TurkeyPointRAIsPEm Resource

From: Comar, Manny
Sent: Wednesday, February 20, 2013 3:07 PM
To: TurkeyPointRAIsPEm Resource
Subject: REQUEST FOR ADDITIONAL INFORMATION LTR. No: 72 RELATED TO SRP: 11.02 LIQUID WASTE MANAGEMENT FOR THE TURKEY POINT UNITS 6 AND 7 COLA
Attachments: PTN-RAI-LTR-072.doc

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February 20, 2013

Mano K. Nazar
Senior Vice President and Chief Nuclear Officer
Florida Power & Light Company
Mail Stop NNP/JB
700 Universe Blvd
Juno Beach, FL 33408-0420

SUBJECT: REQUEST FOR ADDITIONAL INFORMATION LETTER NO.072 RELATED TO SRP SECTION 11.02 LIQUID WASTE MANAGEMENT SYSTEMS FOR THE TURKEY POINT NUCLEAR PLANT UNITS 6 AND 7 COMBINED LICENSE APPLICATION

Dear Mr. Nazar:

By letter dated June 30, 2009, as supplemented by letters dated August 7, 2009, September 3, 2010, December 21, 2010, December 16, 2011 and December 14, 2012, Florida Power and Light submitted its application to the U. S. Nuclear Regulatory Commission (NRC) for a combined license (COL) for two AP1000 advanced passive pressurized water reactors pursuant to 10 CFR Part 52. The NRC staff is performing a detailed review of this application to enable the staff to reach a conclusion on the safety of the proposed application.

The NRC staff has identified that additional information is needed to continue portions of the review. The staff's request for additional information (RAI) is contained in the enclosure to this letter.

To support the review schedule, you are requested to respond within 45 days of the date of this letter. If you are unable to provide a response within 45 days, please state when you will be able to provide the response. In the event the response submitted is incomplete, please indicate in the response when the complete response will be provided. If changes are needed to the final safety analysis report, the staff requests that the RAI response include the proposed wording changes. Your response should also indicate whether any of the information provided is to be withheld as exempt from public disclosure pursuant to 10 CFR 2.390.

If you have any questions or comments concerning this matter, you may contact me at 301-415-3863 or manny.comar@nrc.gov.

Sincerely,

/**RA**/

Manny Comar, Lead Project Manager
AP1000 Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-040
52-041

Enclosure:
Request for Additional Information

CC: see next page

If you have any questions or comments concerning this matter, you may contact me at 301-415-3863 or manny.comar@nrc.gov.

Sincerely,

/**RA**/

Manny Comar, Lead Project Manager
AP1000 Licensing Branch 4
Division of New Reactor Licensing
Office of New Reactors

Docket Nos. 52-040
52-041
eRAI Tracking No. 6985

Enclosure:
Request for Additional Information

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DATE	1/4/13	1/7/13	1/22/13	2/20/13

*Approval captured electronically in the electronic RAI system.

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Request for Additional Information 72
Issue Date: 2/20/2013
Application Title: Turkey Point Units 6 and 7
Operating Company: Florida P and L
Docket No. 52-040 and 52-041
Review Section: 11.02 - Liquid Waste Management System
Application Section: 11.2.3.5

QUESTIONS

11.02-6

Supplemental Staff RAI to RAI 11.02-1, 11.02-2, 11.02-3, and 11.02-4.

Background

In FSAR Rev. 4, Section 11.2.3.5, PTN COL 11.2-2, the applicant proposes a disposal method for liquid radioactive effluents using deep well injection into the Boulder Zone. When compared to routine effluent discharges in surface waters, the radioactivity injected in the Boulder Zone is expected to be isolated from the surface environment and out of reach of traditional radiation exposure scenarios and pathways considered by NRC regulations and guidance. Traditional effluent discharge methods dilute and disperse the radioactivity in the environment, but this disposal method confines the radioactivity into a slow moving and expanding plume with the total inventory of long-lived radionuclides increasing over the operating life of the plant. As a result, radiological assessment methods and assumed exposure scenarios used to quantify radiological impacts and compliance with NRC regulations for effluents discharged in surface water bodies are not directly applicable.

The deep well injection method involves technical and regulatory considerations that are not explicitly addressed under 10 CFR 50.34a, and 50.36a, and 10 CFR Part 50, Appendix I design objectives and ALARA provisions in controlling radioactive effluent releases. Similarly, the requirements of 10 CFR 20.1301 and 20.1302 and 40 CFR Part 190 [under Part 20.1301(e)] in complying with effluent concentration limits and doses to members of the public also do not explicitly address deep well injection. However, the applicant must still meet applicable requirements under these regulations in applying the deep well injection method for waste disposal.

Accordingly, the applicant has performed and provided an analysis in its current application under the provisions of 10 CFR 20.2002, “Method for obtaining approval of proposed disposal procedures.” However, the results are presented in a manner that excludes a demonstration of compliance with some NRC requirements and associated guidance on the assumption that the discharge method offers complete isolation of the radioactivity with no radiation exposures to the public. The applicant has not included information sufficient to determine if it meets the requirements of 10 CFR 20.1301, 10 CFR 20.1302, and 10 CFR 20.1406; and numerical guides, design objectives, and ALARA provisions of 10 CFR Part 50, Appendix I for liquid effluents.

10 CFR 20.2002 provides an applicant with a method to obtain approval for proposed procedures, not otherwise authorized in the regulations, for disposal of licensed material generated in the licensee's activities. Under 10 CFR Part 20.2002, an applicant has to provide (a) a description of the waste, including the chemical and physical properties important to risk evaluation and the proposed manner and conditions of disposal; (b) an analysis of the environment in which wastes will be disposed; (c) the nature and location of other potentially affected licensed and unlicensed facilities; and (d) analyses and procedures to ensure that doses are maintained ALARA and within the dose limits of 10 CFR Part 20. The NRC typically approves Part 20.2002 requests that will result in a dose to a member of the public (including all exposure groups) that is no more than "a few millirem/year" (see SECY-07-0060, Attachment 1, and NUREG-1757, Vol. 1, Rev. 2, Section 15.12). As is noted in the SECY paper, the NRC selected this criterion because it is a fraction of the dose associated with naturally occurring background radiation, a fraction of the annual public dose limit, and an attainable objective in the majority of cases.

In this context, the staff considers its well-established Part 50 light-water-reactor criteria (including those prescribed by Appendix I) in determining whether all releases of radioactive material to the environment are ALARA and what monitoring, design criteria, and other conditions apply. As a result, the staff's evaluation of this disposal method under Part 20.2002 does not preclude the staff from considering the substantial technical requirements, design criteria, technical specifications, monitoring, and annual reporting called for by other provisions of Part 20 and Part 50.

Moreover, the staff notes that there is a need to ensure that NRC and Florida Department of Environmental Protection (FLDEP) requirements, when issued, are not conflicting and do not impose duplicative requirements, such as for radiological monitoring, periodic inspections and testing in confirming the mechanical integrity of the injection and monitoring wells, and requirements for well abandonment and closure at the end of their operational cycles or in the event of well failures and migration of radioactive materials in Upper Floridan aquifers.

As a result, there are a number of issues that the staff needs to consider in bridging and integrating these regulatory requirements and NRC acceptance criteria. The issues involve the resolution of geo-hydrological characteristics of the Boulder Zone; use of information described in the construction and testing of the first exploratory and monitoring wells (see FPL reports of Sept. 2012); development of an appropriate radioactive source term confined within an amorphous plume; development of an approach and method for modeling potential exposure scenarios that consider well failures and intrusion scenarios as expected operational occurrences using current land-use practices for this part of Florida; identification of surrogate criteria in achieving the same regulatory objectives since some of current regulatory requirements do not apply to this disposal method; identification of FLDEP permit conditions that would fulfill or supplement NRC requirements on installation, testing, operation, and environmental monitoring; and insertion of specific license conditions on the design features of injection and monitoring wells whose construction would not be completed before the issuance of the combined license.

RAI Questions on Proposed Deep Well Injection Disposal Method

The information provided in FSAR Rev. 4, Sections 9.2, 10.4.5, and 11.2 and responses to staff RAIs presented in FPL correspondence (May 22, 2012 and July 13, 2012) are not sufficient for the staff to validate and verify the estimated doses of the assumed exposure

scenario. Additional detail should be provided to enable the staff to verify that the estimated doses in the FSAR are bounding and acceptable. Without this information, the staff is unable to make a determination that the applicant meets the acceptance criteria in SRP 11.2 and complies with the requirements of 10 CFR 20.2002, 20.1301, 20.1302, and 20.1406, and 10 CFR Part 50, Appendix I numerical guides, design objectives, and ALARA provisions. This supplemental RAI on the proposed deep well injection method consolidates and subsumes the issues identified in prior staff RAIs. As a result, the following RAIs are closed: RAI 11.02-1, 11.02-2, 11.02-3, and 11.02-4.

1. The proposed discharge method for the disposal of treated liquid radioactive waste by injection into the Boulder Zone (about 2800 to 3500 feet below grade) represents a waste management approach that is not practiced by any other nuclear power plant in the U.S. While deep well injection provides the means to isolate liquid radioactive waste over the long-term, complete isolation is not assured because of the potential for human intrusion via drilling into the Boulder Zone, and unknown hydraulic connections between the Lower and Upper Floridan aquifers through the middle confining unit. Thus, the applicant is requested to consider radiological impacts of the disposal method should radioactivity be brought up to the surface by (1) drilling activities undertaken at a location beyond the control of the applicant (licensee) and expose well drillers to radiaoctive materials, (2) failure of a well casing or packing that could contaminate the Upper Floridan Aquifer and expose water users to radioactive materials, and (3) upward migration of the injectate from the Boulder Zone into the base of the Upper Floridan Aquifer and expose water users to radioactive materials. Based on a review of the literature, the staff notes that there have been instances where contaminants have migrated upward out of the Boulder Zone. In some studies, this was not attributed to improper well construction. As is noted in FSAR Rev. 4, Section 2.4.12.2.1.2 and Figure 2.4.12-214 and in the FPL report on the construction of the dual zone monitoring well, the Upper Floridan Aquifer has been designated as an underground source of drinking water (USDW).

2. In assessing radiological impacts, the applicant is requested to address the following exposure scenarios and pathways in bracketing the range of events and doses to members of the public that could result if exposed to the injectate. The scenarios assume that these events would take place offsite with the applicant (licensee) not being aware of these events during plant operation. The scenarios may include, but are not limited to the following:

i. a drilling scenario, taking place offsite, involving contaminated drilling mud and cuttings being brought to the surface and exposing workers during drilling activities and nearby members of the public.

ii. the failure of injection well packings and joints after closure and abandonment, with the assumption that the failed wells become conduits connecting the radioactive plume within the Boulder Zone to the Upper Floridan aquifer from which contaminated water would be used at the surface. Some reported uses of water include landscaping and nursery irrigation, agriculture, aquaculture, and industrial applications. The applicant should present a detailed analysis of potential exposure pathways and doses from this scenario and describe all supporting assumptions. The applicant should discuss the effects and expiration of institutional controls, if any, on deep well injection activities and use of the land and groundwater in the vicinity of the plant site.

iii. a U-tube scenario where offsite well drilling activities and differential pressures associated with injection would result in the radioactive plume, within the Boulder Zone, being hydraulically pushed into the Upper Floridan aquifer. The analysis should consider the potential migration of fluids and radioactivity through offsite wells or formation/fissures, and well penetrations to USDW as well as natural migration into overlying aquifers.

iv. Alternatively, the applicant could develop a single bounding scenario (from the above scenarios or equivalent variations of these scenarios) in defining and characterizing types of activities or natural processes leading to radiation exposures, and assumed exposure pathways and potential doses to offsite drilling crew workers and members of the public. Should this alternative be selected, the applicant is requested to provide the appropriate justification and supporting information in identifying such a bounding scenario for the staff to conduct an independent evaluation of the applicant's approach and results in concluding that regulatory requirements have been met.

3. In developing the radioactive source terms for any of the above scenarios, the applicant is requested to consider the cumulative inventories of long-lived radionuclides expected to be present after 40 years of operations for both reactor units. The applicant should present a detailed analysis, identify long-lived radionuclides of importance to dose modeling, describe the physical and chemical properties important to the dose assessment, and describe the expected behavior of each radionuclide in the Boulder Zone based, in part, on their deposition and adsorption characteristics if assumed. This analysis should include the accumulation, radial distribution, and movement of radioactivity within and out of the Boulder Zone. Sources of radioactivity include long-lived radionuclides, such as H-3, C-14, Sr-90, Tc-99, I-129, and Cs-137, among others, and transuranics. The analysis should provide radionuclide specific estimates of their concentrations in and around the injection point and in radial directions of the plume within the Boulder Zone after 40 years of plant operation. The source term should consider whether the injectate results in a plume (depending on the use of reclaimed municipal waste water or seawater) that is buoyant or readily miscible within the 200-foot thick Boulder Zone formation brine. The applicant should consider geochemical effects associated radionuclide chemical speciation and absorption within the rock formation.

4. In modeling the movement of radioactivity in groundwater, the traditional approach applies distribution coefficients (Kd) and retardation factors. The Kd approach works best for radionuclides that are in contact with very small soil particles, where the Kd lumps the effects of number of complex chemical processes into a single value. However, currently published Kd values used in modeling the movement of radioactivity in groundwater may not apply to this type of environment. The applicant is requested to indicate if in modeling the movement of radioactivity in the Boulder Zone, the evaluation considered the application of retardation factors, and, if so, describe how Kd values were modified and assigned to radionuclides. The applicant is requested to indicate whether the presence of residual concentrations of organic compounds in reclaimed municipal waste water were considered in developing distribution coefficients and retardation factors.

5. Since the deep well injection system will involve the use of 12 injection wells in relatively close proximity, the applicant is requested to address (1) a rise in pressure given the combined operation of multiple wells, and (2) potential fractures and formation of hydraulic connections, followed by upwelling into the above confining units. Regarding possible failures of well casings, the applicant is requested to describe design features of well casings and joints, and measures that will be implemented in ensuring the mechanical integrity of the injection and monitoring wells over their operational lives. In this context, the applicant is requested to describe plant operations and procedures should any upwelling or failures of the injection system be noted, and whether interim provisions will be made to use backup systems in disposing or storing of radioactive liquid effluents. The applicant should also describe well abandonment procedures, if needed during the lifetime of the license, including steps to confirm the mechanical condition of the wells, and methods and materials that would be used

to plug and seal wells.

6. With respect to injection flow and dilution flow rates, the applicant is requested to reconcile differences in stated flow rates and citations for the location of such information. For example, FSAR Tier 2, Rev. 4, Section 11.2.3.5 refers to FSAR Section 9.2.6.2.1 for details on deep well injection, but this FSAR section addresses the treatment of sanitary wastes. While FSAR Tier 2, Rev. 4, Section 11.2.3.5 identifies dilution flow rates for the disposal of liquid effluents by deep well injection in assessing radiological impacts, it does not refer to a specific FSAR section for design specific information, such as FSAR Tier 2, Section 9.2 or 10.4.5. A review of ER, Rev. 4, Section 5.2.3.2.4 indicates that the stated flow rates are 12,500 gpm and 58,000 gpm, which are consistent with ER Rev. 4, Table 3.3-1 under normal and maximum cases. However, FSAR Rev. 4, Section 2.4.12.2.1.3 refers to peak and operational injection rates, with a stated 14,000 gpm for reclaimed water and 62,500 gpm for seawater as implied normal operational flow rates. These injection rates are driven, in part, by FLDEP specifications on maximum linear velocities and friction loss and injection pressures, but such details and limitations on the design basis are not described in the FSAR. Accordingly, it is not clear which injection flow rates form the FSAR design basis, and whether the stated injection flow rates reflect the information presented in FPL's September 2012 report on the construction and testing of the first exploratory well. The applicant is requested to review and revise the FSAR and include in its revision a description of the DWI system and flow schematics, essential operational features and characteristics, and design basis of deep well injection flow rates when using reclaimed water and seawater and qualify the operational conditions for each, as expected normal operation versus peak or maximum conditions, and their justifications in modeling radiological impacts.

7. While the applicant indicates that liquid effluent discharges will be diluted with a flow rate of 12,500 gpm using reclaimed municipal waste water or 58,000 gpm using seawater, the description does not address the conditions and dilution flow rates when the plant is not operating, such as during extended outages. The applicant is requested to describe in the appropriate FSAR section deep well injection rates under different plant conditions, procedural controls for the disposal of liquid effluents whenever the plant is in an outage mode, sources of dilution flow rates in this operating status, and expected dilution flow rates. The applicant should address whether it will impose in the ODCM and SREC restrictions such that discharges of liquid effluents will not be initiated unless a minimum dilution flow rate is established in demonstrating compliance with effluent concentration limits and unity-rule of 10 CFR Part 20, Appendix B, Table 2, Column 2; dose limits of 10 CFR 20.1301, 20.1302, and 20.1301(e); and numerical guides, design objectives, and ALARA provisions of Appendix I to 10 CFR Part 50 for liquid effluents.

8. With respect to system operations and anticipated operational occurrences, the applicant is requested to assess a postulated event involving the failure of some injection equipment, such as injection pipe damaged by a moving vehicle, valve failures, over pressurization, blowout of seals, joint failures, and operator errors. This evaluation would consider programs and procedures used to control radiation exposures and doses to plant workers in responding to accidental spills of the injectate on the site and runoff to unrestricted areas via the site's surface water drainage system. This evaluation should consider the specific design features of the deep well injection system, its location on the applicant's property, engineered and administrative controls used in terminating the injection flow or diverting it to other injection wells.

9. 10 CFR 20.1406 requires that applicants describe how facility design and procedures for operation will minimize, to the extent practicable, contamination of the facility and the environment; facilitate eventual decommissioning; and minimize, to the extent practicable, the generation of radioactive waste. While the NRC recognizes that the proposed disposal method is regulated by FLDEP under EPA provisions, the applicant is requested to discuss and describe the extent to which engineered design features and leakage detection monitoring satisfying the regulatory requirements of FLDEP would also demonstrate compliance with 10 CFR 20.1406 in minimizing the contamination of plant discharge blowdown systems and the environment, including groundwater and surface water. The applicant should identify specific conditions of FLDEP permit and discuss the extent to which such provisions would also address NRC requirements and guidance for routine operational inspections, periodic testing in confirming the mechanical integrity of injection and monitoring wells, and describe system components and their design features that will be used to reduce leakage before pumping into the injection wells and avoid uncontrolled and unmonitored releases of liquid effluents to the environment. Relevant NRC guidance is presented in IE Bulletin 80-10, "Contamination of Nonradioactive System and Resulting Potential for Unmonitored, Uncontrolled Release to Environment," Regulatory Guide (RG) 4.21 "Minimization of Contamination and Radioactive Waste Generation: Life Cycle Planning," and Nuclear Energy Institute (NEI) Topical Report (TP) 08-08A "Generic FSAR Template Guidance for Life Cycle Minimization of Contamination."

10. With respect to environmental radiological monitoring, the applicant is requested to describe sampling locations and elevations above the Boulder Zone, sampling frequency, and analytical program in detecting the presence of long-lived and environmentally mobile radionuclides. The applicant should identify specific conditions of FLDEP permit on environmental monitoring and discuss the extent to which such provisions would also address NRC requirements of the radiological environmental monitoring program (REMP). The environmental radiological monitoring program should also acknowledge, given the information presented in FSAR Rev. 4, Section 2.4.12.2.1.2, that the sampling and analysis program will include the evaluation of water samples from Upper Floridan aquifer production wells that are used to supply cooling and process water for the operation of FPL Units 1, 2 and 5 and protective actions that will be taken if radioactive materials are detected.

11. As part of the REMP, the applicant should also address the presence of naturally occurring radioactivity in the Upper and Lower Floridan aquifers. For example, a December 1996 article published in the Florida Water Resources Journal notes that gross alpha activity concentrations of 90 and 375 pCi/L were noted in the Upper and Lower Floridan aquifers, respectively. These concentrations are associated with the presence of U, Ra and Th and their respective decay products and K-40. The applicant should include in its operational monitoring program the means to assess the variability of the concentrations of naturally occurring radioactivity over an appropriate time period. A baseline should be established before the operation of injection and monitoring wells since the presence of alpha radioactivity in environmental samples could be later erroneously attributed to fuel failures.