Progress Energy

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

Ref: 10 CFR 50.90

October 5, 2011
3F1011-04

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

Subject: Crystal River Unit 3 – License Amendment Request #310, Revision 1 Departure from a Method of Evaluation for the Auxiliary Building Overhead Crane - Response to Request for Additional Information (TAC No. ME5208)

References:
1. NRC to CR-3 email dated August 24, 2011, "Follow up RAIs regarding LAR 310, Departure from a Method of Evaluation for the Auxiliary Building Overhead Crane and Revisions to Associated Commitments (TAC No. ME5208)"
2. NRC to CR-3 email dated September 21, 2011, "Clarifying question regarding to the NRC RAI-2 in July 20, 2011 letter"

Dear Sir:

Pursuant to 10 CFR 50.90, Florida Power Corporation (FPC), doing business as Progress Energy Florida, Inc. (PEF), hereby provides the responses to Requests for Additional Information forwarded by the References above. The responses to the Requests for Additional Information are contained in the attachment and enclosure to this letter.

This response contains no new regulatory commitments.

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

Sincerely,

Jon A. Franke
Vice President
Crystal River Nuclear Plant

JAF/scp

Attachment: Response to Request for Additional Information

Enclosure: Crystal River Seismic Restraints on Fuel Handling Building Crane (FHCR-5) Konecranes Document #36539-33

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

A001
NRR

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 5th day of October, 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 ______

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302/LICENSE NUMBER DPR-72

LICENSE AMENDMENT REQUEST #310, REVISION 1

ATTACHMENT

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

RESPONSE TO REQUEST FOR ADDITIONAL INFORMATION

By letter dated December 20, 2010, as superseded by letter dated July 20, 2011, Florida Power Corporation submitted Crystal River Unit 3 (CR-3) – License Amendment Request (LAR) # 310, Revision 1, "Departure from a Method of Evaluation for the Auxiliary Building Overhead Crane, Revisions to Associated Commitments, and Response to Request for Additional Information." On August 24 and September 21, 2011, the NRC emailed requests for additional information (RAIs) needed in order to complete their technical review. The responses are provided below.

RAI – August 24, 2011:

In Attachment 5 (page 20 of 21, under Criteria 1 of Section 5.1.2), of your letter dated July 20, 2011, third bullet states:

> "The working platform is supported by four drive cables that have a 10-to-1 Safety factor and also supported during movement over the pool area by four safety cables of the same size and strength as the drive cables. This provides adequate redundancy for supporting the working platform. It is concluded that the working platform meets the intent of Sections 5.1.1, 5.1.2 and Section 5.1.6 of the NUREG."

Please confirm, by referring to calculations, that the working platform itself (not the cables) is capable to stand the impact load of the hydraulic jack (8500 lbs dead weight) when the hydraulic jack fails and drops on the platform.

CR-3 Response:

There are no calculations for the scenario postulated in the RAI. During coupling and use of a jack, it is suspended just above the deck of the working platform so personnel standing on the platform can connect the jack to a tendon, operate the jack, and monitor pressure gauges on the jack.

NUREG-0612, "Control of Heavy Loads at Nuclear Power Plants," commitments are described in the CR-3 Final Safety Analysis Report, Section 9.6.4, "Control of Heavy Loads Program Description." The NUREG-0612 guidelines that apply to rigging and use of a tendon jack are:

Guideline 1 – Safe Load Paths: CR-3 procedures define safe load paths for load handling operations in order to avoid or minimize the time of travel over spent fuel.

Guideline 2 – Procedures: CR-3 uses plant procedures for all rigging and handling of heavy loads as well as crane operating procedures. Procedures are written to meet the intent of NUREG-0612 guidelines.

Guideline 3 – Crane Operators: Crane Operators are trained in a program developed to be in compliance with the requirements of ANSI B30.2-1976, "Overhead and Gantry Cranes." This training is applicable to Site and Contract Personnel and includes a practical checkout.

Guideline 5 – Lifting Devices (not specifically designed): Procedures implemented for the testing and use of slings at CR-3 comply with the intent of ANSI B30.9-1971, "Slings."

Guideline 6 – Cranes (inspection, testing and maintenance): All critical cranes satisfy the intent of this guideline of NUREG-0612 with regards to inspection, testing, and maintenance. The crane inspection, testing, and maintenance program at CR-3 is in compliance with ANSI B30.2 and the Occupational Safety and Health Standards of 29 CFR as they relate to cranes, hoists and rigging.

When a hydraulic jack is suspended, it is supported by rigging that is in compliance with approved procedures and practices that implement NUREG-0612 commitments for CR-3. This includes using a hoist with appropriate margins of safety, rigging below the hoist hook that is properly sized, is subject to periodic inspection and testing, and is installed and operated by trained and qualified personnel. Compliance with existing approved procedures and safe working practices provides adequate assurance that a failure such as the scenario postulated in the RAI is highly unlikely to occur.

CR-3 Condition Report 486707 has been generated to determine what additional controls are required regarding operation of a suspended jack and a working platform. There is no historic safety concern associated with dome tendon surveillance activities, since no dome tendon detensioning has been conducted in the vicinity of the spent fuel pool since the missile shields were removed.

RAI – September 21, 2011:

The licensee in the calculation number S09-0036, Section 8.2, "Crane Model," attached to its letter dated July 20, 2011, stated that the properties of the crane model are based on information provided by the crane vendor. Please confirm that all of the rails (main girders and bridges) are stable and restraint during seismic analysis as required per ASME NOG-1-2004, Fig 4154.3-1, Crane Mathematical Model for Seismic Analysis," and specified in Table 4154.3-1, "Restraint Condition at Nodes".

CR-3 Response:

A simplified model of the new Fuel Handling Crane (FHCR-5) was provided by the crane manufacturer to Progress Energy for use in the structural analysis of the Auxiliary Building portions that serve as the crane support structure. This input was used in preparation of Calculation S09-0036, which is the GTSTRUDL model for the combined Auxiliary Building / simplified crane model. Following preparation of Calculation S09-0036, a matching ANSYS model was prepared by Progress Energy to model the Auxiliary Building and simplified crane model. The crane manufacturer used this model in analysis of their crane. The boundary conditions at trolley and runway rails in the calculations are per NOG-1-2004, Section 4154.3, "Boundary Conditions at Trolley and Runway Rails." This section of NOG-1-2004 states that, "Boundary conditions for the crane model shall be consistent with those specified in paragraph 4153.6, Fig 4154.3-1, and Table 4154.3-1." The boundary conditions used are specified in the Design Criteria Document (FPC118-PR-001 – previously provided).

The crane rails are stable and restrained per the requirements of NOG-1-2004. The existing field conditions match the conditions that are modeled in the analysis. See the attached Enclosure from the crane manufacturer which discusses the design of rails, rail clips, and seismic restraints. This Enclosure discusses compliance of the new crane's rail connections and seismic restraints with respect to NOG-1-2004, Section 4154.3.

Note that NOG-1-2004, Section 4153.6, "Boundary Conditions at Trolley and Runway Rails," states that, "The restraint device and resisting structure shall be designed for the maximum load resulting from the boundary condition considered. The crane shall be modeled with the boundary conditions specified in Fig 4154.3-1, unless additional restraining, driving, or holding mechanisms exist." The analysis of FHCR-5 and structure model the boundary conditions specified in Fig 4154.3-1. In addition, FHCR-5 features include "additional holding mechanisms" referred to in NOG-1-2004, Section 4153.6. The "additional holding mechanisms" are the seismic restraints on the bridge and trolley. The crane manufacturer has analyzed the seismic restraints for both the trolley and bridge for the worst case design loads, and determined that the seismic restraints are structurally adequate for these design loads.

The design of the crane ensures that the NOG-1-2004, Section 4153.6 criteria are met: "The crane bridge (including gantry legs, if applicable) and trolley shall be provided with devices so that they remain on their respective runways during and after a seismic event."

PROGRESS ENERGY FLORIDA, INC.

CRYSTAL RIVER UNIT 3

DOCKET NUMBER 50-302/LICENSE NUMBER DPR-72

LICENSE AMENDMENT REQUEST #310, REVISION 1

ENCLOSURE

CRYSTAL RIVER SEISMIC RESTRAINTS ON FUEL HANDLING BUILDING CRANE (FHCR-5) KONECRANES DOCUMENT #36539-33

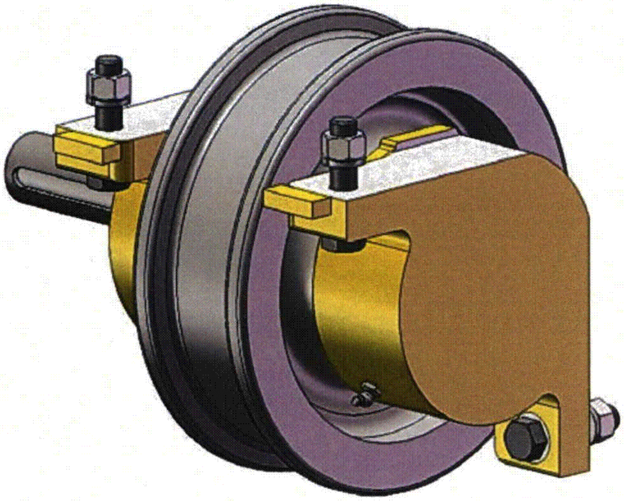
KONECRANES®
Lifting Businesses™

September 28, 2011, Rev. 1

Crystal River Nuclear Power Plant
15760 W. Powerline Street (NW2A)
Crystal River, FL 34428

Subject: CRYSTAL RIVER SEISMIC RESTRAINTS ON FUEL HANDLING BUILDING CRANE (FHCR-5)
KONECRANES DOCUMENT #36539-33

The Crystal River Fuel Handling Building Crane is designed with double flanged wheels that fit over an AISC rail on both the trolley and bridge. The flanged wheel is designed to help steer the crane down the rail as a result of the wheel's curved profile that interfaces with the rail head. The wheel is designed so the curved profile on either side of the wheel does not hug the rail, but is separated or spaced to allow approximately ½" of room on either side or "wheel float" between the rail and wheel. The spacing is maintained small to prevent the crane from skewing, but sufficient to prevent binding of the crane as it moves down the rail.



The crane at Crystal River is fitted with Seismic Restraints (P&H Drawing QR89281 for bridge and QR89169 for trolley) which have the function of maintaining the crane on the rail during a seismic event. They are mounted to ensure they do not interfere with the normal operation of the crane, but will control the movement of the crane during a seismic or abnormal event. The seismic restraints are fitted to interact with the structure supporting the rail (runway for ridge and top structure of girder for trolley) and give approximately 3/4" of space to allow the crane to operate normally, which results in approximately 1/4" spacing between when the wheel flange interfaces with the rail and before the restraints engage in the lateral plane of motion. Per NUREG-0554, "*If a seismic event comparable to a safe shutdown earthquake (SSE) occurs, the bridge should remain on the runway with brakes applied, and the trolley should remain on the crane girders with brakes applied.*" NOG-1-2004, para 4153.6 Boundary Conditions at Trolley and Runway Rails mimics the same words with "*The crane bridge (including gantry legs, if applicable) and trolley shall be provided with devices so that they remain on their respective runways during and after a seismic event.*" The crane does not need to operate after a SSE, but does need to remain in place and maintain control of the load.

During a seismic event, the bridge and trolley may move laterally and the flange of the wheels will interface with their respective rail head before the seismic restraints are contacted. The wheel is a forged steel component that is heat treated and will withstand a significant impact load to help maintain the crane on the rail. The forged rail is secured per the requirements of Crane Manufacturers Association of America Specification #70 (CMAA-70)with clips with a close spacing to help maintain the rails integrity to side loading during normal and abnormal events. However, the standard methodology of *defense-in-depth* as prescribed by both NUREG 0554 and NOG-1 is applied by utilizing back-ups to ensure the bridge and trolley remain on their respective runways during and after a seismic event. If the wheel flange, rail or rail clips yield, the seismic restraints will interface with an entirely different structural component to maintain the crane on the structure. Rail and wheel size, wheel hardness and other wheel parameters are designed per the specific requirements in CMAA-70 and ASME NOG-1. The rail clips are selected by the type of rail being used and a suitable mounting application as prescribed by the clip manufacturer. The seismic restraint is a critical component (NOG-1, Table 7200-1) and is designed based on the special requirement in NOG-1 and the seismic loading calculated in the coupled seismic model developed per NOG-1, Section 4000.

If the seismic restraints contact their respective structure, the crane wheels approximately move by ¾" in the lateral plane, of which ½" of movement is already accounted for in the crane design by providing a wheel float. Therefore, there is about ¼" of wheel displacement in the lateral plane beyond the wheel float consideration. However, this ¼" displacement is very small in comparison with the wheel flange width and hence the crane will still be resting on the rail, when the seismic restraints get engaged with their respective structure. In addition, the end truck will rest on the rail after a postulated wheel assembly failure since the end truck steel structure is designed to prevent the crane from dropping more than 1" due to a wheel shaft break. The restraints will maintain the cranes relative position in a small envelope and hence on top of the rail, even if the rail is deformed.

Studying the post behavior of yielding of wheel flange or rail is a highly non-linear dynamic problem with numerous assumptions. Add to this the fact the probabilistic nature of variables involved in the system including machinery tolerance in the shafts, gears, motors, wheel sliding and bearings and the issues become significantly more complex. Therefore the methodology used by Crystal River and authorized by NOG-1 is to allow a linear analysis, where "*The restraint devices shall be considered to be in contact with the resisting structure in establishing boundary conditions used in the analysis for the crane.*" as per section 4153.6 and section 4154.3. The restraints can be secondary restraints as per section 4461 "*secondary restraints which are not necessarily in contact under normal loading conditions shall be provided to resist the vertical up and horizontal loads due to severe environmental and extreme environmental loading conditions*". This is a conservative approach taken to address a probabilistic non-linear dynamic problem in a simple way using the limiting value of loads and gaps present in the system with minimal number of components taking the entire load.

The use of the seismic restraints for the Crystal River crane provides a redundant and conservative methodology for ensuring the crane meets the requirements of NOG-1 and NUREG 0554 by maintaining the crane components on the runway. With a defense-in-depth strategy, the crane seismic restraints provide a simple approach that does not necessitate maintenance or adjustments in the future to ensure the plant maintains control of a load during an abnormal event.

If you have any questions, please do not hesitate to contact me.

Sincerely,

Jay D. Edmundson, P.E.
Chief Engineer

Kanakasabai Pugazhendhi
Reviewer
Supervisor, Structural Engineering