



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001

August 20, 2010

MEMORANDUM TO: ACRS Members

FROM: Derek A. Widmayer, Senior Staff Scientist /RA/  
Reactor Safety Branch B, ACRS

SUBJECT: CERTIFICATION OF THE MINUTES FOR THE MEETING OF THE US  
EPR SUBCOMMITTEE, SEPTEMBER 9, 2009 – ROCKVILLE,  
MARYLAND

The minutes of the subject meeting have been certified on August 18, 2010, as the official record of the proceedings for that meeting. A copy of the certified minutes is attached.

Attachment: Certified Minutes

cc: ACRS Staff Engineers



UNITED STATES  
NUCLEAR REGULATORY COMMISSION  
ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
WASHINGTON, DC 20555 - 0001

MEMORANDUM TO: Derek A. Widmayer, Senior Staff Scientist  
Reactor Safety Branch B, ACRS

FROM: Dr. Dana Powers, Chairman  
U.S. EPR Subcommittee

SUBJECT: CERTIFICATION OF THE MINUTES FOR THE MEETING OF THE U.S.  
EPR SUBCOMMITTEE, SEPTEMBER 9, 2009 – ROCKVILLE,  
MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting on September 9, 2009, are an accurate record of the proceedings of that meeting.

*/RA/*

*19/Aug/2010*

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Dana Powers, Chairman  
U.S. EPR Subcommittee

Date

Certified On: August 19, 2010  
By: Dana A. Powers

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS  
U.S. EPR SUBCOMMITTEE  
MEETING MINUTES  
September 9, 2009  
Rockville, MD**

**INTRODUCTION**

The Advisory Committee on Reactor Safeguards (ACRS) Subcommittee on the U.S. EPR met on September 9, 2009, at 11555 Rockville Pike, Rockville, MD, in the Commissioner's Hearing Room. The purpose of the meeting was to hear presentations and discuss the information on the U.S. EPR containment design and analysis, including the contents of technical report ANP-10299P, "*Applicability of AREVA NP Containment Response Evaluation Methodology to the U.S. EPR for Large Break LOCA Analysis*," Revision 1, and other safety analysis methodologies presented in the US EPR Design Control Document (DCD). This was an information only meeting, so the Subcommittee planned to gather information, analyze relevant information and facts to formulate inquiries, as appropriate, for further deliberation, but did not plan on reporting any findings or conclusions to the full ACRS.

The meeting was divided into sessions open to the public, followed by closed sessions where additional proprietary information was discussed with the Subcommittee. Mr. Derek A. Widmayer was the cognizant ACRS staff scientist and the Designated Federal Official for this meeting. The Subcommittee received no written comments or requests for time to make oral statements from any members of the public regarding this meeting. The meeting was convened at 8:30 am and adjourned at 4:19 pm.

**ATTENDEES**

**ACRS**

D. Powers, Chairman  
S. Armijo, Member  
M. Bonaca, Member  
O. Maynard, Member  
H. Ray, Member  
W. Shack, Member  
J. Stetkar, Member  
M. Ryan, Member  
D. Widmayer, ACRS Staff

**NRC Staff**

G. Tesfaye, NRO/DNRL  
J. Colaccino, NRO/DNRL  
J. Carneal, NRO/DNRL  
J. Lu, NRO/DSRA  
W. Jensen, NRO/DSRA

**Areva NP**

S. Sloan  
M. Parece  
R. Salm  
B. Martin  
B. Dunn  
J. Winter  
T. George, Numerical Applications, Inc.

## **SUMMARY OF MEETING**

### **(Reference to Transcript Page Numbers and Presentation Slide Numbers)**

#### **Introduction**

Dr. Dana Powers, Chairman of the U.S. EPR Subcommittee, introduced the Subcommittee Meeting and explained that the Subcommittee would be introduced to some of the methodologies used to perform analysis on the EPR, and that it was the first of several discussions of the design that the Subcommittee expected to undergo and the review process was just beginning. (Open Transcript Pages 3 – 5)

#### **PRESENTATIONS**

##### **Opening Remarks on EPR DCD Status**

Mr. Getachew Tesfaye, the US EPR Design Certification Document (DCD) Project Manager in NRO provided a brief overview of the staff's review of the EPR DCD and the schedule of presentations on chapters of the Safety Evaluation Report (SER) with Open Items planned for future Subcommittee meetings. (Open Transcript Pages 6 – 11)  
(NRC Slides 1 – 4)

##### **AREVA, NP Overview**

Ms. Sandra Sloan, Manager of Regulatory Affairs for New Plants, AREVA NP, provided a brief overview of the reasons for today's Subcommittee meeting and introduced the presenters from AREVA, NP. (Open Transcript Pages 11 – 17), (AREVA Slides entitled, "*U.S. EPR Containment Design and Analysis and U.S. EPR Analysis Methodologies*," Numbers 1 – 6)

##### **AREVA, NP Presentation on Containment Design and Analysis (OPEN)**

Mr. Marty Parece, AREVA NP Vice President of Technology, provided the initial presentation on the U.S. EPR containment design and analysis. The presentation gave an overview of the design and important features of the containment building for the U.S. EPR and touched on some information presented in technical report ANP-10299P, "*Applicability of AREVA NP Containment Response Evaluation Methodology to the U.S. EPR for Large Break LOCA Analysis*," Revision 1. (Open Transcript Pages 17 – 79), (AREVA Slides entitled, "*U.S. EPR Containment Design and Analysis and U.S. EPR Analysis Methodologies*," Numbers 7 – 32)

##### **AREVA, NP Presentation on Containment Design and Analysis (CLOSED)**

Mr. Marty Parece, AREVA NP Vice President of Technology, continued the presentation on the U.S. EPR containment design and analysis in closed session. Mr. Parece presented more details on the mass and energy methods used to analyze the containment, the hot leg injection, and the multi-node analysis provided in Revision 1 to ANP-10299P. (Closed Transcript Pages 1 – 47), (AREVA Proprietary Slides entitled, "*U.S. EPR Containment Design and Analysis*," Numbers 1 – 33)

### **AREVA, NP Presentation on Safety Analysis Methods (OPEN)**

Mr. Bob Salm, Manager of New Plants Process Engineering, AREVA NP, provided the initial presentation on the U.S. EPR safety analysis methodologies. He presented discussions on the safety features of the EPR that are relevant to the safety analysis and briefly described some of the methodologies used. (Open Transcript Pages 80 – 102), (AREVA Slides entitled, “*U.S. EPR Analysis Methodologies*,” Numbers 1 – 13)

### **AREVA, NP Presentation on Safety Analysis Methods (CLOSED)**

Mr. Jonathan Witter, Advisory Engineer to AREVA, NP New Reactor Core Engineering, continued the safety analysis methodology discussion in the closed session. Mr. Witter provided information specifically on the Control Rod Ejection Accident Methodology in detail (Closed Transcript Pages 48 – 75), (AREVA Proprietary Slides entitled, “*U.S. EPR Control Rod Ejection (CRE) Accident Methodology*,” Numbers 1 – 7).. Mr. Salm continued the closed session with a presentation on the Realistic Large Break LOCA best estimate plus uncertainty methodology (Closed Transcript Pages 75 – 113), (AREVA Proprietary Slides entitled, “*RLBLOCA Methodology*,” Numbers 21 – 33). Mr. Salm continued the closed session with a presentation on the Small Break LOCA deterministic methodology (Closed Transcript Pages 113 – 129), (AREVA Proprietary Slides entitled, “*Small Break LOCA Methodology*,” Numbers 34 – 47)

### **Subcommittee Discussion**

In response to a question from Member Ray, AREVA NP representatives discussed the response of the EPR to a steam generator tube rupture event and the order of automatic and manual commands that may result. (Closed Transcript Pages 129 – 142)

### **SIGNIFICANT DISCUSSION ITEMS**

The following summarize the most significant discussion items from the Subcommittee Meeting:

#### **Presentation on Staff International Activities**

Chairman Powers introduced the issue for the Committee involving the extent to consider the depth of reviews and the conclusions reached by the regulatory bodies which have approved the U.S. EPR design in other countries. Mr. Joseph Collacino, Chief of the U.S., EPR Branch in NRC’s Office of New Reactors responded by explaining the activities of the Multi-National Design Evaluation Group or MDEP for the EPR where significant discussion takes place on technical issues of concern. He volunteered to provide a briefing to the Subcommittee on the group and their activities at an appropriate time in the review to be determined later.

#### **Operational Status of Rupture and Convection Foils of the CONVECT System**

Member Maynard expressed a concern about the need to maintain the rupture foils of the CONVECT System during normal operations so that they would operate properly in case of an event. Member Stetkar also asked if one or two foils were ruptured prematurely, would this have a radiological impact. In the Closed Session, Member Maynard discussed this further, identifying a need for AREVA to address the operational condition of the foils during monitoring and describing the conditions for which repairs would need to be made and for when a situation may arise warranting shutdown.

Another concern about the foils was addressed by Member Armijo. He explored whether it was important that all of the foils of the CONVECT System opened at once, or whether if some of them stuck it was an issue. AREVA NP said they are conducting sensitivity analyses on this now, but also addressed that both the convection and rupture foil areas that are available provide much more area than they believe is needed for proper convection, but they are confirming this with analysis.

#### Difference in Time in Analysis for Switch to Manual Operations

Member Shack pointed out that the international community is crediting 90 minutes in the analysis of design basis accidents for switching from automatic to manual operation while the U.S. EPR is crediting only 60 minutes. AREVA NP answered that this difference was being discussed within the EPR international community. AREVA feels confident that the emergency operating procedures will be validated through operator training that the switchover to manual can be accomplished within 60 minutes. The Chairman mentioned that discussions of human factors in later Subcommittee meetings would explore this item more rigorously.

#### Availability of Main Steam Relief Trains

Member Ray questioned whether the main steam relief trains were taken “out-of-service” when one of the 4 safety trains was down for maintenance and AREVA NP explained that the main steam relief train maintenance would be conducted separately and was a very short activity, and that all four main steam relief trains were available during operations, subject to the short unavailability when maintenance was being performed on one.

#### Applicability of Methodologies to EPR

Chairman Powers brought up his concern that the reports presented to staff demonstrating the applicability of methodologies to the EPR are not supported by experimental verification. AREVA NP explained that they are using verified methods from operating plants, and Chairman Powers said that this was understood. The Chairman provided a couple of examples in the past, and explained that if a physical change took place in the response of the EPR design at a specific point in the analysis, that this phenomena is not included in the methodology unless AREVA has included it in the model, and the only way they will know it needs to be included in the model is from experimentation. The Chairman identified this as a concern again during discussions conducted in the Closed session of the use of the Cathcart-Powell analysis. Member Shack also shared his concerns on this same issue during Closed session discussions.

AREVA responses pointed out that the analyses were verified for Westinghouse four-loop plants and that a lot of data has been developed for many purposes, and that extrapolating to the EPR is not a large delta and results are what would be expected using good engineering judgment. They state they are not introducing new phenomena, and that the scaling done in the models preserves the existing phenomena modeled, that parameter values such as temperatures, flow rates, velocities, etc. stay within the ranges of applicability of the models, and that experimental verification and scaling analysis at a facility such as LOFT is unnecessary.

#### Containment Over-pressure and the LHSI and MHSI Pumps

In response to a concern from Member Stetkar, AREVA NP acknowledged that no credit is being taken for containment over-pressure, and that the LHSI and MHSI pumps are qualified to operate under the conditions calculated in the analysis for a period longer than 10 hours.

## **FUTURE SUBCOMMITTEE ISSUES**

The following topics were identified by the Subcommittee Chairman as items that would be discussed in detail in future Subcommittee based on discussions during this Subcommittee meeting: The Subcommittee Chairman pointed out that the subject of the hydrogen recombiners would generate a lot of discussion when they are presented in detail. The Subcommittee Chairman also pointed out that the conservatism of the method used to determine the source term from a radiological standpoint would need to be discussed, especially as it relates to the conservatism claimed in the thermal hydraulic analysis of the containment building.

## **SUBCOMMITTEE CONCLUSIONS**

Chairman Powers concluded the meeting by indicating that it was a good introduction to the plant and that the Full Committee members who have expertise in thermal hydraulics would likely have more issues, and that the fuel issues identified in the Subcommittee meeting would also likely still arise in future meetings.

## **REFERENCES**

- 1) ANP-10299P, Revision 1, "*Applicability of AREVA NP Containment Response Evaluation Methodology to the U.S. EPR for Large Break LOCA Analysis*," AREVA, NP, July 2009. (Proprietary)