Geothermal Energy Development

Near

National Parks

A

Position Paper

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Introduction

Recent actions by Interior Secretary James Watt have brought the issue of geothermal resource development in the vicinity of national parks to news headlines. Secretary Watt recently issued Departmental procedures which will streamline the process for approving leases for geothermal resource exploration and extraction (1,8). Watt also set a deadline of September 1982 for eliminating the backlog of lease applications (13). These new procedures will ease the way for private industry to enter public lands adjacent to national parks for the purpose of geothermal exploration and mining. This situation is particularly disturbing when one considers that the development may occur near Yellowstone, Mount Rainier, and Lassen Volcanic National Parks (13). The Secretary also proposed that wilderness areas be opened to exploration (1,13).

M. Rupert Cutler, Senior Vice-President of the National Audubon Society, in hearings before the House Sub-committee on Public Lands and National Parks, stated that geothermal development amounted to superimposing "an industrial complex ... on what is now a pristine landscape. Such development would be the antithesis of wilderness" (13).

Position Statement

The threat to the integrity of these national parks, posed by geothermal resource extraction, is too great to justify geothermal development within close proximity of the parks. Before delving into the arguments supporting this position, a brief discussion on geothermal resources and policies will be given.

Background

The majority of the U.S. geothermal resources are located in

the western states (including and west of Montana, Wyoming, Colorado, and New Mexico)(7). As might be expected, the largest geothermal reserves are located in areas where the earth is geologically unstable. That same geologic instability produces some of the Nation's most unique landscapes; areas which currently are or, are likely to be, included in the National Park System.

Geothermal resources can be utilized to produce electrical energy or as a source for surface water supply augmentation. Geothermal energy occurs naturally in two forms (9). Wet steam, or steam which contains a high percentage of water molecules and, dry steam, which is much hotter and under greater pressure than wet steam. Wet steam reservoirs are located close to the earth's surface and have been used successfully for private home heating purposes (6). Dry steam is usually located deep underground and is necesary for generation of electricity (6). Several power plants, with dry steam driven turbines, have been operating for a number of years with a fair amount of success (6).

In 1974, the Bureau of Reclamation, was exploring geothermal resources in the Imperial Valley of southern California. This agency was attempting to determine "the feasibility of desalting the high quantity of mineralized geothermal fluids potentially available for use in the water-short Pacific Southwest"(8).

An understanding of the potential for geothermal resources to partially solve the Nation's energy and water supply woes, leads to the immediate recognition that this is a politically sensitive issue. Undoubtedly pressure in favor of development of these resources will be great.

Current leasing procedures for resources on Federal lands consist of two steps. First, an environmental impact statement is prepared by the agency which administers the land from which the

resource is to be extracted. Second, the Bureau of Land Management issues or denies leases based on the recommendations contained in the environmental impact statement. (2,6,14)

Secretary Watt's recent directive brought about several major changes in lease management. Limits on numbers of acres held by anyone leasee in each state were increased, timeframes for lease application processing were set, and wilderness areas were opened to exploration (1,13). The Secretary also directed that environmental reviews on projects be restricted to impacts which are "reasonably certain to occur" (13). That effectively biases what is supposed to be an equitable environmental analysis. Although the Secretary has pledged to protect the national parks from mineral development, his actions have failed to protect the parks from threats associated with mining outside of the park boundaries (1,13).

The fate of our national parks, as they relate to geothermal resource development, lies largely with Congress. Several proposed Geothermal Steam Acts have been drafted, but none seem to provide adequate protection for park resources (14).

Position Defense

From initial impressions, geothermal resources may appear to be highly desirable as an energy and water source. There are numerous arguments however, which make extraction of the resources near national parks very undesirable. Those can be summarized into three categories: 1) problems related to the extraction and use of the resource, 2) known environmental impacts, and 3) potential environmental impacts.

Extraction and Use Problems

Problems associated with geothermal resource extraction and use have created a situation in which even private industry is reluctant to vehemently pursue the resource (11). Most reserves are located in areas which are great distances from population centers. This means that large power transmission lines must be installed to link the power source with the users. If the resource is used as a water supply, major water delivery systems must be installed (8). Frequently, construction of power lines, canals or pipelines result in a project which is not cost-effective.

Where power plants or desalination plants are built near populated areas, hydrogen sulfide gas is a tremendous nuisance. Citizens living near the Geysers Geothermal Area in California claim the odor associated with the power plant is the most frequently voiced concern (4). Additionally, geothermal steam contains a large quantity of particulate matter. Over time, those particles build up in a power plant's machinery and have been known to cripple turbines (11). Although geothermal energy is a renewable energy source, the renewal process has significant problems also. Spent steam can be re-injected into the ground as water. Sub-surface hot rocks will naturally re-heat the water which then becomes available for extraction. Re-injection of residue waters with high concentrations of dissolved and suspended particles, has disrupted the ability of the water to percolate through the earth's outermost layers by clogging cracks and fissures in the subterranean rocks in much the same way that particles clog pipes and turbines (9). The potential for disruption of hydrologic processes is obvious. Finally, heat release associated with capturing geothermal energy is substantial (10). This becomes a major handicap when comparing this energy source to others.

Known Environmental Impacts

In addition to the problems explained previously, there are a number of known environmental impacts associated with geothermal resource extraction. Development of roads and drilling pads will create erosion and siltation problems (5). Development will alter wildlife habitat and will disrupt the wildlife directly (10). Furthermore, steam collection, power transmission and water distribution systems, resulting in an array of pipes, powerlines, and canals, are incongruous with most landscapes. Imagine hiking in the backcountry and stumbling across a power plant or a desalination plant. What a way to spoil an aesthetic experience. (4) Additionally, whenever sub-surface oil,water, or steam reservoirs are drained, pressure on the rocks above the reservoir will be reduced. This results in ground subsidence immediately above the reservoir (4). Human alterations of the natural landscape of this sort would be unacceptable if they occurred within national parks.

Potential Environmental Impacts

An even stronger case against geothermal resource development in the proximity of national parks can be made by explaining the potential environmental impacts of that development. Geothermal wells, like oil wells, are subject to blowouts. If a blowout occurs, large quantities of water containing various salts would spew out onto the surrounding ground and vegetation (4). Although this is a natural form of pollution, it is relaeased in an unnatural manner. Some concern has also been expressed over the possibility of stimulating earthquakes through geothermal resource extraction. This is most likely to occur where water is being

re-injected into underground reservoirs and improper pressures are created. As stated earlier, most areas where geothermal resources are found are normally unstable. Any sudden alteration of sub-surface pressures, including that caused by initial steam removal, could cause earthquakes. (4) In addition, if residue waters are not re-injected into the ground for recycling, they are usually released into existing streams and rivers. Because the residue is warm and high in salts, thermal and chemical changes take place in the drainage system (4). This is another example of natural pollution but, man has aided in its release.

A situation of utmost concern to Yellowstone, which may also have counterparts at other parks, is the protection of endangered or significant species habitat (10). In the case of Yellowstone, the grizzly bear habitat extends well beyond the park boundaries into areas that are slated for geothermal exploration. No doubt, any development in this area outside of the park would further the decline of the grizzly bear inside the park (14). Continuing with this concept a little further, "the natural heat flow and hot water discharge [associated with geothermal areas] is critical to wildlife." "Bison, elk, trumpeter swan, Canada geese, and many other waterfowl congregate in the thermal areas or on the rivers during the winter months."(14). Loss of thermal features may mean loss of these wildlife populations as winter residents of Yellowstone (14).

Finally, and most importantly, there is strong evidence indicating that geothermal resource extraction has disrupted and, in some cases, stopped the geyser activity near geothermal development sites. Changes in geyser activity related to geothermal

development have occurred at The Spa, New Zealand; Lardarello, Italy; Beowawe, Nevada; Steamboat Springs, Nevada; and in Iceland.(13,14) "In fact, only three of the world's ten most outstanding geyser basins remain essentially undisturbed" (13). One of those three is Yellowstone. Although no one knows what may happen at Yellowstone or any other park should development proceed (8.14), the risk of adversely impacting a national park or of losing a thermal feature of worldwide and national significance is too great to gamble with. Imagine shutting Old Faithful Geyser down!(10)

Summary

> Super-heated rock and water under the crust of the earth - geothermal energy - may prove an excellent source of energy. Eventually, an entire industry may spring up around the resource in the Western States, possibly involving several million acres of land in the production of electric power, usable heat, and mineral byproducts. Such development has the potential of noise pollution, air contamination from gases, pollution of surface and ground waters, and disturbance of ground cover. Moreover, roads, wells, pipelines, transmission lines, and industrial plants will have to be built. Wildlife will be the first to be affected.... Can we change the environment that much and get away with it? Will future generations pay for our demand for luxury and comfort today? No one knows for certain.(7)

The combination of technological problems, known environmental impacts, and potential environmental impacts makes an overwhelming case against the development of geothermal resources in the vicinity of national parks. The possiblity of losing national treasures and the feature which symbolizes the birth of the United States National Park System and all park systems throughout the world cannot be ignored.

Recommendations

National Park Service (NPS) policy on mineral exploration,

leasing and mining states:

> Mineral exploration, leasing, and mining are not permitted except where expressly authorized by law.... The National Park Service will strive to control mineral leasing, and eliminate mining activities that are inimical to the purpose of any unit of the National Park System.(16)

Closely related to this policy is the NPS policy on cooperative regional planning, which states:

> Cooperative planning on specific proposals will be done to ensure that various points of view are considered in formulating proposals and that potential sources of conflict are discovered and, if possible, resolved.... Informal cooperative planning and occasionally formal coordinated planning may be needed in many areas, including but not limited to:
> - protection and preservation of natural and cultural resources in the park and its region (Italics mine)(16)

These two policies seemingly leave the door open for the NPS to attempt to influence geothermal development outside of park boundaries when the possibility of in-park impacts exists. Protection for the parks can therefore best be provided by establishing a substantial buffer zone around each park and by banning all mining in those zones. This zone should be ten to fifteen miles wide.

It would also be wise for the Department of the Interior and the Department of Agriculture to adopt a position on geothermal development similar to that held by the Society of American Foresters. That organization's policy on mining on public lands reads as follows:

> The decision as to whether or not minerals should be extracted from forestlands should take into account all land resource values existing both before and after the proposed mining operations. Comprehensive assessment of not only mineral but also all other affected resources of forestlands is therefore essential to achieving long-term continuity of forest ecosystems and to attaining optimal forest and mineral benefits for all people. (Italics mine)(3)

The value of maintaining our national parks in an undisturbed state and the recreational, inspirational, aesthetic, and scientific values of thermal features in our parks must be given just consideration when assessing the impacts of geothermal development. In my estimation, these values outweigh the benefits which would be obtained by utilizing the resources near the parks.

Malcolm Wallop, a senator from Wyoming, has asked the question which best summarizes the political and environmental nature of this issue. "How would you like to go down in history as the man who ruined Old Faithful?"(13)

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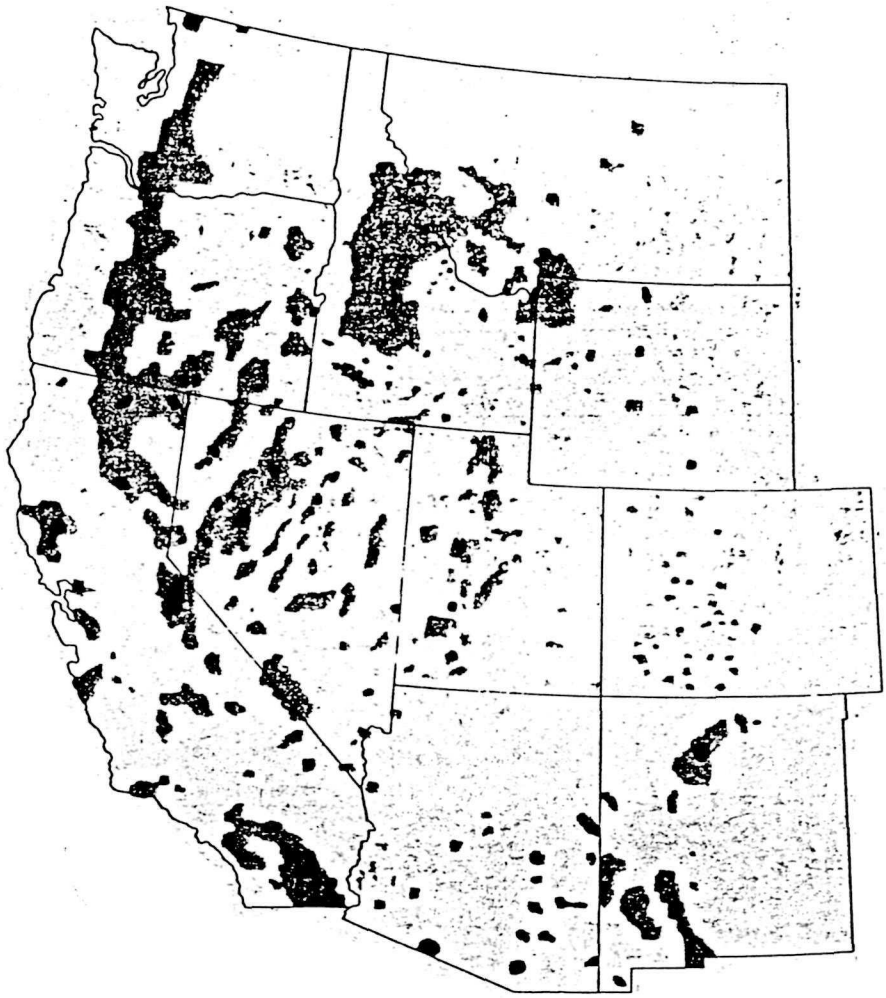
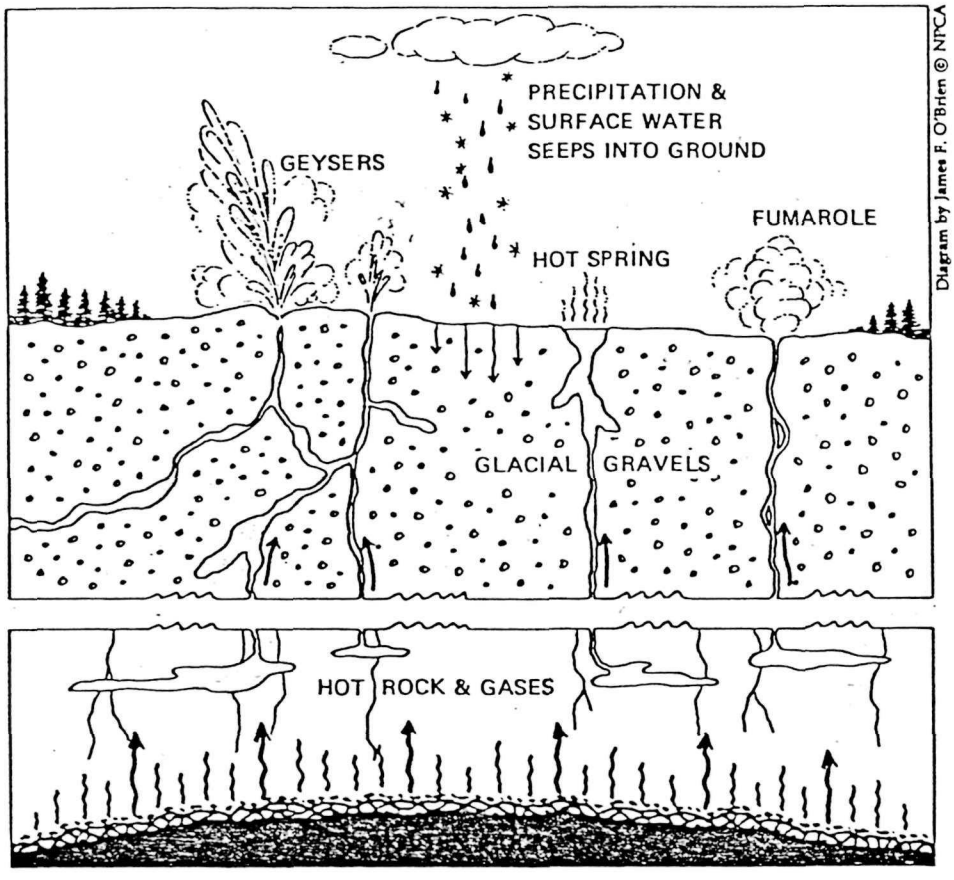
APPENDIX



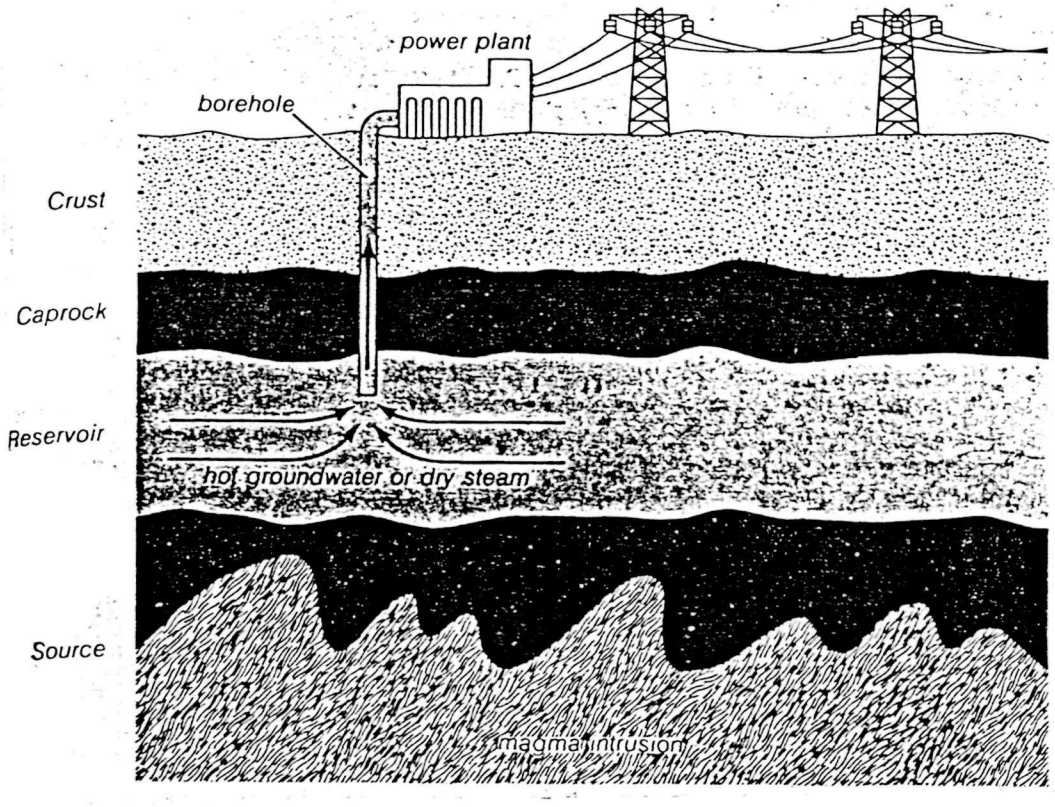
proved geothermal reserves

likely geothermal reserves

(G. Tyler Miller, Jr., Living in the Environment, Wadsworth Publishing Co.)



Yellowstone Plumbing



Schematic view of a dry (steam) or wet (hot water or brine plus steam) geothermal well and power plant.

(G. Tyler Miller, Jr., Living in the Environment, Wadsworth Publishing Co.)