



**UNITED STATES
NUCLEAR REGULATORY COMMISSION**
WASHINGTON, D.C. 20555-0001

December 4, 2009

LICENSEE: FLORIDA POWER CORPORATION, DOING BUSINESS AS PROGRESS
ENERGY (PGN)

FACILITY: CRYSTAL RIVER UNIT 3 NUCLEAR GENERATING PLANT

SUBJECT: SUMMARY OF NOVEMBER 20, 2009, MEETING WITH PGN REGARDING THE
CRYSTAL RIVER UNIT 3 CONTAINMENT BUILDING CONCRETE
DELAMINATION (TAC NO. ME2372)

On November 20, 2009, a Category 1 public meeting was held between the U.S. Nuclear Regulatory Commission (NRC) and representatives of PGN at NRC Headquarters, One White Flint North, 11555 Rockville Pike, Rockville, Maryland. The purpose of the meeting was to discuss the recently identified containment building concrete delamination. A list of attendees is provided as an enclosure.

The presentation started with opening remarks from Eric Leeds, Director, NRC Office of Nuclear Regulation; Luis Reyes, Administrator, NRC Region II, and Jim Scarola, PGN Senior Vice President and Chief Nuclear Officer. Eric Leeds emphasized that the purpose of this presentation was for PGN to provide a status of their investigation of the recently identified containment building concrete delamination; although, the investigation was not yet complete. Luis Reyes briefly discussed the ongoing Special Inspection at Crystal River that began on October 13. The purpose of the Special Inspection is to help the NRC better understand the issue and to independently assess PGN's actions to address it.

Jim Scarola outlined the presentation (Agencywide Documents Access and Management System (ADAMS) Accession No. ML093240292), which included an analysis of extent of condition, a design basis analysis, root cause, and repair options. He then yielded the floor to Jon Franke who discussed the analysis of extent of condition.

Jon Franke, Vice President, Crystal River Nuclear Plant, discussed some of the current refueling activities, especially those related to the extended power uprate and the steam generator replacement (SGR). He continued his presentation, describing general dimensions of the reactor building and its design features. Next he discussed some activities involving the steam generator replacement, which included creating a 25 feet by 27 feet opening in the side of the containment building. A water jet generating approximately 25,000 pounds per square inch of pressure was used in the concrete removal process. The delamination was found during this concrete removal process approximately 9 to 10 inches from the outside surface, the depth of the horizontal tendons.

Garry Miller, Manager, PGN Containment Project, a new PGN organization created specifically to manage the containment delamination issue, continued the presentation by describing various analyses involved in the investigation of the issue. Joe Donahue, Vice President, PGN Nuclear Oversight, described changes made to the nuclear oversight organization to support the issue as well. A special subcommittee of the Nuclear Safety Oversight Committee was

convened to provide an independent review of activities associated with the containment concrete delamination.

Next in the presentation was Paul Fagan of PGN, who discussed the assessment of extent of condition. Various tests were performed on the containment structure. The majority of the external structure of containment and accessible containment wall surfaces in adjacent buildings were subject to impulse response testing (IR). This type of testing is useful for plate-like structures in determining delamination. Ground penetrating radar was used to locate tendons beneath the surface of the concrete before obtaining core bore samples.

The core bores were used to confirm the IR results; and the samples were also sent to multiple labs for petrographic and other analysis. The holes left by the core bores were inspected using a boroscope to view the inside of the concrete and confirm whether or not delamination was present. Impact echo testing may also be used in the future to further confirm these results. The results of the test to date show that the delamination is limited to the area between buttresses 3 and 4 and centered on the SGR opening.

Garry Miller continued discussing the results of the investigation to date; although, it must be emphasized that at the time of the presentation, no root cause determination had been made. Mr. Miller discussed the shape of the delamination and the apparent relation to energized and de-energized tendons. He also discussed different structural features that probably served to limit propagation of the delamination.

At this point, questions were taken from members of the audience. A member of the NRC asked if there was a correlation between the results of the core bores and the IR testing. The answer was that the IR testing predicted with 100 percent accuracy the delamination confirmed by the core bores. The NRC staff member also asked about the strength of the concrete. The answer was that the strength was less than expected but still above design parameters.

Another NRC staff member asked about the limitations of the IR testing method. The answer received was that IR testing determines the existence of delamination, but not at what depth the delamination occurs. In order to determine the depth of the delamination, impact echo testing or core bores, as was done, is needed.

Paul Gunter of Beyond Nuclear asked questions next. His first question related to the square footage of the exterior of the containment building and the coverage of the core bores. He next asked if the containment building was "sub-atmospheric", which it is not. His third question related to inspection of the steel liner for corrosion. The answer was that liner corrosion inspection was not the subject of this effort, but is covered in inservice inspections.

After a 10 minute break, Dr. Chong Chiu of Performance Improvement International, discussed the different failure modes that his company was investigating. Through reviewing construction and operational history of the containment building, 74 different failure modes were hypothesized. His job is to refute those failure modes that did not occur or could not have contributed to the delamination of the concrete. These failure modes were grouped into nine different categories. As of the date of the presentation, 47 failure modes had been eliminated. As more data is gathered from the field, the number of failure modes will be narrowed further. Any repair model will encompass all supported or unrefuted failure modes, and the schedule for repair will be driven by the technical analysis.

Ed Bird of MPR Associates, Inc. continued the presentation discussing detailed finite element analyses (FEA) that model the forces within the structure of the containment building. Afterwards, Mr. Miller provided a walkthrough of the different repair options that PGN is considering. Ultimately, the final repair option will be to remove and replace the delaminated material, restoring the applicable design basis margin.

At this point, additional questions were taken from members of the audience. One NRC staff member asked about asymmetries of the structure compared to the FEA model. Another NRC staff member asked how rebar was included in the FEA model, and the answer was that it was not, and did not need to be modeled explicitly. A staff member from NRC's Region I office asked if differences in containment structures from other plants had been included in the root cause analysis where SGRs had taken place without delamination, and the answer was yes.

Mr. Reyes summarized the presentation, and stated that the special inspection of the Crystal River Unit 3 was still active and after PGN presents their root cause analysis, then a public meeting will be held to present the results of the inspection. Another public meeting may be held before the unit is placed back in service. The NRC staff is also investigating generic implications.

Mr. Scarola then presented his closing remarks, stating that PGN respects and appreciates the expertise and openness of the NRC. He also stated PGN's commitment that energy production is second to its top priority of safety.

Mr. Gunter asked that the licensee's root cause analysis be made public.

Thomas Saporito of Saporito Energy Consultants then commented that in his opinion the licensee's design and testing methods were insufficient and that impact echo testing and destructive testing of the containment building needed to be performed. He also asked that the other reactor units on site be shut down until the root cause analysis is finished. However, there is only one reactor on site. Further, he asked that a formal hearing be convened before the repair is completed and questioned whether generic correspondence would be forthcoming. With that the meeting was adjourned.

Members of the public were in attendance, however no Public Meeting Feedback forms were received. Please direct any inquiries to me at 301-415-1447, or Farideh.Saba@nrc.gov.



Tracy J. Orf, Project Manager
Plant Licensing Branch, II-2
Division of Operating Reactor Licensing
Office of Nuclear Reactor Regulation

Docket No. 50-302

Enclosure: List of Attendees

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LIST OF ATTENDEES

NOVEMBER 20, 2009, MEETING WITH PROGRESS ENERGY

CONTAINMENT BUILDING CONCRETE DELAMINATION

Attending in person:

Dan Fisher, Areva INL
Paul Gunter, Beyond Nuclear
Ron Burg, CTL Group
Honggang Cao, CTL Group
Pam Cowan, Exelon Nuclear
John Piazza, Exelon Nuclear
Dave Crabtree, INPO
Edward Bird, MPR
Jim Riley, NEI
Nikki Gilanshahi, NRC/NRO
Vaughn Thomas, NRC/NRO
Hans Ashar, NRC/NRR
Rajender Auluck, NRC/NRR
Peter Bamford, NRC/NRR
Robert Bernardo, NRC/NRR
Jerome Bettel, NRC/NRR
Eva Brown, NRC/NRR
Nick DiFrancesco, NRC/NRR
Farhad Farzam, NRC/NRR
Dave Garmon, NRC/NRR
Brian Hollian, NRC/NRR
Meena Khanna, NRC/NRR
Rob Kuntz, NRC/NRR
Eric Leeds, NRC/NRR
Bryce Lehman, NRC/NRR
Kamal Manoly, NRC/NRR
Carol Nove, NRC/NRR
Trace Orf, NRC/NRR
Daniel Santos, NRC/NRR
Abdul Sheikh, NRC/NRR
Wilkins Smith, NRC/NRR
George Thomas, NRC/NRR
Alexander Tsirigotis, NRC/NRR
John Monninger, NRC/OCM
Herman Graves, NRC/RES
Jose Pires, NRC/RES
Mary Wegner, NRC/RES
Robert Carrion, NRC/RII
Mark Franke, NRC/RII

Luis Reyes, NRC/RII
LaDonna Suggs, NRC/RII
Paul Jacques, Nuclear Electric Insurance
Limited
William Freebairn, Nucleonics Week
Joe Donahue, PGN
Robert Duncan, PGN
Paul Fagan, PGN
Jon Franke, PGN
Mike Heath, PGN
Mike Hughes, PGN
Ernest Kapopoulos, PGN
Ron Knott, PGN
Brian McCabe, PGN
Garry Miller, PGN
Sid Powell, PGN
Jim Scarola, PGN
Chong Chiu, PII
Anand Singh, Sargent & Lundy
Tom Spink, TVA
W. Jay Leininger, Unistar Nuclear
Mark Beaumont, URS
Nathan Kyle, URS, Washinton Div.

Enclosure

Attending via telephone:

Robert Oliveira, American Nuclear Insurers
Alan, Anbex
Nawar Alchaar, Areva NP
Michael Hoskins, Areva NP
Bill Hovis, Areva NP
Ronda Pederson, Areva NP
Mark Van Noy, Areva NP
Jack Dambach, Bay News
Amanda Mims, Citrus County Chronicle
Mark Rigsby, Manager - Support Services
Nuclear, Crystal River
John MacCrimmon, Dominion
Franklin Hope, Enercon Services, Inc.
Eddie Rodriguez, Engineering Codes
Program, Entergy Services, Inc.
Ken Canavan, EPRI
Maria Guimaraes, EPRI
John Lindberg, EPRI
Leonard Loflin, EPRI
David Modeen, EPRI
Greg Selby, EPRI
Henry Stephens, EPRI
James Wall, EPRI
Dean Galanis, Exelon
Michael Younger, Florida Division of
Emergency Management
Allen Hiser, NRC/NRR
Billy Jessup, NRC/NRR
Marlayna Vaaler, NRC/NRR
John White, NRC/RI
John Bozga, NRC/RIII
David Hills, NRC/RIII
Jason Redd, Nuclear Development,
Southern Nuclear Operating Company
Betsy Cox, Nuclear Plant Development,
Progress Energy
Tony Zimmerman, Nuclear Regulatory
Affairs, Progress Energy
Bob Munger, Nuclear Service Organization
Kevin Spear, Orlando Sentinel
Gary Little, Progress Energy
Jim Berman, PSC, Florida
Mike Clary, Resident (retired
Progress Energy)
Gary Sanford, Resident, Crystal River
Judy Prantl, Resident, St. Petersburg
Lisa Senesac, Sargent & Lundy, LLC

Digna Alvarez, Senator Bill Nelson Staff
Susie PerezQuinn, Senator Bill Nelson Staff
Rudy Alvarado, Sigma, LLC
Greg Lang, SNC Licensing
Ted Koser, South Texas Project
Dennis Swann, Southern Nuclear Operating
Company
Keith Axler, Southwest Research Institute
Lietai Yang, Southwest Research Institute
Rick Danielson, St. Petersburg Times
Don Morris, St. Petersburg Times
Dave Schafer, Steam Generator
Replacement Project, Southern
California Edison
Shari Day, Structural Integrity
Associates, Inc.
Terry Herrmann, Structural Integrity
Associates, Inc.
Howard Hill, TMI
Sri Dodeja, URS Nuclear Center
Mike Thumm, URS Washington Division
Dale Krause, V.C. Summer Nuclear Station
Raffi Shahabian, WorleyParsons
Richard Ionelli, no affiliation cited
Rhonda Roff, no affiliation cited

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/RA/

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ADAMS Accession No. PKG ML093020101 Meeting Notice ML093020101
Meeting Summary ML093360229 Handouts ML093240292

OFFICE	LPL2-2/PM	LPL2-2/LA	LPL2-2/BC	DORL/LPL2-2/PM
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