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SUBJECT: Application for amend to License NPF-16,modifying Surveillance Requirement 4.9.8.1 & 4.9.8.2 to allow reduction in required min shutdown cooling flow rate under certain conditions during operational Mode 6.

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Florida Power & Light Company, P.O. Box 128, Fort Pierce, FL 34954-0128

February 27, 1995

L-95-042
10 CFR 50.90

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

Re: St. Lucie Unit 2
Docket No. 50-389
Proposed License Amendment
SDCS Minimum Flow Rate Requirements

Pursuant to 10 CFR 50.90, Florida Power & Light Company (FPL) requests to amend Facility Operating License NPF-16 for St. Lucie Unit 2 by incorporating the attached Technical Specifications (TS) revisions. The amendment will modify surveillance requirement(SR) 4.9.8.1 and 4.9.8.2 to allow a reduction in the required minimum shutdown cooling flow rate under certain conditions during operational MODE 6. In addition, the format of the SR will be changed to clarify the intent of the stated surveillances.

It is requested that the proposed amendment, if approved, be issued by September 1, 1995, prior to the next scheduled refueling outage.

Attachment 1 is an evaluation of the proposed TS changes. Attachment 2 is the "Determination of No Significant Hazards Consideration." Attachment 3 contains a copy of the appropriate TS pages marked-up to show the proposed changes.

The proposed amendment has been reviewed by the St. Lucie Facility Review Group and the Florida Power & Light Company Nuclear Review Board. In accordance with 10 CFR 50.91 (b)(1), a copy of the proposed amendment is being forwarded to the State Designee for the State of Florida.

Please contact us if there are any questions about this submittal.

Very truly yours,

D. A. Sager
Vice President
St. Lucie Plant

DAS/RLD

Attachments
cc: See next page

A001
1/1

cc: Stewart D. Ebneter, Regional Administrator, Region II, USNRC.

Senior Resident Inspector, USNRC, St. Lucie Plant.

Mr. W.A. Passetti, Florida Department of Health and Rehabilitative Services.

STATE OF FLORIDA)
) ss.
COUNTY OF ST. LUCIE)

D. A. Sager being first duly sworn, deposes and says:

That he is Vice President, St. Lucie Plant for the Nuclear Division of Florida Power & Light Company, the Licensee herein;

That he has executed the foregoing document; that the statements made in this document are true and correct to the best of his knowledge, information and belief, and that he is authorized to execute the document on behalf of said Licensee.

D. A. Sager
D. A. Sager

STATE OF FLORIDA

COUNTY OF St. Lucie

The foregoing instrument was acknowledged before me this 27th day of February, 1995 by D.A. Sager, who is personally known to me and who did take an oath.

Karen West

KAREN WEST
Name of Notary Public

My Commission expires 4-18-98

Commission No. CC359926

KAREN WEST
MY COMMISSION # CC359926 EXPIRES
April 18, 1998
BONDED THRU TROY FAIN INSURANCE, INC.

St. Lucie Unit 2
Docket No. 50-389
Proposed License Amendment
SDCS Minimum Flow Rate Requirements

ATTACHMENT 1

EVALUATION OF PROPOSED TS CHANGES

EVALUATION OF PROPOSED TS CHANGES

Introduction

Florida Power and Light Company (FPL) proposes to change the St. Lucie Unit 2 Technical Specifications (TS) involving operation of the Shutdown Cooling System (SDCS) during refueling conditions. A provision will be added to the existing specifications to allow the 3000 gpm required minimum reactor coolant flow rate to be reduced, under certain conditions, to 1850 gpm. The revision will accommodate isolation of a SDCS-to-Reactor Coolant System (RCS) injection line for maintenance during MODE 6 conditions, and considers single failure criteria. The specified conditions for which the reduced flow rate will be permitted are considered to be conservative, and are compatible with the existing bases for the affected Limiting Conditions for Operation (LCO). In addition, the statement of required surveillances will be revised to clarify that the specified coolant flow rate is the total flow rate to the reactor pressure vessel.

Description of Changes

1) Surveillance Requirements (SR) 4.9.8.1 and 4.9.8.2 specify that, "At least one shutdown cooling loop shall be verified to be in operation and circulating reactor coolant at a flow rate of greater than or equal to 3000 gpm at least once per 12 hours." The surveillance will be restated as follows:

> "At least once per 12 hours:
>
> a. At least one shutdown cooling loop shall be verified to be in operation.
>
> b. The total flow rate of reactor coolant to the reactor pressure vessel shall be verified to be greater than or equal to 3000 gpm."

2) The specified minimum flow rate will be modified (as shown in Attachment 3) by adding the following footnote:

> "The reactor coolant flow rate requirement may be reduced to 1850 gpm if the following conditions are satisfied before the reduced requirement is implemented: the reactor has been determined to have been subcritical for at least 125 hours, the maximum RCS temperature is $\leq$ 117 °F, and the temperature of CCW to the shutdown cooling heat exchanger is $\leq$ 87 °F."

3) Bases section B 3/4.9.8 will be revised by adding a summary statement of the reasons for the specific plant conditions under which the footnote may be applied (Attachment 3, Insert - A).

Background

The plant design provides two independent SDCS loops. Train A employs Low Pressure Safety Injection (LPSI) pump 2A to circulate reactor coolant from RCS Hot Leg 2A, through Shutdown Cooling Heat Exchanger (SDHX) 2A, and back to the RCS via the safety injection penetrations in RCS Cold Legs 2A1 and 2A2. Flow through the SDHX is controlled by adjusting a motor operated control valve at the heat exchanger outlet, in conjunction with a total flow control valve located in a flowpath parallel to the heat exchanger. Train B likewise uses LPSI pump 2B to circulate water from hot leg 2B, through SDHX 2B, and into the safety injection penetrations for RCS Cold Legs 2B1 and 2B2. Each LPSI pump is a single stage, centrifugal pump which has a rated design flow rate of 3000 gpm, and minimum runout flow rate of 4500 gpm.

During MODE 6 operations, an OPERABLE shutdown cooling loop must be capable of circulating reactor coolant at a flow rate ≥ 3000 gpm to satisfy the specified surveillances. To support certain maintenance activities on the low pressure safety injection headers, which are the same headers used to circulate reactor coolant during SDCS operations, one of the two RCS injection lines for the affected train must be isolated. Since a SDCS train is incapable of achieving ≥ 3000 gpm through the remaining single RCS injection point, that train must be declared inoperable.

With the water level less than 23 feet above the top of the reactor pressure vessel flange, two independent shutdown cooling loops must be OPERABLE pursuant to LCO 3/4.9.8.2, and the 3000 gpm minimum capacity to satisfy the SR also applies. Therefore, maintenance that requires isolation of one of the two injection flowpaths for either SDCS train is prohibited, and is limited to the plant condition where only one OPERABLE shutdown cooling loop is required e.g., the RCS water level is greater than 23 feet above the reactor pressure vessel flange (TS 3/4.9.8.1). For this reason, analyses were performed to verify the adequacy of one SDCS train to satisfy the Bases for the existing LCO when the flow rate capacity of that train is limited to less than 3000 gpm.

Analysis of the Proposed TS Changes

MODE 6 operability requirements for shutdown cooling loops are described in Bases Section 3/4.9.8: (1) sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140 °F as required in the REFUELING MODE, and (2) sufficient coolant circulation is maintained through the reactor core to minimize the effects of a boron dilution incident and prevent boron stratification. In addition, the requirement to have two shutdown cooling loops OPERABLE when there is less than 23 feet of water above the reactor pressure vessel flange with irradiated fuel in the core ensures that a single failure of the operating shutdown cooling loop will not result in a complete loss of decay heat removal capability.

Considering a MODE 6 plant configuration where the water level is less than 23 feet above the reactor pressure vessel flange, the alternate SDCS train is inoperable, and the operating shutdown cooling loop is circulating reactor coolant through only one SDCS-to-RCS cold leg penetration, e.g., "single point injection," an evaluation of the ability to satisfy the bases for TS 3/4.9.8 was conducted. Calculations performed by Asea Brown Boveri-Combustion Engineering (ABB-CE) were confirmed by FPL, and are based on the following principal assumptions:

a. Initial maximum RCS temperature 120 °F.
b. Initial CCW temperature 90 °F.
c. Decay heat fractions per Nuclear Regulatory Commission (NRC) Branch Technical Position (BTP) ASB 9-2 (Standard Review Plan 9.2.5).
d. SDCS Injection Flow 1800 gpm (Minimum Guaranteed)
e. RCS Level 29.5' (corresponds to RCS Mid-Loop operation).

1) **Decay Heat Removal:** *Sufficient cooling capacity is available to remove decay heat and maintain the water in the reactor pressure vessel below 140 °F as required in the REFUELING MODE.*

The RCS heat-up calculations are based on a reactor coolant flow rate of 1800 gpm, and a reduced inventory corresponding to an RCS water level of 29.5 feet (mid-loop). The primary system masses and volumes are conservatively calculated assuming that the steam generator nozzle dams are installed. The calculations are, therefore, valid for configurations with and without nozzle dams. Decay heat fractions taken from the NRC BTP ASB 9-2 formulation, recommended for light water

reactors for long term cooling, are based on an operating history of 16,000 effective full power operating hours (EFPH). The resultant peak RCS temperature is shown to be < 140 °F when the time after shutdown is at least 5 days. The reduced flow configuration is, therefore, not recommended for less than 5 days after shutdown.

FPL further determined that the proposed minimum shutdown time of 125 hours would provide additional conservatism and extend applicability of the analysis to a 24 month fuel cycle (assumed 16,500 EFPH).

2) **Boron Dilution:** *Sufficient coolant circulation is maintained through the reactor core to minimize the effects of a boron dilution incident.*

Calculations show that, at a flow rate of 1800 gpm and an inventory corresponding to mid-loop operation, a time of 17 minutes is required for one cycle of RCS fluid circulation.

The Inadvertent Boron Dilution event for MODE 6 conditions is documented in the PSL2 Updated Final Safety Analysis Report (UFSAR). The UFSAR analysis shows that, for the assumed condition of 3 charging pumps running, an operator boron dilution alarm would be required at no less than 58 minutes, and the minimum time to criticality would be more than 88 minutes. These times correspond to more than 3 and 5 shutdown cooling loop transit times, respectively, at the reduced inventory, 1800 gpm flow rate conditions. The flow rate, therefore, is considered adequate to provide sufficient mixing and a timely indication of a gradual, uniform decrease in RCS boron concentration. It is concluded that the operator has sufficient time to recognize the event and isolate the dilution source prior to significant loss of shutdown margin.

3) **Boron Stratification:** *Sufficient coolant circulation is maintained through the reactor core to prevent boron stratification.*

For the range of temperatures under consideration, boron precipitation is considered to be unlikely unless a very highly concentrated boron source (much greater than 3.5 weight percent boric acid) inserts large amounts of boron into the RCS. LCO 3.1.2.7 limits the maximum concentration in the boric acid makeup tanks to 3.5 wt.% (6119 ppm boron); thus,

assurance is provided that boron in the RCS will not achieve concentrations at which precipitation would occur. Boron precipitation caused by dilution with cold water is also not expected to occur for the boron concentrations required during MODE 6 refueling operations.

Assuming the RCS is well mixed prior to entering the reduced flow configuration, stratification is not considered credible at the proposed flow rate without the occurrence of boron precipitation. Diffusion in a stagnant region is the only other mechanism for stratification and, based on an assessment of the diffusion coefficients, would need greater than four months to develop (well beyond the time scale of interest).

It is concluded that boron stratification would not occur for the conditions assumed in this analysis.

4) Guaranteed Minimum Flow: The flow corresponding to one LPSI pump injecting reactor coolant into the RCS through one line of maximum resistance is calculated to be approximately 2000 gpm. Thus, assurance is provided that single point injection will satisfy the minimum guaranteed flow rate of 1800 gpm assumed in the analysis.

FPL is concerned that the existing syntax of SR 4.9.8.1 and 4.9.8.2 has an element of ambiguity that could lead to an attempt to maintain more than twice the required flow rate to the reactor vessel when two SDCS loops are operating. The proposed changes to the SR format and syntax will clarify that the minimum flow rate requirement applies to the total flow rate of reactor coolant to the reactor pressure vessel. The surveillance interval and required verifications are not changed, and the proposed wording will provide assurance that an operational error inconsistent with the bases for the LCO will not occur.

Conclusion

The analysis of proposed TS changes shows that with a shutdown cooling flow rate of 1800 gpm, initial RCS temperature 120 °F, and initial CCW temperature 90 °F, a SDCS train can satisfy the stated bases for operability if the time after reactor shutdown is at least 120 hours. Additional margins of conservatism are included in the proposed footnote, e.g., credit for a SDCS train with single point injection would not be permitted until the reactor has been

determined to have been shutdown for 125 hours; 1850 gpm is proposed for the surveillance value allowing 50 gpm for flow measurement uncertainties; the proposed initial conditions that must be satisfied before the reduced flow provision is implemented require that the maximum indicated RCS temperature be ≤ 117 °F and the maximum indicated CCW temperature be ≤ 87 °F, and thereby provides a 3°F measurement uncertainty similar to the RCS temperature uncertainty used in the plant safety analysis.

The calculated flow rate for one LPSI pump circulating reactor coolant through a single RCS injection point is approximately 2000 gpm. Therefore, if an idle shutdown cooling loop is in this configuration (for the assumed initial conditions), and a single failure is postulated to occur in the operating SDCS train, additional assurance is provided that the remaining cooling and circulation capacity would be sufficient to remove decay heat and maintain the water in the reactor vessel below 140 °F, minimize the effects of a boron dilution incident, and prevent boron stratification.

The conclusions reached for mid-loop conditions also apply to the less restrictive plant conditions specified in TS 3/4.9.8.1. However, the minimum required reactor coolant flow rate for conditions other than specified in the proposed amendment, including when making a reduction in the RCS boron concentration pursuant to LCO 3/4.1.1.3, remain unchanged.

St. Lucie Unit 2
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ATTACHMENT 2

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

DETERMINATION OF NO SIGNIFICANT HAZARDS CONSIDERATION

Pursuant to 10CFR50.92, a determination may be made that a proposed license amendment involves no significant hazards consideration if operation of the facility in accordance with the proposed amendment would not: (1) involve a significant increase in the probability or consequences of an accident previously evaluated; or (2) create the possibility of a new or different kind of accident from any accident previously evaluated; or (3) involve a significant reduction in a margin of safety. Each standard is discussed as follows:

(1) Operation of the facility in accordance with the proposed amendment would not involve a significant increase in the probability or consequences of an accident previously evaluated.

Operation of the SDCS is not an accident initiator and, therefore, does not significantly increase the probability of an accident previously evaluated.

The proposed change will allow a plant configuration needed to perform maintenance activities on LPSI/SDCS headers by isolating one injection flow line for an operable SDCS train during certain MODE 6 conditions. In the event of a failure or unavailability of the alternate SDCS train, this configuration could result in the proposed minimum flow rate. The proposed change only modifies the minimum required flow rate, and does not affect the probability of this event. FPL has evaluated the proposed value of reactor coolant flow and has shown that the bases for the existing LCO will continue to be satisfied. Therefore, there are no significant increases in the consequences of any event from the proposed change. No other system interactions are involved related to previously evaluated accidents, and the proposed change has no adverse effect on any other system performance.

Therefore, operation of the facility in accordance with the proposed amendment will not involve a significant increase in the probability or consequences of an accident previously evaluated.

(2) Operation of the facility in accordance with the proposed amendment would not create the possibility of a new or different kind of accident from any accident previously evaluated.

The proposed change does not affect the normal operation of the plant. No new systems are introduced and there is no adverse effect on any other system configuration or performance. The change will, however, allow isolation of one SDCS injection flow path for maintenance activities in MODE 6 under controlled conditions. The failure of the alternate SDCS train does not create a new accident and has been further evaluated in the reduced flow configuration, and shown to meet all the TS bases requirements. Therefore, operation of the facility in accordance with the proposed amendment will not create the possibility of a new or different kind of accident from any accident previously evaluated.

(3) Operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety.

The safety considerations related to the proposed change are described in the bases to TS 3/4.9.8. FPL has evaluated the proposed reduction in SDCS flow requirement, under stated conditions, and has shown that the proposed flow rate meets all the TS bases requirements involving decay heat removal, boron dilution, and stratification. Established acceptance criteria providing margins of safety are not being changed by the proposed amendment. Therefore, operation of the facility in accordance with the proposed amendment would not involve a significant reduction in a margin of safety.

Based on the discussion presented above and on the supporting Evaluation of Proposed TS Changes, FPL has concluded that this proposed license amendment involves no significant hazards consideration.