July 9, 2004

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

SUBJECT: ST. LUCIE UNITS 1 AND 2 - REQUEST FOR ADDITIONAL INFORMATION REGARDING REVISING THE LICENSING BASES TO UTILIZE THE ALTERNATE SOURCE TERM (MC0882 AND MC0883)

Dear Mr. Stall:

By two letters dated September 18, 2003, Florida Power and Light Company submitted amendment requests to revise the licensing bases to utilize the alternate source term as allowed in Title 10 of the *Code of Federal Regulations*, Part 50, Section 67 for reanalysis of the radiological consequences of the Updated Final Safety Analysis Report Chapter 15 accidents for St. Lucie Units 1 and 2.

The U. S. Nuclear Regulatory Commission staff has reviewed your submittals and finds that a response to the enclosed request for additional information is needed before we can complete the review. This was discussed with members of your staff on June 28, 2004, and Mr. George Madden indicated that a response would be provided by August 15, 2004.

If you have any questions, please feel free to contact me at 301-415-3974.

Sincerely,

/RA/

Brendan T. Moroney, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos.: 50-335 and 50-389

Enclosure: As stated

cc w/encl: See next page

cc:

Senior Resident Inspector
St. Lucie Plant
U.S. Nuclear Regulatory Commission
P.O. Box 6090
Jensen Beach, Florida 34957

Craig Fugate, Director
Division of Emergency Preparedness
Department of Community Affairs
2740 Centerview Drive
Tallahassee, Florida 32399-2100

M. S. Ross, Managing Attorney
Florida Power & Light Company
P.O. Box 14000
Juno Beach, FL 33408-0420

Marjan Mashhadi, Senior Attorney
Florida Power & Light Company
801 Pennsylvania Avenue, NW.
Suite 220
Washington, DC 20004

Mr. Douglas Anderson
County Administrator
St. Lucie County
2300 Virginia Avenue
Fort Pierce, Florida 34982

Mr. William A. Passetti, Chief
Department of Health
Bureau of Radiation Control
2020 Capital Circle, SE, Bin #C21
Tallahassee, Florida 32399-1741

Mr. William Jefferson, Jr.
Site Vice President
St. Lucie Nuclear Plant
6351 South Ocean Drive
Jensen Beach, Florida 34957-2000

Mr. G. L. Johnston
Plant General Manager
St. Lucie Nuclear Plant
6351 South Ocean Drive
Jensen Beach, Florida 34957

Mr. Terry Patterson
Licensing Manager
St. Lucie Nuclear Plant
6351 South Ocean Drive
Jensen Beach, Florida 34957

David Moore, Vice President
Nuclear Operations Support
Florida Power and Light Company
P.O. Box 14000
Juno Beach, FL 33408-0420

Mr. Rajiv S. Kundalkar
Vice President - Nuclear Engineering
Florida Power & Light Company
P.O. Box 14000
Juno Beach, FL 33408-0420

Mr. J. Kammel
Radiological Emergency
Planning Administrator
Department of Public Safety
6000 Southeast Tower Drive
Stuart, Florida

July 9, 2004

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

SUBJECT: ST. LUCIE UNITS 1 AND 2 - REQUEST FOR ADDITIONAL INFORMATION REGARDING REVISING THE LICENSING BASES TO UTILIZE THE ALTERNATE SOURCE TERM (MC0882 AND MC0883)

Dear Mr. Stall:

By two letters dated September 18, 2003, Florida Power and Light Company submitted amendment requests to revise the licensing bases to utilize the alternate source term as allowed in Title 10 of the *Code of Federal Regulations*, Part 50, Section 67 for reanalysis of the radiological consequences of the Updated Final Safety Analysis Report Chapter 15 accidents for St. Lucie Units 1 and 2.

The U. S. Nuclear Regulatory Commission staff has reviewed your submittals and finds that a response to the enclosed request for additional information is needed before we can complete the review. This was discussed with members of your staff on June 28, 2004, and Mr. George Madden indicated that a response would be provided by August 15, 2004.

If you have any questions, please feel free to contact me at 301-415-3974.

Sincerely,

/RA/

Brendan T. Moroney, Project Manager, Section 2
Project Directorate II
Division of Licensing Project Management
Office of Nuclear Reactor Regulation

Docket Nos.: 50-335 and 50-389

Enclosure: As stated

cc w/encl: See next page

DISTRIBUTION:

PUBLIC	LPDII-2 R/F	JArroyo	RDennig	CHarbuck
OGC	MMarshall	MBlumberg	YDiaz	TBoyce
ACRS	BMoroney	BHarvey	LLund	JMunday
DLPM DPR				

ADAMS Accession No.: ML041960392 NRR-088

OFFICE	PDII-1/PE	PDII-2/PM	SPSB-C/SC	EMCB-C/SC	PDII-2/SC (A)
NAME	JArroyo	BMoroney	RDennig	LLund	MMarshall
DATE	7/1/04	7/1/04	7/8/04	7/8/04	7/9/04

OFFICIAL RECORD COPY

REQUEST FOR ADDITIONAL INFORMATION

FLORIDA POWER AND LIGHT COMPANY

ST. LUCIE NUCLEAR POWER PLANT, UNITS 1 AND 2

DOCKET NUMBERS 50-335 AND 50-389

Unit 1 and Unit 2

1. What design bases parameters, assumptions or methodologies (other than those provided in the September 18, 2003, submittal) were changed in the radiological design basis accident analyses as a result of the proposed change? If there are many changes it would be helpful to compare and contrast them in a table. Also, please provide a justification for any changes.

2. Based upon a preliminary review of the proposed amendment the reviewer is unable to match the calculated doses for the accident analyses. It would be helpful if the licensee would provide their design bases accident calculations. If the calculations are provided, answers to questions provided in this request for additional information may reference the calculation. If the calculation is referenced, please provide the section or page number where the information is located.

3. Regarding the proposed technical specification change in the definition of "dose equivalent I-131," Florida Power and Light (FPL) uses the thyroid dose as the basis of the proposed change. This definition finds use in the reactor coolant system (RCS) and secondary specific activity technical specifications. The purpose of those technical specifications is to control the actual specific activities to levels less than those which would exceed the initial assumptions made in the radiological consequence analyses. Previously, those analyses determined whole body and thyroid doses, consistent with the dose guidelines in Title 10 of the *Code of Federal Regulations* (CFR), Part 100, Section 11. However, with the proposed implementation of the alternate source term, the total effective dose equivalent criteria supercede the whole body and thyroid dose. The staff has not required licensees to revise this definition. Since you have proposed a change, please provide a justification for the use of thyroid dose conversion factors when the <u>effective</u> factors provided in Federal Guidance Report 11 Table 2.1 would be more appropriate.

4. With regard to control room emergency ventilation actuation, FPL has assumed a 50 second (Unit 1) and 30 second (Unit 2) delay in actuation for all analyzed accidents. In Section 1.6.3.2 of the licensee's submittal (§1.6.3.2), FPL states that this actuation is based on either a Containment Isolation Actuation Signal or high radiation being detected at the control room intake. It is stated that for the loss of coolant accident a containment high pressure signal actuates isolation, and that a 50 second (Unit 1) and a 30 second (Unit 2) delay provides for diesel generator start time and damper actuation time. Please explain how the assumed 50 second (Unit 1) and 30 second (Unit 2) delay is conservative for all accidents, considering the response considerations identified by FPL. Explain how the time for the input activity to ramp up to the alarm set point level

and the impact of differences in accident-specific radionuclide effluent mixes on monitor response are considered in the determination of these delay times.

5. The values provided for unfiltered inleakage in the FPL 180-day response to Generic Letter 2003-01 (dated December 9, 2003, Attachment 1, Page 3) appear to bound the values used in License Amendment Requests (LARs). The values were preliminary at the time the letter was written. Please confirm that the values used in the LARs bound those values measured using the American Society for Testing and Materials E741-00 integrated inleakage tests.

6. §2.4.2 and §2.4.4 and several tables for other accidents state that the unaffected steam generator (SG) is used to cool down the plant during the Steam Generator Tube Rupture (SGTR) accident. Activity is released via steaming from the unaffected SG Atmospheric Dump Valves (ADVs) until the decay heat generated in the reactor core can be removed by the Shutdown Cooling System. The Updated Final Safety Analysis Report (UFSAR) for Unit 2, §15.6.2.1.7.3 states, that the shutdown cooling is activated after the pressure and temperature are reduced to 175 psia and 300 degree F. Since the secondary side of the unaffected steam generator continues to generate steam until the temperature is less than 212 degrees F, please confirm that the plant physically restricts further releases once the Shutdown Cooling System is put into operation. Explain how this activity is restricted?

7. Regarding the Lose of Coolant Accident (LOCA) analysis:

    a. In §2.1.3 (Unit 1) or §2.1.4 (Unit 2), FPL states that they are assuming an aerosol deposition rate of 0.1 hr^{-1}. Since this parameter is somewhat dependent on plant parameters, the staff's prior approval of 0.1 hr^{-1} for another licensee may not be relevant to St. Lucie. Please provide a St. Lucie-specific justification for your proposed deviation from this guidance.

    b. Regarding §2.1.2.19 through §2.1.2.22 and §2.1.3 (Unit 1) or §2.1.4 (Unit 2), the staff cannot find FPL's treatment of Emergency Core Cooling System (ECCS) leakage acceptable without additional supporting justifications for the following deviations from guidance:

        - Regulatory Position 5.3 states that "<u>with the exception of iodine</u>, all radioactive materials in the recirculating liquid are assumed to be retained in liquid phase." FPL has stated that "this analysis assumes that all of the elemental and organic iodine in the leaked fluid is volatile and becomes an airborne release to the ECCS area. Furthermore, all of the particulates in the 10 percent flashed fraction of the release are assumed to become airborne in the ECCS area."

        - Regulatory Positions 5.4 and 5.5 provide that the flashing fraction is to be based on the fraction of the <u>total iodine</u> in the liquid.

        - Regulatory Position 5.6 states that the radioiodine available for release is assumed to be <u>97 percent elemental and 3 percent organic</u>. FPL states that the temperature and pH history of the sump and Refueling Water

Storage Tank (RWST) are considered in determining the chemical form of iodine.

- §2.1.2 states that the revised LOCA dose consequence analysis is consistent with the guidance provided in Regulatory Guide (RG) 1.183, Appendix A, yet the LAR for Unit 2 (LAR 2) analysis does not appear to be consistent with the guidance provided in RG 5.6. Position 5.6 states that the radioiodine that is postulated to be available for release to the environment is assumed to be 97 percent elemental and 3 percent organic. The LARs assume that the chemical form of the Engineered Safety Feature (ESF) leakage is 95 percent to 99.6 percent aerosol, 0.25 percent to 4.85 percent elemental and 0.15 percent organic. The statement that the LARs are consistent with RG 1.183 does not appear to be correct and should be modified. The staff does not believe that the assumption that the form of the iodine in the sump water is the same as the chemical form of the ESF leakage is accurate.

The staff structured these regulatory positions to be deterministic and conservative in order to compensate for the lack of research into iodine speciation beyond the containment, and the uncertainties of applying laboratory data to the post-accident environment of the plant. Regulatory Position 5.5 does state that a smaller flash fraction could be justified based on the actual sump pH history and area ventilation rates. The staff believes that FPL has not provided sufficient data for the staff to find its proposed treatment of ECCS leakage adequately conservative. Please provide a quantitative justification for your assumptions including, but not limited to, the following information:

1. The staff requests clarification regarding the amount of iodine released from the ECCS leakage.

2. A full description of the iodine speciation analysis that supports your assumptions, including methodology, assumptions, input data. Consideration should be given to the mass transfer at the surface of the ESF leakage water pool, the possibility of evaporation to dryness, available experiments to justify the assumed chemical forms, and the potential for changing pH in all areas subject to ESF leakage.

3. A discussion of how the iodine speciation may change as the containment sump water is circulated through the ECCS components and piping and out to the RWST.

4. A discussion of the impact of all possible post-accident liquid inputs to the RWST, including the possible post-accident refilling of the RWST with other sources of water.

5. A discussion on how the iodine speciation might change as the ECCS leakage is sprayed out of a leak, or streams across a floor into a building sump.

c. In §2.1.3 (Unit 1) or §2.1.4 (Unit 2) the release of the activity from the vapor space within the Refueling Water Tank (RWT) is based upon the displacement of air by incoming leakage and the expansion and contraction due to the diurnal heating and cooling of the contents of the RWT. Please address the following:

   1. Please provide the analysis or the assumptions, methods and inputs of the analysis that determined this activity released. Justify why the analysis is conservative.

   2. Was evaporation of the RWT water considered as a contributor to the air flow rate?

   3. Since the iodine partition is the ratio of the vapor pressures of the iodine in the liquid and gas phases in the RWT, please discuss the impact of tank pressure changes associated with diurnal temperature swings.

   4. As noted above, the staff questions the iodine fraction value.

d. In §2.1.3 (Unit 1) or §2.1.4 (Unit 2), the maximum Decontamination Factor (DF) for elemental and particulate iodine are discussed. Please explain how the initial maximum airborne iodine concentration in the containment was determined for this determining DF.

e. The Updated Final Safety Analysis Report (UFSAR) provides an analysis of the consequences of post-accident hydrogen venting as a backup to the redundant hydrogen recombiners. This analysis was not addressed in the submittal. Is it FPL's intent to remove this analysis from the licensing basis? If not, why was this component of the LOCA not addressed in the license amendment request?

f. §2.1.2.5 states that the mixing rate is assumed to be two turnovers of the unsprayed region per hour. RG 1.183, Regulatory Position 3.3 provides this as a default assumption, if adequate flow exists between these two regions. Please briefly describe the basis for assuming that this flow will exist between the sprayed and unsprayed region.

g. LAR 2 Table 2.1-1 states that the secondary containment drawdown time is 135 seconds. UFSAR for Unit 2, §6.2.3.2.2, "Shield Building Ventilation System" states: "Within 310 seconds after a LOCA, the Shield Building annulus pressure is below atmospheric." What changes were made so that a shorter drawdown time could be utilized in the radiological analysis?

h. UFSAR for Unit 2, Table 6.4-2 provides the control room 30 day post-LOCA doses from major external radiation sources. The value for the total dose is less than 1.4 rem. Table 1.6.3-2 of the LAR for both units provide the LOCA direct shine dose. The total doses from these tables are 0.168 and 0.282 rem, respectively. Please explain the differences between the UFSAR analyses and the LAR analyses for both units.

i. UFSAR for Unit 2, Figure 15.6.6-9a, “Containment Leakage Dose Model,” illustrates the flow path models for containment leakage. Flow paths 10 and 11 provide the leakage into the negative pressure area of the reactor auxiliary building and directly to the environment. How is this bypass flow split between these two flow paths? Please provide a table giving the flow rates vs. time after a LOCA for all release pathways for both units. Provide a justification for the values used.

1. §2.1.3 (Unit 1) and §2.1.4 (Unit 2) state that the activity that bypasses the secondary containment is assumed to have leaked within the reactor auxiliary building where it is collected by the ventilation system and released to the environment via ground level release from the plant stack without assumed filtration. Page 16.6-107, Figure 15.6.6-9a of the UFSAR for Unit 2 shows a bypass pathway noted as number 11 that bypasses the shield building annulus directly to the environment. Please explain why the original licensing bases appear to consider a portion of the bypass flow to areas other than the reactor auxiliary building, yet the proposed change does not.

2. §2.1.2.11 states that “the leakage from containment collected by the secondary containment is processed by ESF filters prior to an assumed ground level release.” Please clarify if this means that the release path is via the shield building ventilation system. If this is correct explain why other pathways are not considered (for example via the reactor auxiliary building to the controlled ventilation area system). If the pathway via the shield building ventilation system is more conservative, explain why.

3. For the release from the containment purge coincident with a LOCA provide the chemical form of iodine released and justify these values. Also, provide the flow rates out of the containment purge, the closure time assumed after a LOCA and justify the particulate, elemental and organic iodine filtration efficiencies for the containment purge. Include the bed size (2" or 4") of the carbon absorbers and the test method used to verify the efficiencies.

j. UFSAR for Unit 2, Figure 15.6.6-9a, “Containment Leakage Dose Model,” illustrates the flow path models for containment leakage. Flow path 10 indicates bypass flow directly into the reactor auxiliary building. Since the control room envelope is contained in the reactor auxiliary building, justify why the <u>unfiltered inleakage</u> for both units is currently taken from the average of the two remote intakes rather than from inleakage pathways from reactor auxiliary building to the control room envelope.

k. The UFSAR for Unit 2 states that the inleakage due to opening and closing doors in the control room is 3 cfm. What is the amount due to opening and closing doors assumed in the LAR control room dose models for each unit? Justify or reference the design basis values.

l. LAR for Unit1 (LAR1) Table 2.1.1 states that the secondary containment filter efficiencies for Unit 1 are: 99 percent for particulate, and 97.5 percent for elemental and organic iodine. The UFSAR for Unit 1, §6.2.3.3.1 states that the Service Building Ventilation System (SBVS) filter efficiencies are: 99 percent for particulate, 95 percent for elemental and 95 percent for organic. Please explain why these values are different and justify the changes.

   LAR 2 Table 2.1.1 states that the secondary containment filter efficiencies for Unit 2 are: 98 percent for particulate, and 89 percent for elemental and organic iodine. UFSAR for Unit 2, Table 15.6.6-11 states that the SBVS filter efficiencies are: 99 percent for particulate, 95 percent for elemental and 50 percent for organic. Please explain why these values are different and justify the changes.

m. Verify that the LAR 1 containment releases prior to drawdown are assumed from the nearest penetration to the control room ventilation intake. If not justify the release point assumed.

8. With regard to the SGTR analysis:

   a. LAR 1 Table 2.4-1 lists an RCS mass of 480,472 lbm and 438,783 lbm. Table 2.4-4 lists an RCS mass of 438,783 lbm. Table 2.6-1 lists a minimum RCS mass of 411,500 lbm. While the staff understands why minimum and maximum values may be used to maximize doses, it is not clear why the RCS mass assumed in establishing the iodine appearance rate was assumed to be 438,783 lbm. Please explain the basis of this assumption.

      LAR 2 Table 2.4-1 lists an RCS mass of 452,000 lbm and 475,385 lbm. Table 2.4-4 lists an RCS mass of 452,000 lbm. Table 2.6-1 lists a minimum RCS mass of 385,113 lbm and a maximum mass of 475,385 lbm. While the staff understands why minimum and maximum values may be used to maximize doses, it is not clear why the RCS mass assumed in establishing the iodine appearance rate was assumed to be 452,000 lbm. Please explain the basis of this assumption.

   b. Bullet five of §2.4.2.12, states that SG tube bundle uncovery is not postulated for this event. Please justify this assumption.

   c. LAR 1 & LAR 2, Table 2.4-1, provides a break flow flash fraction of 8.76 percent. Is this value the current licensing basis number? If not, please provide a justification for this value. If so, please provide a reference for this number.

   d. Please explain and justify the assumptions that during the first 0.0915 hours of the SGTR 546,210 lbm are released to the condenser then after 0.0915 the releases are to the Main Steam Safety Valves (MSSVs).

9. With regard to the locked rotor analysis, the current licensing basis allows operation of the ADVs in automatic mode. The current licensing basis considers a stuck open ADV. The staff does not understand, given the current licensing basis, how the proposed locked rotor analysis is conservative given that the stuck open ADV is not considered.

Please provide additional justification in the form of an analysis to show how the omission of the stuck open ADV is conservative.

10. With regard to the control element assembly ejection analysis:

    a. In the LAR Table 2.6-1 states that an aerosol deposition rate of 0.1 hr^{-1}, is assumed. Please provide a Saint Lucie specific justification for this assumed aerosol deposition rate.

    b. LAR 2 Table 2.6-1 provides a secondary containment drawdown time of 240 second. The UFSAR for Unit 2, §6.2.3.2.2, "Shield Building Ventilation System" states: "Within 310 seconds after a LOCA, the shield building annulus pressure is below atmospheric." What changes were made so that a shorter drawdown time could be utilized in the radiological analysis?

    c. Please confirm the staff's understanding that the 0.5 percent fuel centerline melt is referenced to the entire core and not only that fraction of the core that exceeds Departure from Nucleate Boiling.

11. UFSAR for Unit 2, Figure 15.6.6-9a, "Containment Leakage Dose Model," illustrates the flow path models for containment leakage. Flow paths 10 and 11 provide the leakage into the negative pressure area of the reactor auxiliary building and directly to the environment. How is this bypass flow split between these two flow paths? Please provide a table giving the flow rates versus time after a Control Element Assembly Ejection for all release pathways. Provide a justification for the values used.

12. With regard to the letdown line rupture analysis:

    a. LAR 2 Table 2.7-1 lists an RCS mass of 452,000 lbm. Table 2.7-3 lists an RCS mass of 452,000 lbm. Table 2.6-1 lists a minimum RCS mass of 385,113 lbm and a maximum mass of 475,385 lbm. While the staff understands why minimum and maximum values may be used to maximize doses, it is not clear why the RCS mass assumed in establishing the iodine appearance rate was assumed to be 452,000 lbm. Please explain the basis of this assumption.

    b. LAR 2 §2.7.5, Table 1.8.1-3 presents the Release-Receptor pairs applicable to the dose from the Locked Rotor release points for the different modes of Control Room operation during the event. Clarify the intent of this sentence in relation to the letdown line rupture accident.

13. With regard to the waste gas decay tank (WGDT) rupture:

    a. §2.9.3 states, radioactive decay is assumed only for the minimum period of time required to transfer the gases to the gas decay tank. What is the minimum period of time used in the analysis? Justify the value used.

    b. §2.9.3 states, the WGDT noble gas isotopic inventory specified in UFSAR Table 15.7.4.1-2 is scaled up by a factor of 24.84 to satisfy the TS 3.11.2.6 limit of 285,000 curies of noble gases (considered as Xenon (Xe-133)). Explain the basis for the value of 24.84. Noble gases other than Xe-133 are considered in Table 15.7.4-2. Why is Xe-133 the only noble gas considered when this adjustment is made?

c. For the gaseous and waste system failure events, the licensee proposes to use the criterion of "well within 10 CFR 100." The staff did not address these two events in RG 1.183 since these events are not likely to result in core damage. Therefore, no AST-specific dose criteria were provided. Nonetheless, the staff notes that the Standard Review Plan Sections 15.7.1, 15.7.2, and 15.7.4 impose acceptance criteria from Branch Technical Position 11-5. These in turn derive from 10 CFR Part 20 rather than Part 100. The staff's original safety analysis report based its acceptance criteria of a "small fraction of the guidelines." Please provide a specific reference to a document that indicates that the staff accepted the proposed criteria as part of the licensees licensing basis. Please briefly describe the basis of the St. Lucie Offsite Dose Calculation Manual controls that limit the content of these tanks. Please explain any significant differences between these basis and the acceptance criteria you are proposing in this LAR.

14. In regard to the assumed control room envelope unfiltered inleakage, different values were assumed in different accident analyses. For example, in the LOCA analysis, the assumed inleakage for Unit 2 is 540 cfm and 1000 cfm for the SGTR. Explain why different values were used and what value will be used for the how the design basis inleakage is defined.

15. Control room ventilation filter efficiencies that are applied to the filtered makeup and recirculation flows are stated as:

a. 99 percent for particulate, elemental iodine and organic iodine for Unit 1,

b. 99 percent for particulate, and 97.5 percent for elemental and organic iodine for Unit 2

UFSAR for Unit 1, §15.4.1.8 states the values are currently 99 percent for particulate, and 95 percent for elemental and organic iodine for Unit 1. UFSAR for Unit 2, Table 15.6.6-11 states the values are currently 99 percent for particulate, elemental iodine and organic iodine for Unit 2 Since the assumed 99 percent efficiencies for the Unit 1, charcoal absorbers appear to be in conflict with RG 1.52 please justify the assumed Unit 1 values. Please explain why the elemental and organic efficiencies are 97.5 percent for elemental and organic for Unit 2.

16. For the spent fuel cask drop and fuel handling accidents analyses are provided for two different DFs. Consistent with RG 1.183, please confirm that the amendment requests to change the design basis DFs for these accidents to an overall decontamination factor of 200.

17. In order to complete its evaluation, the staff needs to review the general assumptions and calculations used by the licensee to prove that the containment sump pH will be maintained above 7 throughout the duration of the accident. Please describe the

procedure utilized, including sample calculations, for calculating this pH of the containment sump water during the 30 day period after a LOCA. The calculations should include the chemicals used for pH control: NaOH in Unit 1 and tri-sodium phosphate (TSP) in Unit 2.

18. Paragraph 1 of Section 1.6.3.1 of the AST Licensing Technical Report for St. Lucie Units 1 and 2 (Report No. NAI-1101-043, Revision 2 and Report No. NAI-1101-044, Revision 1) states that during normal control room ventilation system operation, fresh air is taken in through either the northern or the southern outside air intakes by remote manual opening of the redundant motor operated isolation valves. In contrast, Paragraph 3 of Section 1.6.3.3 of the same report states that both of these control room ventilation intakes remain open during normal operation and the control room ventilation system draws outside air through both of the vents in parallel. Please clarify whether both outside air intakes are always open during normal operation and whether the flow rates through each air intake are always equal.

    Likewise, Paragraph 3 of Section 1.6.3.3 of Report No. NAI-1101-043 and Report No. NAI-1101-044 states that the dispersion factors for air being drawn into the control room are the average of the dispersion factors for the two intake locations during normal control room ventilation system operation. In contrast, Paragraph 6 of Section 1.8.1 of the same report implies that the dispersion factors for the unfavorable intake location are used during normal control room ventilation system operation. The former assumption would be valid only if the flow rates through each intake are always equal during normal control room ventilation system operation whereas the latter assumption would be appropriate if the flow rates through each intake are not always equal. Please clarify the dispersion factors used in the dose analyses during normal control room ventilation system operation prior to control room isolation.

19. The control room operators have the ability to determine which air intake has the least amount of radiation by observing radiation monitors located in each of the two outside air intake ducts. After the initial control room isolation period, operators are assumed to have selectively open the ventilation system intake location with the lower radioactive concentration in order to maintain positive pressure and air quality in the Control Room (CR). This un-isolation of the control room is assumed to occur 90 minutes from the start of the accident and continue throughout the rest of the 30-day duration of the event. It is possible that wind shifts and changing release rates from multiple release pathways throughout the 30-day duration of the event could change which air intake has the lower radioactive concentration. Please explain how the operators will be able to continuously observe the radiation monitor levels at each intake throughout the 30-day event period to ensure that the least contaminated intake is always being used to pressurize the control room.

20. Table 1.8.1-2 of the AST Licensing Technical Report for St. Lucie Units 1 and 2 (Report No. NAI-1101-043, Revision 2 and Report No. NAI-1101-044, Revision 1) presents the atmospheric dispersion factors used for the various accident scenarios. Since the two CR intakes are not in the same 90 degree window for plant vent releases, additional dilution credit for plant vent releases can be taken under certain circumstances. For example, the χ/Q value presented in Table 1.8.1-2 for release-receptor pair “A” (plant vent release to the north CR intake) includes a factor of two reduction to account for

dilution by the flow from the "clean" intake during normal control room ventilation system operation. Likewise, the χ/Q values presented in Table 1.8.1-2 for release-receptor pair "B" (plant vent release to the south CR intake) includes a factor of four reduction to account for the expectation that the operators will make the proper intake selection by opening the outside air intake with the least amount of radiation after initiation of filtered air makeup. However, it is not appropriate to take either of these two dilution credits for unfiltered inleakage. Consequently, please confirm that the χ/Q values used to model unfiltered inleakage for plant vent releases prior to CR isolation and after initiation of filtered air makeup did not include the dilution credits discussed above.

Also note that the factor of two reduction to account for dilution by the flow from the "clean" intake during normal control room ventilation system operation is only valid if the flow rates through each intake are always equal during normal control room ventilation system operation. If this is not the case, this additional dilution credit for plant vent releases is not appropriate.

21. Paragraph 1 of Section 2.2.4 of the AST Licensing Technical Report for St. Lucie Units 1 and 2 (Report No. NAI-1101-043, Revision 2 and Report No. NAI-1101-044, Revision 1) states that the atmospheric dispersion factors used for the fuel handling accident were based on the location of the containment maintenance hatch, yet Paragraph 2 of Section 2.2.1 of the same report states that the dispersion factors from the fuel handling building were slightly greater that the dispersion factors from the containment maintenance hatch. Please confirm the release pathway for the set of χ/Q values used to model the fuel handling accident. Also provide a copy of the ARCON96 computer code outputs used to produce the χ/Q values for releases from the containment maintenance hatch.

22. Section 2.1.1.2 of the St. Lucie Units 1 and 2 UFSAR states that the radii of the Exclusion Area Boundary (EAB) and Low Population Zone (LPZ) are 0.97 mile (1,561 meters) and 1 mile (1,609 meters), respectively, from the center of the St. Lucie plant. However, the EAB and LPZ downwind distances provided as input to the PAVAN atmospheric dispersion model were 1,537 meters and 1,585 meters for Unit 1 and 1,442 meters and 1,490 meters for Unit 2, respectively. Please provided the basis for EAB and LPZ radii used as input to the PAVAN computer code.

23. The dose analysis assumes contaminated outside air enters the control room unfiltered via various leakage paths during the entire course of the event. At the beginning of the event, an initial dispersion factor applicable to the least favorable control room ventilation system intake location is assigned to this unfiltered inleakage. Following control room isolation, when both control room air intakes are closed, a dispersion factor corresponding to a location that is at the midpoint of both of the control room air intake locations is applied. At the time when the operator unisolates the control room by opening the favorable air intake, the dispersion factor for the more favorable control room intake location is used.

Unfiltered inleakage is the result of unintended infiltration through pathways such as doorways, envelope penetrations, and leakage in ventilation system components. For example, Section 6.4.1.3.1 of the St. Lucie Unit 1 UFSAR presents a control room leakage calculation which estimates that 89 percent of the control room leakage is from gasketed doors and Section 6.4.2.3 of the St. Lucie Unit 2 UFSAR presents a control room leakage calculation which estimates that 90 percent of the control room leakage is from electrical openings and airtight personnel access doors (UFSAR Table 6.4-1). It is not clear that this unfiltered inleakage pathway will necessarily change as a function of either the control room isolation mode or the air intakes used to pressurize the control room. Consequently, please explain why unfiltered inleakage is not modeled using the most limiting dispersion factors associated with the bounding potential unfiltered inleakage pathway for the duration of the event.

Unit 1 Only

1. The meteorological data processing description provided with the ARCON96 meteorological data input file states that the delta-temperature data used in determining stability class were in units of °F/50m. However, the St. Lucie Unit 1 UFSAR Section 2.3.3 says that differential temperature is measured between 57.9 meters and 10 meters, implying that the delta-temperature data are recorded in units of °F/47.9 meters. If the delta-temperature data used to determine stability class were in units of °F/47.9 meters instead of °F/50m, please determine the impact on the classification of stability and the resulting ARCON96 and PAVAN χ/Q values.

2. LAR 1 includes an evaluation for the radiological consequences for inadvertent opening of a SG relief or safety valve. UFSAR for Unit 1, §15.2.11.3.2 states that the radiological releases due to the opening of a power operated atmospheric dump valve are bounded by the stuck open main steam safety valve event. Given this, why was this accident included in LAR 1 rather than the stuck open MSSV event.

Unit 2 Only

1. The St. Lucie Unit 2 UFSAR Section 2.3.3.4 states that differential ambient air temperature is available between the 33.5-meter and 10-meter levels and between the 57.9-meter and 10-meter levels on the onsite meteorological tower. Please specify which of these two delta-temperature measurements were used to derive the atmospheric stability classification used as input to the ARCON96 and PAVAN computer codes.

2. Please justify using the release-receptor pair "N" (stack/plant vent release to midpoint between intakes) χ/Q value of 3.79E-3 sec/m^3 presented in Table 1.8.1-2 of AST Licensing Technical Report for St. Lucie Unit 2 (Report No. NAI-1101-044, Revision 1) to model unfiltered inleakage to the CR during CR isolation for the fuel handling accident.

3. UFSAR for Unit 2, §6.5.2, Containment Spray System/Iodine Removal System (IRS), states the purpose of the IRS is to achieve a containment sump pH between 7.0 and 7.5 after all the spray chemicals mix with the available water inventory. UFSAR for Unit 2, Figure 6.5-8 shows that the minimum pH remains at approximately 7.0 pH. UFSAR for Unit 2, §15.6.6.4.1.6 states that:

> Calculations of potential doses to control room personnel considered the possibility of iodine reevolution. The justification for assuming that

reevolution of iodine takes place is based on 1) the low long-term sump pH of 7 and, 2) the claim that hydrazine oxidizes quickly when exposed to air and, therefore, is not available for iodine retention following depletion of its inventory. Iodine reevolution would increase the quantity of airborne iodine available for release to the environment following the termination of hydrazine injection. This, in effect, reduces the overall effectiveness of the IRS and would provide a conservative evaluation of doses to control room personnel. The possibility of iodine reevolution could be delayed through a long hydrazine injection period. Increasing the hydrazine injection time could be accomplished by manually shutting down one hydrazine injection pump one hour after the start of a LOCA. This manual action would require an operator to leave the control room and access one of the motor control centers at the electrical equipment room. The acceptability of this operator action was based on an evaluation of his post LOCA 30-day exposure, taking into consideration time spent outside the control room to assess compliance with GDC-19 of Appendix A to 10 CFR 50.

Regulatory Position 3.5, Appendix A of RG 1.183, states that analyses should consider iodine reevolution if the suppression pool liquid pH is not maintained greater than 7. Given the current licensing bases, justify why reevolution and the possibility of manual operator actions outside the control room are not included in the proposed analyses.