PDR-1 LPDR-Wm-10 (2) Wm-11 (2) Wm-16 (2) A4165

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*87 JUN 19 A10:11

June 17, 1987

Mr. K.C. Chang 623-SS U.S. Nuclear Regulatory Commission Washington, DC 20555

WM Project 10, 11, 16 Docket No. (Return to WM, 623-SS)

Dear Mr. Chang:

VOUCHER FOR PROFESSIONAL SERVICES

Attached are the original and required two copies of the voucher for my professional services June 3-17, 1987.

I have now worked 129 days of the 130-day limit.

My activities covered by the current voucher are discussed in the attached Progress Report.

The Progress Report also includes a discussion of possible future work. Please call me after you have had a chance to consider the suggested work.

Very truly yours,

Kénneth W. Stephens

Attachments:

Voucher Progress Report

V16

8709080084 870617 PDR WMRES EECSEPHE A-4165 PDR

87222721 WM Project: WM-10,11,16 PDR w/encl (Return to WM, 623-SS)

WM Record File: A4165 LPDR w/encl

Summary of Progress Kenneth W. Stephens 6/3/87 -- 6/17/87

Methodology Demonstration Report

The report, with the exception of the appendixes, was delivered to NRC on May 20. It has been given preliminary review. After the appendixes (now in preparation) are delivered, NRC will review the combined document.

Future Work

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During the 8 days covered by this progress report, my activities have been concentrated on review of what has been accomplished during the past several months and on suggestions for future work.

The attached figure illustrates how our work fits into the overall NRC performance assessment objectives. In essence, the engineered barriers work can be divided into four main blocks: 1) single packages, 2) multiple packages, 3) adaption of the methodology to salt and tuff, and 4) EBS contingency work.

The first block deals with work to develop and implement performance assessment of single waste packages. The initial phase was completed with the Methodology Report (NUREG/CR-4477), and continued with the Methodology Demonstration Report now in the final stages. There is a continuing need for further development of process models (e.g., corrosion) relating to the packages.

The next block involves the evolution from single-package performance assessment to the collective effect of multiple packages in a repository. This was begun with Loren Zaremba's recent examples for the User Manuals accompanying the computer code. He has implemented a BWIP-style approach that uses a Poisson process to develop failure probabilities and releases from the assemblage of packages.

The third block addresses work necessary to adapt the methodology for application in salt and tuff repositories. The basic methodology already developed was designed to be as generic as possible with respect to geologic media. However, it will be necessary to collect/develop process models and data that are media-specific.

The fourth block involves EBS contingency work that NRC may wish to perform in order to be prepared for the licensing phase.



Consultant Activities in Support of the Overall NRC Mission

Recently, consultants C. Boyars, G. Fuller, R. Moler, L. Zaremba, and K. Stephens met to discuss appropriate future work. The following activities were discussed:

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- o Implementation of the code CONVO on the PC (Fuller).
- o Updating of the code to handle randomization of spent fuel age and burnup (Fuller).
- Development of an advection/diffusion release model within the repository. [This is part of the contingency work related to the engineered barrier system.] (Zaremba/Moler).
- o Adaptation of the thermal methodology for use in a tuff repository (Zaremba, <u>et al</u>).
- Adaptation of corrosion modeling work for salt and tuff applications (Moler).
- Implementation of discrete-events (e.g., earthquakes) in the performance assessment methodology (Moler, <u>et al</u>).
- Research into chemistry-related topics, as well as general support through data collection for the other consultants (Boyars).
- Analysis of synergistic effects of emplaced waste packages (Stephens).
- Analysis of the credit DOE may later decide to claim for engineered barriers other than the waste packages (Stephens).
- Collection and interpretation of earthquake data in support of the discrete-events work (Stephens).
- o Miscellaneous consulting support (Stephens).

Consulting-activity sheets are attached describing the possible Stephens work in more detail. The other consultants can provide similar information on their topics listed above.

Title: Synergistic Effects of Emplaced Waste Packages

Consultant: K. W. Stephens

<u>Need</u>

So far, DOE work associated with waste packages emplaced in a repository is based on an assumption that the failure probabilities of individual packages are not influenced by what happens to the other packages. Although DOE is rumored to have considered this issue at the policy level, there is apparently no significant current effort to establish whether synergistic effects are relevant.

An exploratory study should be conducted to determine whether synergistic effects are an important issue or can be discounted.

Activities

Estimated Effort

0	Catalog known	information	on	the	5	days
	subject.					

o Screen what is known, and generate 15 days recommendations on further work.

Output

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o 10 to 20 page letter report.

o Possible technical paper later.

Title: EBS-Credit Analysis

Consultant: K. W. Stephens

<u>Need</u>

The apparent DOE strategy for compliance with 10 CFR 60 engineered-barrier-system requirements is to meet the requirements at the edge of the waste packages. Unfortunately, there is now evidence that this may not be possible for all waste packages in all geologic media.

It is prudent for NRC to consider the alternate approaches DOE may use and for NRC to be able to assess the reasonableness of such approaches.

<u>Activities</u>

Estimated Effort

Identify scenarios under which DOE 0 may wish to claim additional credit for EBS components outside the waste packages. Determine whether it is possible to ο estimate (even roughly) the credit that may be attributable to nonpackage engineered barriers. 20 days Generate recommendations regarding: 0 Adequacy of current models and data Need for additional analysis Policy alternatives available to NRC.

Output

o 10 to 20 page letter report.

Title: Miscellaneous Consulting Work

Consultant: K. W. Stephens

<u>Need</u>

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Consultants C. Boyars, G. Fuller, R. Moler, L. Zaremba, and K. Stephens are supporting NRC in closely related work. Although they are working independently, there is a need for coordination of their activities.

In addition to the pre-defined activities, there are miscellaneous activities that support the primary work and support NRC on an as-needed basis.

Activities (examples)

Estimated Effort



Output

o Reports as necessary.

Title: Support for Discrete-Events Work

Consultant: K. W. Stephens

<u>Need</u>

One extension of the current waste package performance assessment methodology is an ability to handle discrete-events, such as earthquakes. Consultants R. Moler and G. Fuller will make the necessary changes to the computer codes.

For the work to be applied in actual applications, it is necessary to collect information on the probabilities and intensities of earthquakes within the United States. A body of this information has been developed for nuclear power plant licensing purposes, but must be adapted for use in the discrete-event hazard functions for waste packages.

The Department of Energy has handled the subject of earthquake probabilities and the effect on waste packages essentially through site-selection, i.e., once a site has met selection criteria, little if any probabilistic earthquake analysis will be done. This subject should be explored by NRC to rule out the possibility that earthquake probabilities (albeit small) dominate the other failure-mode probabilities.

Activities

Estimated Effort

- o Collect information from NRC Staff 5 days involved in earthquake protection.
- o Review literature regarding specific 5 days application to waste disposal.
- Work with other consultants to incor- 10 days porate the data into the performance assessment codes.

Output

- o 10 to 20 page letter report.
- o Possible technical paper later.