

## MEMORANDUM

TO: G. H. Marcus  
 FROM: J. N. Sorensen *JNS*  
 DATE: June 9, 1998  
 SUBJECT: Activity Report, First Quarter 1998

*Copies to  
 Larkin  
 Kress  
 Seale  
 Powers*

An interim memorandum was prepared on defense in depth (Perspectives on Defense in Depth, February 3, 1998). Defense in depth is discussed from the differing viewpoints of organizations that use the term, including IAEA, NRC, and (within NRC) Nuclear Reactor Regulation, Regulatory Research, and NMSS. The important properties of the term from each perspective are highlighted. The structuralist and rationalist views that have evolved within the ACRS are described, and essential differences are identified.

A proposal was prepared to develop a structured analysis model of the regulatory process. A graphic language will be used to display the relationship between NRC requirements and specific regulatory activities, and between NRC regulatory activities and consequent licensee activities. The initial focus would be on reactor regulation, and specifically on the inspection process. A revised proposal was prepared based on comments from Dr. Marcus, Dr. Kress and Dr. Seale (memo to T. S. Kress, Research Proposal, February 19, 1998). Dr. Kress and Dr. Seale approved the proposal, and work was initiated.

Comments were provided to George Apostolakis, Tom Kress, and Dana Powers on a draft ACRS letter to the Commission regarding elevation of core damage frequency to a fundamental safety goal. It was suggested that Committee give more consideration to the regulatory need for such a change (February 27, 1998.)

In early March, Drs. Kress, Powers and Apostolakis requested a summary of the work done on defense in depth that might serve as the basis for a technical paper and suggest a possible conclusion. The remainder of March was devoted to that effort.

Note: In January, a task was initiated to assist the ACRS in its review of the AP-600 design. The specific assignment undertaken was to assist in the review of auxiliary systems, ITAAC and RTNSS. This effort was suspended at the beginning of February, at the direction of Dr. Powers, in order to devote more time to the structured analysis research project.

Document Log, J. N. Sorensen, Chronological Order

JNS-97-01

To: ACRS  
Copy: None  
Date: August 27, 1997  
Subject: Historical Notes on Defense in Depth (Viewgraphs)  
Summary: Presentation to the Subcommittee on Regulatory Policy and Practices on the history and current usage of the term "Defense in Depth."

JNS-97-02

To: T. S. Kress  
Copy: ACRS, ACNW, Staff, Fellows  
Date: October 9, 1997  
Subject: Historical Notes on Defense in Depth  
Summary: Traces the use of the term "defense-in-depth" from 1967 to the present. The earliest use was to denote multiple physical barriers. Later it was used to describe overall safety strategies such as: prevent accident initiators, quickly terminate accident sequences that are initiated, and mitigate the consequences of accidents that are not terminated. There are currently no regulatory requirements that invoke the term defense in depth. It is referred to as an approach, a concept, or a philosophy. There is no official or preferred definition.

JNS-97-03

To: ACRS Members  
Copy: ACRS/ACNW Staff, J.T.Larkins, R.P.Savio, ACNW Members  
Date: October 15, 1997  
Subject: Historical Notes on Defense in Depth  
Summary: Transmits JNS-97-02

JNS-97-04

To: R. P. Savio  
Copy: ACRS Members, J.T.Larkins, M.M.El-Zeftawy, Fellows  
Date: October 20, 1997  
Subject: Review of NRC Research Programs Managed by the Reactor and Plant Systems Branch and the Electrical, Materials, and Mechanical Engineering Branch  
Summary: Provides review and commentary on selected elements of the Nuclear Regulatory Research program, including scope, budget, and major contractors. Intended to provide input to the Committee's evaluation of the safety research program for its letter to Congress and for its later report to the Commission.

JNS-97-05

To: R. P. Savio  
Copy: ACRS Members, A. W. Cronenberg  
Date: October 22, 1997  
Subject: Research Related to Industry Deregulation  
Summary: Provides commentary on how electrical industry restructuring might create needs for particular areas of research. Areas suggested include system and component aging, risk-informed regulation, high burnup fuel, and age related degradation of materials.

JNS-97-06

To: T. S. Kress  
Copy: None  
Date: November 3, 1997  
Subject: Progress (?) on Defense-in-depth  
Summary: Provides a summary of the August 27, 1997 Regulatory Policies and Practices Subcommittee meeting on defense-in-depth and suggests three options for proceeding to develop a policy recommendation.

JNS-97-07

To: M. R. Knapp  
Copy: J. T. Larkins  
Date: November 17, 1997  
Subject: "Fellows" Papers on the Research Program  
Summary: Transmits preliminary papers prepared by Sorensen, Cronenberg, Sherry and Gnugnoli for input to ACRS evaluation of safety research program.

JNS-97-08

To: T. S. Kress  
Copy: Dana Powers  
Date: November 12, 1997  
Subject: Notes on Defense-in-depth  
Summary: Provides a discussion of defense in depth as viewed by Dr. Kress, Dr. Powers and Dr. Apostolakis. Attempts to articulate "structuralist" and "rationalist" views. Explores the advisability of a formal policy on defense in depth, and tentatively concludes that Title 10 expresses the Commission's view of how much defense in depth is required. Suggested attributes of defense in depth are identified to provoke further discussion.

JNS-97-09

To: George Apostolakis  
Copy: None  
Date: November 13, 1997  
Subject: Notes on Defense-in-depth  
Summary: Condensation of JNS-97-08 to solicit Dr. Apostolakis' comments on Sorensen's characterization of the rationalist view of defense in depth.

JNS-97-10

To: George Apostolakis  
Copy: None  
Date: November 13, 1997  
Subject: Defense-in-depth  
Summary: Transmits electronic copy of JNS-97-09

JNS-97-11

To: Dana Powers  
Copy: None  
Date: November 20, 1997  
Subject: Defense-in-depth  
Summary: Transmits JNS-97-08 to Dana Powers

JNS-97-12

To: T. S. Kress  
Copy: None  
Date: November 20, 1997  
Subject: Defense-in-depth  
Summary: Transmits George Apostolakis' comments on JNS-97-02 and JNS-97-09.

JNS-97-13

To: T. S. Kress  
Copy: M.T.Markley, M.M.El-Zeftawy  
Date: December 9, 1997  
Subject: Conversation with Tom King  
Summary: Informs Dr. Kress that staff does not intend to recommend a policy on defense in depth to the Commission. Staff will deal with that issue in conjunction with evaluating possible revisions to the safety goal policy statement.

JNS-98-01

To: Don Miller  
Copy: Gail Marcus  
Date: January 29, 1998  
Subject: Activity Summary  
Summary: Provides a summary of J. N. Sorensen's activities since joining the ACRS in July 1997, and identifies possible future research topics.

JNS-98-02

To: Kress, Powers, Apostolakis  
Copy: Gail Marcus  
Date: February 3, 1998  
Subject: Perspectives on Defense in Depth  
Summary: Discusses defense in depth from the differing viewpoints of organizations that use the term, including IAEA, NRC, and (within NRC) Nuclear Reactor Regulation, Regulatory Research, and NMSS. Highlights the important property(s) of the term from each perspective. Describes the structuralist and rationalist views that have evolved within the ACRS, and identifies essential differences.

JNS-98-03

To: T. S. Kress  
Copy: Gail Marcus  
Date: February 12, 1998  
Subject: Research Proposal  
Summary: Proposes a research project to develop a structured analysis model of the NRC's regulatory process. A graphic language would be used to display the relationship between NRC requirements and specific regulatory activities, and between NRC regulatory activities and consequent licensee activities. The immediate benefit would be a better understanding of the regulatory process, particularly at the interface between the NRC and its licensees. The initial focus would be on reactor regulation, and in particular on the inspection process.

JNS-98-04

To: T. S. Kress  
Copy: Gail Marcus, Dana Powers, Bob Seale  
Date: February 19, 1998  
Subject: Research Proposal - Revised  
Summary: Revision to JNS-98-03 based on Kress/Marcus Comments

JNS-98-05 (AWC-102.98)

To: ACRS Members, Staff and Fellows  
Copy: None  
Date: February 24, 1998  
Subject: Additional Thoughts on Expert Elicitation Research  
Priorities

Summary: Discusses analytical hierarchy process and its use by Nuclear Regulatory Research to prioritize research activities. Concludes that use of a single ranking criterion, "safety significance" for example, is preferable to multiple ranking criteria. (Effort led and documented by Gus Cronenberg.)

JNS-98-06

To: George Apostolakis, Tom Kress, Dana Powers  
Copy: None  
Date: February 27, 1998  
Subject: CDF and Fundamental Goals  
Summary: Comments on draft ACRS letter to the Commission regarding elevation of core damage frequency to a fundamental safety goal. Suggests that Committee give more thought to the regulatory need for such a change.

JNS-98-07

To: George Apostolakis  
Copy: Tom Kress, Dana Powers  
Date: February 27, 1998  
Subject: Defense in Depth - Reply  
Summary: Comments on George Apostolakis' observation that the Commission's safety goal policy statement appears to support the "rationalist" view of defense in depth.

JNS-98-08

To: George Apostolakis  
Copy: None  
Date: March 10, 1998  
Subject: Defense in Depth Paper  
Summary: Transmits a copy of INSAG-10.

JNS-98-09

To: File  
Copy: None  
Date: March 30, 1998  
Subject: Defense in Depth Paper (working draft)