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May 29, 1984

Mr. Peter Ornstein
Geotechnical Branch
Division of Waste Management
U.S. Nuclear Regulatory Commission
7915 Eastern Avenue
Silver Spring, MD 20910

Dear Mr. Ornstein:

Attached is a revised program plan and tentative outline for
"Scenario Development Self-Teaching Curriculum: Techniques for
Developing and Screening Scenarios for the Release of Radio-
active Waste from Geologic Repositories."

If you have any questions concerning this communication, please
feel free to call me, Gene Runkle, or Regina Hunter.

Sincerely,

Robert M. Cranwell

Robert M. Cranwell
Supervisor
Waste Management Systems
Division 6431

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Program Plan for Scenario Development Self-Teaching Curriculum

Purpose

Scenario development and screening is an integral part of the Risk Assessment Methodology developed for the NRC by Sandia National Laboratories (SNL). The proposed seminar and a self-teaching curriculum will transfer to the NRC the techniques, methods, and information necessary for the development and screening of scenarios for the release of radioactive waste from geologic repositories.

Background

SNL Division 6431 has developed and continues to develop a suite of methods and computer codes for NRC's use during the evaluation and licensing of geologic repositories. A central part of the methodology is scenario analysis--the development and screening of scenarios and analysis of their probabilities consequences. Codes and models must be applied to specific scenarios; however, past efforts in Technology Transfer either have assumed familiarity with scenario-development techniques or have supplied ready-made scenarios for use with specific codes. The self-teaching curriculum proposed here will provide NRC staff with an opportunity to learn and practice the techniques and skills required for scenario development and screening.

Task 1. Preparation of the Seminar

Although the scenario-development techniques have been briefly described in presentations and published reports, no suitable teaching materials are available. Lecture materials and example problems will be prepared before the seminar. The seminar, expected to take two days, will include lectures on the following topics:

- o Purposes and Approaches of Scenario Development
- o Identification of Potentially Disruptive Events and Processes.
- o Construction of Scenarios
- o Evaluation of Probability and Consequences
- o Screening Scenarios

The seminar will include time for solving and discussing example problems.

Task 1 is expected to take slightly less than 2 man-months and cost \$20K, including travel expenses.

Task 2. Preparation of the Self-Teaching Curriculum

Very little of the previously published material is suitable for inclusion in a self-teaching curriculum. For this reason, the self-teaching curriculum will take about 3 months to write. Most of the curriculum will be written by the time of the seminar. After the seminar, example problems and lecture content will be revised as necessary, and the curriculum will be completed, reviewed, and revised. Table 1 is an annotated Proposed Table of Contents.

Task 2 is expected to take 5 man-months and cost \$50K.

Work to be Performed

Because this project has not been scheduled, man-months, not calendar months, are given as numbers in the bar chart below. It is expected that staff commitment will be about 70%.

	1	2	3	4	5	6	7
<u>Task 1</u>							
Prepare and Work							
Example Problems	-	-	--				
Prepare Lecture Materials				---			
Present Lectures					-		
<u>Task 2</u>							
Revise Example Problems							
and Lecture Content						--	
Write Self-Teaching							
Curriculum	---	---	--	--	--		
Internal Review						--	
Revisions							--

Personnel

Regina L. Hunter: Areas of Expertise--Performance Assessment, Scenario Development; Geology

Robert M. Cranwell: Areas of Expertise--Probabalistic Risk Assessment; Mathematics; Probabalistic Techniques

Gene E. Runkle: Areas of Expertise--Risk Assessment and Consequence Analysis; Technology Transfer

Table 1. Annotated Proposed Table of Contents

**Scenario Development Self-Teaching Curriculum:
Techniques for Developing and Screening Scenarios for the
Release of Radioactive Waste from Deep Geologic Repositories**

I. Introduction

- A. Purposes and Approaches to Scenario Development**
- B. Major Literature.**

This section will discuss uses of scenarios, including possible applications to other aspects of the nuclear fuel cycle. Other methods for developing scenarios, such as the Delphi technique and fault tree analysis, will be compared with the methods described in this report.

II. Steps in Scenario Development and Screening

- A. Identification of Potentially Disruptive Events and Processes (PDEP's)**

Existing lists of PDEP's will be presented and discussed. Methods for evaluating and compiling such lists will be described. PDEP's may or may not be medium-specific.

III. Classification and Screening of Events and Processes

- A. Release Phenomena**
- B. Transport Phenomena**

This section will compare and contrast release and transport phenomena, emphasizing the applicability of each phenomenon to specific media.

IV. Formation of Event Trees and Scenarios

This section will discuss techniques for ensuring completeness, reasonableness, lack of redundancy, and usefulness of the event trees and scenarios.

V. Screening Scenarios

- A. Probability**
- B. Consequence**

This section will discuss the logical bases and techniques for screening scenarios. A discussion of usefulness of risk-based screening at an early state of scenario development will be included.

VI. Recommending a Final Set of Scenarios

The basis for recommendations for modeling will be presented.

VII. Scenario Analysis

- A. Consequence Analysis
- B. Risk Estimation

This section will be a general discussion of the uses of scenarios after they are developed and screened. Examples of consequence analysis from the literature will be presented. The pros and cons of risk estimation will be discussed.

VIII. Summary

IX. References