Progress Energy

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

Ref: 10 CFR 50.90

May 29, 2009
3F0509-09

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

Subject: Crystal River Unit 3 – License Amendment Request #307, Revision 0: Methodology for Rod Ejection Accident Analysis Under Extended Power Uprate Conditions – Response to Request for Additional Information

Reference: Crystal River Unit 3 to NRC Letter dated February 26, 2009, "Crystal River Unit 3 – License Amendment Request #307, Revision 0: Methodology for Rod Ejection Accident Analysis Under Extended Power Uprate Conditions (TAC NO. ME0730)

Dear Sir:

Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc., in accordance with 10 CFR 50.90, hereby provides a response to a request for additional information (RAI) related to License Amendment Request (LAR) #307, Revision 0. This RAI was received by electronic mail on May 6, 2009.

Attachment B contains proprietary information. AREVA NP Inc. requests the proprietary information be withheld from public disclosure in accordance with 10 CFR 2.390(a)(4). An Affidavit supporting the request is provided in Attachment A. A non-proprietary version of the response is attached in Attachment C.

In accordance with 10 CFR 50.91, a copy of the RAI response is being provided to the designated State of Florida Official.

This correspondence contains no new regulatory commitments.

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

Sincerely,

Jon A. Franke
Vice President
Crystal River Unit 3

JAF/rt

Attachments:
A. Affidavit for Withholding Proprietary Information from Public Disclosure
B. Response to Request for Additional Information (Proprietary)
C. Response to Request for Additional Information (non-Proprietary)

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

A001
NRR

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

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 29 day of May, 2009, by Jon A. Franke.

Signature of Notary Public
State of Florida

CAROLYN E. PORTMANN
Notary Public - State of Florida
My Commission Expires Mar 1, 2010
Commission # DD 524380
Bonded By National Notary Assn.

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

Personally Known ✓ -OR- Produced Identification ____

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET Number 50-302 /License Number DPR-72

LICENSE AMENDMENT REQUEST #307, Revision 0

Attachment A

Affidavit for Withholding Proprietary Information from Public Disclosure

AFFIDAVIT

COMMONWEALTH OF VIRGINIA)
) ss.
CITY OF LYNCHBURG)

1. My name is Gayle F. Elliott. I am Manager, Product Licensing, for AREVA NP Inc. and as such I am authorized to execute this Affidavit.

2. I am familiar with the criteria applied by AREVA NP to determine whether certain AREVA NP information is proprietary. I am familiar with the policies established by AREVA NP to ensure the proper application of these criteria.

3. I am familiar with the AREVA NP information contained in the attachment to a letter to the U.S. Nuclear Regulatory Commission from Mr. Jon A. Franke (Progress Energy) entitled, "Crystal River Unit 3 – License Amendment Request: License Amendment Request No. 307, Revision 0: Methodology for Rod Ejection Accident Analysis Under Extended Power Uprate Conditions – Response to Request for Additional Information," Docket No. 50-302, Operating License No. DPR-72, Letter No. 3F0609-01, and referred to herein as "Document." Information contained in this Document has been classified by AREVA NP as proprietary in accordance with the policies established by AREVA NP for the control and protection of proprietary and confidential information.

4. This Document contains information of a proprietary and confidential nature and is of the type customarily held in confidence by AREVA NP and not made available to the public. Based on my experience, I am aware that other companies regard information of the kind contained in this Document as proprietary and confidential.

5. This Document has been made available to the U.S. Nuclear Regulatory Commission in confidence with the request that the information contained in this Document be withheld from public disclosure. The request for withholding of proprietary information is made in accordance with 10 CFR 2.390. The information for which withholding from disclosure is requested qualifies under 10 CFR 2.390(a)(4) "Trade secrets and commercial or financial information."

6. The following criteria are customarily applied by AREVA NP to determine whether information should be classified as proprietary:

(a) The information reveals details of AREVA NP's research and development plans and programs or their results.

(b) Use of the information by a competitor would permit the competitor to significantly reduce its expenditures, in time or resources, to design, produce, or market a similar product or service.

(c) The information includes test data or analytical techniques concerning a process, methodology, or component, the application of which results in a competitive advantage for AREVA NP.

(d) The information reveals certain distinguishing aspects of a process, methodology, or component, the exclusive use of which provides a competitive advantage for AREVA NP in product optimization or marketability.

(e) The information is vital to a competitive advantage held by AREVA NP, would be helpful to competitors to AREVA NP, and would likely cause substantial harm to the competitive position of AREVA NP.

The information in the Document is considered proprietary for the reasons set forth in paragraphs 6(b) and 6(c) above.

7. In accordance with AREVA NP's policies governing the protection and control of information, proprietary information contained in this Document have been made available,

on a limited basis, to others outside AREVA NP only as required and under suitable agreement providing for nondisclosure and limited use of the information.

8. AREVA NP policy requires that proprietary information be kept in a secured file or area and distributed on a need-to-know basis.

9. The foregoing statements are true and correct to the best of my knowledge, information, and belief.

SUBSCRIBED before me this 20th day of May 2009.

Sherry L. McFaden
NOTARY PUBLIC, COMMONWEALTH OF VIRGINIA
MY COMMISSION EXPIRES: 10/31/10
Reg. # 7079129

SHERRY L. MCFADEN
Notary Public
Commonwealth of Virginia
7079129
My Commission Expires Oct 31, 2010

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET Number 50-302 /License Number DPR-72

LICENSE AMENDMENT REQUEST #307, Revision 0

Attachment C

Response to Request for Additional Information (non-Proprietary)

Response to Request for Additional Information

Based on an electronic mail transmission that was received from the NRC on May 6, 2009, the following additional information is provided by Crystal River Unit 3 (CR-3).

NRC Request RAI-01:

Fig. 7-5 shows temperatures of Gadolinia containing fuel, which indeed is lower than fuel containing no Gadolinia. How does the melt temperature of fuel vary with Gadolinia content? How close to the limit are the temperatures shown on Fig. 7-5 to melting, despite the fact that they are lower than that with no Gadolinia?

CR-3 Response:

As given on Page 10-3 of the COPERNIC Fuel Rod Design Computer Code Topical Report (Reference 2 of ANP-2788P, Revision 0, *Crystal River Unit 3 Rod Ejection Accident Methodology Report*), the melting temperature of UO_2 and UO_2-Gd_2O_3 is [ ]. The main effect of Gadolinia additions is to reduce the thermal conductivity of the fuel pellets. This reduction in thermal conductivity is accounted for in COPERNIC (Section 4.3.3.2 of the COPERNIC Topical Report) and it is countered by reduced U_{235} enrichments that lower the power level capability in the Gadolinia fuel rods.

As shown in Figure 7-5 of ANP-2788P, Revision 0, the temperatures of the fuel containing Gadolinia are [ ]. For this sample case, the temperature differences from the minimum fuel melt limit temperature specified in Section 7.3 of ANP-2788P, Revision 0, for each of the fuel rod types shown in Figure 7-5 of ANP-2788P, Revision 0, are provided in Table RAI-01-1 at the event termination time of 19 seconds.

Table RAI-01-1 – Fuel Temperature Differences from Fuel Melt Limit Temperature

Fuel Rod Type	Rod Power Level Ratio to UO_2 Rod	Centerline Temperature at 19 sec (°F)	Difference from Melt Limit Temperature (°F)
0 w/o Gadolinia	1.00	[ ]	[ ]
3 w/o Gadolinia	[ ]	[ ]	[ ]
8 w/o Gadolinia	[ ]	[ ]	[ ]

NRC Request RAI-02:

Figs. 7-6 to 7-8 show pre- to post-power curves determined using static and dynamic calculations for Ref. 5. Are the corresponding curves for Crystal River 3 similar?

CR-3 Response:

For the cases analyzed, no Departure from Nucleate Boiling (DNB) related failures were predicted during the pulse so these curves were not generated for Crystal River Unit 3. If Departure from Nucleate Boiling Ratio (DNBR) failures were predicted to fail during the pulse, a curve similar to Figure 7-6 of ANP-2788P, Revision 0, would be generated to count the number of failures. The behavior is expected to be similar to those illustrated in Figures 7-6 through 7-8 of ANP-2788P, Revision 0.

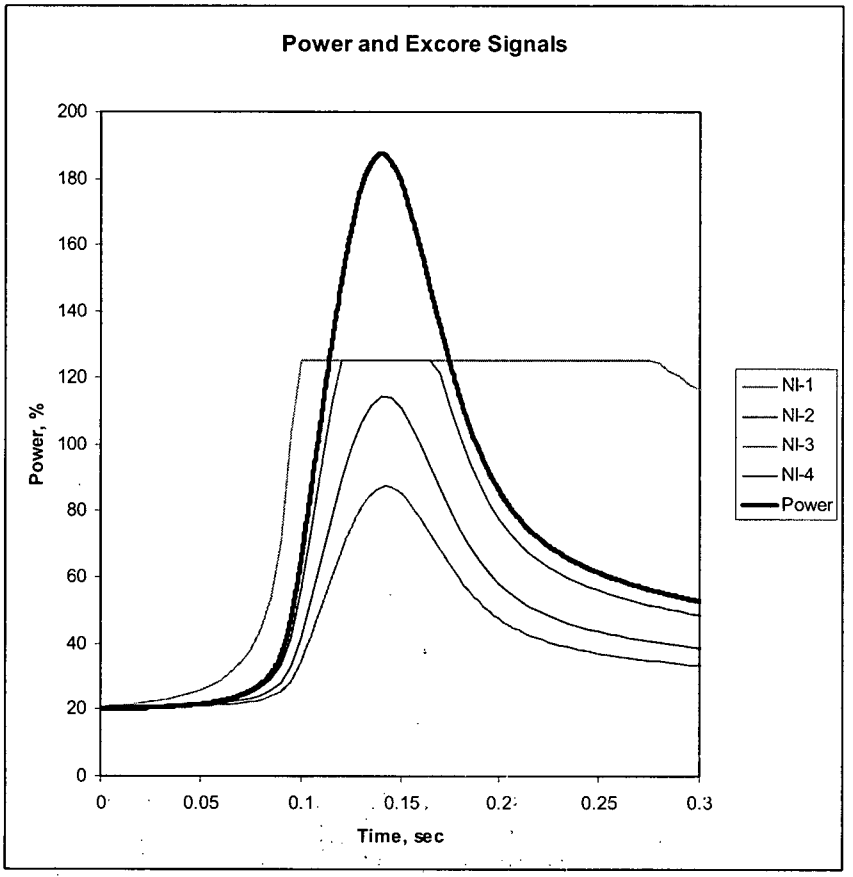
NRC Request RAI-03:

The 20% power EOC case analyzed in Chapter 8 has a power pulse peak of 187% (Table 8-6), which is beyond the 112% high flux trip point (Table 8-1). Why was this transient analyzed assuming no trip during the first 5s, but instead continued using the system code and terminated using one of the other trip signals?

CR-3 Response:

The core power listed in Table 8-6 of ANP-2788P, Revision 0, is the core power and is not the indicated power of the excore detectors. The plant trip employs the indicated power from the measured signals of the excore detectors. The trip depends on the excore signal response to the ejected rod event. The excore signal response has two dependencies that are discussed in this response. First, the excore signal depends upon the proximity of the detector to the location of the ejected rod. Second, the maximum excore power signal from the circuitry is 125 percent power. Both of these dependencies can be modeled in NEMO-K. The End Of Cycle (EOC) ejected rod simulation from 20 percent power is shown in Figure RAI-03-1. As described in Table 8-1 of ANP-2788P, Revision 0, three analyzed signals must be above 112 percent power to trip the plant. In this figure, two of the signals reach the maximum indicated power. The third highest signal reaches approximately 114 percent power which would have tripped the plant. However, this value is close enough to the trip value of 112 percent, that minor variations in the major variables that control the peak power could result in lower powers and not trip the plant. For example, if the mean generation time (or inverse average thermal neutron velocity) was 3 percent higher, then the peak power would be approximately 3 percent lower and this plant transient would not have induced a reactor trip. Rather than fine tuning which conditions would not cause the trip, the analysis for the EOC 20 percent power case was conservatively run with no high flux trip.

Figure RAI-03-1



NRC Request RAI-04:

Is there an intermediate point between BOC and EOC that will result in input parameters that will yield a more severe transient response than those corresponding to those at each end of the cycle?

CR-3 Response:

The Moderator Temperature Coefficient (MTC) is the only input variable in Table 9-1 of ANP-2788P, Revision 0, that may not change monotonically with burnup. It could become more positive with cycle burnup if the burnable absorbers burn out faster than the fuel. This is evidenced by an increase of the critical boron concentration with cycle burnup early in the cycle. A more positive MTC could have less feedback, if it is higher than the value analyzed for the ejected rod accident, and could result in a more severe power transient. This behavior is not typical of the current designs employed. However, future changes in core design could lead to this condition. The current design process does examine the cycle lifetime for maximum MTC, and if the maximum MTC occurs later than Beginning Of Cycle (BOC), the ejected rod checks would be performed at this burnup and compared with the BOC conditions defined in Table 9-1 of ANP-2788P, Revision 0. If not acceptable, the design would be rejected or an analysis would need to be performed with the new limiting conditions as stated in Section 9.0 of ANP-2788P, Revision 0.