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TESTIMONY BY DR. RAUL A. DEJU,
BASALT WASTE ISOLATION PROJECT,
BEFORE THE

'83 NOV -4 P256 COMMITTEE ON ENERGY RESEARCH AND PRODUCTION
COMMITTEE ON SCIENCE AND TECHNOLOGY
UNITED STATES HOUSE OF REPRESENTATIVES
WASHINGTON, D.C., MARCH 2, 1983, 9:30 A.M.

Madam Chairman. I appreciate this opportunity to appear before the Committee today.

The Basalt Waste Isolation Project is part of the National effort by the U.S. Department of Energy to identify sites suitable for a nuclear waste repository. Our mission is to assess whether or not a nuclear waste repository can be sited in the basalts beneath the U.S. Department of Energy's Hanford Site. This site is located in south-central Washington State.

As far back as 1957, the National Academy of Sciences recommended that basins that were hydrologically isolated be drilled and tested to determine their adequacy for long-term storage of solidified radioactive material. Since that decision, the basalts underlying the Hanford Site have been studied extensively for this purpose. As part of that recommendation, an existing deep borehole, south of the Hanford Site, was tested hydrologically. This deep borehole was used to identify whether or not the deep basalts adjacent to and within the Hanford Site were suitable for radioactive waste storage. As a result of the information obtained from the borehole studies, funding was provided from 1968 through 1972 to drill several additional holes in the Hanford Site to further characterize the underlying basalts.

Four of the deep holes drilled in basalt between 1968 and 1972 were to depths in excess of 3,000 feet and served to obtain rock core samples and information about the hydrology of the deep strata. Such hydrologic testing indicated that the basalts beneath the Hanford Site are of very low permeability and would likely be suitable for isolating and confining solidified radioactive waste materials.

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After these early studies, it was determined that many types of geologic media throughout the United States should be studied under a systematic, broader based program. Therefore, in 1976, the National Waste Terminal Storage Program was established by the U.S. Department of Energy to provide the research and development needed to support the assessment of suitability of several rock formations, including salt, tuff, granite, and basalt, as a nuclear waste repository. Sites containing these rock types are located throughout the United States. As part of this National program, the basalt studies received additional funding, with emphasis on assessing the feasibility of constructing a nuclear waste repository in basalt based on a thorough analysis of technical, economical, and social factors.

On January 7, 1983, as you know, President Reagan signed into law the Nuclear Waste Policy Act of 1982. This Act establishes a step-by-step process by which the President, the Congress, the affected individual States, the U.S. Department of Energy, and other Federal agencies can work together in siting, constructing, and operating a high-level nuclear waste repository. The U.S. Department of Energy is required by Section 116(a) of the Act to identify States having potentially acceptable sites for a waste repository. A potentially acceptable site is defined by the Act as:

"Any site at which, after geologic studies and field mapping but before detailed geologic data gathering, the Department undertakes preliminary drilling and geophysical testing for the definition of site location."

As I have mentioned, site characterization work at Hanford has been ongoing since 1968. Based on the information acquired through the effort to date, we believe that Hanford contains a potentially acceptable site. Secretary of Energy Hodel notified Governor Spellman of Washington of this conclusion on February 2, 1983.

The studies to date that led to this conclusion have not revealed any technological impediment to siting a nuclear waste repository in the basalts beneath the Hanford Site. In fact, the basalts show many favorable attributes.

The basalt rocks beneath the Hanford Site are unlike any other basalt in the world, in that they are extremely thick. This thickness is due to the conditions under which they were formed -- the creation of massive lava flows, one lying directly on top of the previous flow. This process of accumulation continued essentially uninterrupted millions of years ago until more than 10,000 feet of basalt rock had accumulated.

The terrain over the area being considered for a potential repository is basically flat. The deep basalt flows underlying this area are also flat lying, and the thickness of individual flows remains uniform over distances on the order of 40 miles. Such flatness and uniformity enhance our ability to predict the continuity of these flows and makes construction easier.

The Hanford Site is also located in a seismically stable area. There are no major fault zones in the area being considered for a nuclear waste repository.

The physical and chemical conditions in potential repository layers in these basalts are highly suitable for nuclear waste canister stability. In addition, the solubility rate of any waste materials, which through premature canister breach could reach the groundwater, is extremely low. Because the solubility is so low, any leaching of the solid nuclear waste would be extremely slow. The few radionuclides that would go into solution in the groundwater also would move very slowly, decreasing in concentration as they decay along the flow path.

In some areas of the world, groundwater can move through fractures in basalt (i.e., terrain). However, the fractures in the deep basalts beneath the Hanford Site are filled with other minerals. Hydrologic testing has shown that these basalts, with their filled fractures, have permeabilities as much as 1,000 times less pervious than the concrete used in structures such as major dams.

I have mentioned a number of favorable attributes associated with the basalts underlying the Hanford Site; however, I also want to inform you

about concerns that need to be resolved to either confirm or eliminate the basalts as a potential nuclear waste repository host medium. Three key concerns have been identified. They are:

- A thorough understanding of the groundwater hydrology beneath the Hanford Site is needed to assure that a repository in basalt will not contribute unacceptable amounts of contaminants to the accessible environment.
- Our ability to construct a repository shaft and a network of underground tunnels needs to be fully demonstrated through an exploratory shaft program.
- Our ability to ultimately seal a repository, such that its integrity and the isolation of the waste are guaranteed, needs to be demonstrated.

A comprehensive program that addresses these concerns is presently under way. The results of studies to date, as well as a complete description of planned programs, have been included in the Site Characterization Report that was transmitted to the U.S. Nuclear Regulatory Commission in November 1982. Two fundamental areas of our program that address the major issues I just mentioned include:

- An active program of hydrologic investigations that has involved expenditures of approximately seventy million dollars to date and will require expenditure of an additional thirty million dollars prior to the potential submittal of a license application for construction of a repository in basalt. These hydrologic studies are coupled with extensive modeling studies and with the workings of an active task force over the last year involving various National laboratories as well as the U.S. Geological Survey. This task force is working toward resolving different points of view regarding the hydrology of the Hanford Site. Recent meetings of this task force have been very encouraging.

- An active program of underground exploration that includes construction of a 6-foot finished-diameter exploratory shaft to repository depths and a network of underground tunnels to provide access to the subsurface, such that one can study the actual stratum being considered for a nuclear waste repository. This program would serve to demonstrate the constructibility of such a facility and would provide the space needed to conduct various scientific and engineering tests prior to the potential submittal of a license application. Sealing tests will likely be conducted in this facility.

In addition, the Basalt Waste Isolation Project is making progress in the preparation of the various documents required by the Nuclear Waste Policy Act of 1982.

The screening guidelines for a nuclear waste repository were published in the Federal Register this past month. A Draft Environmental Assessment for the Basalt Waste Isolation Project's site characterization activities is being issued this week. Hearings on the siting process are being scheduled for March 21 and March 25, 1983, respectively.

All elements of the Basalt Waste Isolation Project are aimed at permitting a siting recommendation regarding a repository in basalt in fiscal year 1987, as called for in the Act. However, the program scheduled to achieve this is extremely tight and is going to require extensive effort to maintain all its components on schedule to achieve the dates called for in the Act. Approximately two hundred twenty-five million dollars will have been spent on the Basalt Waste Isolation Project through the end of this fiscal year, with a total anticipated expenditure of five hundred-fifty million dollars through the potential submittal of a license application at the end of fiscal year 1987.

I will conclude by reiterating my earlier statement that at this time no impediment to siting a nuclear waste repository in basalt has been found; however, additional work remains to be done to resolve areas of concern. I am confident that completion of this work will provide the data needed to make a sound decision regarding the Hanford basalts.

This concludes the text of my prepared statement. I would be happy to answer any questions at this time.