IMPLICATIONS OF THE TIMING OF THE PRELIMINARY DETERMINATION OF SUITABILITY

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ABSTRACT

The Nuclear Waste Policy Act of 1982 requires that the Environmental Impact Statement prepared for the recommendation of a repository site must consider three sites -- the one selected for the repository and at least two alternatives. All of these sites must have been characterized, and the Secretary of Energy must have made a preliminary determination that each is suitable for development as a repository. There is great disagreement about whether that "preliminary determination of suitability" is to be made before or after site characterization. If the Act is interpreted as requiring the determination to be made after characterization is completed, DOE cannot recommend the first site for licensing until it has three sites that appear suitable after full characterization; if the determination can be made before characterization, DOE can proceed to licensing even if only one site survives characterization. While DOE plans to make the preliminary determination before starting characterization, the uncertainty about how a court might ultimately interpret the Act injects a significant institutional uncertainty into the schedule for the repository, and complicates contingency planning for the siting process. Early resolution of the interpretation would greatly aid DOE's planning for the siting program.

INTRODUCTION

Section 114(f) of the Nuclear Waste Policy Act requires that an Environmental Impact Statement (EIS) be prepared at the time the Secretary of Energy recommends to the President the first site for a geologic repository. The EIS must consider as alternate sites "3 candidate sites with respect to which (1) site characterization has been completed under section 113; and (2) the Secretary has made a preliminary determination that such sites are suitable for development as repositories consistent with the guidelines promulgated under section 112(a)." Both requirements appear to be subject to varying interpretations, with results that have major implications for the likelihood of success of any given siting program. Under one combination of interpretations, DOE would be able to recommend a site for licensing as soon as one site has been characterized sufficiently to support a license application; under another, DOE would not be able to recommend a site until it had brought three sites to that stage.

THE PRELIMINARY DETERMINATION OF SUITABILITY

There is disagreement about when section 114(f) requires the preliminary determination of suitability to be made. The DOE Mission Plan states that the Secretary of Energy will make the preliminary determination early, at the time that DOE recommends three sites to the President for characterization.[1] Some Members of Congress support the DOE interpretation,[2] while others say that the determination is to be made at or near the end of the characterization process.[3,4] There is little explicit legislative history bearing on the issue, and as yet no judicial record to help resolve the disagreement.

The effectiveness of any given siting program will be largely determined by how this issue is resolved. Depending upon the timing of the preliminary determination of suitability, characterizing only three sites initially could provide either a considerable degree of redundancy or none at all as far as DOE's ability to avoid major delays in recommending the first site for licensing is concerned.

If the preliminary determination of suitability can be made before characterization, then characterizing three sites as DOE now plans to do should provide sufficient redundancy to give a reasonable degree of confidence that at least one would survive the characterization process and that DOE could recommend a site for licensing without major delay. In this case, contingency planning needs to focus on what would be done in the event that only one site appears usable for a repository after characterization. If that occurs, there will be some risk of major delays after the first site is recommended in the event that (a) the site is vetoed by the host state and Congress does not override the veto, or (b) the site is rejected by NRC at some point in the licensing process. In either case, a backup would need to be available as quickly as possible to minimize delays. (In fact, the Act requires that DOE recommend a second site within one year if the first is vetoed and the veto is upheld.)

However, if the preliminary determination of suitability must be made after characterization, then DOE could not recommend the first site for licensing until it had characterized three sites to the point that they could all be determined to be suitable for a repository. In this case, if DOE started with only three sites, the recommendation of the first site for licensing could be delayed by (a) delays in characterizing one or more of the sites, and/or (b) discovery of information during characterization that would disqualify one or more sites. The likelihood that no such problems would

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arise with any of three sites is low enough to warrant more extensive contingency plans. (To use a very simple example, if there is as little as a 20 percent chance that each individual site could experience a major delay or failure, there would be about a 50 percent chance that at least one of three would experience such a problem.)

Thus, as DOE indicates, a finding that the preliminary determination of suitability must be made after characterization would either require characterization of more sites at the outset, or run a substantial risk of major delays before the first site could be recommended for licensing (Ref. 1, vol. II, p. 25). Given the potential impact of the Gramm-Rudman-Hollings bill on Federal expenditures including those from the Nuclear Waste Fund, the prospects for full characterization of extra sites as insurance against delays appear dim.

Those who believe that the preliminary determination cannot be made before characterization begins have not reached any clear consensus about the specific point in the characterization process at which it should be made. In a letter on the timing of the preliminary determination of suitability, several key members of the House of Representatives who were involved in passage of NWPA stated that the determination should come "late in the site characterization process" (Ref. 4). An accompanying staff analysis of the legislative history of section 114(f) suggests that the preliminary determination of suitability would be made after "a detailed understanding of the site's geologic characteristics", but would still allow for the possibility that the site would subsequently be found unsuitable. It also indicates that testing at-depth would be required to produce that detailed understanding.

This ambiguity concerning the proper point for the preliminary determination of suitability comes from the fact that there is no precise technically-defined end point to the site characterization. process. Characterization will include both field tests from the surface designed to establish the large-scale properties of the site and surrounding environment, and in situ tests at the proposed depth of the repository. The more tests that can be done, and the longer they can be conducted, the more confidence in the suitability of the site can be obtained. There is no fixed point at which all conceivable relevant information would have been gathered. Instead, DOE will have to make a judgment as to when sufficient data are available to support a license application. At that point, DOE can recommend a site. If the preliminary determination of suitability had to be made after sufficient data were available to support a license application, it would imply that full underground testing (now expected to involve two exploratory shafts and an underground test facility) would have to be completed for at least three, and probably four or more, sites. It would also mean that DOE could not recommend one site for licensing until three had been determined to be ready for licensing.

However, the specification that the preliminary determination of suitability should come "late" in the characterization process suggests that it is not expected to come at the very end -- that is, at the point at which DOE has enough data to decide that no further testing is needed to support a license application for the site. Indeed, if it did not come before that point, there would not seem to be any room for the site to be found inadequate at a later point in characterization, an event which the staff analysis cited above contemplates as possible. That view is also supported by section 114(a)(1)(E), which requires that the recommendation of a repository site to the President must be accompanied by a report containing preliminary comments by NRC concerning the extent to which the data from site characterization are sufficient for a license application. Presumably DOE would only recommend a site for which the NRC made a positive finding about the data and analysis, and NRC would only make such a finding if the data were sufficient to suggest that the site would in fact be licensable. Thus a preliminary determination of suitability made at this point would be tantamount to a preliminary finding by the NRC that the site appears suitable for licensing based on the available data. If the DOE preliminary determination of suitability is intended to be a less severe test than an NRC preliminary finding that the available data are sufficient for a license application, then the preliminary determination of suitability would need to be made at some earlier point in characterization.

Because site characterization is not clearly defined, there is no obvious stopping-place at which to make a preliminary determination of suitability, if it is decided that it must be made after characterization begins but before it ends. Since a major part of the cost and environmental impact of site characterization activities is associated with the underground test facility, one possible point before all of those costs and impacts have been incurred would be at the completion of the first exploratory shaft for the in situ facility. Some data on the suitability of the site will be obtained during the construction of the first shaft itself, particularly if the test program is designed to use the first shaft for that purpose. In addition, much relevant information to be obtained during characterization will be obtained from field activities on the surface, including additional boreholes. Some fraction of this data could also be available by the time the first shaft is completed. If the preliminary determination of suitability were to be made at this point, the test program could be designed to determine as quickly as possible whether any disqualifying conditions are present or qualifying conditions are absent.

To show how resolution of the ambiguities about section 114(f) can affect the site characterization strategy, the Office of Technology Assessment (OTA) outlined a hypothetical siting plan based on the assumption that the preliminary determination of suitability could be made following construction of the first exploratory shaft. The plan uses a two-phase characterization process, with completion of the first shaft (and perhaps a short exploratory drift at the bottom) as the dividing line between the two phases. Efforts in the first phase would consist of tests during construction of the shaft and an initial drift (or horizontal boreholes), as well as field tests (e.g. borehole pump tests to determine the bulk hydrologic characteristics of the site). The first phase would be focussed on rapidly reducing the uncertainty about the presence of disqualifying factors or the absence of qualifying factors -- i.e. on obtaining information that could lead to a determination that the site is not suitable. (This may require more time during the sinking of the first shaft to allow for an appropriate test program.)

At the end of this phase, DOE would complete the Advanced Conceptual Design for the repository at each site -- the second step in the first of three design stages described in the Mission Plan (Ref. 1, Vol. 1, pp. 221-222). According to the Mission Plan, this design should be completed by the time the first exploratory shaft is constructed (Ref. 1, Vol. 1, Fig. 3-5, p. 59). Since the Advanced Conceptual Design will include a demonstration of project feasibility and an estimate of total life cycle cost for a repository at the proposed site (Ref. 1, Vol. 1, p. 221), it would provide a useful basis for determining whether further evaluation of the site is warranted.

If this approach were consistent with the requirements of section 114(f), it could significantly reduce the costs and environmental impacts of the characterization stage. Specifically, it could allow unsuitable sites to be identified and rejected as quickly as possible, so that the expense and environmental impacts of further characterization could be avoided. This could be attractive to the host states.

With a preliminary determination of suitability at this point, several options for the first phase would be possible. Three are discussed below.

o Option 1: Recommend 4 sites for characterization. Prepare Site Characterization Plans for all four, and conduct the surface testing part of the first phase of characterization for all four; but sink initial shafts only at the most promising three. If one drops out, then sink a shaft at the fourth site. If more than one drop out, than sink a shaft at the fourth site and at one or two new sites. Beginning work on a fourth site increases initial costs somewhat, but reduces the delay involved if one site drops out and a backup has to be brought along. Furthermore, the extra cost would be low, since the additional work involved would only be surface testing.

o Option 2: Start with only three sites. If one or more drops out by the end of the first phase, recommend other sites for characterization (the number depending upon how many sites had dropped out). This has the minimum initial cost, but the maximum potential delay if any of the original three is dropped. However, the expected delay would be less than if the preliminary determination of suitability were made at the very end of characterization of three sites because (a) the decision that an additional site was needed would be made earlier, and (b) the determination that the new site is or is not suitable would be made earlier.

o Option 3: Characterize four sites all the way to the end of the first phase. This option minimizes the expected delay resulting from failure of a site, but increases the costs and impacts if it turns out that the fourth site was not needed; i.e. if the three highest ranked sites all proved suitable at the end of the first phase. However, the extra cost of parallel characterization of a fourth site would be substantially lower than if the preliminary determination of suitability were made at the end of characterization, because the extra site would only have the first shaft sunk before its suitability was determined.

COMPLETION OF CHARACTERIZATION AT THREE SITES

As noted above, section 114(f) also requires that characterization must have been completed for the three sites described in the EIS. The ambiguity here involves just how far in the characterization process each site must be taken before characterization can be determined to have been completed for purposes of this section. This question is distinct from the question of when the preliminary determination of suitability is to be made, although the two questions are related. Obviously, if the preliminary determination of suitability must be made only after sufficient data are available to support a license application, then all three sites must be characterized to that point. However, if the preliminary determination of suitability can be made before the end of characterization, or even before characterization begins, then it is not clear whether the three suitable sites must all be characterized beyond the point at which the preliminary determination of suitability is made.

As with the timing of the preliminary determination, the resolution of this question could have significant implications for the degree of uncertainty in the repository schedule, and for the appropriate siting strategy. If section 114(f) would allow DOE to terminate characterization of a site at any point following the preliminary determination of suitability, then a site can be recommended for a repository as soon as DOE has developed sufficient favorable data for one site to support a license application. That is, the program can proceed as quickly as the fastest site under consideration is ready for licensing. However, if each site that is not clearly disqualified following the preliminary determination of suitability must be carried all the way to the end of characterization, then the first site could not be recommended until the other remaining qualified sites had also been characterized to the same extent.

It is not difficult to imagine a situation five or more years hence in which one site has dropped out, one has been characterized to the point that DOE believes it is ready for licensing, and the third is somewhere in between, with significant parts of the characterization program laid out in the Site Characterization Plan still to be completed. Whether the recommendation of the first site would be held up pending completion of characterization of the other site would depend upon how section 114(f) is interpreted.

If characterization of three sites to the point at which the preliminary determination of suitability was made would fully satisfy the requirements of section 114(f), DOE would be able to recommend the first site for licensing as soon as (1) a preliminary determination of suitability has been made for three sites, and (2) full at-depth testing has been successfully completed for at least one of those sites. If this interpretation were combined with a preliminary determination of suitability made after completion of the first exploratory shaft, several interesting options would be available for the second phase of characterization. (The second phase of characterization would include construction and operation of the second shaft and the in situ test

facility, continuation of surface and lab tests as necessary, and preparation of the License-Application Design -- the second design stage).

The options include some that involve completion of characterization for fewer than three sites. Reducing the number of sites for which full in-situ characterization must be performed and a detailed license application developed could decrease the costs and environmental impacts of the siting program or allow more sites to be considered in the earlier stages at no major increase in cost over current plans.

o Option 1: Complete phase two characterization and license application designs only for the two most promising of the three suitable sites. By assumption, the EIS requirements for three characterized sites would be met by having three sites that were determined to be suitable after having completed the first phase of characterization. If this assumption is valid, it would not be necessary to carry all three to the end of phase 2. Focusing attention on two sites after the first phase of characterization would reduce costs and environmental impacts compared to the approach in the DOE Mission Plan, in which full underground facilities, and detailed designs suitable for a license application, are planned for all three sites. At the same time, carrying two sites all the way to the end of the second phase of characterization (instead of only one) would increase confidence that at least one suitable site would be available for licensing at the end of the process. It would also make it possible for DOE to meet NWPA's requirement that it recommend a second site for licensing within a year if the first is vetoed by the host state and that veto is not overturned by Congress.

The risk of narrowing to two sites at this point is that the site with the best chance of being licensed might be dropped inadvertently; that is, the least preferred of the sites at the end of phase one might turn out to be the most preferred at the end of phase two if it were carried along with the highest ranked sites. This risk could be reduced by designing phase 1 to reducing the key uncertainties about the licensability of the sites as quickly as possible.

o Option 2: Complete phase two characterization for all three, but prepare license application designs only for most promising two. This would increase the the cost and environmental impacts compared to the reference option, but would avoid any risk that the most promising site might be inadvertently dropped at the end of phase 1. Some savings would result from preparing only two license application designs.

o Option 3: Complete phase two characterization and license application designs for all three suitable sites. This is the approach described in the Mission Plan. It maximizes the costs and environmental impacts of characterization, but minimizes the chance of significant delays during the recommendation and licensing process.

CONCLUSION

The preceding discussion shows that the timing of the preliminary determination of suitability can have significant implications for the type of site characterization program that is feasible and appropriate. The earlier the ambiguities in section 114(f) can be resolved, the better it is for the waste management program. DOE notes in the Mission Plan that a requirement that a preliminary determination of suitability be made for three sites at the end ofcharacterization would in effect require that more than three sites be characterized initially, since it is a reasonable possibility that at least one site would drop out during characterization. This discussion suggests that the cost of deferring a definitive resolution of this question could be high.

If DOE proceeds with three sites now on the assumption that the preliminary determination of suitability can be made before characterization, and if one or more of the sites proves to be unsuitable during characterization, then there is a good chance of a lawsuit at the time of the EIS. Such a lawsuit could itself hold up the process for a year or two. If the result of such a suit were a decision that the preliminary determination of suitability must be made at the end of characterization, four or more years could then be required for DOE to characterize additional sites, or Congress would have to amend the Act to make it clear that fewer than three sites were needed -- a process which would entail certain delays and risks of its own.

It has been suggested only half-facetiously that DOE should sue itself to force a judicial interpretation of this section of the Act. If no one else will oblige DOE by seeking a judicial opinion as soon as DOE formally recommends sites for characterization, this might be a very good idea.

REFERENCES

1. U.S. Department of Energy (DOE), Mission Plan for the Civilian Radioactive Waste Management Program, DOE/RW-0005, Vol. 1, p. 64 (1985).

2. Letter from Senators James A. McClure, Pete V. Domenici, J. Bennett Johnston, and Alan K. Simpson to The Honorable John Herrington, Secretary of Energy (June 25, 1985).

3. Letter from Representative Morris K. Udall to Mr. Benard C. Rusche, Director, Office of Civilian Radioactive Waste Management (July 26, 1985).

4. Letter from Representatives John D. Dingell, Edward J. Markey, Al Swift, and Ron Wyden to Ben Rusche (July 26, 1985).