Subject: Report on the results of a Bureau of Land Management data call for information on NEPA records for drilling and subsequent operations of a geothermal well

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Introduction

The purpose of this document is to explain the basis for enabling the Bureau of Land Management (BLM) to establish a categorical exclusion (CX) for authorizing geothermal projects within a developed field. The proposal covers the following activities:

Proposed 516 DM citation 11.9(B)(7):

> *Drilling and subsequent operations of a geothermal well within a developed field for which a currently approved land use plan and/or any environmental document prepared pursuant to NEPA analyzed drilling as a reasonably foreseeable activity. The application of this categorical exclusion is limited to Nevada.*

To make an informed determination regarding the proposed CX, key questions (listed below) were posed, and data relevant to answering these questions were collected through a census inquiry of geothermal drilling operations that were authorized by the BLM from 2000 to 2005. Responses to the following NEPA process questions were analyzed:

- What type of NEPA document preparation process was used to enable the drilling and subsequent operations of a geothermal well?
- How was the well operated?
- Were there significant individual or cumulative impacts in the NEPA analysis for the project? If yes, were the significant individual or cumulative impacts mitigated?
- Were there any unexpected impacts? If there were unanticipated impacts, what were they?
- How were the results validated?

This report describes the administrative process and methods used to construct and manage the data call, and to compile and analyze the data received. Relevant findings to the above questions are presented in tabular and textual format, the discussion concludes with a recommended action for the proposed CX.

Background

As a renewable energy, geothermal resources can help provide for our future energy needs by harnessing abundant, clean, naturally-occurring sources of energy. Renewable energy supplies not only help diversify our energy portfolio, they do so with few environmental impacts. Increased development of domestic renewable geothermal resources can also help alleviate the Nation's problems associated with an over-reliance on foreign energy supplies.

Geothermal energy is heat derived from the earth. It is the thermal energy contained in the rock and fluid that fills the fractures and pores within the rocks of the Earth's crust. Geothermal resources, in localized underground areas of steam or hot water called reservoirs, are available in several western states. The highest temperature resources are generally used for electric power generation. Low and moderate temperature geothermal resources can be used for greenhouses, aquaculture, industrial processes, and heating of buildings, including municipal buildings and schools.

Pursuant to the Geothermal Steam Act of 1970, BLM is responsible for leasing Federal lands for geothermal development and processing permit applications. This authority encompasses approximately 700 million acres of Federal minerals, including BLM lands, National Forest lands, other Federal lands, as well as split estate lands where the Federal Government has retained the mineral rights. Most of the geothermal activity on Federal lands takes place in California and Nevada. Other states with Federal geothermal development include Utah, New Mexico, Idaho and Oregon.

Current NEPA Process

Prior to drilling a geothermal well, the entire geothermal development typically undergoes several stages of NEPA review. First, the BLM must make lands available for leasing and development through the land use planning process. A NEPA analysis will be completed prior to making these lands available and issuing any leases. This NEPA document can either be an EA or EIS, depending on the level of environmental impacts. The NEPA analyses are conceptual in nature because specifics of development are typically not known until exploration defining the resource has been conducted.

When the lessee/operator is ready to drill or develop the lease, they are required to submit an operations plan that specifically describes well pad location, layout, design, procedures for environmental protection, and reclamation (43 CFR 3261.12). The operation plan may cover one well or multiple wells. Based on the plan, a detailed and site-specific NEPA document is prepared that addresses impacts, describes required mitigation, and discloses unavoidable significant impacts. Again, this NEPA document can be an EA or EIS depending on the anticipated scope of the project and associated level of impact.

In addition to a NEPA review of the operation plan, an engineering review of the drilling plan is conducted. The engineering review ensures the well will be drilled in a way that minimizes the risk of a blowout, protects aquifers, protects pubic safety, and protects the environment. When both the NEPA review and the engineering review are complete, the drilling permit is signed.

The permit is the authorization that actually allows work to commence on a Federal geothermal lease.

Operations subsequent to the drilling of a geothermal well are approved with a sundry notice. Subsequent well operations include changes to drilling operations that were unforeseen at the time the geothermal plan of operation was submitted. Examples include a change in casing setting depth, revisions to blowout prevention and cementing programs, changes to directional programs and the drilling of additional wells within the approved field. Subsequent well operations can also include operations after the well has been drilled such as clean-outs, work-over rig, well stimulation, re-injection of fluids, plugging and other minor surface operations. Drilling of a well or subsequent operations, not previously analyzed during the plan of operation review are subject to additional NEPA review.

Data Call Administrative Process

An interdisciplinary team of subject matter experts within the BLM and Department of the Interior (DOI) identified the information needed to determine whether the existing data supports the proposed CX. Instruction Memorandum (IM 2006-031), issued on November 8, 2005, requested information on the NEPA procedures used to support a census collection of geothermal drilling actions for five years. Source materials to complete the data call included land use and resource management plans and associated NEPA documents, internal reports, and subject matter expert opinions.

Washington Office staff created data entry spreadsheets and instructions for entering appropriate data as a means of collecting information. Per direction of the IM, BLM State Offices collected and compiled a 100% sample of the referenced activity from available records in applicable Field Offices. Lead energy contacts in each Field Office were responsible for reporting requested data on 22 items (fields) back to the State Office, who then consolidated the response and returned completed spreadsheets to the Washington Office. The census examined those actions authorizing geothermal drilling from October 1, 2000 through September 30, 2005.

Basis for Proposed Changes to 516 DM part 11

Scope of Representation

Table 1 contains the number of geothermal drilling permits authorized by each BLM state office within the five-year period and the percent of geothermal drilling activities by State in the ten records gathered from the census inquiry.

Table 1: Geographic Distribution of Geothermal Drilling Activities

State	Number of Geothermal Drilling Permits Authorized from 10/1/00 through 09/30/05	Percent of Total Geothermal Drilling Activities (%)
California	1	10
Nevada	8	80
Utah	1	10
Totals	10	100

Data entry sheets created in Microsoft Excel contained a record for each state and fields for providing data based on the CX criteria. The first ten fields contained the following identifying information for each geothermal drilling permit: State, Field Office Name, BLM Organization Code, Contact's Name, Phone Number, Project Name, Type of NEPA Document, NEPA Document Number, Associated Action Requiring Prior NEPA Analysis, and Name of NEPA Document for Associated Action. Each State listed above in Table 1 was provided its own worksheet for recording the requested information.

Every data cell contained precise information to avoid ambiguity. Instructions were provided to support the data entry process. Data entry choices were limited to: explicit information about each geothermal drilling activity; a small choice of coded options; a single metric; or a "yes", "no", or not applicable response. Only 1 of the 22 fields required a narrative response that could generate dissimilar data entries. Narratives were necessary to answer the following question:

- If actual impacts were not the same as predicted impacts, what were the unanticipated impacts?

Evaluation of the NEPA Process

The purpose of the geothermal drilling data call and subsequent analyses was to determine whether these activities are having either individual or cumulative adverse impacts on either the physical or human environment as determined through NEPA. Of the 10 projects in the census population, 90% were conducted through the EA process (see table 2).

The geothermal drilling action based on an EIS was part of the larger Telephone Flat Geothermal Development in California. None of the geothermal drilling activities conducted under an EA or an EIS resulted in significant impacts.

Table 2: Type of NEPA Actions Used for Geothermal Drilling Permit Authorizations

NEPA Type	Frequency from 10/1/00 through 09/30/05	Percent (%)	Number of Actions Resulting in Significant Impacts
EA	9	90	0
EIS	1	10	0
Total	10	100	

Analysis Process

Project data from each state were combined into an Excel workbook. Washington Office staff and National Science & Technology Center staff collaborated to develop a set of rules for determining inconsistent and impractical inputs. BLM staff then checked the rules against the data entries collected in the master data sheet. Key variables were checked and corrected for data-coding differences.

Quality Control Procedures

The data call produced a complete record of required information for 12 geothermal drilling projects. Data received were reviewed by an interdisciplinary team of BLM personnel. Three people independently examined the 22 data fields associated with each record for complete and appropriate information. Incomplete records were completed by interviewing the person responsible for the data entry.

Two iterations of data editing were done to correct inconsistencies with coding and to screen out unusable records such as those with incomplete information or pending decisions. Data from each edit-iteration were kept for the record. The analysis was conducted on the 2nd iteration of data cleaning.

Two records were eliminated during the independent quality review period. One was eliminated since it was outside the time scope of the data call and the other was eliminated since authorization of the geothermal drilling activity is still pending so the project has not been implemented. The net outcome was that ten geothermal drilling permits were analyzed to validate the use of the proposed CX. This analysis was used to answer the following question: "Are certain activities associated with geothermal drilling operations found to have no individual or cumulative significant impacts?." The answer to this question was "yes" for all ten records.

Findings

The following discussion and presentation of findings is based on the results of geothermal drilling authorizations that were reported as a result of the IM 2006-031 data call.

Based on the records reviewed, activities associated with geothermal drilling were found to have no significant individual or cumulative impacts. Impacts anticipated during the NEPA review were the same as predicted. Geothermal drilling and associated impacts were validated by either personal observation by field staff associated with the project, field data collection through a monitoring program, systematic evaluation of information received, or a combination of methods. Six projects were validated by using an "Other" coded. This response is due to the fact that these projects are on-going and results were based on on-going assessment of impacts.

Policy Logic and Business Practices

The drilling of geothermal wells and subsequent well operations have historically undergone a thorough and detailed NEPA analysis either as part of a geothermal utilization plan of operations or when individual wells have been permitted. The findings have not resulted in significant impacts occurring from the drilling of geothermal wells. The proposed CX is for proposed activities not previously covered in these plans of operation such as the proposed drilling of an additional individual well or a subsequent operational activity not previously analyzed in the NEPA review. Streamlining NEPA review for each subsequent action within a geothermal developed field will improve the approval process for this valuable renewable energy source without resulting in significant environmental impacts.

Environmental protection is ensured by BLM's practice of issuing Conditions of Approval (COA) that are tied to each geothermal drilling permit. This protection is augmented with the BLM's mandatory use of Extraordinary Circumstances as found in 516 DM 2, Appendix 2. Before any CX can be applied, the analyst must confirm that no extraordinary circumstances exist precluding the use of a CX.

Conclusion & Recommendation

In sum, none of the geothermal drilling projects reviewed for this analysis resulted in predicted or actual significant individual or cumulative effects. Based on review of the ten projects it is recommended that the proposed CX be limited to use in Nevada. In addition, use of Conditions of Approval and the CX review process will ensure that in the absence of extraordinary circumstances, (516 DM 2, Appendix 2), there are no significant individual or cumulative effects on the environment. Therefore establishing a CX for geothermal drilling and subsequent operation within a developed field in the State of Nevada as identified in 516 DM 11.9(B)(7) is recommended.