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MEMORANDUM TO: C.W. Reamer, Acting Chief
ENGB/DWM/NMSS

THRU: Richard A. Weller, Section Leader *RAW*
Engineering and Material Section
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FROM: Mysore S. Nataraja
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SUBJECT: TRIP REPORT- ENHANCED DESIGN ALTERNATIVE EVALUATION WORKSHOP - MARCH 8-9, 1999

I attended the U.S. Department of Energy (DOE) Phase -2 Workshop on its Enhanced Design Alternatives (EDAs) evaluation held at Las Vegas on March 8 and 9, 1999. As I had reported in my previous trip report dated March 4, 1999, a total of 26 Design Features (such as, drip shields ceramic coatings, etc.) were combined with 8 Design Alternatives (such as low thermal load, high thermal load, etc.) to arrive at several EDAs. Phase 2 of this activity, which is the subject of this trip report, deals with further evaluation of selected EDAs and rating them against certain criteria. The DOE License Application Design Selection process is currently evaluating a reduced set of five EDAs from the point of view of performance, licensability, operability and cost. This process is expected to culminate in the design selection for Site Recommendation and License Application by May, 1999.

A core team of experts evaluated the five EDAs using the following screening criteria and a rating scale of 1 to 5: (1) anticipated regulatory performance criterion of 25 mrem/yr.; (2) safety margin against the 10,000 yr. dose criterion, magnitude and time to reach peak dose, and degree of defense in depth; (3) uncertainty in post-closure performance; (4) environmental effects; (5) advantages with respect to construction, operation, and maintenance; (6) flexibility to increase capacity and increase operational period (up to 300 yrs.) before permanent closure; and (7) cost.

The five EDAs evaluated were: (1) low temperature design -- 45 MTU per acre (the goal is to maintain the drift wall temperature below 96°C); (2) shedding in pillars design (the goal is to maintain a boiling front around each emplacement drift but not coalescing with other fronts around neighboring emplacement drifts); (3) high areal mass loading design (goal is to keep the drift wall temperature under 200°C); (4) high areal mass loading combined with shielded waste package design (same goal as EDA-4, but also reduce gamma dose at the waste package surface to less than 200 mrem/hr.); and (5) very high thermal loading -- 150 MTU per acre (goal is to keep the drift wall temperature under 225°C).

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In all the five EDAs, the goal would be to keep the cladding temperature under 350°C, and all the EDAs would consider a drip shield option as an added enhancement. To accommodate 70, 000 MTU of waste, the land requirement for the five EDAs would range from 1500 acres to 420 acres. It is interesting to note that the cost comparison did not produce a big enough difference among the five EDAs to make one of the options particularly attractive (mainly due to compensating factors). Performance-wise, all EDAs met the regulatory requirement by high margins. DOE defines safety margin as the comparison between the regulatory limit of 25 mrem to the maximum calculated dose during the first 10,000 yrs. The "safety margins" calculated by DOE are 3600, 1250, 1500, 180,000, and 1250, respectively, for the five EDAs. These huge margins have to be carefully interpreted because the comparisons are based on an assumed single juvenile waste package failure in all the five cases.

DOE is currently continuing its evaluations and ranking of the EDAs and is expected to document the final results by May 1999. I have the presentation materials used by DOE during the 2-day workshop for interested staff. I am located in T-7F30.

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