

## THE STATUS OF YUCCA MOUNTAIN SITE CHARACTERIZATION ACTIVITIES

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### ABSTRACT

The U.S. Department of Energy (DOE) Office of Civilian Radioactive Waste Management (OCRWM) is continuing its studies to determine if Yucca Mountain, Nevada, can safely isolate high-level nuclear waste for the next ten thousand years. As mandated by Congress in 1987, DOE is studying the rocks, the climate, and the water table at Yucca Mountain to ensure that the site is suitable before building a repository about 305 meters below the surface. Yucca Mountain, located 160.9 kilometers northwest of Las Vegas, lies on the western edge of the Nevada Test Site. Nevada and DOE have been in litigation over environmental permits needed to conduct studies, but recent court decisions have allowed limited new work to begin. This paper will examine progress made on the Yucca Mountain Site Characterization Project (YMP) during 1991 and continuing into 1992, discuss the complex legal issues and describe new site drilling work. Design work on the underground exploratory studies facility (ESF) will also be discussed.

### DISCUSSION

The Yucca Mountain debate continued to be a top news story in Nevada. In a survey of the state's newspaper and broadcast news executives, Yucca Mountain was chosen as the number two news story for 1991. There were nearly 2,000 articles reported in Nevada newspapers during the year and almost daily news coverage on television. This 6.475 square-kilometer site has been the center of controversy, publicity, and ensuing legal battles between the State of Nevada and DOE.

Legal issues surrounding the YMP are complex, but there was progress this year in favor of DOE. Nevada passed Assembly Bill 222 in 1989 in an effort to halt DOE's characterization of Yucca Mountain by declaring a repository "illegal" and outlawing any radioactive waste in the state. It also passed two joint resolutions opposing the repository. In 1991, the U.S. Supreme Court upheld a Ninth Circuit Court ruling that Nevada's "veto" of Yucca Mountain was premature, made before the site had even been characterized.

Nevada has been firm in its resolve to delay the site characterization work. By delaying the processing of three environmental permits needed to conduct field work, the state has slowed the progress of scientific studies. An air quality registration permit requested January 1988 was delayed 1200 days before finally being issued. The standard processing time in Nevada is 90 days. Only after a Las Vegas District Court judge ordered the state to process all three DOE environmental permits was the air quality certificate issued in June 1991. A second permit, for underground injection of tracers, was received in July 1991.

A hearing was held on the third permit, water appropriation, in September 1991. DOE has been granted a temporary permit to use water from the VH-1 well (about 72.42 kilometers away from Yucca Mountain) for site characterization studies, but has not received the water appropriations' permit to use the J-13 well near Fortymile Wash. Nevada contends that drawing down water for use on project activities threatens the water recharge system for Amargosa Valley and Ash Meadows. YMP scientists monitoring the water at wells near

Yucca Mountain counter that they do not foresee any significant impact or drawdown by activities planned at the site. The National Park Service withdrew its protest about water usage after negotiations with DOE.

Nevada's state engineer will make his recommendation on the water permit by the end of February 1992. The important decision about water usage is that the requested well, J-13, is a permanent long-term source of water and is more centrally located to planned site activities. It also has the necessary pipe system in place to use the water efficiently. For current work, water has to be transported by truck from VH-1.

To ensure that the studies underway at Yucca Mountain are not further delayed or interrupted, new legislation has been introduced in the Senate directing the DOE to carry out site characterization studies. This legislation is based on President Bush's National Energy Strategy that calls, in part, for increased use of nuclear power to meet the nation's energy needs. A House of Representatives subcommittee has also introduced similar legislation to ensure that progress of the studies isn't further interrupted. The bills proposed by the Senate and the House do not exempt DOE from complying with applicable environmental laws and regulations, but do ensure that the studies proceed as scheduled.

In January 1992, a hearing by the Congressional Subcommittee on Energy and the Environment was held in Las Vegas to discuss proposed legislation that would remove Nevada's jurisdiction to issue permits. The subcommittee panel heard testimony from a variety of sources and took its findings back to Congress. Congressman Peter Kostmayer, D-Pennsylvania, subcommittee chairman, told Nevada politicians that if the state delays permitting further, the state may lose its jurisdiction to issue permits. The bottom line is that every time DOE needs a permit to do work at Yucca Mountain, the agency has been forced to go to court to get that permit.

### NEW FIELD WORK

Actual new field work on the project began again on July 8, 1991, after two of the required three environmental permits were issued. To comply with appropriate rules, DOE had

50,000 gallons of water trucked daily from Death Valley Junction, California, 72.42 kilometers away, to suppress dust during the work. Two trenches in Midway Valley are of particular interest to project scientists. In order to learn more about the magnitude and history of faults in this area that may have been active within the last 10,000 to 1,000,000 years, the trenches will be excavated and mapped. Seismic hazard studies are also being done to ensure that surface buildings would not be damaged by cracks or movement of the rock.

Trench 14, an existing trench whose ribboned calcite and silica deposits have been the center of a scientific dispute, has been deepened to a depth of about 7.32 meters in order to further examine and make conclusions about the deposits. In the 1980s, the trench was excavated across the Bow Ridge Fault. The vein-like deposits of calcite and silica extending to the floor of the trench have been the subject of considerable scientific debate, proceedings of which have been reviewed by two separate panels--the 17-member National Academy of Sciences (NAS) and a five-member, YMP-sponsored panel. The five-member panel has produced two reports reflecting majority and minority viewpoints which are now under review by DOE. A NAS report discussing its findings about the calcite-silica deposits is expected early in 1992.

The controversy stems from the origin of the water that deposited the minerals. Most scientists believe the deposits were formed by downward percolating rainwater that dissolved carbonate minerals and silica as it moved through the soils, and redeposited them when the water evaporated at deeper levels. A few scientists state that the minerals are from ancient spring deposits, and that this indicates the water table was once at the surface. It is important to study and understand past hydrologic conditions at Yucca Mountain because the primary means for radionuclides being released into the accessible environment is through their dissolution and transport in groundwater.

Other current field work includes volcanism studies at Crater Flat. Ten years of studying the seven volcanoes located about 19.31 kilometers from Yucca Mountain indicate that one cone may have erupted less than 50,000 years ago. Some 20 small-scale soil pits are being dug near the Lathrop Wells cone at Crater Flat to collect samples for studies. These samples will be used to further characterize features of the cone such as age and origin. Project scientists believe that another eruption at this crater would not affect the integrity of a repository. The probability of a volcano erupting at Yucca Mountain is extremely low -- one in 500 million per year.

Environmental scientists are in the field monitoring water resources in the Yucca Mountain area to protect against potential impacts on water rights, sensitive wildlife habitats and other beneficial uses of groundwater in Amargosa Valley, Ash Meadows, and Death Valley.

The monitoring program includes measuring water levels at 34 wells and measuring discharge at five springs. An observation well 1300 feet deep is under construction (well JF-3) to monitor potential drawdown of the aquifer near well J-13. Aquifer pump tests will be performed to refine water-table characteristics before long-term monitoring of water levels begins.

It is unlikely that the relatively small withdrawals of water from well J-13 over the life of site characterization would result in any measurable or distinguishable effects on spring

discharges or water levels in the area. The water monitoring was approved by the National Park Service in April 1991.

The major part of the surface-based testing program is the drilling program. There are two drilling programs underway at Yucca Mountain and one more anticipated in 1992. At the JF-3 well, holes drilled down to 396.24 meters will enable environmental scientists to observe the effects on the aquifer.

Another drilling program involves drilling shallow holes in the Yucca Mountain area in order to determine moisture conditions of soil and rock close to the surface. These "neutron" holes will serve several purposes. One is to provide access to the area immediately below the surface for long-term monitoring of moisture infiltration. A probe that uses neutron radar is lowered down the hole monthly to measure the moisture conditions found in the rock and soil below. Changes in moisture, or water content, whether increased or decreased, are because of infiltration, percolation and evapotranspiration. This information enables scientists to understand and characterize infiltration at Yucca Mountain.

At the neutron holes scientists also are collecting samples of rock, or core, to be later tested in a laboratory. In the lab, scientists measure water content, water potential, porosity, density, permeability and water retention characteristics of the core samples. The data collected will eventually be integrated into the larger site characterization data base.

Another drilling program should start in Spring 1992. The LM-300 drill rig, which has been field-tested at Apache Leap, Arizona, and recently in Tooele, Utah, will be used in the Yucca Mountain area to drill "dry" into the unsaturated zone, the dry rock above the water table. Initial boreholes drilled by the LM-300 will be about 396.24 meters deep.

#### EXPLORATORY STUDIES FACILITY DESIGN

Engineers have made progress on design work for the ESF, which just recently completed a Title I (preliminary) design. The ESF Title I design calls for 283,280.2 square meters of surface facilities, with north and south ramps, and a central shaft leading to an underground laboratory. Tunnel boring machines similar to the one being used to build an underground tunnel across the English Channel will bore 20.92 kilometers of underground drifts. There are 96 tests planned with more than 20,726.4 meters of excavations. Scientists will work in the underground laboratory examining the layers of rock and measuring the suitability of the rock to isolate nuclear waste.

The next phase, ESF Title II design, is much more comprehensive and detailed and began in October 1991 with initial site preparation drawings. Some of the activities for 1992 include finalizing the location of the portal or shaft, developing operations, maintenance and safety plans, and doing some selected drilling (two to four shallow holes) as part of the surface-based testing program. The ESF Title II design incorporates the recommendations of review boards such as the Nuclear Waste Technical Review Board (NWTRB) and creates a level of detail that will move the ESF one step closer from the concept and design stage to actual construction.

#### EXPANDED PUBLIC OUTREACH

Finally, in 1991, DOE expanded its public outreach programs. In addition to the 51 exhibits staged, there were 219 speaking presentations given during the year to schools and general audiences about the YMP. The nine affected counties

that have been identified as impacted by a potential repository had county outreach representatives visit and contact county officials. The latest public outreach effort is the "Open House" tour to Yucca Mountain. In March 1991, DOE launched a public program to tour Yucca Mountain. Nevadans from primarily Las Vegas, but also from Amargosa Valley and Beatty interact with YMP scientists throughout the day-long tour. Participants fill out evaluation forms at the tour's end and the majority who've taken the tours state that DOE should continue its studies of Yucca Mountain. By the end of December 1991, 4,000 people had participated in tours.

The Yucca Mountain Site Characterization Project faces many technical challenges, but there have been inroads to the

serious legal issues delaying the studies in the field. The YMP is moving forward once again. DOE and the State of Nevada have been and will continue to be involved in litigation, but two of three needed environmental permits have been granted and the ruling on the water permit is expected shortly. New field work is limited, at this time by funding constraints, but there is progress in Midway Valley, in the monitoring programs, and with the new drilling work. Finally, DOE continues to expand its public outreach programs in Nevada. The latest outreach effort--tours to Yucca Mountain--offers Nevadans an opportunity to meet YMP scientists and see a "bird's eye-view" of the site.