UNITED STATES
NUCLEAR REGULATORY COMMISSION
REGION II
101 MARIETTA STREET, N.W., SUITE 2900
ATLANTA, GEORGIA 30323-0199

April 25, 1995

MEMORANDUM TO: Kenneth P. Barr, Chief
Emergency Preparedness Section

FROM: Glen W. Salyers, Radiation Specialist
Emergency Preparedness Section

SUBJECT: REVIEW OF REVISION 27 TO St. LUCIE NUCLEAR PLANT EMERGENCY PLAN

I. BACKGROUND AND DISCUSSION

The licensee submitted Revision 27 of the St. Lucie Nuclear Plant Emergency Plan to the NRC within 30 days of the effective date of November 1, 1994, as required 10 CFR Part 50, Appendix E.V.

Revision 27 contained approximately 237 side bar changes. Most of the changes incorporated categorical changes and corrections which did not alter the meaning or intent of the affected statements. Examples of categorical changes are:

- Numerous "articles" and "conjunctions" were added.
- Typos were corrected.
- Pronoun genders' were made politically correct.
- The word Off-Site was changed to Off-site.
- ERO, management, and facility titles were corrected.
- The licensee changed "Whole Body Dose" to "Total Dose (TEDE); and "Thyroid Dose" to "Thyroid Dose (CED)." This resolves the terminology issue we had with St. Lucie.
- Referenced instrumentation ranges, and setpoint reading were corrected. As example, u/Ci were changed to cpm or mrem.

NOTE:

- Minor changes are discussed in Paragraph II.
- Evaluation of substantive EAL changes are discussed in Paragraph III.
- Changes that appeared to decrease the effectiveness of the Plan are discussed in Paragraph IV.

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II. EVALUATION OF MINOR CHANGES

1. **CHANGE:** Page 5-21, Section 5.2.8, under "Alert and Notification System," the number of sirens was changed from "86" to "85," due to the retirement of the mini-siren.

   COMMENT: The licensee had installed new sirens on Hutchinson Island. With the addition of the new sirens, the licensee retired the mini-siren. The "mini-siren" alerted Site Security to perform route alerting both North and South of the Site on Hutchinson Island that was within the EPZ.

   CONCLUSION: The original Alert and Notification System was approved by FEMA in accordance with FEMA-REP-10, "Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants" as part of their original licensing. The population on Hutchinson Island within the EPZ has increased considerable since FEMA acceptance of the original Alert and Notification System. The licensee stated that based upon equipment performance data and population studies of the area, calculations indicate that the addition of the new sirens meets the requirements of FEMA-REP-10, "Guide for the Evaluation of Alert and Notification Systems for Nuclear Power Plants." The licensee further state that their "siren system" is a "living" system. The reviewer concluded that the removal of the "mini-siren" did not decreased the effectiveness of the Plan.

2. **CHANGE:** Page 5-23,(24), Section 5.3.1, The paragraph following footnote 5 was deleted.

   "The radiation exposure of individuals providing ambulance service and medical treatment service will be keep as low as reasonably achievable. Proper precautions will be taken to assure that these individuals' exposures will remain within the limits of 10 CFR 20."

   COMMENT: The licensee's justification was: "This change is consistent with the revised FPL HP Policy"?

   CONCLUSION: The licensee is still responsible assuring that these individuals' exposures will remain within the limits of 10 CFR 20". The change doses not decrease the effectiveness of the Plan.

3. **CHANGE:** Page 5-24, Section 5.3.2, Dose Records, The fourth paragraph stated in part: "Any dose in excess of the annual limits specified in Section 20.1201(a) will be accounted for in accordance with 10 CFR 20.1206(e)."

COMMENT: The EP Section is titled "Dose Records." 10 CFR 20 1206(e) states: The licensee does not authorize a Planned Special Exposure that would cause an individual to receive a dose from all Planned Special Exposures and all doses in excess of the limits to exceed ..... What does 1206(e) have to do with dose records?

CONCLUSION: The EP Section is titled "Dose Records." As written the paragraph appears to be incorrect or incomplete. The Paragraph should reference 1206(e),(f), and (g). The reviewers comments was discussed with the licensee in a telephone conversation on April 3, 1994. The change doses not decrease the effectiveness of the Plan.

4. **CHANGE:** Page 7-6, Section 7.1.4.1, paragraph 1, The requirement; to vary the annual exercise year to year such that all major elements of the Plan are tested, was changed from 5 years to 6 years.

COMMENT: The licensee's justification was: "basis is from NRC Inspection Procedure 82302 which references Supplement 1 to NUREG 0654, "Criteria for Utility Offsite Planning and Preparedness - Final Report."

CONCLUSION: The licensee has a legitimate basis for the change. The change does not decrease the effectiveness of the Plan.

5. **CHANGE:** Page 7-8, Section 7.1.4, the changed added a new paragraph 7.1.4.7, "Post Accident Sampling System (PASS)."

COMMENT: The paragraph identified the PASS as a NUREG 0737 item, and stated that the functioning and testing of the system was described in plant chemistry procedures.

CONCLUSION: The change does not decrease the effectiveness of the Plan.

III. EVALUATION OF SUBSTANTIVE EAL CHANGES

1. **CHANGE:** Based upon the memorandum from R. L. Emch, Jr., USNRC NRR to W.E. Cline, USNRC DRSS/RPEP RII dated July 11, 1994, and titled, "Branch Position on Acceptable Deviations to Appendix 1, to NUREG-0654, FEMA REP-1," the licensee made the following changes:

a. EAL Group 1.D "Abnormal Temperature Pressure" was deleted.

b. EAL Group 3, "Contaminated Injury" was deleted.

c. EAL Group 4.A., Alert, "Fuel Element Failure" Initiating Condition #2 "One or more RCP's fail leading to fuel failure," was deleted.

d. EAL Group 6.A., "Emergency Coordinator's judgement that plant conditions exist which warrant increased awareness on the part of the operating staff and or local authorities:, Initiating condition #1., was deleted. The following Initiating Condition was added: "Any plant shutdown required by Technical Specifications in which the required shutdown in not reached within action limits".

e. EAL Group 8.A., "Loss of Plant Control Functions", NOUE EAL: "Unplanned Initiation of ECCS, was deleted.

f. EAL Group 8.A., "Loss of Alarms Communication Monitoring," the following EALs were revised:

1). NOUE EAL "Significant loss of effluent monitoring capability, (meteorological monitoring instrumentation was deleted) communications, indication and alarm panels, etc., which impairs ability to perform accident or emergency assessment," Initiating Conditions #3 and #4, was deleted (See No. III.2 below).

The following Initiating Condition was added: "Unplanned loss of most or all safety system annunciators for greater than 15 minutes.

2). Alert EAL "Loss of Alarms," Initiating Conditions #1 and #2 was deleted (See No. III.3 below).

The following Initiating Conditions was added:

a. Unplanned Loss of all safety system annunciators.

AND

b. Plant transient in progress.

3. Site Area Emergency EAL "Loss of alarms (with plant transient was deleted)" (See No. III.4 below).

The following Initiating Condition was added: "Inability to monitor a significant transient in progress."

2. **CHANGE:** 8.B. LOSS OF ALARMS, COMMUNICATION, MONITORING (NOUE)

NOUE: Significant loss of indication and alarm panels (Modes 1, 2, 3,and 4), condition number 4 was deleted as written and re-written and re-numbered as condition number 3.

Was: 4. Loss of indications or alarm panels which, in the opinion of the NPS or EC, significantly impairs accident or emergency assessment.

Changed to: Unplanned loss of most or all safety system annunciators for greater than 15 minutes.

COMMENT: The change is based upon the Memorandum from R. L. Emch, Jr., USNRC NRR to W.E. Cline, USNRC DRSS/RPEP RII dated July 11, 1994, and titled, "Branch Position on Acceptable Deviations to Appendix 1, to NUREG-0654, FEMA REP-1."

The term "Safety System" is not defined or clear and would allow a lot of latitude in making a declaration. When questioned, the licensee stated that the term was understood by licensed operators. It may be, but the reviewer considers it an objective term.

CONCLUSION: The reviewer concluded the change does not reduce the effectiveness of the Plan.

3. **CHANGE:** 8.B. LOSS OF ALARMS, COMMUNICATION, MONITORING (ALERT)

ALERT: loss of alarm (Modes 1,2,3,4), condition numbers 1 and 2 were re-written.

Was: 1. Most or all control room annunciators lost with plant not at cold shutdown.

AND

2. Inability to immediately restore power to annunciators.

Changed to: 1. Unplanned loss of all safety system annunciators.

AND

2. Plant transient in progress.

COMMENT: The change is based upon the Memorandum from R. L. Emch, Jr., USNRC NRR to W.E. Cline, USNRC DRSS/RPEP RII dated July 11, 1994 and titled, "Branch Position on Acceptable Deviations to Appendix 1, to NUREG-0654, FEMA REP-1.

CONCLUSION: The reviewer concluded that the change does not decrease the effectiveness of the Plan.

4. **CHANGE:** 8.B. LOSS OF ALARMS, COMMUNICATION, MONITORING (SITE AREA EMERGENCY)

SITE AREA EMERGENCY: loss of alarm (Modes 1,2,3,4), conditions numbers 1 and 2 deleted and re-written only one condition.

Was: 1. Most or all control room annunciators lost with plant not at cold shutdown.

AND

2. Plant transient in progress.

Changed to: 1. Inability to monitor a significant transient in progress.

COMMENT: The change is based upon the Memorandum from R. L. Emch, Jr., USNRC NRR to W.E. Clinc, USNRC DRSS/RPEP RII dated July 11, 1994 and titled, "Branch Position on Acceptable Deviations to Appendix 1, to NUREG-0654, FEMA REP-1.

CONCLUSION: The reviewer concluded that the change does not decrease the effectiveness of the Plan.

IV. EVALUATION OF CHANGES THAT APPEAR TO DECREASE THE EFFECTIVENESS OF PLAN

MODE 5: Cold Shutdown, Keff <.99, <200 degrees F.

Assumption of plant systems: Two SDC systems are in operable or one SDC system is operable with both S/G water level >10% narrow range indication.

MODE 6: Refueling, Keff <.95, <140 degrees F., fuel in the vessel and head closure bolts less than fully tensioned or with the head removed.

Assumption of plant systems: The reactor has been subcritical a minimum of 72 hour. Reactor vessel head is removed. One SDC system is in operation. There is 23 ft. of borated water above the reactor vessel flange.

1. **CHANGE:** The following Mode 5 & 6 EAL was added.

1. ABNORMAL PRIMARY LEAK RATE (NOUE)

NOUE: Uncontrolled loss of reactor coolant which in the Emergency Coordinator's judgement warrants increased awareness.

COMMENT: A similar EAL already exist for Modes 1, 2, 3, and 4.

CONCLUSION: A similar EAL already exist for Modes 1, 2, 3, and 4. This option has always been available to the SS. The reviewer concluded that unless or until other Modes 5 and 6 EALs are developed and approved, to have a single Modes 5 and 6 EAL (NOUE) could add to the confusion or not classifying legitimate emergencies while in Modes 5 or 6.

2. **CHANGE:** The following Modes 5 and 6 EAL was added.

1.A. ABNORMAL PRIMARY LEAK RATE (ALERT)

ALERT: If RCS heat removal is in jeopardy, Then go to 8.A., "Loss of Control Functions."
COMMENT: In Mode 1-2-3-4, an Alert is declared if RCS leakage exceeds 50 gpm.

In Mode 5, there are 2 SDC Pumps, each capable of supplying approximately 3000 gpm each (recirculation or injection from the RWST).

The SDC (LPI) pumps take their suction off the bottom of the RCS Hot leg. The elevation of the bottom of the RCS Hot Leg is inches above the top of the fuel assemblies. For a leak rate to jeopardize RCS heat removal, the leak rate would have to be large enough to lower RCS level to a point were the Shutdown Cooling pumps begins losing their suction or cavitating (Vortexing).

In Mode 6, T.S. require a minimum of 23 feet of water above the reactor vessel flange, or approximately 400,000 gallons of water.

To base a Mode 5 or 6 EAL on a leak rate that jeopardizes RCS heat removal, means either the leak rate exceeds 3000 gpm or 400,000 gallons of water are in the containment basement. Reactor vessel water level would be inches above the top of the fuel assemblies because the bottom of the RCS Hot Leg would be uncovered.

CONCLUSION:

- The licensee did not provide a basis document.
- From a human factors aspect, the EAL is deficient in that:
  - The EAL does not relate to Leak Rate.
  - There is insufficient guidance in the EAL to be of use in making a declaration.
  - The operator must utilize "branching" and "referencing" of procedures to make a declaration.

- There are scenarios in which the EAL would not support a needed leak rate classification. An example would be, a 3000 gpm leak in which the LPI pumps could be pumping the RWST thru the core and out the break into the containment. The whole time keeping the core cooled, therefore not meeting the criteria in the EAL for an emergency declaration.

- Technically, the guidance for the Alert Leak Rate EAL is the same as the guidance proposed for the Modes 5 and 6 Leak Rate EAL for SAE and GE.

The reviewer concluded the EAL as written would decrease the effectiveness of the Plan.

3. **CHANGE:** The following Modes 5 and 6 EAL was added.

1.A. ABNORMAL PRIMARY LEAK RATE (Site Area Emergency)

Site Area Emergency:

1. RCS leakage greater than available makeup.

AND

2. Inability to maintain Rx vessel water level above the active fuel.

AND

3. Containment closed.

COMMENT: In Modes 1, 2, 3, and 4, the EAL for a Site Area Emergency base on RCS leakage is: LOCA GREATER THAN capacity of charging pumps.

In Modes 1, 2, and 3, there are 3 positive displacement Charging Pumps rated at approximately 44 gpm each.

In Mode 5, there are 2 LPI Pumps each capable of supplying approximately 3000 gpm.

In Mode 6, in addition to the LPI pumps, there is 23 feet of coolant above the reactor vessel flange, or approximately 400,000 gallons of coolant. When discussing an EAL based upon leakrate, waiting until the "Active Fuel" is uncovered is not prudent.

CONCLUSION:

- The licensee did not provide a basis document.
- The potential EAL Leak Rate is unrealistic. The only ways to uncover the core in Modes 5 and 6 are:
  1) A hole in the Reactor Vessel, below the top of the active fuel that will pass 6,000 gpm (two SDC pumps at 3,000 gpm each). Otherwise, the leak is located outside the vessel, and the hot and cold legs are above the fuel.
  2) A leak with a simultaneous complete loss of injection and or SDC capabilities and the core boil.
- The criteria of core uncovery is a serious condition. If the leakrate is that severe, an emergency declaration should be made long before core uncovery.
- A strict adherence to a literal reading of the EAL would prevent a Senior Reactor Operator from making a needed emergency declaration because the core has not uncovered.

The reviewer can not determine from the provided material whether the emergency preparedness group communicates with plant operations in developing EALs or, if they do, does plant operations have a basic understanding of emergency preparedness? The reviewer concluded that the EAL as written would decrease the effectiveness of the Plan.

4. **CHANGE:** The following Modes 5 and 6 EAL was added.

1.A. ABNORMAL PRIMARY LEAK RATE (General Emergency)

General Emergency:

1. RCS leakage greater than available makeup.

AND

2. Inability to maintain Rx vessel water level above the active fuel.

AND

3. Containment NOT closed.

COMMENT: Same as the comments for 1.A. SAE above.

CONCLUSION: Same conclusion as for 1.A. SAE above, decreases the effectiveness of the Plan.

5. **CHANGE:** The following Modes 5 and 6 EAL was added.

8.A LOSS OF PLANT CONTROL FUNCTIONS, NOUE

NOUE: Complete loss of shutdown cooling and the inability to restore at least one train.

a. Failure of shutdown cooling systems, with fuel in Reactor Vessel, resulting in loss of both trains of shutdown cooling greater than 15 minutes and heatup of the RCS by greater than 10 degrees F.

AND

b. Steam generators are NOT available for heat removal.

COMMENT: If the plant is in mode 5 and no S/G are available, then the plant is in mid-loop operation with the S/G manway covers off. Otherwise, the S/Gs would be in wet layup (For chemistry / corrosion control considerations). If **both** SDC systems are lost during mid-loop operation, normal RCS temperature indication would

be lost. Neither SDC Hx inlet or outlet temperatures or RCS RTDs would provide a valid RCS temperature indication. Additionally, in Mode 6, the incores would not be available. The EAL does not indicate the method of RCS temperature determination.

Based upon St. Lucie Unit 1 Off-Normal Operating Procedure 1-0440030, Figure 1, Time to Core Boiling, and Figure 2 Flow To Makeup For Boil-Off, 5 days after Shutdown, Refueling Cavity Inventory of 36 feet (Reactor Vessel Flange), RCS temperature of 180 degrees, the RCS will **BOIL** in 11 minutes at the rate of 60 gpm. Based upon the EAL, the Core would be allowed to boil for 4 additional minutes before a **NOUE** would have to be declared. The mid-loop time to boil off calcul ion would obviously be a lot quicker.

IN Mode 5, the worst case scenario, the reactor would be shutdown within days after a long power history (high decay heat load), S/G manways would be open, the coolant near the top of the fuel could be boiling without a plant emergency being declared.

In A. of the EAL, it is not clear what is meant by the phrase "Failure of shutdown cooling systems?" Does it mean the Shutdown Cooling System (SDC), or any of the shutdown cooling systems such as CCW, SW, or S/Gs?

NOTE: Reference St. Lucie Unit 1 Off-Normal Operating Procedure 1-0440030 for what constitutes a loss of SDC.

Section 3.1 "Unusual Event" of the licensee's Emergency Plan states: The Unusual Event category applies to off-normal events or conditions at the Plant for which no significant degradation of the level of safety of the plant has occurred or is expected. Any releases of radioactive material which have occurred or which may be expected are minor and constitute no appreciable health hazard.

CONCLUSION:

- The licensee did not provide a basis document.
- The EAL dose not fit the definition of a NOUE as stated in Section 3.1 of their Plan.
- Losing both Shutdown Cooling Systems satisfies the criteria for the new Modes 5 and 6 8.A EAL for an Alert.
- If you have lost the shutdown cooling systems for 15 minutes, why the ""and" RCS temperature must increase 10 degrees" before a declaration can be made?
- Human factors, what is meant by "Failure of the Shutdown Cooling System(s)."
- There are scenarios were the definition of a NOUE is exceeded with this EAL.

The reviewer concluded that the EAL is a decrease in the effectiveness of the Plan.

6. CHANGE: The following Modes 5 and 6 EAL was added.

8.A LOSS OF PLANT CONTROL FUNCTIONS, ALERT

ALERT: Complete loss of function needed to maintain cold shutdown.

a. Failure of shutdown cooling systems, with fuel in Reactor Vessel, resulting in loss of cold shutdown conditions.

AND

b. Containment closed.

COMMENT:

- The Alert EAL reads less severe or less restrictive of an event than the NOUE EAL.
- It is not clear what is meant by the phrase "Failure of shutdown cooling systems?" Does it mean the Shutdown Cooling System, or any of the shutdown cooling systems Examples are, CCW, SW, or S/Gs.
- Does the term "cold shutdown conditions," mean "Mode 5 RCS below 200 degrees" or the RCS commencing to heat up once the shutdown cooling system is lost?
- Assuming "cold shutdown conditions" means Mode 5 or RCS temperature of 200 degrees, if the plant was in Mode 6 refueling at 110 degrees, the plant would not be required to declare an Alert until the RCS temperature heated up 90 degrees or a temperature of 200 degrees.

CONCLUSION: The licensee did not provide a basis document. The boundaries of the EAL are not clearly defined and may raise many question in the operators mind when trying to make a classification. The reviewer concluded that the EAL is a decrease in the effectiveness of the Plan.

7. **CHANGE:** The following Modes 5 and 6 EAL was added.

8.A LOSS OF PLANT CONTROL FUNCTIONS, Site Area Emergency

SITE AREA EMERGENCY: Complete loss of function needed to maintain cold shutdown and a release in progress.

a. Failure of shutdown cooling systems. with fuel in Reactor Vessel, resulting in loss of cold shutdown conditions.

AND

b. Containment not closed with a release in progress.

COMMENT: Same as the comments for an Alert above.

- The term "release" is not defined. Would the release of a Waste monitoring tank or a waste gas decay tank qualify as a release?

CONCLUSION: The licensee did not provide a basis document. Again, the boundaries of the EAL are not clearly defined and may raise many question in the operators mind when trying to make a classification. The reviewer concluded that the EAL is a decrease in the effectiveness of the Plan.

V. SUMMARY AND CONCLUSION

The reviewer determined except for the issue of Modes 5 and 6 EALs discussed in Paragraph IV, all of the changes in Revision 27 were consistent with the provisions of 10 CFR 50.54(q), 10 CFR 50.47(b), Appendix E to 10 CFR Part 50, and Section II of NUREG-0654. The letter to the licensee will convey this finding.

Further information regarding this evaluation may be found in the reviewer's annotations of Revision 27 and in the licensee's justification package (maintained in Section files).

cc: C. Banks