



**LESSONS LEARNED FROM AN ANALYSIS
OF "SAFETY ISSUES AT THE
DEFENSE PRODUCTION REACTORS"**

for the

**Office of Civilian Radioactive
Waste Management
U.S. Department of Energy
Washington, DC**

Prepared By:
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Received w/Ltr Dated 12/12/88

November 1988

**Prepared Under DOE Contract
No. DE-AC02-85CH10167**

8812140201

12/12/88

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FOREWORD

Lessons Learned From An Analysis of the "Safety Issues at the Defense Production Reactors", (Report) is one of several such evaluations conducted as part of the U.S. Department of Energy (DOE) Office of Civilian Radioactive Waste Management's (OCRWM) overall plan to establish a qualified Quality Assurance (QA) program.

This paper presents conclusions derived from reviewing the Report in an effort to determine the lessons that could be learned to enhance the OCRWM QA program. Specific recommendations are presented to assist OCRWM management in avoiding similar problems.

1.0 INTRODUCTION

1.1 PURPOSE

This paper presents conclusions derived from reviewing the "Safety Issues at the Defense Production Reactors" (Report) in an effort to determine the lessons that could be learned to enhance the Department of Energy (DOE) Office of Civilian Radioactive Waste Management's (OCRWM) Quality Assurance (QA) program. An evaluation of the Report's findings is presented along with a discussion as to how these findings relate to the OCRWM QA program. Specific recommendations are presented to avoid similar problems in the high-level waste program.

1.2 SYNOPSIS OF REPORT

After the April 1986 nuclear accident at the Chernobyl Nuclear Power Station in the Soviet Union, DOE requested that the National Academy of Sciences (NAS) and the National Academy of Engineering conduct a review of the Chernobyl accident and assess its implications on eleven of DOE's larger reactors. These two academies formed the Committee to Assess Safety and Technical Issues at DOE Reactors. The committee's report specifically addresses the K, L, and P reactors located at the Savannah River Plant in South Carolina and the N Reactor located on the Hanford Nuclear Reservation in Washington.

The Report is an examination by a number of outside experts of particular technical issues and uncertainties, and an evaluation of the conceptual soundness of DOE's approach to reactor safety. In addition, the Report provides an assessment of the safety management, safety review, and safety methodology employed by DOE and the contractors who operate the reactors, and highlights safety and technical issues requiring resolution.

1.3 EXECUTIVE SUMMARY

The report addresses problems with DOE reactor operations in three categories: organization and reporting structure, the DOE safety framework, and specific technical findings. An evaluation of the Report's findings along with recommendations to avoid similar problems in the high-level waste management program are summarized below.

The organizational and reporting problems identified in the Report were the result of a lack of independence of the QA organization. The OCRWM has recently established an Office of Quality Assurance which reports directly to the Director, OCRWM. The OCRWM Program organization provides for an independent line of communication and reporting between the project QA staff and Headquarters. As a means of strengthening this relationship, OCRWM should consider rotating Headquarters QA and technical staff through the project QA organization.

The Report recommends that QA personnel be directly involved in key safety issues. In this regard, OCRWM should consider requiring QA staff involvement and concurrence in Q-List and Quality Activities List development, Quality Level Assignments and other key safety and technical issues.

The Report's conclusions relative to the DOE safety framework involved DOE's failure to clearly state safety objectives and requirements, such as contained in DOE Orders, and failure to implement requirements in a timely fashion. The OCRWM is developing a consolidated, consistent, and clear source of requirements for the PROGRAM. Schedules are being developed, and in-line reviews and other hold-points established to assure compliance with these requirements. Additionally, the OCRWM should consider developing a formal action assignment and tracking system such that disciplined implementation of the requirements can be achieved and verified.

The report indicates that there was a lack of conservatism in establishing design bases within the DOE reactor program. If conservatively implemented, the Q-List and Quality Activities List methodology, and Quality Level Assignment process will help to discipline the process of establishing design bases. OCRWM should consider building conservatism into this process by requiring assignment of the highest Quality Level to all design and scientific activities unless or until a lower Quality Level can be technically justified.

2.0 EVALUATION OF THE REPORT'S FINDINGS

2.1 GENERAL

The Report addresses problems with DOE reactors in three categories: organization and reporting structure, the DOE safety framework, and specific technical findings.

2.2 ORGANIZATIONAL AND REPORTING STRUCTURE

The DOE operations offices at Savannah River and Hanford are responsible for reactor operations and report to two separate offices in DOE Headquarters. These are the Defense Programs Office, and Environmental, Safety, and Health (ES&H) Office. The effectiveness of this arrangement depends on the capabilities and the relative authority in each office. These Headquarters organizations depend on the operations offices and their contractors for information concerning the day-to-day operation and level of safety achieved in the plants. This situation places the operations offices in the position of providing operating information as well as safety and quality assurance information to Headquarters. Production goals may not always be perceived as being consistent with safety and quality assurance objectives.

The Report recommends that ES&H have a permanent and significant on-site presence with a formal reporting relationship between on-site personnel and Headquarters staff, and that ES&H have more direct involvement with resolution of key safety issues. The Report recommends that the project QA staffs develop a formal relationship with the Headquarters QA organization.

The Report also recommends that the QA organizations be directly involved in key safety issues through

preparation of such documents as nonconformance reports and approval of Q-Lists.

2.3 DOE SAFETY FRAMEWORK

With respect to the production reactors, the Report concludes that DOE has established a safety system that consists of three major elements: a safety objective, orders that prescribe the means for achieving the objectives, and a process for ensuring and verifying compliance. The Report indicates that DOE did not clearly articulate and document safety objectives and requirements for the reactors. The Report recommends that DOE safety objectives and requirements be clarified.

The Report notes that many standards and orders "..are not implemented in a timely fashion by the contractor" and is very critical of what is called the "delay-upon-delay" mode of implementing safety standards and DOE Orders.

2.4 TECHNICAL FINDINGS

Although the specific technical findings are mostly related to operating reactors, the Report presents a technical observation which is generally applicable to the OCRWM program.

The Report concludes that a principle lesson learned from both Chernobyl and Three Mile Island is that accidents more severe than the design basis accidents, often considered "incredible" in the past, could indeed occur. This conclusion suggests that the method of evaluation and determination of "worst case" or so called "maximum credible accidents" be revised to include assessment of certain incredible phenomenon for potential applicability. In this regard, the Report implies that there is a lack of conservatism in establishing design bases within the DOE reactor program.

3.0 ANALYSIS OF LESSONS LEARNED

The Report addresses DOE reactors not subject to U.S. Nuclear Regulatory Commission (NRC) oversight or inspection. Since the OCRWM program is subject to NRC oversight, review, inspection, and licensing, many of the Report's conclusions related to the lack of independent oversight do not apply. However, it should be noted that the OCRWM does not rely on outside independent oversight in implementing its QA program. The QA program is designed to prevent, identify and resolve quality problems. Outside independent oversight merely provides additional confidence of effective QA program implementation.

3.1 ORGANIZATIONAL AND REPORTING STRUCTURE

The organizational and reporting problems identified in the Report were the result of a lack of independence and authority of the QA organization. The OCRWM has established the Office of Quality Assurance that reports directly to the Director, OCRWM. The OCRWM PROGRAM organization provides for an independent line of communications and reporting between the project QA staff and Headquarters. As a means of strengthening the relationship between Headquarters and the project, OCRWM should consider rotating Headquarters QA and technical staff through the project QA organization.

The Report recommends that QA personnel be directly involved in key safety issues. OCRWM procedures presently require QA personnel involvement in the non-conformance control system. To strengthen this involvement, OCRWM should consider requiring QA staff concurrence in Q-List and Quality Activities List development, Quality Level Assignment, and other key safety and technical issues.

3.2 DOE SAFETY FRAMEWORK

The Report's conclusions relative to the DOE Safety Framework mainly involved DOE's failure to clearly state safety objectives and requirements. The OCRWM is subject to NRC and U.S. Environmental Protection Agency regulations as well as DOE Orders. The problem of clearly communicating QA and technical objectives and requirements is difficult. Because of the many sources of requirements, applicability is not always obvious and requirements often overlap each other. To facilitate uniform understanding of the requirements, the OCRWM is

developing an overall QA requirements document and separate technical requirements documents governing the design of the engineered items and conduct of site characterization activities. These documents will incorporate applicable standards, orders and government regulations.

Timely implementation of standards and orders was also identified as a major technical problem by the Report. Because of its size and distributed organization, the waste management program could be plagued by similar problems. OCRWM, upon establishing a clear source of technical and QA requirements for the program, plans to assign responsibilities and develop schedules for their implementation. In-line reviews and hold-points are being established to assure compliance with these requirements. Additionally, the OCRWM should consider developing a formal action assignment and tracking system to facilitate management and implementation.

3.3 TECHNICAL FINDINGS

The Report's conclusion relative to the lack of conservatism in establishing design bases has direct application to the OCRWM QA program. Because of the "one-of-a-kind" nature of waste management activities as well as the extended time frame over which waste isolation must be ensured, analysis of "worst case" or "maximum credible accidents" must be conservative. If conservatively implemented, the Q-List and Quality Activities List methodology, and Quality Level Assignment process will help to discipline the process of

establishing the design bases. OCRWM should consider building conservatism into this process by requiring assignment of the highest Quality Level to all design and science activities unless a lower Quality Level can be technically justified.

4.0 RECOMMENDATIONS

4.1 GENERAL

The following provides a summary of the recommendations presented in the previous section. OCRWM should consider these recommendations during the development and implementation of the OCRWM QA program.

4.2 ORGANIZATION AND REPORTING STRUCTURE

As a means of strengthening the relationship between Headquarters and the project, OCRWM should consider rotating Headquarters QA and technical staff through the project QA organization.

To strengthen the involvement of QA organizations in key safety issues, OCRWM should consider requiring QA staff involvement and concurrence in Q-List and Quality Activities List development, Quality Level Assignments, and other key safety and technical issues.

4.3 DOE SAFETY FRAMEWORK

To prevent the "delay-upon-delay" mode of implementing requirements, the OCRWM should consider developing a formal method of communicating requirements, responsibilities and action assignment, and status

tracking. Additionally the OCRWM should consider developing a formal action assignment and tracking system such that communication and implementation of QA requirements can be managed, monitored, and verified.

4.4 TECHNICAL FINDINGS

To ensure that design bases are conservatively established, OCRWM should consider requiring assignment of the highest Quality Level to all design and science activities unless or until a lower Quality Level can be technically justified.

EPILOGUE

During the conduct of this analysis, the P-Reactor at Savannah River experienced some unexpected "power spikes" during its restart. The cause(s) of the situation is currently being investigated. The results of the investigation should be available in the near future, at which time the utility of an addendum to this analysis should be evaluated.

