Progress Energy

Crystal River Nuclear Plant
Docket No. 50-302
Operating License No. DPR-72

December 15, 2011
3F1211-05

U.S. Nuclear Regulatory Commission
Attn: Document Control Desk
Washington, DC 20555-0001

Subject: Crystal River Unit 3 – Response to Request for Additional Information to Support NRC Health Physics and Human Performance Branch Technical Review of the CR-3 Extended Power Uprate LAR (TAC No. ME6527)

References:
1. CR-3 to NRC letter dated June 15, 2011, "Crystal River Unit 3 – License Amendment Request #309, Revision 0, Extended Power Uprate" (Accession No. ML112070659)
2. NRC to CR-3 letter dated December 7, 2011, "Crystal River Unit 3 Nuclear Generating Plant - Request for Additional Information for Extended Power Uprate License Amendment Request (TAC No. ME6527)" (Accession No. ML11326A231)

Dear Sir:

By letter dated June 15, 2011, Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc., requested a license amendment to increase the rated thermal power level of Crystal River Unit 3 (CR-3) from 2609 megawatts (MWt) to 3014 MWt. On December 7, 2011, the NRC provided a request for additional information (RAI) required to complete its evaluation of the CR-3 Extended Power Uprate (EPU) License Amendment Request (LAR).

In addition, CR-3 is providing an update to Table 2.9.2-10, "CR-3 EPU Activity Available for Release for Non-LOCA Accidents," contained in the CR-3 EPU Technical Report (TR) to correct the listing of radionuclide quantities for the Locked Rotor Accident. During an internal review of the documents supporting Section 2.9.2 of the CR-3 EPU TR, the vendor identified that the radionuclide quantities for the Locked Rotor Accident were incorrect. The dose results for the Locked Rotor Accident were based on the correct radionuclide quantities for EPU conditions and are correctly reflected in Section 2.9.2, "Radiological Consequence Analyses," of the CR-3 EPU TR. This administrative error was entered into the vendor and CR-3 corrective action programs in August 2011 and September 2011, respectively, and does not affect the conclusions regarding the consequences of a Locked Rotor Accident.

Attachment 1, "Response to Request for Additional Information to Support NRC Health Physics and Human Performance Branch Technical Review of the CR-3 EPU LAR," provides the CR-3 formal response to the RAI needed to support the Health Physics and Human Performance Branch technical review of the CR-3 EPU LAR.

Attachment 2, "Revised List of Radionuclide Quantities for the Locked Rotor Accident," provides the revised update to Table 2.9.2-10 contained in the CR-3 EPU TR , specifically page 2.9.2-29, listing the correct radionuclide quantities for the Locked Rotor Accident. Please remove and replace CR-3 EPU TR page 2.9.2-29, in copies of Attachments 5 and 7 of CR-3 LAR #309, with the attached updated pages.

This correspondence contains no new regulatory commitments.

A001
NRR

Progress Energy Florida, Inc.
Crystal River Nuclear Plant
15760 W. Powerline Street
Crystal River, FL 34428

The information provided by this correspondence does not change the intent or the justification for the requested EPU license amendment. FPC has determined that this supplement does not affect the basis for concluding that the proposed license amendment (Reference 1) does not involve a Significant Hazards Consideration. As such, the 10 CFR 50.92 evaluation provided in the June 15, 2011 submittal (Reference 1) remains valid.

If you have any questions regarding this submittal, please contact Mr. Dan Westcott, Superintendent, Licensing and Regulatory Programs at (352) 563-4796.

Sincerely,

Jon A. Franke
Vice President
Crystal River Nuclear Plant

JAF/gwe

Attachments:

1. Response to Request for Additional Information to Support NRC Health Physics and Human Performance Branch Technical Review of the CR-3 EPU LAR

2. Revised List of Radionuclide Quantities for the Locked Rotor Accident

xc: NRR Project Manager
Regional Administrator, Region II
Senior Resident Inspector
State Contact

STATE OF FLORIDA

COUNTY OF CITRUS

Jon A. Franke states that he is the Vice President, Crystal River Nuclear Plant for Florida Power Corporation, doing business as Progress Energy Florida, Inc.; that he is authorized on the part of said company to sign and file with the Nuclear Regulatory Commission the information attached hereto; and that all such statements made and matters set forth therein are true and correct to the best of his knowledge, information, and belief.

Jon A. Franke
Vice President
Crystal River Nuclear Plant

The foregoing document was acknowledged before me this 15 day of December, 2011, by Jon A. Franke.

Signature of Notary Public
State of Florida

CAROLYN E. PORTMANN
Commission # DD 937553
Expires March 1, 2014
Bonded Thru Troy Fain Insurance 800-385-7019

(Print, type, or stamp Commissioned
Name of Notary Public)

Personally ✓ Known _____ -OR- Produced Identification _____

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302 /LICENSE NUMBER DPR-72

ATTACHMENT 1

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION TO SUPPORT NRC HEALTH PHYSICS AND HUMAN PERFORMANCE BRANCH TECHNICAL REVIEW OF THE CR-3 EPU LAR

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By letter dated June 15, 2011, Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc., requested a license amendment to increase the rated thermal power level of Crystal River Unit 3 (CR-3) from 2609 megawatts (MWt) to 3014 MWt. On December 7, 2011, the NRC provided a request for additional information (RAI) required to complete its evaluation of the CR-3 Extended Power Uprate (EPU) License Amendment Request (LAR). The following provides the CR-3 formal response to the RAI needed to support the Health Physics and Human Performance Branch (AHPB) technical review of the CR-3 EPU LAR. For tracking purposes, each item related to this RAI is uniquely identified as AHPB X-Y, with X indicating the RAI set and Y indicating the sequential item number.

Health Physics and Human Performance Branch (AHPB)

Human Factors:

6. (AHPB 1-1)

Table 2.12.1-8 of Attachment 5, "CR-3 Extended Power Ascension Test Plan," indicates that plant radiation surveys will be performed continuously between 0% and 100% full power to verify expected dose rates. Describe the scope of these surveys and provide a listing of plant areas where you will conduct radiation surveys following the proposed EPU implementation and describe your criteria for selecting these areas. Verify that they include surveys of all plant areas potentially affected by operations at the EPU full power level. Indicate whether survey plans for these areas include collection of benchmark data needed to assess the impact of the EPU on radiation levels.

Response:

The plant radiation surveys listed in Table 2.12.1-8 of the CR-3 EPU Technical Report (TR) (Reference 1, Attachments 5 and 7) are referring to routine plant radiation surveys required by plant health physics procedures and include the currently established radiation areas determined by existing criteria consistent with applicable 10 CFR 20 requirements.

At EPU conditions, the higher core power is not expected to create any new radiation areas since no EPU plant modifications will result in routing radioactive material to existing non-radiation areas. During power ascension testing, routine plant radiation surveys will continue to be conducted as required by plant health physics procedures and radiological postings will be upgraded or downgraded as required. Existing plant radiation survey data is available for use as pre-EPU benchmark data needed to assess the impact of the EPU on radiation levels. In addition, the CR-3 Area Gamma Monitoring System comprises 24 channels, each of which is provided with a gamma sensitive detector installed at selected locations to aid in determining the radiation levels throughout the plant. As such, the Area Gamma Monitoring System will provide an alert in the event of unexpected changes in plant radiation levels at EPU conditions. As noted in Table 2.12.1-3 of the CR-3 EPU TR, (Reference 1, Attachments 5 and 7) to augment routine radiation surveys performed during normal operation, a Biological Shield Survey will be included in the power ascension test plan to assure that plant shielding is adequate and areas with elevated radiation levels are properly identified and posted.

7. (AHPB 1-2)

Page 2.10.1-3 provides the maximum dose to any individual at the plant from 2004 through 2008. Does "any individual at the plant" refer only to permanent employees or does it include contractors?

Response:

The maximum dose per year to any individual for the years 2004 through 2008 reported on page 2.10.1-3 of the CR-3 EPU TR (Reference 1, Attachments 5 and 7) are based on individuals at CR-3 that were issued thermo-luminescent dosimetry (TLDs) during the identified periods and includes both contractors and employees.

8. (AHPB 1-3)

Page 2.10.1-7 of Attachment 5 states that based on small break loss-of-coolant-accident (LOCA) results, the time available for actions in the emergency diesel generator (EDG) rooms to maintain a dose less than 5 rem is reduced from 25 minutes to approximately 10 minutes, which still provides sufficient time to perform short compensatory actions in the EDG rooms. Provide a detailed analysis that demonstrates that 10 minutes is sufficient time for the operator to access and egress the area and perform the required actions in the EDG rooms under LOCA conditions (e.g., while wearing protective equipment).

Response:

As noted in Section 2.10.1, "Occupational and Public Radiation Doses," of the CR-3 EPU TR (Reference 1, Attachments 5 and 7), during a loss of coolant accident there are no specific local actions required in the EDG rooms. The time available for actions in the EDG rooms was previously reported in the FPC response to TMI Action Item II.B.2 of NUREG-0737, "Clarification of TMI Action Plan Requirements," given the importance of the EDGs. The updated time available for actions in the EDG rooms was reported in the CR-3 EPU LAR as a matter of general information.

9. (AHPB 1-4)

Table 2.9.2-16 of Attachment 5 summarizes the CR-3 EPU LOCA Radiological Consequences. The EPU doses for the Exclusion Area Boundary, Low Population Zone and Main Control Room are greater than the pre-EPU doses by about a factor of 1.63. However, the EPU dose for the Technical Support Center (3.02 rem) is lower than the pre-EPU dose (4.71 rem). Provide additional information to explain the decrease in the dose for the Technical Support Center.

Response:

The Exclusion Area Boundary and Low Population Zone atmospheric dispersion factors (χ/Q values) were updated using the PAVAN methodology to determine the EPU offsite doses. The PAVAN methodology is similar to the older Murphy/Campe methodology that was used to determine the pre-EPU χ/Q values. As expected, the reported EPU dose results are higher for the offsite receptors than the pre-EPU dose.

The Main Control Room (MCR) χ/Q values were originally derived using the Murphy/Campe methodology. These χ/Q values were used to determine the EPU MCR dose. As expected, the reported EPU dose results are higher for the MCR than the pre-EPU dose.

As noted in the CR-3 acceptance review response letter to the NRC dated July 5, 2011 (Reference 2), the Technical Support Center (TSC) χ/Q values were generated using ARCON96 instead of the Murphy/Campe methodology. This resulted in an apparent decrease in calculated dose to the TSC at EPU conditions; pre-EPU dose reported was based on Murphy/Campe methodology and EPU dose reported was based on ARCON96 methodology. Use of ARCON96 methodology for the CR-3 TSC is considered acceptable based on the guidance contained in Regulatory Guide 1.194, "Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants," (Reference 3). As allowed by Regulatory Guide 1.194, CR-3 has selectively chosen to use the ARCON96 code for determining TSC χ/Q values since it is more capable of handling the complex building geometries associated with this particular release path.

References

1. CR-3 to NRC letter dated June 15, 2011, "Crystal River Unit 3 – License Amendment Request #309, Revision 0, Extended Power Uprate." (Accession No. ML112070659)

2. CR-3 to NRC letter dated July 5, 2011, "Crystal River Unit 3 – Request for Additional Information to Support NRC Acceptance Review of CR-3 Extended Power Uprate LAR"

3. NRC Regulatory Guide 1.194, "Atmospheric Relative Concentrations for Control Room Radiological Habitability Assessments at Nuclear Power Plants," June 2003.

FLORIDA POWER CORPORATION

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302/LICENSE NUMBER DPR-72

ATTACHMENT 2

REVISED LIST OF RADIONUCLIDE QUANTITIES FOR THE LOCKED ROTOR ACCIDENT

Table 2.9.2-10: CR-3 EPU Activity Available for Release for Non-LOCA Accidents

Nuclide	Activity Released FHA (1 Failed Fuel Assembly) (Ci) [2]	Activity Released REA Due to 1% Clad Failure (Ci) [2]	Activity Released REA Due to 1% Fuel Melt (Ci) [2, 3]	Activity Released LRA Due to 1% Clad Failure (Ci) [2]
Kr-83m [1]	1.308E+04	2.31E+04	2.08E+05	2.31E+04
Kr-85m	3.011E+04	5.33E+04	4.80E+05	5.33E+04
Kr-85	2.400E+03	2.12E+03	1.91E+04	4.25E+03
Kr-87	6.036E+04	1.07E+05	9.61E+05	1.07E+05
Kr-88	8.527E+04	1.51E+05	1.36E+06	1.51E+05
Xe-133m [1]	7.885E+03	9.30E+03	8.37E+04	1.40E+04
Xe-133	2.596E+05	3.06E+05	2.76E+06	4.60E+05
Xe-135m[1]	3.387E+04	6.00E+04	5.40E+05	6.00E+04
Xe-135	6.294E+04	1.11E+05	1.00E+06	1.11E+05
Xe-138 [1]	1.538E+05	2.72E+05	2.45E+06	2.72E+05
I-131	1.352E+05	1.50E+05	5.98E+05	2.39E+05
I-132	1.204E+05	2.13E+05	8.52E+05	2.13E+05
I-133	2.602E+05	3.07E+05	1.23E+06	4.61E+05
I-134	1.933E+05	3.42E+05	1.37E+06	3.42E+05
I-135	1.613E+05	2.85E+05	1.14E+06	2.85E+05
Rb-86	6.580E+02	0.00E+00	0.00E+00	1.16E+03
Rb-88 [1]	2.066E+05	0.00E+00	0.00E+00	3.66E+05
Cs-134	6.463E+04	0.00E+00	0.00E+00	1.14E+05
Cs-136	1.784E+04	0.00E+00	0.00E+00	3.16E+04
Cs-137	3.105E+04	0.00E+00	0.00E+00	5.50E+04

Notes:

(1) Radionuclides not in RADTRAD (References 6 and 7) default library. Additional radionuclides included in LOCA and FHA analyses updated RATRAD library.

(2) At pre-EPU conditions, the activity released corresponds to the following:

- FHA: pre-EPU normalized activity (Ci) (Table 2.9.2-2) x 2619 MWth x 1/177
- CREA: pre-EPU normalized activity (Ci) (Table 2.9.2-2) x 2619 MWth x 1%

(Note: For pre-EPU conditions, fuel melt was not evaluated.)

- LRA: This accident was not evaluated since there was no failed fuel postulated at pre-EPU conditions for the LRA.

(3) Exclusive of gap activity for REA limiting scenario (secondary release).

Table 2.9.2-10: CR-3 EPU Activity Available for Release for Non-LOCA Accidents

Nuclide	Activity Released FHA (1 Failed Fuel Assembly) (Ci) [2]	Activity Released REA Due to 1% Clad Failure (Ci) [2]	Activity Released REA Due to 1% Fuel Melt (Ci) [2, 3]	Activity Released LRA Due to 1% Clad Failure (Ci) [2]
Kr-83m [1]	1.308E+04	2.31E+04	2.08E+05	2.31E+04
Kr-85m	3.011E+04	5.33E+04	4.80E+05	5.33E+04
Kr-85	2.400E+03	2.12E+03	1.91E+04	4.25E+03
Kr-87	6.036E+04	1.07E+05	9.61E+05	1.07E+05
Kr-88	8.527E+04	1.51E+05	1.36E+06	1.51E+05
Xe-133m [1]	7.885E+03	9.30E+03	8.37E+04	1.40E+04
Xe-133	2.596E+05	3.06E+05	2.76E+06	4.60E+05
Xe-135m [1]	3.387E+04	6.00E+04	5.40E+05	6.00E+04
Xe-135	6.294E+04	1.11E+05	1.00E+06	1.11E+05
Xe-138 [1]	1.538E+05	2.72E+05	2.45E+06	2.72E+05
I-131	1.352E+05	1.50E+05	5.98E+05	2.39E+05
I-132	1.204E+05	2.13E+05	8.52E+05	2.13E+05
I-133	2.602E+05	3.07E+05	1.23E+06	4.61E+05
I-134	1.933E+05	3.42E+05	1.37E+06	3.42E+05
I-135	1.613E+05	2.85E+05	1.14E+06	2.85E+05
Rb-86	6.580E+02	0.00E+00	0.00E+00	1.16E+03
Rb-88 [1]	2.066E+05	0.00E+00	0.00E+00	3.66E+05
Cs-134	6.463E+04	0.00E+00	0.00E+00	1.14E+05
Cs-136	1.784E+04	0.00E+00	0.00E+00	3.16E+04
Cs-137	3.105E+04	0.00E+00	0.00E+00	5.50E+04

Notes:

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- CREA: pre-EPU normalized activity (Ci) (Table 2.9.2-2) x 2619 MWth x 1%

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