

March 15, 2001

MEMORANDUM TO: Stuart A. Richards, Director  
Project Directorate IV & Decommissioning  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

FROM: Stewart N. Bailey, Project Manager, Section 2  
Project Directorate III **/RA/**  
Division of Licensing Project Management  
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF FEBRUARY 23, 2001, MEETING WITH FRAMATOME  
ON FUEL CLADDING DUCTILITY

Reference: Nuclear Engineering and Design, Volume 147, No. 1, Page 53, Comparative  
Studies on High-Temperature Corrosion of ZrNb1 and Zircoloy-4

On February 23, 2001, the U. S. Nuclear Regulatory Commission (NRC) met with Framatome ANP to discuss the validity of the 17 percent oxidation criterion for loss-of-coolant accident (LOCA) conditions for M5 cladding. The meeting was scheduled in response to the staff's January 26, 2001, letter which requested a meeting on this subject after the staff became aware of a paper by J. Bohmert titled, "Embrittlement of ZrNb1 at Room Temperature After High-temperature Oxidation in Steam Atmosphere" (Reference).

The meeting began with a non-proprietary presentation which covered a review of the M5 in-reactor operating experience and an overview of Framatome's testing of M5 cladding performance. This presentation included data on the M5 manufacturing experience, including material on the chemical composition and the thermomechanical processing, as well as data on the irradiation experience. Framatome presented data which demonstrates that M5 exhibits low corrosion and low hydrogen pickup, and no acceleration of corrosion or hydrogen pickup at high burnups. Next, Framatome presented an overview of the tests that had been performed to demonstrate that M5 performs equal to or better than Zr4 and significantly better than the Zr-1%Nb material tested by Bohmert. These tests included oxidation rate, quench embrittlement, ring compression, bending, and impact tests.

The proprietary section of the meeting covered the testing in greater detail with data presented on each of the tests. The NRC staff and their contractors asked numerous questions about the details of the tests. After the Framatome presentations, the staff stated that Framatome had made a convincing case that the approved LOCA oxidation limit of 17 percent is appropriate for M5 cladding and that the staff considers the questions regarding M5 post LOCA embrittlement, which were suggested by the data in the Reference, to be satisfactorily addressed. At the conclusion of the meeting, the staff expressed their appreciation to Framatome for the prompt and thorough response to the issue.

Attachment 1 is a list of meeting attendees. The non-proprietary slides used by Framatome during the meeting are available under ADAMS accession number ML010640015.

Project No. 693

Attachment: Meeting Attendees

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DISTRIBUTION: See attached list

Accession No: ML010740359

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MEETING SUMMARY WITH FRAMATOME ON FEBRUARY 23, 2001, TO DISCUSS FUEL  
CLADDING DUCTILITY ISSUES

Dated: March 15, 2001

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Framatome ANP

Project No. 693

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**FRAMATOME ANP  
MEETING ON FUEL CLADDING DUCTILITY  
FEBRUARY 23, 2001**

**ATTENDANCE LIST**

**FRAMATOME ANP**

Mike Aldrich  
Tom Coleman  
Bert Dunn  
Gary Garner  
Frank McPhatter  
Rick Williamson

**NRC**

Stewart Bailey  
Sud Basu  
Ralph Caruso  
Muffet Chatterton  
Med El-Zeftawy  
Sandra Frattali  
Ed Kendrick  
Ralph Meyer  
Jack Rosenthal  
Harold Scott  
Jared Wermiel  
Shih-Liang Wu

**OTHER**

Carl Beyer, PNNL  
Hee Chung, ANL-East  
Moussa Mahgerefteh, Exelon Corporation  
Leslie Collins, Westinghouse  
Edwin Lyman, Nuclear Control Institute  
Elaine Hiruo, Platts Nuclear Publications