PDR Adv-Copy

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

December 16, 1999

MEMORANDUM TO: Mathew Chiramal
Electrical and Instrumentation Controls Branch
Division of Engineering
Office of Nuclear Reactor Regulation

FROM: Robert Brill
Engineering Research Applications Branch
Division of Engineering Technology
Office of Nuclear Regulatory Research

SUBJECT: COMPLETION OF TASKS 1 AND 2 STUDY TO DEVELOP A STRUCTURED APPROACH FOR THE REVIEW OF DIGITAL PLANT PROTECTION SYSTEM SAFETY REQUIREMENTS SPECIFICATIONS[1]

Task 1 and Task 2 of the Structured Approach study have been completed by Sandia and LLNL. Task 1 was to develop a top down Structured Approach for the review of Digital Plant Protection System Requirements Specifications. Task 2 was to test the approach and revise the Task 1 Approach as necessary.

The problem Task 1 addressed is that systems engineering methods have not been developed to ensure that Nuclear Power Plant protection system and software requirements are complete, consistent, and correct. Requirements incompleteness lack is considered to be a major contributor to software errors.

The purpose of Task 1 was to develop a technique for the top down review of requirements specifications beginning at the system level and extending down through the software functional requirements level. The purpose of Task 2 was to perform a trial application of the technique developed by Task 1.

The trial application of the Structured Approach demonstrated the following:

1. It provides a reviewer with a technique to:

   a) perform a very broad review of protection system requirements;

   b) maintain traceability between the functional and integrity requirements and the plant safety analyses and protection system analyses; and

[1]The Structured Approach work consists of three Tasks, Task 1 and 2 as described in the text of this memorandum and Task 3 is currently in progress. It is developing review templates for several layers of I&C Design. These templates are to carry the Structured Approach from the system level down to the component level. The techniques of the Structured Approach are to be applied to the "likely" components of a digital system.

DF02

c) highlight areas for further investigation which may not be identified in a less rigorous review.

2. A major benefit of the Structured Approach is that it gives the reviewer a thorough understanding of the basis for the design.

3. The trial found the need to review a very large number of plant design documents in order to obtain the necessary information.

4. The Structured Approach can not collect sufficient data regarding exactly what functions must be performed because plant documentation does not contain this information. Rather, it identifies the functions generically but does not specify the specific functions required of protection systems functions.

5. At this time, it does not consider design choices that must be documented in order to ensure proper functional interfaces between protection system components and subsystems. This is because it is a design function which is performed after the plant documentation has been reviewed.

6. The Structured Approach led to the concept of developing a set of review templates that can be used by NRR staff in reviews. The templates will be an effective practical use of the structured approach.

Conclusions:

For the purposes of NRR review the structured approach needs further refinement, but it is a technique that establishes traceability from system requirements through software requirements. The review templates, which will be supplied later this year, can be used for audits of digital systems.

Please contact me (415-6760) if you have any questions or need additional information.

Attachments:
A Structured Approach for Review of Digital Plant
Protection System Requirements Specifications
Volume 1 - Overview
Volume 2 - Details
Volume 3 - Trial Application to Advanced Boiling
Water Reactor Protection System Requirements
Distribution: See next page

DOCUMENT NAME: g:\brill\final structured report-memo

To receive a copy of this document, indicate in the box: "C" = Copy without attachment/enclosure "E" = Copy with attachment/enclosure "N" = No copy

OFFICE	ERAB/RES	C							
NAME	RBrill Brill								
DATE	12/14 /99								

OFFICIAL RECORD COPY

Distribution List
Christina Antonescu, Vol. 1 only
John Calvert, Vol. 1 only
Terry Jackson
Joel Kramer
Eric Lee, NRR
Paul Loeser, NRR
K. Mortensen, NRR
Mike Waterman, NRR
PDR
ERAB r/f