



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

October 1, 2009

MEMORANDUM TO: ACRS Members

FROM: Christopher L. Brown, Senior Staff Engineer */RA/*
 Reactor Safety Branch A, ACRS

 Weidong Wang, Senior Staff Engineer */RA/*
 Reactor Safety Branch B, ACRS

SUBJECT: CERTIFICATION OF THE MINUTES OF ACRS ESBWR
 SUBCOMMITTEE MEETING ON THE NORTH ANNA COLA,
 JULY 21 AND 22, 2009 – ROCKVILLE, MARYLAND

The minutes of the subject meeting were certified on September 24, 2009, as the official record of the proceedings of that meeting. A copy of the certified minutes is attached.

Attachment: As stated

cc w/o Attachment: E. Hackett
 C. Santos



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October 1, 2009

MEMORANDUM TO: Christopher L. Brown, Senior Staff Engineer
Reactor Safety Branch A, ACRS

Weidong Wang, Senior Staff Engineer */RA/*
Reactor Safety Branch B, ACRS

FROM: Michael Corradini, Chairman
ESBWR Subcommittee

SUBJECT: CERTIFICATION OF MINUTES OF THE ACRS ESBWR
SUBCOMMITTEE MEETING ON THE NORTH ANNA COLA,
JULY 21 AND 22, 2009 – ROCKVILLE, MARYLAND

I hereby certify, to the best of my knowledge and belief, that the minutes of the subject meeting on July 21 and 22, 2009, are an accurate record of the proceedings for that meeting.

/RA/

9/24/2009

Michael Corradini,
ESBWR Subcommittee Chairman

Date

**ADVISORY COMMITTEE ON REACTOR SAFEGUARDS
MINUTES OF ACRS ESBWR SUBCOMMITTEE MEETING ON THE NORTH ANNA COLA
JULY 21 AND 22, 2009
ROCKVILLE, MARYLAND**

The ACRS Economic Simplified Boiling Water Reactor (ESBWR) Subcommittee held a meeting on July 21 and 22, 2009, in Room T-2B1, 11545 Rockville Pike, Rockville, MD. The purpose of this meeting was to review and discuss Chapters 5, 9, 10, 11, 12, 13, and 16 of the Staff's Draft Safety Evaluation Report (SER), with open items and associated documents, on the North Anna COLA. Christopher L. Brown was the designated Federal Official for this meeting. The Subcommittee received no written statements or requests for time to make oral statements from the public. The Subcommittee Chairman convened the meeting at 8:30 a.m. on July 21, 2009 and adjourned at 10:11 p.m. on July 22, 2009.

ATTENDEES:

ACRS Members

M. Corradini, Chairman
J. Sam Armijo
S. Abdel-Khalik
T. Kress, Consultant
G. Wallis, Consultant

ACRS Staff

C. L. Brown, Designated Federal Official

NRC Staff

S. Downey, NRO	D. Barss, NSIR
E. Reichelt, NRO	B. Radlinski, NRO
M. Tonacci, NRO	I. Berrios, NRO
T. Kevern, NRO	G. Georgiev, NRO
M. Eudy, NRO	J. Kellum, , NRO
N. Ray, NRO	C. Ader, NRO
J. Jessie, NRO	J. Segala, NRO
G. Thomas, NRO	T. Hsia, NRO
G. Hammer, NRO	D. Terao, NRO

General Electric-Hitachi (GEH) Staff

R. Wachowiak	F. White
T. Hicks	D. Piepmeyer
R. Kingston	

Dominion Staff

G. Borsh	J. Hegner
M. Paul	J. Weddill
T. Hicks	

Other members of the public attended this meeting. A complete list of attendees is in the ACRS Office File and is available upon request. The presentation slides are attached to the official copy of the meeting transcript.

Chairman Opening Remarks and Objectives

Dr. Michael L. Corradini, Chairman of the ACRS ESBWR Subcommittee, convened the meeting at 8:30 a.m. The purpose of the meeting was to review and discuss Chapters 5, 9, 10, 11,12,13, and 16 of the Staff's Draft Safety Evaluation Report (SER) with open items and associated documents. The presenters included representatives from the Office of New Reactor (NRO), Dominion (the applicant) and GEH.

Dominion Presentation

Chapter 5: Reactor Coolant System (RCS) and Connection System

This chapter includes those systems and components that transport fluids exiting from or entering into the reactor core. These systems form a major portion of the Reactor Coolant Pressure Boundary (RCPB). Ms. Borsh of Dominion presented chapter five of the COLA. She discussed sections where Dominion added additional supplemental information to their application. For integrity of RCPB, she identified the applicable codes. She also discussed the pre-service and in-service inspection and testing programs. Additionally, she described procedures that the operators would use for leak detection monitoring. For the reactor vessel, Dominion committed to develop pressure-temperature limit curves that are in compliance with the Technical Specifications (TS). The reactor vessel material surveillance program was discussed. For component and subsystem design, Ms. Borsh indicated that commitments were added concerning human factors analysis of the control room displays, controls for the RCS vents, and operating procedures to prevent severe water hammer. Two open items were briefly discussed concerning the submission of the Pressure-Temperature Limit (PTL) Report and additional plant specific information.

Chapter 9: Auxiliary Systems

For fuel storage and handling, Ms. Borsh indicated that Dominion committed to develop heavy loads handling procedures for fuel movement. Dominion plans to address plant systems required for refueling to prevent inadvertent criticality. Requirements applicable to cranes and lifting devices for overhead heavy loads were briefly discussed.

Ms. Borsh discussed plant systems functions. It was stated the the Plant Service Water System (PSWS) has no safety-related function and was treated in the DCD as RTNSS (Regulatory Treatment Non-Safety System) component. The function of the PSWS is to reject heat from the nonsafety-related Reactor Component Cooling Water System (RCCWS) and Turbine Component Cooling Water System (TCCWS). It was stated that this system consists of two independent 100% redundant trains that are continuously circulating water through RCCWS and TCCWS heat exchangers. She also discussed an open item related to the fiberglass reinforced polyester pipe for buried PSWS piping used to preclude long-term corrosion.

The function of Makeup Water System is to supply demineralized water to equipment listed in DCD. Dominion considers it as a nonsafety-related system consisting of demineralization system, storage, and transfer subsystem. The makeup water system was designed for normal

operation during outages. To avoid a huge system, Ms. Borsh said that Dominion designed a temporary offsite water treatment system. The Potable Water System and Sanitary Waste Discharge System is used to provide portable water and sewage collection and treatment for normal plant operation and shutdown periods. It was stated that Dominion treats this as a nonsafety-related system. Ultimate Heat Sink (UHS) is provided by Isolation Condenser/Passive Containment Cooling Systems pools. Ms. Borsh said that Dominion provided milestone and commitment for the development of procedures to connect makeup water source to UHS seven days after an accident. Finally, Post-Accident Sampling Program and Hydrogen Water Chemistry System (HWCS), the Fire Protection System (FPS), Emergency Communication Systems, Diesel Generator (DG) Fuel Oil Storage and Transfer System, and Fire hazards Analysis were also discussed.

Chapter 10: Steam and Power Conversion System

Dominion addressed the maintenance and inspection program. Ms. Borsh indicated that the program supports the turbine missle generation probability analysis. She added that Dominion will establish the frequencies for their inspection and maintenance based on the bounding turbine missle probability analysis.

In the DCD, the portions of Circulating Water System (CIRC) are identified as conceptual design and the COL applicant has to provide the plant-specific information. Ms. Borsh provided an overview of the arrangement of the equipment, descriptions of the components, instrumentation, and system operations. Dominion will use Chemical Storage and Transfer System and Blowdown control to maintain the chemistry in the CIRC. She added that the station water is used to supply makeup water to the system.

Chapter 11: Radioactive Waste Management (WM)

Ms. Borsh said that Dominion added information to all sections of the application except for the section on source terms. Liquid and Gaseous WM System included cost benefit analysis for liquid waste system. For the liquid WM, Ms. Borsh described the procedures to address non-radioactive systems that could become contaminated. Minimizing contamination was also discussed. For the Process Radiation Monitoring System, Dominion made reference to the Offsite Dose Calculation Manual (ODCM) and information in the DCD (i.e., setpoints, sensitivity, and lower limit of detection used for offsite dose monitors).

Chapter 12: Radiation Protection

To ensure that occupational radiation exposures are As Low As Reasonably Achievable (ALARA), Ms. Borsh described Dominion's ALARA program. She indicated that Dominion has evaluated the annual radioactive airborne releases for North Anna, Unit 3 during normal operations. They determined the annual airborne offsite doses and concentrations and discussed compliance with the regulations. Also, she said that Dominion has evaluated the liquid releases and doses offsite. Dominion also addressed access to "Very High Radiation Area" and airborne radiation monitoring instrumentation.

Chapter 13: Conduct of Operation

Ms. Borsh discussed the training, emergency planning, and operational program implementation. In addition, plant procedures, physical security, and fitness for duty were briefly discussed.

Chapter 16: Technical Specifications

Ms. Borsh said that the ESBWR TS were developed utilizing NUREG-1434, "Standard TS General Electric Plants, BWR/6," revision 3.1 to the extent practical. She noted that Dominion created plant specific TS by filling in the brackets and COL items that listed in the generic TS. Dominion's TS are based on plant specific information, bounding values, and NRC approved method to develop plant specific values. Two exemptions were discussed. The exemptions are related to the normal accumulator operating pressure for control rod drive system and the acceptance criteria for the differential pressure across the Control Room HVAC Emergency Filter Unit.

NRC staff Presentation

Mr. Tom Kevern provided opening remarks and a brief overview of the SER Chapters to be presented. Mr. Kevern also discussed follow-up items and lessons learned from the previous Subcommittee meetings.

Chapter 5: Reactor Coolant System (RCS) and Connection System

Staff indicated that the reactor vessel materials are similar to current operating reactors. It is expected that it will have less copper, nickel, and sulfur in the belt line area. The staff indicated that Dominion provided the appropriate information with respect to the Surveillance Capsule Program. Staff also indicated that they are currently reviewing that PTL report submitted by Dominion.

Chapter 9: Auxiliary Systems

The staff discussed PSWS open items. For post-accident sampling program, the staff concluded that the program meets the recommendation contained in NUREG-0800. Hydrogen Water Chemistry System, Hydrogen Storage and Supply System, and Oxygen Injection System was said to meet NRC approved guidance. The staff also discussed the fire hazard analysis (FHA) and the probabilistic evaluation of a fire. The staff concluded that Dominion adequately addressed the fire protection system. Mr. Radlinski of the staff presented the review of the nonsafety-related diesel generator support system. The system covers the fuel oil, lube oil, the starting air, the cooling water, and the intake as well as the subsystems that support the operation of the diesel generator. He said the open items are related to seven day fuel oil supply and the industry standards for underground fuel oil transfer piping.

Chapter 10: Steam and Power Conversion System

The staff plans to evaluate the in-service maintenance and inspection of turbine rotors and turbine missile probability analysis. For the Circulating Water System (CIRC), the staff indicated that Dominion provided specific information about the plant design, operation, instrumentation and controls, flood protection, and chemical injection. The staff evaluated the site-specific information in accordance with the regulations and staff guidance. The staff concluded that the applicant provided adequate information and the site specific design is acceptable.

Water quality and chemical injection is another COL item for the CIRC. The applicant is required to provide the threshold values and operator actions for the chemistry excursions in the condensate system. The staff indicated that Dominion submitted information that shows the

control parameters and operator actions. The staff reviewed the information and found that the control parameters and the operator actions are more stringent than what is contained in staff guidance. Therefore, the staff found the approach acceptable.

Chapter 11: Radioactive Waste Management (WM)

Ms. Berrios mentioned that the WM review is based on an older revision to the SRP. She noted that the section on effluent releases and doses is in chapter twelve.

The source term addresses the primary cooling and primary steam concentration. Ms. Berrios indicated that the applicant adopted by reference ESBWR DCD for the source term section. Based on a review of the applied radioactive effluent source terms and confirmation of offsite dose results, the staff found the approach acceptable. She also said that the staff confirmed that the results of a site-specific cost-benefit analysis in that LWMS augment is not expected to further reduce population doses within 50-mile of the site. For Gaseous Waste Management System (GWMS), Dominion addressed the guidance and requirements of Part 50 adequately. The applicant met the ALARA criteria. She also indicated that the staff confirmed that the results of site-specific cost-benefit analyses in that GWMS augment is not expected to further reduce population doses within 50-mile of the site. For SWMS, Dominion addressed most of COL information items adequately. However, Dominion has not adequately addressed COL information item on provisions to store LLW in the short and long-terms. This RAI is open.

Chapter 12: Radiation Protection

The staff summarized the contents of chapter twelve and key regulations. Staff reviewed and evaluated Dominion's commitment for an effective ALARA policy. Staff's presentation also covered the offsite doses evaluation and the gaseous and liquid effluents results. The staff also evaluated Operational Radiation Protection Program and confirmed that Dominion has an acceptable Radiation Protection Program with appropriate milestones to implement the ALARA/Radiation Protection program.

Chapter 13: Conduct of Operation

Mr. Musico discussed the staff review and evaluation of Dominion's emergency plan. The discussion focused on the emergency planning zones and onsite/offsite plans. For Operational Programs, staff indicated that the regulatory basis used was SECY-05-0197 (Operational Programs for COLA). The SECY document includes a generic table that identifies each of the operational programs and milestones. The staff concluded that Dominion's consistency to the SECY is adequate.

Chapter 16: TS

The staff made the conclusions that Unit 3 plant-specific TS and bases are not yet complete and cannot satisfy regulatory requirement because of open items. The staff is expecting additional changes to Unit 3 plant-specific TS and technical bases. Staff indicated that GEH will submit ESBWR DCD, Rev. 6, and that Dominion's information will need to be revised based on the information in the DCD.

Final Staff Summary

The staff has completed all of SERs with open items for all 19 chapters. The last three chapters, 2, 3 and 14, will be on August 21, 2009. There are approximately 45 open items and several confirmatory items. The staff does not see any “show-stoppers” for North Anna.

Member Comments

Chairman Corradini asked about the status of the PTL report and asked if the report is applicable to all designs. Ms. Borsh responded that the report was submitted on June 17, 2009 and the report is for the all ESBWR plants. Rick Wachowiak said that report defines the methodology and that applicants will need to modify the methodology with such items as the vessel material and other plant-specific data.

Member Abdell-Khalik asked about the review processes. In particular, he was concerned about the procedures used to identify and monitor low level unidentified leakage. In response, the staff said that the applicant committed to have procedures at a later time. The staff will review and evaluate the content of the procedures when received.

Consultant Kress asked has the turbine missile probability analysis report been submitted to the NRC. In response, Rick Wachowiak said the report will be submitted to the NRC. Dominion staff said that they will update their application to reflect the content of the report. ACRS members requested a copy of the report.

Consultant Wallis asked about the prevention of severe water hammer. The COL team responded that the system operating procedures would avoid the possibility of water hammer. Consultant Wallis commented that this approach is “quite circular reasoning”. Chairman Corradini followed-up by asking what is unique about the ESBWR design that the procedures would be different than current operating BWRs. Rick Wachowiak provided examples of uniqueness and the different operating characteristics of ESBWR. He said that the ESBWR does not have a core spray system. The core spray system in the current operating BWRs is susceptible to the water hammer. So while the principles of avoiding water hammer are the same, the details would be different in an ESBWR. The other difference is that the ESBWR shutdown cooling function is provided by reactor water cleanup system while the BWRs use LPCI or RHR system.

Chairman Corradini questioned the characteristic difference of waste generated from Unit 3 and Units 1 and 2. The COL team responded by saying that the existing facility was designed and built for Units 1 and 2. For the radwaste comparison of the PWR versus the Unit 3 ESBWR, the team stated that there are different operating procedures. Consultant Kress followed-up by asking about locations to transport radioactive waste. In response, the team said that the waste will be stored on site until a central U.S. facility is built in the future.

Consultant Wallis asked if the COLA takes account of people boating and swimming near the discharging lake. The COL team assured him that this issue was covered in the design.

When staff was discussing the issue concerning minimize facility contamination, Consultant Wallis commented that the word “minimize” is over used. To be meaningful, one needs to quantify before and after. Consultant Wallis objected to use of the phrase “minimize water hammer” in one of the open items. Wallis commented that one can minimize something and it can still be of intolerable magnitude.

Members asked about the durability of polyester piping used in PSWS for precluding long-term corrosion. Mr. Weddell responded that Dominion is designing and installing piping according to standards. The American Waterworks Association and ASTM standards will be used. For aging issues, Dominion responded that proper manufacturing, installation, and inspection, and maintenance will be done. Member Armijo agreed with Consultant Kress and requested a report regarding the experience of this piping.

Member Abdel-Khalik pointed out that if there is a measurable change in the inventory of hydrogen onsite how does it impact the PRA. Mr. Wachowiak responded that Dominion took credit for a tank located sufficiently away from any plant equipment. He said that as long as it is sited properly in accordance with the guidelines, it wouldn't affect the site-specific PRA.

Chairman Corradini asked about when FEMA and NRC are both involved. NRC staff said that the NRC reviews on-site plans and FEMA reviews off-site emergency plans. NRC considers FEMA's report in making ultimate decision. FEMA found a few open items and corrections needed to be made. Chairman Corradini and Member Armijo followed-up by asking the character of the open items and the relationship between Units 1, 2 and 3. In response, the staff said that the state plan is the same for all Units.

At the end of the meeting, Consultant Kress commented that both the applicant and the staff have done a good job and it looks like the project is on the right track. Kress believed that the staff has the appropriate guidance for reviewing DCDs and COLAs.

Member Armijo complimented Dominion for implementing the hydrogen water chemistry. A good decision was made on not implementing zinc.

Consultant Kress commented about the review the simulator and if there is a standard review plan for it. Consultant Wallis commented that a simulator is supposed to be realistic but he thinks that the assumptions for the design bases accidents are not realistic.

SUBCOMMITTEE DECISIONS AND ACTIONS:

Following the Dominion and staff presentations and discussions, Chairman Corradini asked if anyone had any further questions, thanked everyone for their presentations, and then adjourned the meeting at 10:11 am, July 22, 2009.

BACKGROUND MATERIALS PROVIDED TO THE SUBCOMMITTEE PRIOR TO THIS MEETING:

Note: Additional details of this meeting can be obtained from a transcript of this meeting available for downloading or viewing on the Internet at <http://www.nrc.gov/reading-rm/doc-collections/acrs/tr/subcommittee/2007/> or purchase from Neal R. Gross and Co., Inc., (Court Reporters and Transcribers) 1323 Rhode Island Avenue, NW, Washington, DC 20005 (202) 234-4433.