007-28391.

Analysis: The team concluded the ICW operability verification procedure was inadequate due a design control performance deficiency in the engineering analyses to establish quantitative acceptance criteria for ICW operability at high ocean temperatures. In particular, the engineering analysis did not account for instrument uncertainty and EDG under frequency in the equations which developed the acceptance criteria (curves) in the procedure. The finding was more than minor because it affected the procedure quality attribute associated with the mitigating systems cornerstone as related to the reliability, availability, and capability of the ICW system. The team reviewed the finding using the phase 1 SDP worksheet for mitigating systems and determined the finding was of very low significance (Green) because it was a design deficiency determined not to have resulted in the loss of safety function. The performance deficiency occurred when the procedure was issued on July 26, 2006. This finding was reviewed for cross-cutting aspects and none were identified. The team did not identify a previous reasonable opportunity for the licensee to have identified this design input deficiency other than at original procedure development.

Enforcement: 10 CFR 50, Appendix B, Criterion V, requires, in part, that activities affecting quality shall be prescribed by documented instructions and procedures and shall include appropriate quantitative or qualitative acceptance criteria for determining that important activities have been satisfactorily accomplished. Contrary to the above, procedure 2-OSP-21.03, Shiftly ICW Operability Test, Rev. 1, did not provide appropriate quantitative acceptance criteria for verification of ICW system operability at high ocean temperature. Because this issue was of very low safety significance and it was entered into the licensee’s corrective action program (CR 2007-28391), it is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy: NCV 05000335,389/2007006-01, Inadequate Procedure for Verification of ICW Operability.

.2.3 Shutdown Cooling (SDC) HXs

a. Inspection Scope

The team reviewed the heat exchanger specification information, design basis information and supporting calculations to identify the heat removal requirements and capability of the SDC HXs to remove the required heat load during normal cooldown, refueling, and post-accident recirculation. Corrective action documentation related to preventive and routine maintenance was reviewed to verify the licensee’s capability for detection, monitoring, and correction of potential degradation. A field walkdown was performed to assess observable material conditions and verify that the system configuration was consistent with the design basis assumptions, system operating procedures, and plant drawings.

b. Findings

No findings of significance were identified.

.2.4 Alternate Ultimate Heat Sink (UHS)

a. Inspection Scope

The team reviewed the design basis documentation, including the DBD, supporting calculations, drawings, and the UFSAR to identify the design safety function for the alternate ultimate heat sink which provided an alternate source of cooling water in the event that the safe shutdown earthquake (SSE) impeded the normal canal supplied ICW source. The team reviewed the quality and availability of the alternate ICW source provided by Big Mud Creek to verify it was consistent with the normal source. This included review of expected water temperature and level to verify these parameters were consistent with the normal ocean intake canal ICW water source. TS surveillance procedures and results were also reviewed to verify the adequacy of the alternate UHS was verified and maintained.

b. Findings

No findings of significance were identified.

.2.5 Alternate UHS Isolation Valves (SB 37-1, 37-2)

a. Inspection Scope

The team reviewed the design basis documentation, including the DBD, supporting calculations, drawings, and the UFSAR to identify the design base function of the air operated butterfly valves which isolate the alternate UHS source from the intake to the ICW system. Equipment history as indicated by surveillance test results, corrective maintenance and condition reports was reviewed to verify that equipment degradation was monitored and identified equipment problems were appropriately resolved. The team performed a field walk down to assess the valves' observable material conditions. Additionally, the team performed a field verification of the procedure which provided an alternate motive force, local nitrogen tanks and associated hardware, for valve operation.

b. Findings

No findings of significance were identified.

.2.6 Containment Fan Coolers (CFCs)

a. Inspection Scope

The team reviewed the design basis documentation, drawings, and the UFSAR to identify design, maintenance, and operational requirements for the containment cooling fans. Vendor fan specifications and pre-operational performance testing were reviewed to verify that the installed fans were capable of meeting the design fan flow requirements and to verify that the motors were appropriately sized. Equipment history, as indicated by corrective maintenance and condition reports, was reviewed to verify that identified problems were appropriately resolved. The team reviewed the analysis of the brake horsepower (BHP) requirements for the pump to verify that appropriate design inputs were used in identifying the worst case loading on the fan motor. Engineering evaluations of fan test results were reviewed to verify that the appropriate design inputs were used in establishing the adequacy of the installed fans. The team also reviewed the licensee's response to Generic Letter 96-06, Assurance of Equipment Operability and Containment Integrity During Design-Basis Accident Conditions, as well as supporting analyses.

b. Findings

Introduction: The team identified a finding of very low safety significance (Green) involving a non-cited violation of 10 CFR 50, Appendix B, Criterion III, Design Control for failure to use the most limiting design inputs in engineering analyses.

Description: The team identified several examples of engineering analyses in which the most limiting design input values were not used. Subsequently, the conclusions of the various analyses were not conservative. Following additional analyses during the inspection for the individual examples identified, it was determined that no loss of safety function occurred. The examples indicated an engineering practice off of not using the most limiting parameters as design inputs in engineering analyses. The following examples were identified:

Engineering analysis of containment cooling fans' horsepower requirements:

The evaluation of the capability of the motors of the containment fan coolers should have used the highest possible density of the air steam mixture during a Loss of Coolant Accident (LOCA). The most limiting design inputs for fan electrical load determination would have used values associated with conditions of maximum HX efficiency, such as clean heat exchanger tubes and fins as well as the coldest CCW temperature and the maximum possible CCW flow rate. Using these values will increase the heat removal capacity of the heat exchangers, increase the density of the air/steam mixture, maximize the motor break horsepower, and maximize the number of kilowatts drawn from the EDGs. The flow rate test of the fan motors and the evaluation of test results occurred during the 1983 preoperational test of the CFCs.

During the inspection, the licensee reevaluated the fan motors using the most limiting parameters and determined that accident design conditions could increase the fan motor horsepower requirement to a value exceeding the 144 BHP value used in the EDG loading analysis. An operability assessment documented in CR 2007-29127 demonstrated that although the Unit 1 EDG loading value for the CFCs was exceeded, there was no operability concern as adequate EDG load margin existed to account for the additional load.
A similar analysis of Unit 2 also indicated that the most limiting parameters were not used, but that the design values for motor horse power and diesel loadings were not exceeded.

Engineering analysis of the test of the 1A and 1B CCW heat exchangers:

A test of the CCW heat exchangers was conducted in April, 2007, to validate the design basis for the heat exchangers after implementation of a modification of the upstream strainers. Test data was collected in accordance with procedure 1-NOP-14.02, Component Cooling Water System Operation, Rev. 9, dated 11/28/2006 (Appendices J and K for the 1A and 1B heat exchangers respectively). The test results were deemed inconclusive by the engineer because there was not sufficient heat load during the test. A greater heat load would have resulted in more accurate test results.

The team reviewed the test methodology and determined that the overall uncertainty associated with the instruments used for testing of the CCW heat exchangers was not documented in the test procedure nor in any evaluation of the test results. The licensee provided data on the instruments used for the tests, from which the overall uncertainty could be derived, but the licensee did not evaluate the overall uncertainty associated with the test and did not determine the resulting magnitude of the penalty that should be imposed on the coolers' heat removal capacity. As a result of determining the test results inconclusive the effect of the modified strainers on the CCW heat exchangers thermal performance has not been quantified. This was identified as another example in which the most limiting design inputs were not used in establishing acceptance criteria in test procedures. The licensee addressed this issue in CR 2007-27879.

Engineering analysis of the opening of CFC dampers:

In 1983, the Unit 2 CFC coolers flow rate was tested. The test results showed 34,173 cubic feet per minute (CFM) at the accident (low) speed where 40,000 CFM was expected. The testing organization, Certified Test and Balance Company, determined that there was inadequate air flow force to fully open the damper which resulted in lower than design flow. The inadequate flow force was due to the combination of air low speed and low air density.

Calculation PSL-2FSM-97-029, Containment Fan Cooler Dampers Opening Force vs. Air Density, Rev. 0, dated 11/24/1997 was issued. This purpose of this calculation was to quantify the magnitude of the force on the damper and determine whether the damper would remain in the full open position when the air density is at it maximum during a LOCA. In the calculation, the licensee applied the maximum density of 0.187 lb/ft^3 allowed by the fan vendor (American Air Filter) to determine the force that would be acting on the dampers. However, this value is not conservative as it is not the limiting value that should be used for minimizing the force acting on the dampers. A lower and more limiting density (0.173 lb/ft3) associated with the maximum LOCA condition density should have been used. A license analysis performed during the inspection, using the most limiting densities associated with the LOCA conditions, determined that a sufficient force would develop to fully open the dampers and allow the design flow rate. CRs 2007-27856 and 2007-28093 documented the design input errors in this analysis.

Engineering analysis of ICW pump performance tests:

The engineering analysis of the results of the ICW pump performance tests did not consider the full extent of uncertainty associated with the test instrumentation or the impact on pump flow values of the most limiting frequency allowed for the EDGs. The EDG frequency to determine flow values was 60 Hz while the Technical Specifications (TS) allow that value to be 2% lower. This could lower pump flow by 2% and discharge pressure by about 4%. During the inspection, the licensee quantified the effect of 2% under frequency to be 1305 gpm, and the effect of uncertainties associated test instrumentation to be 655 gpm. The tests of the 2A and 2C pumps occurred on 8/16/2007 and the test of the 2B pump occurred on 5/31/2007. The team reviewed the test results incorporating the instrument uncertainty and historic EDG under frequency values and determined the test results remained valid. The licensee addressed this issue in CR 2007-27879.

Engineering analysis for sizing the Unit 2 Vital Battery:

The values for worst case cell-to-cell and terminal connection resistance that were allowed by electrical maintenance procedures, were not included as design inputs in the battery sizing and voltage analysis as demonstrated by review of the Unit 2 125V DC System ETAP Model & Analysis, Calculation No. PSL-2FSE-05-003, Rev. 0, dated 3/31/06. The team concluded that the failure to consider the electrical maintenance procedure acceptance criteria limits for cell-to-cell and terminal connections, and for the jumper cable connection resistance acceptance criteria limits and the additional voltage reduction during cell jumpering, as design inputs resulted in calculated battery voltage conditions that were non-conservative. Based on preliminary calculations by the licensee, the design margin for battery 2B was found to be negative 0.014% (- 0.0157 volts) during 2-cell jumpering that was allowed under Procedure EMP-50.21. The licensee confirmed that cell jumpering had not been performed since the subject calculation was issued. The licensee addressed this issue in CR 2007-29985.

Analysis: The team concluded the failure to use the most limiting design input values in engineering analyses is a performance deficiency. The examples indicated an engineering practice of not using the most limiting parameters as design inputs in engineering analyses. During the inspection, the licensee performed analysis on the examples identified using the appropriate limiting design inputs and determined no loss of safety function resulted from the initial deficient analyses. The finding was greater than minor because if uncorrected it could impact the operability of safety related systems and would become a more significant safety concern. The team reviewed the finding using the Phase 1 SDP worksheet for mitigating systems and determined the finding was of very low safety significance (Green) because it was a design deficiency determined not to have resulted in the loss of safety function. No cross cutting aspect was identified for this finding. The following CRs address these examples: 2007-23984, 2007-27856, 2007-28093, 2007-29127, 2007-23473, 2007-27879, 2007-28789, and 2007-29985.

Enforcement: 10 CFR 50 Appendix B, Criterion III, Design Control, requires that measures shall be established to assure that the design basis for those structures, systems, and components (SSCs) to which Appendix B applies are correctly translated into specifications, drawings, procedures, and instructions. Contrary to the above, the design basis was not correctly translated into specifications, procedures and instructions for SSCs to which Appendix B applied. Specifically, engineering analyses for sizing of vital batteries, and containment cooling fans and test procedure acceptance criteria for CCW and ICW systems did not include appropriate design inputs to assure the design basis for these SSCs was implemented and maintained. The examples occurred over a period from 1983 to 2007. Because this issue was of very low safety significance and it was entered into the licensee's corrective action program (CR 2007-30456), it is being treated as an NCV, consistent with Section VI.A.1 of the NRC Enforcement Policy: NCV 05000335,389/2007006-02, Failure to Use the Most Limiting Design Inputs in Engineering Analyses - Several Examples.

.2.7 TCV 14-4A, -B, ICW to CCW HX Temperature Control Valves

a. Inspection Scope

The team reviewed the design basis documentation, drawings, valve vendor manual, and the UFSAR to identify the design and operational requirements for the valves which throttle ICW flow through the CCW HXs. The team reviewed test documentation to verify that valve performance ,related to throttled flow rates and valve positioning, was consistent with accident analysis assumptions. The vendor manual and documentation of preventive maintenance activities were reviewed to verify preventive maintenance inspection, actuator lubrication, and stem lubrication were consistent with vendor recommendations. Equipment history as indicated by corrective maintenance work orders and condition reports was reviewed to verify that identified equipment problems were adequately resolved.

b. Findings

Introduction: The team identified a finding of very low safety significance (Green) involving a NCV of 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, for inadequate corrective actions associated with degraded performance of the CCW heat exchanger temperature control valve (2-TCV 14-4A). The inadequate corrective actions contributed to the valve failure during the quarterly stroke time test on February 15, 2007.

Description: The licensee initiated 8 CRs between February 2005 and February 2007, related to TCV-14-4A equipment issues. Of these equipment issues several instances of stroke time failure were identified. The most recent occurrence of stroke time failure occurred on 11/15/2006 when the valve stroked in approximately 78 seconds exceeding its stroke time limit of 64.6 seconds. This failure was documented in CR 2006-33364, which performed an apparent cause evaluation of the stroke time failure. The conclusion of that evaluation was that the apparent cause of the high measured stroke time was increased valve, actuator, or tube friction due to degradation. However, based on Flowscan diagnostic testing at that time, the valve margins under design basis conditions were determined to be acceptable by the licensee. Because it was believed that valve margins were acceptable the licensee took no immediate corrective actions. Instead, the licensee determined that the valve would be disassembled and inspected when it was to be removed during the next Unit 2 outage which was to occur in the fall of 2007.

During the quarterly stroke time test on 2/15/2007, valve TCV 14-4A stalled at 58 percent open. The design basis function of this valve is to fully open to allow sufficient flow to provide reactor and containment heat removal following an accident. A repeat stroke time test was performed within hours of the original failure in which the valve stalled at 6 percent open. The valve was stroke a third time in which it completed its stroke, with a time well over the stroke time limit.

Prior to making any repairs on valve 2-TCV 14-4A, the licensee performed a Flowscan diagnostic test. The test concluded that there was a continuing degrading trend in the performance of TCV-14-4A and that the degradation could be in the actuator or the torque tube of the valve. Additionally, the Flowscan results also indicated that the valve had acceptable positive margin under design basis conditions. However, it is recognized that the valve failed to fully open during the 2/15/2007 stroke time test, which was preformed under near design basis conditions.

After diagnostic testing the licensee installed a stem clamp to hold the valve in the open position, and the actuator and torque tube were removed and overhauled under WO 37002996. Post-overhaul flow scan tests were performed on the actuator, and the results showed a decrease in actuator friction. An as left stoke time test was performed and the measured stroke time was 48.37 seconds.

NRC inspectors questioned CCW system operability with 2-TCV 14-4A stalled open at 58%. The licensee performed and evaluation which concluded that 2-TCV 14-4A would reduce ICW system temperature margin by .243°F while being stalled at 58% open. Based on this evaluation the licensee determined that the CCW systems would have met their design basis requirements to remove accident heat loads with 2-TCV 14-4A stalled 58 percent open.

<u>Analysis</u>: The failure to take appropriate corrective actions associated with degraded performance of 2-TCV 14-4A is a performance deficiency associated with the Mitigating Systems cornerstone. The finding is greater than minor because it is associated with the Mitigating Systems cornerstone attribute of equipment performance and affects the cornerstones objective of ensuring the availability, reliability, and operability of the ICW system. The team reviewed the finding using the Phase 1 SDP worksheet for mitigating

systems and determined the finding was of very low significance (Green) because there was no loss of system safety function. Analysis performed by the licensee during the inspection, CDBI tracking number 0700194 response dated 9/19/2007, determined that at 58 percent open the ICW was capable of removing the design base accident heat load. This finding has a cross cutting aspect in the area of Problem Identification and Resolution, specifically Corrective Action Program, because the licensee failed to take appropriate corrective actions to address safety issues and adverse trends in a timely manner, commensurate with their safety significance (MC 0305 aspect P.1(d)).

Enforcement: 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, states, in part, that measures shall be established and implemented to assure that conditions adverse to quality such as failures, malfunctions, and deficiencies, are promptly identified and corrected. Contrary to the above, measures were not implemented to assure conditions adverse to quality were promptly identified and corrected, in that on February 15, 2007, a failure malfunction occurred on 2-TCV 14-4A, following degraded conditions which were identified in 2005 and 2006. Because this failure to comply with 10 CFR 50, Appendix B, Criterion XVI, Corrective Action, is of very low safety significance and has been entered into the licensee's corrective actions program, CR 2007-28776, this violation is being identified as an NCV, consistent with Section VI.A. of the NRC Enforcement Policy: NCV 05000335,389/2007006-03, Inadequate Corrective Action Associated with Degraded Performance of the CCW Heat Exchanger Temperature Control Valve (2-TCV 14-4A).

.2.8 MOV-V3659, High Pressure Safety Injection (HPSI) Pump Discharge to Refueling Water Tank (RWT)

a. Inspection Scope

The team reviewed the design basis documentation, drawings, valve vendor manual, and the UFSAR to identify the design and operational requirements for the valve which allows an HPSI pump minimum recirculation flow path to the RWT. The team reviewed the motor operated valve (MOV) mechanical analysis calculation for the valve to verify that the design bases, system pressure conditions, and degraded voltage conditions were used in developing and translating diagnostic setup requirements and acceptance criteria into the MOV diagnostic test. The team reviewed the minimum required and the maximum allowable thrust and torque as well as stall torque. Maintenance documentation was reviewed to verify that MOVs were periodically tested and that appropriate torque switch settings were maintained. Equipment history as indicated by corrective maintenance work orders and condition reports was reviewed to verify that identified equipment problems were adequately resolved.

b. Findings

No findings of significance were identified.

.2.9 SS-21-1A, 1B, CCW Hx Strainer for ICW inlet

a. Inspection Scope

The team reviewed the design basis documentation, drawings, valve vendor manual, and the UFSAR to identify the design and operational requirements for the strainers in the ICW supply line upstream of the CCW HXs. The team reviewed the potential impact of the recently modified strainers on system flow balance and reliability of ICW flow to the heat exchangers. Equipment history as indicated by corrective maintenance work orders and condition reports was reviewed to verify that identified equipment problems were adequately resolved. A field walkdown was performed to assess the observable material conditions of the strainers.

b. Findings

No findings of significance were identified.

2.10 Emergency Core Cooling Systems (ECCS) Suction Swapover MOVs (RWT to Containment Sump)

a. Inspection Scope

The team reviewed the design basis documentation, drawings, valve vendor manual, and the UFSAR to identify the design and operational requirements for the ECCS suction swapover valves (MV-0701A, 1B, 2B,2A, MOV RWT to LPSI, HPSI, Containment Spray Pumps). The team reviewed the MOV mechanical analysis calculation for the valves to verify that the design bases, system pressure conditions, and degraded voltage conditions were used in developing and translating diagnostic setup requirements and acceptance criteria into the MOV diagnostic test. The team reviewed the minimum required and the maximum allowable thrust and torque as well as stall torque. The vendor manual and documentation of preventive maintenance activities were reviewed to verify preventive maintenance inspection, actuator lubrication, and stem lubrication were consistent with vendor recommendations. Maintenance documentation was reviewed to verify that MOVs were periodically tested and that appropriate torque switch settings were maintained. Equipment history as indicated by corrective maintenance work orders and condition reports was reviewed to verify that identified equipment problems were adequately resolved.

b. Findings

No findings of significance were identified.

.2.11 MOV HCV-3657 (Control Valve for LPSI HX Outlet Crosstie to LPSI Discharge Header)

a. Inspection Scope

The team reviewed Shutdown Cooling Heat Exchanger and LPSI design basis documentation, the UFSAR, and plant drawings to identify the design basis requirements for the LPSI HX outlet crosstie MOV. The team reviewed the testing, inspection, and corrective action history of MOV HCV-3657 and its associated piping to verify the design basis has been maintained. Test procedures and results were reviewed to verify acceptance criteria were consistent with the design bases and the component safety function was maintained. Preventative maintenance and corrective actions were reviewed to confirm potential degradation was being monitored and identified equipment problems were corrected. The team conducted a field walkdown to assess the observable material conditions.

b. Findings

No findings of significance were identified.

.2.12 LPSI Pumps

a. Inspection Scope

The team reviewed the design basis documentation, pump vendor manual and related vendor correspondence, drawings, and the UFSAR to identify design, maintenance, and operational requirements related to pump flow and developed head, achieved system flow, NPSH, vortex formation and prevention, minimum flow requirements, and runout protection. These requirements were reviewed for pump operation for shutdown cooling during mid-loop operation. Design calculations as well as documentation of in-service, periodic surveillance tests, and flow balances were reviewed to verify that design performance requirements were met. Additionally, the team reviewed the potential impact of allowed reduced EDG frequency on pump performance for normal and accident operation.

The team reviewed the adequacy, reliability, and availability of the power supply to the pumps in normal and degraded voltage conditions. This review included review of motor specifications, vendor manual requirements, cable specifications, and breaker specifications. Corrective action documents were also reviewed to assess potential degradation in the energy supply. A walk-down of the motor and pump was done to assess the physical condition of the motor and verify that the system configuration was consistent with the design basis assumptions, system operating procedures, and plant drawings.

b. Findings

No findings of significance were identied.

.2.13 120V AC Instrument Bus, 1MA-1A, 1MA-1B

a. Inspection Scope

The team reviewed the DBD, drawings, and the UFSAR to identify the safety function of the 120 VAC instrumentation distribution bus and supporting equipment. The vendor manuals and industry operations experience information were reviewed to identify manufacturer recommendations and industry identified problems. Support equipment included inverters, isolation transformers, and circuit breakers. Procurement documentation for replacement parts was reviewed to verify the quality of replacement was consistent with procurement specification and safety system quality requirements. The inverter loading and inverter interlocks with the back up power supply were reviewed. Field walkdowns were performed to assess observable material conditions and to verify the system alignment was consistent with drawings and the system operating procedure. The equipment history as indicated by condition reports, corrective maintenance work orders, and system health reports was reviewed to verify that identified equipment problems were appropriately resolved.

b. Findings

No findings of significance were identified.

.2.14 120/208V Power Distribution - Power Panes (PP) -101, 102, 102A, 111, 112, 202, 211, 212, 246, 247, 250, 251, 268, 269

a. Inspection Scope

The team reviewed Class 1E power panel drawings and sizing analysis to determine the required capacity and vendor equipment ratings for the 120/208V Power Distribution components. The voltage drop calculation was reviewed to determine the minimum voltage available at MCC 1A-6, 1B-6, 1A-7, 1B-7, 2A-6, 2B-6, 2A-7, 2B-7, 2A-8, and the 2B-8 bus during degraded voltage conditions. The vendor documentation was reviewed to determine the adequacy of system breaker interrupting capability. Equipment history, as indicated by preventive maintenance documentation, corrective work orders, and condition reports, was reviewed to verify that identified equipment problems were resolved and equipment degradation was monitored. A field walk down was performed to verify the installation was consistent with vendor recommendations, nameplate data indicated the equipment was consistent with design requirements, assess the observable material condition, and assess potential adverse conditions or equipment hazards .

b. Findings

No findings of significance were identified.

.2.15 125 VDC Vital Batteries 2A, 2B

a. Inspection Scope

The team reviewed the design basis documentation and UFSAR to identify the loading requirements for the vital batteries. The team reviewed the inputs to the battery sizing analysis and the battery voltage study, TS and maintenance allowable terminal load resistance, and panel load schedules to verify the adequate sizing of the battery. The battery voltage study was reviewed to verify adequate voltage was available to critical components. The vendor manual was reviewed to verify battery installation and operating instructions were implemented. Battery TS surveillance test and inspection results were reviewed to verify degradation was identified and anomalies were addressed and corrected. The equipment history as indicated by corrective work orders and condition reports was reviewed to verify that identified equipment problems were corrected. Modification history was reviewed to identify changes to the battery/charger system and potential effect on the design basis for the battery. A field walkdown was performed to assess observable material conditions of the batteries.

b. Findings

No findings of significance were identified.

.2.16 Reactor Vessel Level Instrumentation Used During Shutdown/Mid-loop Operations

a. Inspection Scope

The design basis documentation and the UFSAR were reviewed to identify the safety function of reactor coolant system level standpipe system, including the associated level transmitter, instrumentation, and alarm. The team reviewed related design basis information, reactor coolant system drawings, standpipe system drawings, relative elevations, procedures, and calibration documentation as well as the calculation of reactor coolant system water level gradients at mid-loop conditions to verify that the use of standpipe readings (control room instrumentation and physical local standpipe readings) incorporates the level gradient or differential between the pressure transmitter tap from the reactor coolant system and the standpipe connection to the reactor coolant system. The team also reviewed the calibration procedures for the various sensing and signal processing components that were installed in the system to verify that instrument uncertainty had been included.

b. Findings

No findings of significance were identified.

.2.17 Temperature Indicator Controller for CCW HX Outlet TIC-14-4A, 4B

a. Inspection Scope

The team reviewed the CCW and ICW design basis documentation, UFSAR, and instrument diagrams to identify temperature monitoring and performance requirements associated with the CCW outlet temperature indication and control instrumentation. The vendor manuals were reviewed to identify equipment performance specifications and installation recommendations. The power supply was reviewed to verify power was available for all plant conditions requiring use of the temperature controller for CCW HX operation. The calibration documentation was reviewed to verify that the instrumentation was maintained in accordance with vendor recommendations and design requirements.

b. Findings

No findings of significance were identified.

.3 Review of Low Margin Operator Actions

a. Inspection Scope

The team performed a margin assessment and detailed review of a sample of risk significant and time critical operator actions (TCOAs). Where possible, margins were determined by the review of the assumed design basis and UFSAR response times and performance times documented by job performance measure (JPM) results within operator time critical task verification tests. For the selected operator actions, the team performed a walk through of associated Emergency Operating Procedures (EOPs), Off-Normal Operating Procedures (ONPs), Annunciator Response Procedures (ARPs), and other operations procedures with appropriate plant operators and engineers to assess operator knowledge level, adequacy of procedures, availability of special equipment when required, and the conditions under which the procedures would be performed. Detailed reviews were also conducted with risk assessment engineers, engineering safety analysts, training department leadership, and through observation and utilization of a simulator training period to further understand and assess the procedural rationale and approach to meeting the design basis and UFSAR response and performance times. Operator actions in response to the following events were reviewed:

- Align 1A instrument air compressor after Loss of Offsite Power
- Mid loop operations – include shut down cooling (SDC) leak/loss of SDC
- Manual swap-over to containment sump if auto swap fails
- Tripping of reactor coolant pumps due to loss of CCW
- Cross-connect 4KV vital bus due to station blackout (SBO)

b. Findings:

URI 1: Compliance with 10 CFR 50.63, SBO Rule Unit 1

During the review of the operator actions and procedure to cross-connect the 4KV vital bus between units, the team identified licensee issues regarding compliance with 10 CFR 50.63, SBO Rule, for Unit 1. In particular, questions were raised regarding the SBO rule requirement to verify by testing the capability to restore AC power to Unit 1 within 10 minutes of a SBO or perform a coping analysis if the time to restore AC power exceeded 10 minutes. Unit 1 coping strategy for SBO was to restore AC power in 10 minutes. Unit 2 SBO coping strategy was as a 4 hour coping plant.

The licensee’s Unit 1 response to the SBO rule, and subsequently accepted by the NRC in the SER, dated 9/12/1991, stated the coping strategy for Unit 1 SBO was to provide alternate AC (AAC) source within 10 minutes of the SBO event. The AAC was to be provided by a modification to install hardware between the Unit 1 and Unit 2 vital buses.

The hardware was installed; however, there was no testing documented to verify the 10 minute restoration of AC power capability. On 9/7/1993, the licensee amended the UFSAR to state that the AAC would be provided in 25 minutes. The applicable operations procedures and JPM performance times in 2006 and 2007 reflect this 25 minute restoration time. The SBO rule [10 CFR 50.63(c)(2)] required AAC plants to perform a coping analysis to address how the plant would cope without AC power for one hour if AC power could not be restored in 10 minutes. No coping analysis was performed initially nor after the 25 minute time was amended to the UFSAR.

During the inspection, the licensee provided technical information to demonstrate that Unit 1 could adequately respond to an SBO event, maintaining the reactor core cooled and maintaining containment integrity, success criteria for SBO in 10 CFR 50.63, during the 25 minutes it takes to restore AC power to the Unit. Additionally, the team observed an SBO scenario on the plant simulator and noted that reactor core cooling and containment integrity were not challenged in the time taken to restore AC power. The team concluded there was no apparent immediate safety issue associated with this non-compliance with the SBO Rule.

Not withstanding, this issue is unresolved pending licensee actions to verify compliance with 10 CFR 50.63. This would include any of the following actions:

1. Verify by testing the 10 minutes restoration of AC power capability.
2. Performance and submission to the NRC of the required coping analysis if AC recovery cannot be verified to occur in 10 minutes.

This item is identified as URI 05000335/2007006-04, Unit 1 Compliance with the Requirements of 10 CFR 50.63, SBO Rule.

URI 2: Lack of Periodic Testing of SBO AAC Recovery Equipment

An unresolved item was identified related to the need for periodic testing of equipment used to restore AC power to Unit 1 on SBO. The equipment used to restore AC included 4 KV breakers on each cross-tie bus and the underground 4 KV cable which connects the Unit 1 and Unit 2 buses. The team noted that the underground 4 KV cable used to cross connect the vital buses was not inspected or tested since the installation in 1993. The breakers are mechanically cycled periodically. However, the entire equipment circuit to accomplish the cross connect has not been verified to function as an energized circuit since the initial installation. This item is unresolved pending:

1. Licensee development of an appropriate periodic test for the AAC equipment at rated SBO loading capacity
2. The performance of the test described above and submission of results to the NRC RII office for review.

The lack of periodic testing of the equipment required for restoration of AC power is identified as URI 05000335,389/2007006-05.: Lack of Periodic Testing of SBO AAC Recovery Equipment.

.4 Review of Industry Operating Experience

a. Inspection Scope

The team reviewed selected operating experience issues that had occurred at domestic and foreign nuclear facilities for applicability at the St. Lucie Nuclear Plant. The team performed an independent applicability review and issues that appeared to be applicable to the St. Lucie Nuclear Plant were selected for a detailed review. The issues that received a detailed review by the team included:

- GL 88-17, Loss of Decay Heat Removal (non power operations)
- NRC IN 2007-06, Potential Common Cause Vulnerabilities in Essential Service Water Systems as applied to sample HXs
- Low EDG Frequency - impact on SR pumps
- GL 89-10 as applied to sample MOVs
- Generic Letter 89-13 Service Water System Problems Affecting safety Related Equipment - related to ICW/CCW HX

b. Findings

No findings of significance were identified.

.5 Review of Permanent Plant Modifications

a. Inspection Scope

The team reviewed two modifications related to the selected risk significant components in detail to verify that the design bases, licensing bases, and performance capability of the components have not been degraded through modifications. The adequacy of design and post modification testing of these modifications was reviewed by performing activities identified in IP 71111.17, Permanent Plant Modifications, Section 02.02.a. Additionally, the team reviewed the modifications in accordance IP 71111.02, Evaluations of Changes, Tests, or Experiments, to verify the licensee had appropriately

evaluated them for 10 CFR 50.59 applicability. The following modifications were reviewed:

PCM 6145	Automatically Load Electrical Equipment Room Exhaust Fans onto EDG, Rev. 0
PCM 2025	ICW Strainer Replacement, Rev. 1

b. Findings

No findings of significance were identified.

4. OTHER ACTIVITIES

4AO6 Meetings, Including Exit

Exit Meeting Summary

On September 28, 2007, the team presented the inspection results to Mr. Johnston, site vice president, and other members of the licensee staff. The team returned all proprietary information examined to the licensee. No proprietary information is documented in the report.

SUPPLEMENTAL INFORMATION

KEY POINTS OF CONTACT

Licensee

D. Checcett, Licensing
T. Cosgrove, Engineering Manager
C. Costanzo, Plant General Manager
K. Frehafer, Licensing Engineer
G. Johnston, Site Vice President
W. Parks, Operations Manager
T. Patterson, Licensing Manager
J. Phillabaum, Engineer
B. Smith, Training
G. Swider, Systems Engineering Manager
C. Wasik, Engineering Manager

NRC

B. Desai, Chief, Engineering Branch 1, RII
K. Kennedy, Deputy Director Division of Reactor Safety, RII
S. Sanchez, Resident Inpsector

ITEMS OPENED, CLOSED, AND DISCUSSED

Open/Closed

05000335, 389/2007006-01	NCV	Inadequate Procedure for Verification of ICW Operability. (Section 1R21.2.2)
05000335, 389/2007006-02	NCV	Failure to Use the Most Limiting Design Inputs in Engineering Analyses - Several Examples. (Section 1R21.2.6)
05000335, 389/2007006-03	NCV	Inadequate Corrective Action Associated with Degraded Performance of the CCW Heat Exchanger Temperature Control Valve (2-TCV 14-4A).(Section 1R21.2.7)

Open

05000335,389/2007006-04	URI	Unit 1 Compliance with Failure to Comply with the Requirements of the 10 CFR 50.63, SBO Rule (Section 1R21.3)
05000335,389/2007006-05	URI	Lack of Periodic Testing of SBO AAC Recovery Equipment (Section 1R21.3)

DOCUMENTS REVIEWED

Calculations

PSL-2FSM-04-019, ICW Performance Curves with 23% of SG Tubes Plugged, Rev. 2
PSL-2FSM-00-004, ICW Performance Curves, Rev. 3
PSL-2FSM-97-029, Containment Fan Coolers dampers Opening Force vs Air Density, Rev. 0
MECH-0081, CFC Heat Transfer Analysis for Design Basis Accident with LOOP, Rev. 2
PSL-2FSM-99-013, Plant calculations for Hx application, Rev. 0
L-MECH-CALC-017, Evaluation of the Calculations Made by Florida Power and Light for the Minimum and Maximum Torque Requirements of the Butterfly Motor Operated Valves in the Generic Letter 89-10 Program at St. Lucie Unit 2, Rev. 14
PSL-2-J-E-90-003, GL 89-10 MOV Cable Voltage Drop, St. Lucie Unit 2, Rev. 8
PSL-1-F-J-E-90-0013, St. Lucie Unit 1 EDG 1A and 1B Electrical Loads, Rev. 5
PSL-1-F-J-E-91-002, Instrument Inverters 1A, 1B, 1C, & 1D AC Output Loading, Rev. 4, 5/06
PSL-2FSE-05-003, Unit 2 125V DC System ETAP Model & Analysis, Rev.0
PSL-BFJE-91-003, Minimum Cells Required For 125V Class 1E Batteries, Rev. 0
PSL-1FJM-90-040, PSL-1 Emergency Diesel Generator Building Room Temperature for Operating Conditions, Rev. 1
PSL-1-F-J-E-90-0013, St. Lucie Unit 1 Emergency Diesel Generator 1A and 1B Electrical Loads, Rev. 5
PSL-ENG-SEES-00-124, Unit 1 EDG Support for Unit 2 Station Blackout Loads, Rev. 0
PSL-1-F-J-E-90-007, Emergency Diesel Generator 1A & 1B - 120/208 VAC Power Panel & 480 Volt Power Panel Load Study, Rev. 3
PSL-2-F-J-E-90-010, Emergency Diesel Generator 2A & 2B - 120/208 VAC Power Panel & 480 Volt Power Panel Load Study, Rev. 4
PSL-2FSE-03-011, St. Lucie - Unit 2 Short Circuit, Voltage Drop and PSB-1 Analysis, Rev. 0
PSL-2FJI-90-002, Determination of the Low Level Alarm Setpoint Recommended by NRC Generic Letter 88-17 for Reactor Vessel Level Instrumentation During Reduced Inventory Operation, Rev. 0
PSL-2FSM-00-001, Unit 2 Shutdown Cooling System Mid-Loop Flow and RCS Level Limits, Rev. 0
PSL-2FJI-00-001, ICW & CCW System Operability Determination - Instrument Uncertainty Calculation St. Lucie Unit 2, Rev. 2
EC-192, MOV TOL Heater Selection Calculation, Rev. 2
Calculation 02109-C-019, AOV Program Unit 2 TCV-14-4-4A/4B Valve Actuator Capability
PSE-2FSE-03-011, Pump Starting Voltages, Rev. 0
PSL-2FSM-00-001, Unit 2 SDC System Mid-Loop Flow and RCS Level Limits, 7/20/07

Operating Procedures

2-OSP-21.03, Shiftly Intake Cooling Water Loop Operability, Rev. 1
1-NOP-14.02, Component Cooling Water System Operation, Rev. 9
2-SOP-25.02, Containment Fan Cooler Monthly Operability Run, Rev. 2
2-0400050, Periodic Test of the Engineered Safety Features, Rev. 51
OP 1-0410020, HPSI/LPSI – Normal Operation, Rev. 62A
OP 1-0360030, Operational Requirments for the Emergency Cooling Water Canal, Rev. 8
1-EOP-99, Appendices/Figures/Tables/Data Sheets for Recirculation Actuation, Rev. 38
2-EOP-99, Appendices/Figures/Tables/Data Sheets for Recirculation Actuation, Rev. 33

1-1010020, Instrument Air System Operation, Rev. 49A
1-1300057, Instrument Air Accummulator Tests, Rev. 10
1-ARP-01-F5, Annunciator Response Procedure, Rev. 1
1-1010030, Loss of Instrument Air, Rev. 32A
1-EOP-99, Appendices / Figures / Tables / Data Sheets, Rev. 38
1-ARP-01-S45, Annunciator Response Procedure, Rev. 0A
2-EOP-10, Station Blackout, Rev. 17
2-0120034, Reactor Coolant Pump, Rev. 32A
2-ARP-01-S46, Annunciator Response Procedure, Rev. 1
2-0440030, Shutdown Cooling Off-Normal, Rev. 45
2-EOP-99, Appendices / Figures / Tables / Data Sheets, Rev. 33
2-EOP-03, Loss of Coolant Accident, Rev. 24
2-ONP-01.04, Plant Condition 4 Shutdown Cooling In Operation – Reduced Inventory Operations, Rev. 23
2-1010030, Loss of Instrument Air, Rev. 24
2-1010020, Instrument Air System Operation, Rev. 43
2-ARP-01-F5, Annunciator Response Procedure, Rev. 1
2-ARP-01-A20, Annunciator Response Procedure Panel A Window 20, Rev. 0A
2-ARP-01-A30, Annunciator Response Procedure Panel A Window 30, Rev. 0A
2-ARP-01-B30, Annunciator Response Procedure Panel B Window 20, Rev. 0
2-ARP-01-B30, Annunciator Response Procedure Panel B Window 30, Rev. 0
2-NOP-01.04, RCS Reduced Inventory and Mid-LOOP Operation, Rev. 27
2-EOP-99, Appendices / Figures / Data Sheets, Rev. 33

Operations Training Related Documents

JPM 0821068, Align Emergency Cooling Water to the 1A Instrument Air Compressor and Start, Rev. 14
JPM 0821019T, Restore CCW and CBO to the RCPs – Unit 2, Rev. 10
JPM0821026B, Manually Initiate RAS – Unit 2, Rev. 7
JPM 0821129T Restore Power to 2A3 Bus via SBO Cross-Tie, Rev. 6
Simulator Exercise Guide 0814240, Electrical Emergencies, Rev. 6
Simulator Exercise Guide 0815007, Station Blackout, Rev. 9
Simulator Exercise Guide 0814075, SPTAs and Contingencies Practices, Rev. 6

Procedures

ADM-78.01, Post Maintenance Testing, Rev. 27
2-2000081, Preoperational Test Procedure, Containment Ventilation System Functional Test, Rev. 0
2-GOP-504, Reactor Plant Heatup – Mode 5 to Mode 4, Rev. 27
OSP-37.01, Emergency Cooling Water Canal – Periodic Test, Rev. 1
OP 1-0010141, Big Mud Creek Surveillance, Rev. 28B
EMP-80.05, Post Maintenance Testing of Limitorque Motor Operated Valves, Rev. 5D
St. Lucie Plant Electrical Maintenance Procedure EMP-80.11, Votes Testing of Globe and Gate Valves, Revision 8, 12/08/04
St. Lucie Plant Electrical Maintenance Procedure EMP-80.12, Votes Differential Pressure Testing of Motor Operated Valves, Revision 1B, 5/20/02

St. Lucie Plant Electrical Maintenance Procedure EMP-80.16, Votes Testing of Globe and Gate Valves, Revision 1, 1/12/07
St. Lucie Plant Electrical Maintenance Procedure EMP-80.06, Preventive Maintenance of Non-Environmentally Qualified Limitorque Motor Operated Valve Actuators, Revision 11, 12/30/04
St. Lucie Plant Electrical Maintenance Procedure EMP-100.01, Maintenance of Thermal Overload Devices, Revision 13A, 2/2/06
EMP-52.01, Periodic Maintenance of 4160V Switchgear, Rev. 22, 10/06
EMP-52.06, Periodic Maintenance of SF6 Switchgear Breakers, Rev. 4, 9/05
1-PTP-23, Bus 1A3 SF6 Breakers Pre-Operational Testing, Rev. 0, 10/05
1-0970020, Operation of the 120V Instrument AC System (Class 1E), Rev. 19B, 7/07
1-ARP-01-A43, Annunciator Response Procedure, Rev. 2
1-0970030, 120V Instrument AC System (Class 1E), Rev. 12B, 7/06
1-EMP-49.02, 120VAC Instrument Bus Inverter and Isolimiter Maintenance and Component Replacement, Rev. 5, 4/07
ADM-11.09, Emergency and Off-Normal Operating Procedure Writer's Guide, Rev. 4A
Combustion Engineering, Emergency Procedure Guidelines, Rev. 03
Plant Specified Technical Guidelines, 2-EOP-03 Loss of Coolant Accident, Rev. 24
ADM-09.14, Reduced Inventory / Mid-LOOP Controls, Rev.1
IMP-80.01, Fisher Flowscanner Operation, Rev. 3
ADM-29.02, ASME Code Testing of Pumps and Valves, Rev. 7
OP-2-0010125A, Schedule of Periodic Tests, Checks and Calibrations, Rev. 87
GMP-47, Verification of AOV Setup and Margin, Rev. 1
2-OSP-03.06A, Flow, Head, Vibration, Leak Check, Rev. 0
2-NOP-01.04, RCS Reduced Inventory and Mid-Loop Operation, Rev. 2

Vendor Manuals

NESE 400, Instruction Manual of the Containment Fan Coolers, Rev. 2
2998-8304, Instruction Manual of the Unit 2 Containment Fan Coolers, Rev. 5
FLO 2998.114A, Emergency Cooling Water Barrier Wall Valves, Rev. 2
13172 PE 718, Motor Operated Valve Specifications, Rev. 05
13172-PE-301, Shutdown Cooling Heat Exchanger Specifications, Rev. 01
Vendor Manual 2998-18792, Limitorque Valve Controls, Instructions and Maintenance Manual, Revision 3, 8/18/98
Vendor Manual 2998-18793, Limitorque Model SMB-000 Valve Actuator Tech Repair Guidelines, 5/24/90
Vendor Manual 2998-18794, Limitorque Model SMB-00 Valve Actuator Tech Repair Guidelines, Revision 0, 5/24/90
8770-11334, Inverter 7.5kVA Instruction and Operating Manual, Rev. 5, 8/07
2998-6165, LPSI Pump Motor, Rev. 4, 4/96
2998-8647, Instruction Manual for 125 VDC Batteries and Chargers, Rev. 12

Design Changes/Modifications

Modification Design Package 085-285, ICW Pump Expansion Joint Replacement, 12/3/1985
TSA #1-07-012, Modification for N_2 Assistance for Actuating Big Mud Creek Valves SB-37-1,2
PCM 06145, Unit 1 Auto Load EER Exhaust Fans onto EDG, Rev. 0

PC/M 89 290 Station Blackout Unit 1 / 2 Cross-Tie
PC/M 140-292, CCW Heat Exchanger Temperature Control Valve Minimum Stop Setpoint, Rev. 0
PC/M 02025, ICW strainer Replacement, Rev. 1

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2007-28391, Specific parameter limits for Unit 2 ICW performance curves in response to NRC CDBI questions
1997-2129, Low flow of HVS-1D locked and cleared after one hour
2007-23984, EPRI Service water heat exchanger testing and guidelines course
CR 2005-9167 Shutdown Cooling Heat Exchanger Dry Boric Acid at Bottom of Bell Flange (03/30/2005)
CR 2005-9320 Failure of Condition Report Initiation for Dry Boric Acid Leakage (03/31/2005)
CR 2005-28326 Unlogged Entry into Tech. Spec. Limiting Condition for Operation for Shutdown Cooling During FCV-3306 Testing (10/17/2005)
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CR 2007-20688 SB-37-2 Failed Surveillance and Valve was Declared Out-Of-Service
CR 2005-29682 Root Cause Analysis of 1A Shutdown Cooling Heat Exchanger Tube Leak Resulting in Component Cooling Water System Contamination (3/20/06)
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CR 2005-22486 2-TVC-14-4A, High running loads
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CR 2007-4626 2-TCV-14-4A, Valve stalled at 58% open

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35003036, MV-07-1A Work Request
35003037, MV-07-1B Work Request
34001801, MV-07-2A Work Request
36003840, MV-07-2B Work Request
3401417901, V3659 Work Order Task
3401412301, V3659 Work Order Task
3501799601, V3660 Work Order Task
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35002749, 4.16kV SWGR: Replace Bkr, 11/05
35001988, Isolimiter 1A Inspection, 5/05
35003688, Isolimiter 1B Inspection, 5/05
32004540, STC Inverter 1A: PM, 3/02
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36023503 01, TS/125V Battery 2A Quarterly PM, 2/14/07
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33005802-01, TS/125V Batt 2A: Perform Discharge Test, 5/10/03
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35019509 01, TS/125V Batt 2B: Perform Discharge Test, 6/12/06
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Drawings

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2998-G-173, Yard Piping Sheet No. 4, Rev. 21
2998-G-077, General Arrangement, Intake Structure Plan and Sections, Rev. 7
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2998-G-078 SH 130B, LPSI Mechanical Line Diagram, Rev. 28
8770-G-332, 480V Miscellaneous, 125V DC and Vital AC One Line, Rev. 23, 4/04
2998-G-078, Flow Diagram Safety Injection System, Sheet 130, 12
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8770-G-085, Flow Diagram Instrument Air System, Sheet 4, Rev. 26
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8770-G-089, Flow Diagram Turbine Cooling Water System, Sheet 2, Rev. 20
2887-G-272A, Combined Main and Auxiliary One Line Diagram, St. Lucie Plant Unit 1 and 2, Rev. 9
2998-G-272, Main One Line Diagram St. Lucie Unit 2, Rev. 20
2998-G-275. Sh. 1, 125 V DC Panels One Line Diagram Bus 2A & 2AA, Rev. 8
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8770-B-335, Sh. 53, 120/208V PP-101 Power Panel, Rev. 18
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2998-B-335, Sh. 59D, 120/208V PP-212 Power Panel, Rev. 5

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Design Basis Documents

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DBD-ICW-1 Vol. 1, Section 9.N.1, Unit 2 Intake Cooling Water System – System Interfaces, Rev. 2
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Miscellaneous Documents

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-014, Maintenance Specification for Valves, Rev. 3
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HCV-3657 Stroke Test Results
FPL Integrated Equipment Reliability Strategy Background Information Document for Motor Operated Valves, Revision 0, 1/26/07
CR 2007-98, Engineering Disposition for IN2006-31, 2/1/2007
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PSD Report No. 6912-783-005, Unit #1 Backfit Program Emergency Diesel Generator Loading Profile Study, BFI 53-13, 7/15/83
Ebasco letter dated 12/14/78, Intake Cooling Water Evaluation.
St. Lucie Unit 1, Intake Cooling Water System Surge
Stroke Time Trends for MV-07-1A/1B, MV-07-2A/2B
PSL-ENG-SEMS-99-064, Review of Unit 2 SDC System Operation, Rev. 1

CRs initiated or revised due to CDBI activity:

2007-23473	Impact of EDG frequency tolerance on plant equipment.
2007-26340	EDG normal/isolate switches, procedure-name tag discrepancy
2007-27048	Incorrect safety classification of a DBD function for Valve 2-TCV 14-4A
2007-27879	Deficiencies with CCW HX test performed in April 2007
2007-27856	Most limiting design input (density) not used in CFC fan pre-op test
2007-28093	Unit 2 CFC fans test deficiency related to damper not opening fully
2007-28265	Unit 2 EDG SBO load evaluation used incorrect design inputs. Results not translated into operating procedure - unnecessary derating of EDGs due to ambient temperature
2007-28276	Minor deficiencies in EOPs
2007-28391	Parameter limits for ICW operability performance curves
2007-28746	Apparent non-compliance with 10 CFR 50.63, SBO Rule
2007-28776	Inadequate corrective action on TCV 14-4A
2007-28789	Revise calc. PSL-2FSE-05-003 to incorporate battery intercell resistance
2007-29127	CFC fan power requirements do not address off-normal design conditions
2007-29544	Incorrect calibration of TIC 14-4A
2007-29985	Calc to support jumpering of 2 vital battery cells does not include design input for cell resistance
2007-30456	Most limiting parameters not used as design input in engineering analyses
2007-30477	Electrical panel PP-202 CKT # 44 door found open
2007-30529	Testing on SBO 4 Kv cable not performed since 1993.