



UNITED STATES
NUCLEAR WASTE TECHNICAL REVIEW BOARD
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00k. 19 (247)

December 11, 1992

Mr. Carl P. Gertz
U.S. Department of Energy
101 Convention Center Drive
Las Vegas, NV 89109

Dear Mr. Gertz:

Carl

Thank you for your November 27, 1992, letter to Bill Barnard. I would also like to take this opportunity, on behalf of the entire Board, to express our appreciation to you, your staff, and contractors for so effectively supporting our recent workshop on ESF design and construction strategy on November 4 and 5, 1992. Your recommendation several months ago to consider a round-table venue was a good one. The comments and feedback we have received unanimously supported the round-table approach in lieu of the normal format for this meeting. Our assessment of the meeting is very positive. It appears that we agree on many of the issues discussed and that considerable progress was made. The participants clearly came away with a better understanding of contemporary tunnelling technology and how it can be used in the ESF.

The Board is supportive of DOE efforts to begin underground exploration and testing for the ESF as soon as possible. Plans to start TBM excavation early in fiscal year 1994 appear to reflect an efficient schedule. Because so much of the program depends on progress in underground exploration and since excavation operations impact other portions of the program, delays should be avoided. We agree with plans to simplify the portal and the surface support facilities and encourage continued investigation of means of reducing costs so that the start of tunnelling is not delayed and funds can be used for both underground exploration and surface-based testing.

Because changes become increasingly more costly and have a greater impact on the schedule as designs and plans develop, we would like to emphasize in this letter those items in the development of the ESF that need immediate attention -- and not wait for the next Board report. Your comments during the November meeting regarding the difficulty in conducting a program in which funding levels are not consistent provided important insight into some of the DOE and NWTRB concerns and differences.

The DOE has developed a site-characterization program with an infrastructure that will support funding at planned levels. However, funding has been substantially lower than planned and even lower than requested -- in the \$200 million range per year -- since fiscal year 1988. In the fall of 1989, the Secretary undertook a reassessment of the program and decided to emphasize determining early site suitability, with a goal of

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license application for 2001. Despite funding levels significantly lower than planned since fiscal year 1991, the target date is still 2001. As you noted early in 1992 and again at the November workshop, the target date can only be met if funds are ramped up to balance the less-than-planned funding of the past three years.

The "flexibility" that the DOE wishes to maintain was described at the November workshop as being the ability to respond to increased funding, should it occur. To maintain this flexibility, the ESF access tunnels and main drift have been sized to accommodate additional TBM and excavation operations from the same portal, should funds become available. This approach has two disadvantages: (1) The ramp-up in funding may not occur, but if it does, it would be inefficient and cause much interference -- particularly in TBM operation. Testing and evaluation would be required to follow very optimistic schedules. (2) It appears that the annual planning for a ramped-up operation actually has resulted in substantial cost to the program and may have delayed progress. High program infrastructure and overhead costs have left only a small portion of the budget available for testing and exploration.

The Board continually has emphasized early start of tunneling to evaluate site suitability and has supported approaches that minimize interference, delays, and inefficiencies involved in trying to mobilize a large number of simultaneous operations. At its meetings with the DOE (March 6, 1991; July 15, 1991; August 13, 1991; September 18, 1991) the Board commented on these issues. In its fourth report the Board recommended that 16- to 20-ft diameters be considered with early access from one portal. In its fifth report the Board recommended an incremental approach to excavating the ESF using one or two smaller TBMs, and excavating opening sizes as small as functionally required.

The Board considers the major short-term goal of the program to be the early determination of the suitability of the Yucca Mountain site. Access across known and unknown faults and fractures to visually examine and evaluate these critical geologic features is a key milestone for determining site suitability and should be a high-priority activity. Until access to the underground can be achieved and the geologic conditions can be examined, the suitability of the site must be considered questionable.

We also support beginning heater tests as soon as possible because of the long lead time required for conducting the tests, their relation to site-suitability questions, and their impact on the repository design.

We believe that the following recommendations, if implemented, would help achieve key milestones for early determination of site suitability at minimum program cost and risk.

1. Efforts should be directed toward efficient execution of the main TBM drive from the North to the South portal without delays. Operating a TBM without interference provides one of the best opportunities to meet program schedules. With the rates of progress standard in the industry, the main drive should be

completed within approximately 12 months. This will provide access (and egress) from two portals and allow the earliest access for exploration and a safe start of testing.

2. The general conclusion from industry participants and consultants at the November workshop was that the *safest*, most efficient means of supporting TBM excavation is by rail vehicles rather than rubber-tired vehicles. Rail will provide similar advantages for supporting the exploration and testing program. We recommend the use of rail to support TBM operations. This too is standard U.S. industry practice.

3. The Core Test Area layout should be designed to facilitate excavation by TBM. Heater test rooms should be excavated by TBM to produce wall rock conditions that are similar to those that would be present in the emplacement drifts of a repository and to minimize introduction of water into the test area. A short-radius TBM should be considered for this. The layout of the Core Test Area should allow the heater test area to be completed and access provided before excavating other portions of the Core Test Area.

4. Presently, a DOE request for proposal is out for a TBM from 25 to 30 ft in diameter. We were surprised to learn that the tunnel size would be chosen based on machine availability and cost. During the discussion at the workshop, we stated that it is not appropriate to allow the cost of the TBM to control tunnel diameter. Increasing tunnel diameter from 25 to 30 ft is an increase in tunnel volume of 44 percent. The cost of the larger tunnel would be much greater than any cost savings achieved in the purchase of a used TBM. It was also noted that, for TBMs in the 30 ft-diameter class, the main bearing would probably have to be replaced prior to completing the north portal to south portal 26,000 ft run — a costly and time-consuming operation. We believe that minimum cost to the project and minimum risk would be achieved with smaller diameters. We conclude that the TBM should not be increased above the 25 ft size.

As noted at the workshop, by using rail transport and providing ventilation for one excavation heading, the tunnel size can even be reduced to 18 to 20 ft. This will allow the use of a class of TBMs that represent better than 90 percent of those manufactured since their first introduction in the early 1950s. Using this size of TBM would reduce both TBM and ESF construction costs, reduce program risks, and speed up construction. An additional advantage would be to provide program flexibility — the ability to excavate turnouts, the core test area, exploratory drifts, and subsequently to excavate the Calico Hills ramps and drifts. Small tunnel size offers the maximum potential for adjusting to an evolving repository design.

5. By using an award fee, cost-reimbursable contract, the cost and schedule incentives that encourage a construction contractor to develop efficient operations will be lacking. It was concluded at the November workshop that such incentives could be included in the construction contract, perhaps within the framework of the award fee. We also recommend that the contractor pursue efficient operating and support crew sizing for the TEP, based on proven tunnel industry practice.

6. The number of organizations and levels responsible for designing, constructing, and managing the ESF construction is greater than most other major federally funded underground projects. We encourage the DOE to consider ways to achieve cost and schedule efficiencies by minimizing overlapping and duplicated functions.

A number of questions were raised during the November workshop that were not adequately discussed, and we understand that further ESF studies are currently being conducted. We suggest that our staffs continue to exchange information and that various items be clarified through staff discussion so that we can reflect the latest information in our Board report on the ESF.

Again, I want to express my appreciation to you for your support of the round-table discussions and the cooperative, open environment you have encouraged within the Yucca Mountain Project. I look forward to additional interactions and reviews of progress of the design and construction of the ESF in the upcoming year.

Sincerely,


Edward J. Cording
Member of the Board

cc:

Board members

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< TRANSACTION REPORT >

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