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October 24, 2001
Contract No. NRC-02-97-009
Account No. 20.01402.571

U.S. Nuclear Regulatory Commission
ATTN: Mrs. Deborah A. DeMarco
Two White Flint North
11545 Rockville Pike
Mail Stop T8 A23
Washington, DC 20555

Subject: Programmatic review of an abstract

Dear Mrs. DeMarco:

The enclosed abstract is being submitted for programmatic review. The abstract will be submitted for presentation at the International Corrosion Congress to be held September 22–27, 2002, in Granada, Spain. The title of this abstract is:

"Lifetime Prediction of High-Level Radioactive Waste Containers Affected by Corrosion" by G.A. Cragnolino, N. Sridhar, D.S. Dunn, C.S. Brossia, and O. Pensado.

This presentation is a result of the activities to be conducted in FY2002 under task 01402.571 to perform and evaluate comparative calculations of container life due to corrosion processes by considering different container materials and varying environmental conditions.

Please advise me of the results of your programmatic review. Your cooperation is this matter is appreciated.

Sincerely,

Budhi Sagar
Technical Director

Enclosure

VJ:jg

cc:					
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Lifetime Prediction of High-Level Radioactive Waste Containers Affected by Corrosion

G.A. Cragnolino, N. Sridhar, D.S. Dunn, C.S.Brossia, and O. Pensado
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This paper describes the approach adopted for evaluating the predicted life of containers to be used for the geological disposal of spent nuclear fuel and high-level radioactive waste in the proposed repository at Yucca Mountain, Nevada, USA. Under anticipated repository conditions, corrosion is the dominant failure mode limiting container life. By using the EBSFAIL module of the U.S. Nuclear Regulatory Commission (NRC) /CNWRA Total-system Performance Assessment (TPA) code, calculations of the failure time of the containers (defined as through-wall penetration) are conducted. Two dominant forms of corrosion, localized (crevice) corrosion and uniform passive corrosion, are considered in this analysis in which the behavior of several Ni-Cr- Mo alloys (alloy 825, alloy 625 and alloy 22) is compared. Using appropriate electrochemical and environmental parameters, the corrosion potential is calculated in the EBSFAIL module as a function of time and compared with experimentally measured values of the repassivation potential for crevice corrosion. Container life is calculated by using measured values of the passive current density if the corrosion potential is lower than the repassivation potential or, if the corrosion potential is higher, by using estimated values of the penetration rate due to crevice corrosion, assuming that the initiation time for this process is negligible. The effect of environmental variables such as temperature and the chemical composition of the waters contacting the containers, in terms of chloride concentration and other inhibiting or activating species, is evaluated. Uncertainties in the container life calculations and the effects on the results of variability in various physical processes are discussed, as well as simplifying assumptions in the corrosion models. A complementary purpose of this paper is to illustrate through several examples that the approach used to estimate container life can be used for life prediction for various structures and components in other industrial applications.