

Prineville District  
**Finding of No Significant Impact**  
Determination

**Introduction:**

The Bureau of Land Management (BLM) has conducted an environmental analysis entitled Newberry Volcano Enhanced Geothermal System (EGS) Demonstration Project Environmental Assessment No. DOI-BLM-OR-P000-2011-0003-EA. This EA was completed in response to a Notice of Intent to Conduct Geothermal Resource Exploration Operations along with a Plan of Exploration, Operations Plan and Drilling program application submitted to the BLM by Davenport Newberry Holdings LLC and AltaRock Energy, Inc. (collectively, “Proponents”) in May 2010. The BLM analyzed three alternatives in the EA including the proposed action briefly described below, one that responded to issues raised during scoping regarding water consumption, and a no action alternative. These alternatives are fully described in Chapter 2 of the EA.

Located approximately 22 miles south of Bend, Oregon within the Bend-Fort Rock Ranger District of the Deschutes National Forest, the proposed Project would create an EGS Demonstration Project involving new technology, techniques, and advanced monitoring protocols for the purpose of testing the feasibility and viability of enhanced geothermal systems for renewable energy production. Specifically, the proposed project would develop and test an EGS reservoir deep underground, using an existing 10,060-foot geothermal well on federal geothermal lease OR40497 held by Davenport Newberry Holdings LLC. Creation of the EGS involves engineering a “reservoir” in suitable hot rocks where water can circulate through and heat up, much like the heat exchange process of a radiator. The reservoir is created using a process termed “hydroshearing.” The proposed project would inject cold water into the existing well at relatively high pressures in order to expand a network of existing natural fractures along three separate but stacked fracture sets at depths between 6,500 and 10,060 feet. Diverters would be used to direct the stimulation fluid to specific areas of pre-existing fractures. Shallow groundwater wells would provide water for the Project.

After the reservoir has been created, water and small amounts of tracers commonly used in groundwater studies would be pumped down the well and into the created EGS reservoir where it would become heated as it circulates through the hot rocks and then is brought back up to the surface as hot water, via two production type wells. Two additional deep geothermal wells would be directionally drilled from the same well pad into the other end of the newly created EGS reservoir. The results would help the Proponents determine the potential for developing energy utilizing enhanced geothermal systems.

Minute fractures created by the hydroshearing process would cause microseismic events which would be mapped and monitored throughout the stimulation process. Monitoring the micro fractures would be accomplished through an array of microseismometers installed either a few feet below ground (surface stations) or in nearby boreholes drilled to a depth of up to 1,100 feet. Up to 20 monitoring sites would be used; 10 surface and 10 borehole. The surface sites would

be located in areas that do not require tree removal and consist of shallow holes dug with hand tools one to four feet deep and two feet in diameter. Of the 10 borehole sites, seven would be located in existing wells or at sites currently approved for such wells. Three new boreholes (6 ¼ inch diameter; up to 1,100 feet deep) would need to be drilled using a truck-mounted drilling rig requiring vegetation to be removed from 0.6 acre total (0.2 acres each). A small solar panel and telemetry antenna would be installed adjacent to each microseismometer. Each solar panel would be approximately 2 feet square and the antenna similar in length. In most cases these would be installed in a nearby tree. Where this is not feasible, a 10 to 40 foot telescoping pole would be used. Two repeater stations of similar design may also be installed. All proposed sites are accessible from existing roads and no new roads would be constructed.

The BLM is the lead agency for this project because the majority of the Project activity would occur on leases issued and administered by the BLM but located entirely on National Forest system lands. The Geothermal Steam Act of 1970, as amended, 30 U.S.C. 1001-1028, provides the authority for the BLM to allow for the exploration, development, and utilization of geothermal resources on BLM-managed public lands, as well as geothermal resources on lands managed by other surface management agencies, such as the United States Forest Service. As a cooperating agency, the Forest Service has fully and actively participated in the environmental analysis process for the Project, has prepared resource analyses for the EA, and has reviewed all studies and documents associated with the NEPA process. Additionally, the U.S. Department of Energy is funding a portion of the Project through the American Reinvestment and Recovery Act. For these reasons, the FS and DOE are cooperating agencies in this EA. If approved the Project would likely begin in 2012 and last for approximately two years.

#### **Plan Conformance:**

In accordance with the Federal Land Policy and Management Act (FLPMA) of 1976, as amended, for leased lands, BLM regulations require that activities on geothermal and other leases conform to the Resource Plan in place which in this case is the Deschutes National Forest Land and Resource Management Plan 1990 as amended (LRMP) and the Newberry National Volcanic Monument Plan (8/94). The LRMP provides statutory guidance for all Forest management activities including the potential for geothermal exploration and development. BLM and the FS have reviewed the proposed project and found it to be in conformance with the LRMPs and with the associated Records of Decision.

#### **Finding of No Significant Impact Determination:**

Based upon a review of the EA and its supporting documents, I have determined that the project is not a major federal action that would significantly affect the quality of the human environment, individually or cumulatively with other actions in the general area. None of the environmental effects described for the proposed project would meet the definition of significance in terms of context or intensity, as defined in 40 CFR 1508.27 and described below nor would they exceed those effects described in the Deschutes National Forest LRMP 1990, as amended. I have therefore determined that an environmental impact statement is not required for this project.

**Context:** Due to the proposed projects proximity to the Newberry National Volcanic Monument (NNVM) and the potential for induced seismicity to be felt by visitors to the NNVM or to effect historic structures in the NNVM, the Proponents propose installing one surface microseismic monitoring station and one strong motion sensor within the NNVM. This is consistent with the Newberry National Volcanic Monument Act (Public Law 101-522), November 1990 which states “The fact that activities or uses outside the Monument and Special Management Area can be seen, heard, measured, or otherwise perceived from within the Monument and Special Management Area shall not, of themselves, limit, restrict, or preclude such activities or uses up to the boundary of the Monument and the Special Management Area” (Public Law 101-522, Section 8(a)). The Act also includes a provision for installing monitoring equipment within the Monument: “The Secretary, in cooperation with the Secretary of Interior, shall maintain a research and monitoring program for geothermal resources for the purpose of identifying and assessing the impact that present and proposed geothermal development in the vicinity of the Monument and Special Management Area may have on the values for which such Monument and Special Management Area were established” (Sec. 6(b)(7)). The NNVM Plan also identifies that monitoring be conducted consistent with this objective (NNVM Comprehensive Management Plan (pg 141)).

A detailed Induced Seismicity Mitigation Plan (ISMP) was developed and approved by the DOE and an independent panel of experts to assess and mitigate any potential effects that could result from any seismicity induced by the project. The ISMP provides a mechanism for implementing actions designed to keep induced seismic events below levels that could affect human health and safety or cause damage to structures within the NNVM (EA p.134 and Appendix A).

Given the physical effects of the project are limited to the local geographic area, the project’s consistency with the NNVM Act, and the mitigation measures contained in the ISMP, I find that the EA has not identified any direct, indirect, or cumulative effects of sufficient size or duration to be significant at the local, regional, or national level. If successful, the project could have important implications for future development of geothermal resources in a broader context.

**Intensity:** The following discussion addresses the ten significance criteria described in 40 CFR 1508.27 and six additional criteria as required by the following BLM Instruction Memorandum, Acts and Executive Orders: Instruction Memorandum No. 99-178, the Lacey Act, as amended; the Federal Noxious Weed Act of 1974; the Endangered Species Act of 1973, as amended; Executive Order 13112 on Invasive Species; Executive Order 12898 on Environmental Justice; Clean Water Act of 1987; Safe Drinking Water Act Amendments to the Clean Water Act of 1996; Executive Order 12088 on federal compliance with pollution control standards, as amended; Executive Order 12589 on Superfund compliance; and Executive Order dated July 14, 1982 on intergovernmental review of federal programs.

1. **Impacts that may be both beneficial and adverse.** The proposed action would impact resources as described in Chapter 4 of the EA. Impacts identified in the EA include possible impacts to groundwater (EA p.115), wildlife (EA p.92), visual resources (EA p.107) and damage to structures from induced seismicity (EA p.128). Project design features and the ISMP were incorporated in the design of the action alternatives to reduce potential adverse impacts to these resources and to ensure that the effects do not rise to a

level considered significant. None of the environmental effects analyzed and discussed in detail in the EA and associated appendices are considered significant.

2. **The degree to which the selected alternative would affect public health or safety.** The EA identifies three potential impacts that the proposed project could have on public health and safety – avalanches and landslides from the induced seismicity (EA p.137) and water resources (EA p.116-127).

With respect to induced seismicity, the ISMP as described above provides a mechanism for implementing actions designed to keep induced seismic events below levels that could affect public health and safety or result in resource damage. As an added precaution, the proponents, in coordination with the USFS, would post informational signs at snow parks and other primary entrance points providing winter access to NNVM, warning that project activities combined with certain weather and snow conditions, could result in avalanches and to take extra precautions by avoiding steep slopes and avalanche prone areas (EA p. 138). Consequently, the EA analysis demonstrates that induced seismicity along with appropriate mitigation, poses a non-significant risk to public health and safety.

The potential for induced seismicity to trigger landslides was addressed in a geotechnical engineering assessment on slopes of concern in the NNVM. The study concludes that "all geologic units have a low to very low risk of deep seated landslides during static and minor earthquake loading with peak horizontal ground accelerations (PGA's) up to 0.1g" (EA p. 137). Further support for this determination can be found in a United States Geological Survey (USGS) survey of landslides caused by earthquakes where it was concluded that for a landslide to occur during a Moment magnitude 4 (M 4) earthquake, the epicentral distance would need to be less than 0.2 km. At Newberry, the nearest slope of concern is more than 4 km away from the stimulation zone (EA p. 137) making it highly unlikely that a landslide would be triggered by the induced seismicity that could result from the microseismic stimulation created by the proposed project.

Concerns were expressed by several commenters regarding the potential impacts of the proposed project to water resources. A detailed water resources study concluded there are no anticipated direct or indirect effects from the project to water quantity or quality (EA, Appendix B and EA p.116-127). In addition, the proposed stimulation of microseismic fractures would occur in low permeability rock several thousand feet below the bottom of the local and regional aquifers. Given the very low permeability of the receptor rock throughout the length of the vertical borehole below the regional aquifer and the casing and cementing of the well bore, there would be no effect on groundwater quality in the regional aquifer (EA p. 126). The tracers and diverters proposed for use have been independently reviewed by experts and are considered non-toxic when used at the rates being proposed. (Memos from Allen Apblett, Ph.D., Associate Professor of Chemistry, Oklahoma State University and Stephen Wheatcraft, Ph.D., Professor Emeritus of Hydrologic Sciences, University of Nevada). As a result, there is a low probability of impacts to public health or safety as a result of implementing the proposed action.

3. **Unique characteristics of the geographic area such as proximity to historic or cultural resources, park lands, prime farm lands, wetlands, wild and scenic rivers, or ecologically critical areas.** There are no effects on park lands, prime farm lands, wetlands, wild and scenic rivers, or ecologically critical areas as a result of implementing the proposed action. With the exception of Paulina Creek, which has been determined to be eligible for inclusion in the Wild and Scenic Rivers Act, none of these areas are included in the project area. While Paulina Creek is included in the area of potential effect, none of the proposed activities or would adversely affect the creek or the values for which it would be considered eligible as a wild and scenic river. An inventory of the historic and cultural resources of the area identified two structures on the National Register for Historic Places and three that are eligible for nomination to the Register. An extensive assessment of structures within the NNVM considered whether any damage could occur to historic Civilian Conservation Corp-era structures in the monument as a result of induced seismicity from the proposed project. The EA analysis determined that the level of shaking that could cause damage to the structures is much higher than the levels anticipated from the proposed project (EA p.134). Furthermore, a maximum threshold below a damaging level to the structures is built into the ISMP and actions would be initiated to insure damage to these structures will not occur. An intensive pedestrian survey for cultural resources was conducted for all areas where new surface disturbance is proposed and none were identified. No traditional cultural properties were identified during the records search (EA p.26). A request by the the Cultural and Heritage Department of the Klamath Tribe for completion of a Traditional Cultural Property is being addressed through ongoing tribal consultation. On-going consultation will include an opportunity for an on-site assessment of the proposed microseismic array sites by members of the Klamath Tribe before construction takes place to assure that there will be no adverse impacts to any sites of potential cultural significance. Therefore, there would be no significant effects to historic structures within the NNVM or cultural resources as a result of the project.
  
4. **The degree to which the effects on the quality of the human environment are likely to be highly controversial.** Based on comments received from the public, the proposed project is the subject of some public controversy. However, the proposed action is not the subject of scientific controversy. Independent scientists, engineers and experts in the EGS field, as well as specialists from national laboratories and universities have reviewed the proposed project. In addition the Department of Energy (DOE) has assembled a technical team from experts throughout the United States, to review aspects of this project. Among the members of the technical review team is a representative of the Lawrence Berkeley National Laboratory, who has expertise in induced seismicity based on his work at the Geysers Geothermal field in California. The National Renewable Energy Laboratory and Sandia National Laboratory are also represented on the DOE technical team. These experts have identified no effects from the proposed project on the human environment that are likely to be scientifically controversial. During both the public scoping and public comment period, no factual evidence was presented that questioned the technical and scientific analyses of the EA or supporting documents.

5. **The degree to which the possible effects on the human environment are highly uncertain or involve unique or unknown risks.** Although some elements of this project involve relatively new technology, testing and scientific peer reviewed research on the technology are sufficient to support the findings and assessment of effects in the EA. The environmental effects to the human environment are fully analyzed in the EA and supported by previous projects, studies and publications (Appendix A of the EA, p. 53). There is a low probability of highly uncertain effects or unique or unknown risks resulting from the proposed project.
6. **The degree to which the action may establish a precedent for future actions with significant effects or represents a decision in principle about a future consideration.** The proposed project is a demonstration project, and scientific results would be considered in developing any future proposed actions involving EGS technology, regardless of where it is located. The proposed action would not establish a precedent for future BLM actions with significant effects, nor would it represent a decision in principle about any potential future proposals because any future proposal would be subject to a separate analysis and decision. A complete analysis of the effects of the proposed action and all other alternatives is described in Chapter 4 of the EA.
7. **Whether the action is related to other actions with individually insignificant but cumulatively significant impacts.** The BLM evaluated the proposed project in the context of past, present and reasonably foreseeable future actions within the defined geographic scope for the proposed project (EA Chapter 4). The EA analysis did not identify any past, present, or reasonably foreseeable future actions with individually insignificant but cumulatively significant effects.
8. **The degree to which the action may adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places or may cause loss or destruction of significant scientific, cultural, or historical resources.** A cultural resource survey was conducted for the project and no cultural resources were identified during the intensive pedestrian survey of proposed areas where new surface disturbance would occur nor were any traditional cultural properties identified during the records search (EA p.26). An inventory of the historic resources of the area identified two structures on the National Register for Historic Places and three more that are eligible or nominated for the Register. An extensive assessment of structures within the NNVM considered whether any damage could occur to historic Civilian Conservation Corp-era structures in the monument as a result of induced seismicity from the proposed project. The EA analysis determined that the level of shaking that could cause damage to the structures is much higher than the levels anticipated from the proposed project (EA p.134). Furthermore, a maximum threshold below a damaging level to the structures is built into the seismic mitigation plan (EA, Appendix A) and mitigation measures would be implemented to insure damage to these structures will be avoided or minimized. The project will not adversely affect districts, sites, highways, structures, or other objects listed in or eligible for listing in the National Register of Historic Places, nor will it cause loss or destruction of significant scientific, cultural, or historical resources (See also response #3).

9. **The degree to which the action may adversely affect an endangered or threatened species or habitat that has been determined to be critical under the Endangered Species Act of 1973.** No listed fish species occupy habitat within the project boundary or habitat adjacent and immediately downstream within watersheds of the project boundary. A biological evaluation (BE) concluded there would be no impacts to proposed, endangered, threatened, or sensitive plant species. A BE was also completed for wildlife species and concluded there would be no effect or no impact to threatened, endangered, candidate, or sensitive wildlife species (EA p. 92-106).

There are two reports of Pacific fisher (*Martes pennant pacifica*) sightings several miles southwest of Paulina Lake, but reliability of these reports is unknown (these historical sightings are a few miles from the nearest proposed site). According to FS records, there is no established fisher breeding habitat on any of the sites where the project will occur. Based on field reconnaissance, suitable habitat conditions for Pacific fisher do not exist within or adjacent to any of the proposed sites, and most of the vegetation interspersed within the sites is considered marginal for this species (EA p. 72). Although there are some pockets of montane mixed conifer interspersed between the sites that could provide suitable habitat, there are no large contiguous blocks of habitat for solitude. While there is potential suitable habitat along Paulina Creek, it is unlikely fishers would inhabit this area due to the high recreation use of the area. Rather, Paulina Creek would have more potential to be utilized for travel/movement. Based on all of these conditions, fishers are given a low probability of occurrence in the immediate project area (EA p.72). In any event, measures to reduce impacts to wildlife and fisheries have been incorporated into the design of the proposed action. Considering all of this information, the EA found that the project would not adversely affect any endangered or threatened species or its critical habitat (EA p.93-94).

10. **Whether the action threatens a violation of a Federal, State, Local, or Tribal law, regulation or policy imposed for the protection of the environment, where non-Federal requirements are consistent with Federal requirements.** The project would not violate any known federal, state, local or tribal law, regulation, policy or other requirement imposed for the protection of the environment. State, local, and tribal interests were consulted and given the opportunity to participate in the environmental analysis process. (See also response #3). Furthermore, the project is consistent with applicable land management plans, policies, and programs.
11. **Comply with Executive Order 11988 (Floodplain Management), Executive Order 11990 (Protection of Wetlands), or the Fish and Wildlife Coordination Act (water resource development projects only).** Upon inspection of the Geographical Information System (GIS) maps and database BLM determined there are no floodplains, wetlands or water resource development projects involved in or potentially affected by this project.

12. **Involve unresolved conflicts concerning alternative uses of available resources (NEPA section 102(2)(E)) not already decided in an approved land use plan.** The proposed project would not involve any unresolved conflicts not already decided in the Deschutes National Forest Land and Resource Management Plan 1990, as amended.
13. **Have a disproportionate significant adverse impacts on low income or minority populations; Executive Order 12898 (Environmental Justice).** The project is located within the interior of the Deschutes National Forest and the proposed action would have very limited potential for direct effects on communities that border the National Forest. Analyses in the EA do not indicate a potential for more than minimal adverse impact to the human population. As such, project activities will not have a disproportionate significant adverse impacts on low income or minority populations; Executive Order 12898 (Environmental Justice).
14. **Restrict access to, and ceremonial use of, Indian sacred sites by Indian religious practitioners or adversely affect the physical integrity of such sacred sites; Executive Order 13007 (Indian Sacred Sites). Have significant adverse effect on Indian Trust Resources.** A cultural resource survey was conducted for the project. No cultural resources were identified during the intensive pedestrian survey of proposed areas where new surface disturbance would occur. No traditional cultural properties were identified during the records search (EA p.26). A request by the Cultural and Heritage Department of the Klamath Tribe for completion of a Traditional Cultural Property is being addressed through ongoing tribal consultation. On-going consultation will include an opportunity for an on-site assessment of the proposed microseismic array sites by members of the Klamath Tribe before construction takes place to assure that there will be no adverse impacts to any sites of potential cultural significance. This project would not restrict access to, and the ceremonial use of, Indian sacred sites by Indian religious practitioners or adversely affect the physical integrity of such sacred sites; Executive Order 13007 (Indian Sacred Sites). This project would not have significant adverse effects on Indian Trust Resources
15. **Contribute to the introduction, existence, or spread of: Federally listed noxious weeds (Federal Noxious Weed Control Act); or invasive non-native species; Executive Order 13112 (Invasive Species).** Total site disturbance would be quite small (less than 0.6 acres) and mitigation measures addressing noxious weeds will be incorporated in the design and implementation of the project (EA p. 52-53). However, as a result of a comment received on the EA, the monitoring period has been extended to five years (Decision Record). Due to the small amount of proposed surface disturbance, the required monitoring, and rehabilitation measures outlined in the EA, this project would not contribute to the introduction, existence, or spread of Federally listed noxious weeds or invasive non-native species.

16. **Have a direct or indirect adverse impact on energy development, production, supply, and/or distribution; Executive Order 13212 (Actions to Expedite Energy-Related Projects).** Although this project has the potential to contribute scientific knowledge related to renewable energy production in the future it does not directly produce electricity nor will it have a direct impact on energy development, production supply, and/or distribution.

Approved By: Carol Benkosky  
Carol Benkosky  
Prineville District Manager

4/15/12  
Date