August 14, 209

MEMORANDUM TO: Patrick L. Hiland, Director
Division of Engineering
Office of Nuclear Reactor Regulation

FROM: Shakur A. Walker, Digital I&C Project Manager **/RA/**
Division of Engineering
Office of Nuclear Reactor Regulation

SUBJECT: SUMMARY OF AUGUST 5, 2009 CATEGORY 2 PUBLIC MEETING WITH ELECTRIC POWER RESEARCH INSTITUTE TO DISCUSS VARIOUS TECHNICAL REPORTS RELATED TO DIGITAL INSTRUMENATION AND CONTROL SYSTEMS

On August 5, 2009, the Nuclear Regulatory Commission (NRC) staff met with the Electric Power Research Institute (EPRI) and members of the public to discuss three technical reports related to digital instrumentation and controls (DI&C) systems. A public meeting notice was issued on July 24, 2009, and was posted on the NRC's external (public) webpage and available in the Agencywide Documents Access and Management System (ADAMS) under Accession No. ML092050507. The NRC staff represented the Office of Nuclear Reactor Regulation (NRR), the Office of Nuclear Regulatory Research (RES), and the Office of New Reactors (NRO). The attendance sheet is included as Attachment 1 to this memorandum.

The purpose of this meeting was to foster an open discussion regarding three technical reports authored by EPRI[1]: 1) EPRI Report 1016731, "Operating Experience Insights on Common-Cause Failures in Digital Instrumentation and Control Systems"[2] dated December 2008; 2) White Paper on Common Cause Failure Applicability[3] dated February 2008; and 3) EPRI Report 1016721, "Benefits and Risks Associated with Expanding Automated Diverse Actuation System Functions" [2] dated December 2008. Specifically, EPRI's presentation on the reports included: a historical overview of the specific subject matters; overview of the presentations to be made at the upcoming Advisory Committee on Reactor Safety (ACRS) Digital I&C Subcommittee meeting scheduled for August 19 -21; the differences between the initial 'white papers' the NRC commented on and the reports that were reviewed in this meeting; and any key insights, conclusions, or recommendations EPRI has derived from the reports. The EPRI presentation slides are included as Attachment 2 to this memorandum.

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[1] NRC staff previously commented on these reports (as white papers) following an August 28, 2008 public meeting of the Digital I&C Steering Committee in which the Nuclear Energy Institute (NEI) requested NRC provide feedback on a series of white papers developed by EPRI. These comments were outlined and issued in a letter to NEI dated November 3, 2008 (ADAMS Accession No. ML083020020).
[2] These EPRI reports are publically available on the EPRI website.
[3] This white paper is not publically available.

In opening remarks, Mr. Patrick Hiland of NRC thanked EPRI and the industry representatives present for participating in the meeting, continuing to foster open communication in order that technical consistency is maintained and public safety is ensured. Mr. Robert Austin of EPRI followed and requested a change in the agenda format, in that, any technical concerns or questions the NRC staff or EPRI had during the commencement of the meeting would be cataloged and addressed following the formal presentation by EPRI. All parties agreed to the change. Discussion of each report and the disposition of any associated questions, concerns, or action items are summarized below.

Operating Experience (OpE) Insights on Common-Cause Failures (CCF)

The first topic EPRI presented was an overview of EPRI Report 1016731, published December 2008. EPRI explained the primary differences between the final publication and the initial white paper NRC received and commented on. The final published report included an expanded discussion of methods and observations; an appendix with brief description of all the events referenced in the report; and had received a peer review from various industry stakeholders. As a result, the following issues were discussed and cataloged:

- A question was raised whether all INPO events and some specific plant events were included in the report, when it appeared some had not been. An explanation was provided by EPRI that the specific plant events discussed should be included and would be verified.
- Non-U.S. nuclear power plant OpE had not been included in the report, but EPRI would like to extend its research to include non-US OpE, and seeks further discussions with RES on this topic[4].
- Various definitions were discussed to help clarify how the EPRI report binned specific events and arrived at report conclusions. These definitions included: software, hardware, concurrent, and failure mode and failure mechanism.
- A discussion on applicable use of analog operating experience was tabled for future discussions with RES[4].

It was concluded that EPRI's objective for the paper was potential use as a training tool and reference document for industry stakeholders. EPRI was not requesting an official review and endorsement of the report, however, proposed that insights could be extracted from the report to improve regulatory guidance.

Digital Failure Mechanisms/Modes/Effects and CCF Applicability

The second topic EPRI presented was on an EPRI white paper focusing on CCF Applicability and Failure Modes and Effects Analysis, published February 2008. The final report for this has not yet been published. As a result of the presentation, discussions ensued on digital failure modes analysis methodology, defensive measures, and the complexity of 1E digital systems versus non-1E systems. These issues were tabled for future discussions with RES[4].

Diverse Actuation Systems/ Risk Insights

[4] NRC and EPRI have a Memorandum of Understanding (MOU) under which cooperative nuclear safety research is considered and conducted (ML070740114). Addenda to this MOU cover Digital I&C and Probabilistic Risk Assessment issues. This MOU is implemented by the Office of Nuclear Regulatory Research.

The final topic EPRI presented was EPRI report 1016721, published December 2008. Maintaining that the white paper methodologies and conclusions remained unchanged in the this report, EPRI explained the primary differences between the final publication and the initial white paper were as follows: The report was restructured to improve readability and an additional sensitivity study was added as a result of feedback from NRC staff. As a result of the presentation, the following issues were discussed and cataloged:

- The impact of the report upon Probabilistic Risk Assessment (PRA) was discussed. EPRI stated that, for the report, digital systems were not modeled for PRA insights. There was discussion on whether digital I&C failure modes were well-understood. While NRC staff emphasized that the complexity of digital systems and the limited understanding of failure modes and system behaviors complicate the modeling efforts; EPRI maintained that modeling digital system failure effects was adequate for the purpose of developing an overall nuclear power plant PRA .
- The following topics were tabled for future discussions with RES[4].
    - Digital system independence when multiple automation systems are the integrated.
    - Modeling of digital I&C in PRA.
    - Human error analysis: Manual actions vs. automation; system complexity increasing with more system integration.

Mr. Patrick Hiland of NRC mentioned some available paths for EPRI to seek an official agency review, comment, and position on the papers: 1) submit the papers and reports to the Digital I&C Steering Committee to have them reviewed by a Task Working Group as outlined in the Digital I&C Project Plan (ML091380154)[5]; or 2) submit the papers and reports through the Topical Report process described in LIC-500 (ML051800651).

A follow-up teleconference between EPRI and NRC has been scheduled for August 17, to improve mutual understanding of these topics, as needed, in preparation for the upcoming ACRS Digital I&C subcommittee meeting.

Enclosure:
1. List of Attendees
2. “Digital I&C Technical Issues” August 5, 2009 slide presentation by EPRI

[5] NRC staff alerted EPRI about the dissolution of most Task Working Groups

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PACKAGE: ML092240516
MEMORANDUM ACCESSION NO: ML092240152 **ENCLOSURE 2: ML092240524**

OFFICE:	NRR/DE	RES/DE	NRR/DE
NAME:	SWalker	DSantos/via email	PHiland
DATE:	08/12/09	08/12/09	08/14/09

OFFICIAL FILE RECORD

LIST OF ATTENDEES

MEETING WITH EPRI TO DISCUSS VARIOUS TECHNICAL REPORTS RELATED TO DIGITAL INSTRUMENTATION AND CONTROLS

WEDNESDAY, AUGUST 5, 2009

NAME	ORGANIZATION
C. Antonescu	NRC/ACRS/RSB-B
J. Ashcraft	NRC/NRO/DE/ICE2
S. Birla	NRC/NRR/DE
N. Carte	NRC/NRR/DE/EICB
M. Case	NRC/RES/DE
S. Darbali	NRC/RES/DE/DICB
J. Gibson	NRC/NRO/DE/ICE2
D. Halverson	NRC/RES/DE/DICB
D. Herrmann	NRC/NRO/DE
P. Hiland	NRC/NRR/ADES/DE
I. Jung	NRC/NRO/DE/ICE2
A. Kuritzky	NRC/RES/DRA/PRAB
S. Rhow	NRC/NRO/DE/ICE2
D. Santos	NRC/RES/DE
R. Stattel	NRC/NRR/DE/EICB
S. Walker	NRC/NRR/DE
M. Waterman	NRC/RES/DE/DICB
R. Austin	EPRI
D. Blanchard	Applied Reliability Engineering
G. Clefton	NEI
B. Geddes	EPRI
J. Harris	NuScale
R. Izema	AREVA
K. Scirola	Mitsubishi
S. Smith	Lockheed Martin
R. Torok	EPRI
N. Thuy	EPRI

DE= Division of Engineering
DRA= Division of Risk Assessment
EICB= Instrumentation & Controls Branch
PRAB= Probability Risk Assessment Branch
DICB= Digital Instrumentation & Controls Branch
ICE2 = Instrumentation, Controls, and Electrical Engineering Branch 2

ENCLOSURE 1