



Challenges and Issues with Building a Potential Railroad to Yucca Mountain

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Abstract

On July 23, 2002, the President of the United States signed into law a joint resolution of the United States Congress designating the Yucca Mountain site in Nye County, Nevada, for development as a geologic repository for the disposal of spent nuclear fuel and high-level radioactive waste. If the U.S. Nuclear Regulatory Commission authorizes construction of the repository and receipt and possession of spent nuclear fuel and high-level radioactive at Yucca Mountain, the U.S. Department of Energy (DOE) would be responsible for transporting these materials to the Yucca Mountain repository as part of its obligation under the Nuclear Waste Policy Act. Part of the site recommendation decision included the analysis of a nation-wide shipping campaign to the proposed repository site. The *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (February 2002) (Repository EIS) evaluated the potential impacts of the transportation of 70,000 Metric Tons of Heavy Metal spent nuclear fuel and high-level radioactive waste from 77 locations around the nation to the potential repository in Nevada over a 24 year shipping campaign. DOE believes that the Repository EIS provides the environmental impact information necessary to make certain broad transportation-related decisions, namely the choice of a national mode of transportation outside Nevada (mostly rail or mostly legal-weight truck), the choice among alternative transportation modes in Nevada (mostly rail, mostly legal-weight truck, or heavy-haul truck with use of an associated intermodal transfer station), and the choice among alternative rail corridors or heavy-haul truck routes with use of an associated intermodal transfer station in Nevada. In the Repository EIS, DOE identified mostly rail as its preferred mode of transportation, both nationally and in the State of Nevada. In December 2003, based on public comments and the environmental analyses in the Repository EIS, DOE identified a preference for the Caliente rail corridor in Nevada. This corridor is approximately 513 kilometers (319 miles) long and would cost an estimated \$880 million (2001 dollars). Should DOE decide to build the Caliente corridor, it may be the longest rail line built in the United States since the Transcontinental Railroad was constructed in 1869. Some of the challenges in building this rail corridor are steep grades (the corridor crosses over 7 mountain ranges), isolated terrain, possible tunnels, and stakeholder acceptance.

Introduction

On July 23, 2002, the President signed into law a joint resolution of the U.S. House of Representatives and the U.S. Senate designating the Yucca Mountain site in Nye County, Nevada, for development as a geologic repository for the disposal of spent nuclear fuel and high-level radioactive waste. In the event the Nuclear Regulatory Commission authorizes construction of the repository and receipt and possession of spent nuclear fuel and high-level radioactive waste at Yucca Mountain, the Department of Energy would be responsible for transporting these materials to the Yucca Mountain Repository as part of its obligations under the Nuclear Waste Policy Act (NWPA). Pursuant to the NWPA and the National Environmental Policy Act (NEPA), DOE issued the *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada* (Repository EIS)(1). That document analyzed the environmental impacts of the proposed action of constructing, operating and monitoring, and eventually closing a geologic repository for the disposal of 70,000 metric tons of heavy metal (MTHM) of spent nuclear fuel and high-level radioactive waste at Yucca Mountain, as well as of transporting spent nuclear fuel and high-level radioactive waste from commercial and DOE sites to the Yucca Mountain site.

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Also on April 8, 2004, DOE issued a Notice of Intent to Prepare an Environmental Impact Statement for the Alignment, Construction, and Operation of a Rail Line to a Geologic Repository at Yucca Mountain, Nye County, NV (3). In the Notice of Intent, the Department announced its intent to prepare a Rail Alignment EIS to assist in selecting a possible alignment for construction of a rail line that would connect the repository at Yucca Mountain to an existing main rail line in Nevada. The Rail Alignment EIS also would consider the potential construction and operation of a rail-to-truck intermodal transfer facility, proposed to be located at the confluence of an existing mainline railroad and a highway, to support legal-weight truck transportation until the rail system is fully operational.

Depending on the alternatives chosen, the route ranges from 512 to 553 kilometers (318 to 344 miles). These alternatives provide flexibility in addressing engineering, land-use or environmental resource issues that could arise in a future, more detailed survey along the corridor. A train would take about 10 hours to travel from the junction with the Union Pacific mainline to the potential Yucca Mountain repository. The ultimate alignment would be approximately 60 meters (200 feet) wide and the overall construction would disturb approximately 18 square kilometers (4500 acres) of land.

Topography

The Caliente Corridor begins in Lincoln County, at an existing section of the Union Pacific Railroad and moves north across mostly U.S. Bureau of Land Management lands towards U.S. 93. Three different alternatives are being analyzed for potential starting points for the Caliente corridor, all of which are near the town of Caliente and depending on the alternatives chosen the corridor is between 512 kilometers (318 miles) and 553 kilometers (331 miles) long from the Union Pacific line connection to the Yucca Mountain site.

The Caliente corridor crosses a number of mountain ranges and valleys with elevations ranging from 900 to 1800 meters (3000 to 4900 feet). The corridor also crosses through passes or foothills of several mountain ranges at elevations ranging from 1600 to 1900 meters (5200 to 6200 feet).

Water

Although much of Nevada is arid, in central Nye County the annual precipitation exceeds 20 centimeters (8 inches), and the annual snowfall exceeds 25 centimeters (10 inches). Occasional brief periods of intense rainfall at rates exceeding 5 centimeters (2 inches) an hour can occur in the summer. The goal in planning the corridors was to avoid springs and riparian lands by 400 meters (1300 feet) if possible. Potential hydrologic hazards along the rail corridor include flash floods and debris flow. DOE would design and build a rail line that would be able to withstand a 100-year flood event safely. The Caliente Corridor crosses 352 washes en route to the proposed repository. Approximately 12 washes along this route are large enough that bridges would be required to cross them.

The water used during construction would come largely from groundwater resources. The annual demands would be a fraction of the perennial yields of most producing aquifers. The amount of water needed for the construction of a branch rail line in the Caliente Corridor for soil compaction, dust control, and workforce use would be about 880,000 cubic meters (710 acre-feet). For planning purposes, DOE assumed that this water would come from 64 wells installed along the rail corridor. The average amount of water withdrawn from each well would be approximately 14,000 cubic meters (11 acre-feet). Most (91 percent) of the water need would be for use in the compaction of fill material. About 40 percent of the corridor length would be over Designated Groundwater Basins, which the Nevada State Engineer's office watches carefully for groundwater depletion. Obtaining a water appropriation from the State Engineer for short-term construction use or using an approved allocation should ensure that groundwater resources would not be adversely affected. As an alternative, DOE could transport water by truck to meet construction needs. The construction of the Caliente corridor would require about 47,000 tanker-truck loads of water or about eight truckloads each day for each work camp along the corridor.

Biological Resources

The only resident threatened or endangered species in the Caliente Corridor is the desert tortoise, which occurs only along the southern end of the corridor. The Railroad Valley springfish (*Crenichthys nevadae*), which is Federally threatened and State protected occurs in Warm Springs, about 3 kilometers (1.9 miles) north of the corridor in Hot Creek Valley. Three other species classified as sensitive by the Bureau of Land Management occur in the corridor. Unnamed subspecies of the Meadow Valley Wash speckled dace (*Rhinichthys osculus* ssp.) and Meadow Valley Wash desert sucker (*Catostomus clarki* ssp. 2) have been found in Meadow Valley Wash north of Caliente. The in the Beatty area, the Nevada sanddune beardtongue (*Penstemon arenarius*) has been found on sandy soils 10 kilometers (6 miles) north of Springdale. A number of bats classified as sensitive by the Bureau of Land Management may also occur along the corridor and the southern end of the corridor and the southern end of the corridor is in the range of the chuckwalla (*Sauromalus obesis*). The Caliente Corridor crosses several areas designated as game habitat by the Bureau of Land Management. Eight Bureau of Land Management-designated wild horse or wild horse and burro herd management areas are also crossed.

Soils

Shrink swell (gauge of how much the volume of a soil changes when it is wet compared to dry), erodes easily (measure of the susceptibility of bare soils to be detached and moved by water) and blowing soils (the susceptibility of soil to wind erosion) attributes are prevalent along the Caliente corridor and could present a concern or limitation for the construction of a rail line. Approximately 61 percent of the corridor has soil attributes with shrink swell, 69 percent with erodes easily and 81 percent of the corridor has blowing soil. Of the approximately 18 square kilometers (4500 acres) of land cover that would be disturbed, the greatest amounts of disturbance would occur in the salt desert scrub and sagebrush land-cover types. This would

involve less than 0.001 percent of the existing area of Nevada in those land-cover types. The disturbance would have no discernible impact on the availability of habitat in any cover type.

Cultural Resources

Archeological surveys have been conducted in less than 1 percent of the total areas for the Caliente corridor. Although it is possible to identify areas in a corridor that are most likely to contain cultural resources based on such factors as general land forms and proximity to water, these predictions are highly uncertain prior to completion of intensive field studies. Records indicate that a number of archaeological sites have been identified along the corridor and that some of these sites are recorded as potentially eligible for nomination to the *National Register of Historic Places*. DOE will be implementing the stipulations and forms of a Programmatic Agreement with the Advisory Council on Historic Preservation to address DOE's responsibilities under Sections 106 and 110 of the National Historical Preservation Act and the Council's implementing regulations.

Socioeconomics

Socioeconomic effects from the construction of a rail line would be small and, for the most part, short-term. The Caliente corridor passes through three counties—Nye, Esmeralda and Lincoln, all of which have low population densities—0.1 persons per square kilometer (0.4 persons per square mile) for Lincoln County; 0.5 persons per square kilometer (1.4 persons per square mile) for Nye County and 0.1 persons per square kilometer (<0.3 persons per square mile) for Esmeralda County.

The length of the Caliente Corridor—513 kilometers (319 miles) is the most important factor for determining the number of workers that would be required. Construction of the branch rail line in the Caliente corridor would require approximately 46 months. To construct a branch rail line in this corridor would require workers laboring approximately 2.8 million hours or 1,410 worker years during the 46-month construction period. Construction would take place simultaneously at multiple locations along the corridor. An estimated six construction camps at roughly equal distances along the corridor would provide temporary living accommodations for construction workers and construction support facilities.

DOE anticipates that total (direct and indirect) employment in the region of influence attributable to the Caliente branch rail line would peak in the first year of construction, 2006, at about 842 workers. Employment of Caliente Corridor construction workers and some indirect support workers would end in 2009. During the operations period, the estimated annual direct employment for the Caliente corridor would be 47 workers. The presence of a rail line could influence future development and land use along the railroad in the communities of Beatty, Caliente, Goldfield, Scotty's Junction, and Warm Springs (that is, zoning and land use might differ depending on the presence or absence of a railroad).

Noise and Vibration

The proposed rail corridor passes through unpopulated desert that is Bureau of Land Management land with average day-night background sound levels of 22 to 38 A-weighted decibels (dBA), influenced primarily by wind. Noise levels of 40 to 55 dBA are present in the rural communities along the corridor including Beatty, Goldfield, Panaca, and Caliente. Since the railroad construction and the operation of trains transporting materials and nuclear waste in casks were planned to avoid human residences and communities to the extent possible, background levels of ground vibration lack human influence and are small. That is, mostly likely less than 50 VdB (velocity decibels, a measure of vibration amplitude). The current population within The estimated population residing within 2 kilometers (1.2 miles) of the Caliente corridor in 2035 would be about 350 persons. The population within 800 meters (0.5 mile) extrapolated to 2035 is 140 persons.

Utilities, Energy, and Materials

Over the 24 years the railroad would be in use transporting 70,000 metric tons of spent nuclear fuel and high-level waste, approximately 42-45 million liters (11-12 million gallons) of diesel fuel would be used while 870-940 thousand liters (230-248 gallons) of regular gasoline would be used. Approximately 72-78 thousand metric tons (79-86 thousand tons) of steel and 420-460 thousand metric tons (463-507 thousand tons) of concrete would also be necessary.

Approximately 2.3 million metric tons (2.5 million tons) of sub-ballast are required for track roadbed construction, and 1.5 million metric tons (1.7 million tons) of crushed rock ballast are needed for track construction. This could require up to two new quarry sites that may need to be developed for the corridor.

Next Steps

The next steps are to continue the regular interaction with stakeholders along the Caliente corridor, which includes miners, ranchers, grazing permittees, private landowners and other interested parties. The Rail Alignment EIS has completed the scoping process and DOE is currently evaluating the wealth of comments received from members of the public. The Draft Rail Alignment EIS is expected to be issued in May, 2005, with the Final Rail Alignment EIS issued in November, 2005.

References

- (1) U.S. Department of Energy, 2002, *Final Environmental Impact Statement for a Geologic Repository for the Disposal of Spent Nuclear Fuel and High-Level Radioactive Waste at Yucca Mountain, Nye County, Nevada*, DOE/EIS-0250F.
- (2) U.S. Department of Energy, 2004, Record of Decision on Mode of Transportation and Nevada Rail Corridor for the Disposal of Spent Nuclear Fuel and High-level Radioactive Waste at Yucca Mountain, Nye County, NV, *Federal Register*, Vol. 69, No. 68, Thursday, April 8, 2004 Notices, pp. 18557-18565
- (3) U.S. Department of Energy, 2004, Notice of Intent to Prepare an Environmental Impact Statement for the Alignment, Construction, and Operation of a Rail Line to a Geologic Repository at Yucca Mountain, Nye County, NV, *Federal Register*, Vol. 69, No. 68, Thursday, April 8, 2004, Notices, pp. 18565-18569.