Legal and Regulatory Issues in Mineral Extraction from Geothermal Fluids in the Western U.S.

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ABSTRACT

Mineral extraction from geothermal fluids has been a goal of geothermal developers for many decades, principally focused on enhancing power production and extending the life of power production facilities. Recent scientific research may make possible extraction of valuable minerals such as lithium and rare earth elements (REE) from geothermal fluids at reasonable cost. The demand for these minerals for batteries and electronic devices is increasing. Revenue from mineral extraction at geothermal power plants could help offset the high capital cost of project development and provide an ongoing revenue stream, incentivizing developers to incorporate mineral extraction in new project design or at operational power plants. The feasibility of mineral extraction will depend not only on the availability of proven technology; it will also depend on securing regulatory approvals at the federal, state and local level, and identifying and addressing potentially conflicting property interests. This paper will discuss the diverse property interests and potentially conflicting laws and regulations that may affect the feasibility of geothermal mineral extraction in the western U.S. Key issues and challenges will be identified, along with recommendations for developers and illustrative examples from California, Nevada, and Utah. The author is an attorney and consultant with areas of practice in water, geothermal resources, and mineral resources. She provides legal and regulatory assessments for geothermal development and mineral extraction projects and has a special interest and expertise in the intersection of natural resource laws.

1. Introduction

Removal of minerals from geothermal brines may provide substantial benefits for geothermal resource developers and project operators. Silica extraction can improve the efficiency of
geothermal power plants by reducing scaling and may enable the use of geothermal brines as a source of water for cooling. In addition, geothermal brines may contain high concentrations of lithium and rare earth elements (REE) that are used in the manufacture of batteries, airplane parts, glass and ceramics, smart phones, digital cameras, computers, lasers and other high-tech equipment, and military applications. Manganese, a mineral used in batteries, as well as ultra-pure silica may be present in geothermal fluids at concentrations justifying commercial investment and extraction. Demand is increasing for these elements due to their uses in high-tech instruments and devices and their strategic importance in military applications.

This paper provides an overview of the legal and regulatory frameworks for mineral extraction from geothermal fluids under federal laws in the United States. This assessment assumes the existence of a federal geothermal lease as the starting point, held by the party seeking to extract minerals or by a party that will establish a business relationship with the lessee to extract minerals. This paper is not intended to identify all relevant leasing or permitting issues, but rather to highlight key issues as a starting point for a full legal and economic evaluation of the potential for mineral extraction from geothermal brines. It is based on review of applicable laws, regulations and case law, geothermal permits and other file materials, and personal communications with BLM staff. In addition to legal and regulatory issues at the federal level, key issues in relevant state laws and programs in California, Nevada, and Utah are highlighted and briefly discussed.

2. Federal Geothermal and Energy Laws

The principal laws applicable to geothermal projects on federal land are –

- The Geothermal Steam Act of 1970, as amended (30 U.S.C. 1001-1028), which includes the federal definition of geothermal resources and establishes the federal program for leasing of geothermal resources, including geothermal byproducts;

- The Federal Land Policy and Management Act of 1976 (FLPMA), Pub L. 94-579, encoded at 43 U.S.C. 1701 et seq., which sets out the authorities and mandates that guide the Bureau of Land Management in its responsibilities, including granting and overseeing leases on federal lands; and

- The Energy Policy Act of 2005 (EPAct), Public Law 109-58, by which the Congress sought to encourage renewable energy development, and which authorized changes to royalty calculations. The Act identifies allocation of royalty shares to state and local programs. It is important to note that some state statutes also provide for explicit allocation of royalties to certain institutions.

2.1 Geothermal Steam Act

2.1.1 Definitions of Resources

The Geothermal Steam Act of 1970, 30 U.S.C.1001 (c), defines “geothermal resources” as “(i) all products of geothermal processes, embracing indigenous steam, hot water and hot brines; (ii) steam and other gases, hot water and hot brines resulting from water, gas, or other fluids
artificially introduced into geothermal formations; (iii) heat or other associated energy found in geothermal formations; and (iv) any byproduct derived from them” [emphasis added]

The definition of “byproduct” is found at 30 U.S.C. 1001 (d): “any mineral or minerals (exclusive of oil, hydrocarbon gas, and helium) which are found in solution or in association with geothermal steam and which have a value of less than 75 per centum of the value of the geothermal steam or are not, because of quantity, quality, or technical difficulties in extraction and production, of sufficient value to warrant extraction and production by themselves.”

2.1.2 Geothermal Lessees’ Rights to Minerals

A standard federal geothermal lease grants the lessee the right to mineral byproducts co-produced with geothermal fluids. Specifically, a geothermal lease vests with the lessee a nonexclusive right to future exploration and an exclusive right to produce and use the geothermal resources within the lease area, subject to existing laws, regulations, formal orders and terms, and stipulations in or attached to the lease form or included as conditions of approval to permits.

The right of a geothermal lessee to co-produced minerals may avoid certain requirements that might apply outside of the geothermal context, such as the requirements for filing and maintaining a claim under the General Mining Law of 1872 as amended, 30 U.S.C. 22 et seq. ("General Mining Law") as well as state mining requirements. However, if a valuable mineral is co-produced as a by-product of the geothermal power generation or direct use operation under a federal geothermal lease, the lessee may be required to pay royalties on the proceeds, which might not be required under the General Mining Law.

The geothermal lessee’s right to minerals may be affected by underlying mineral claims or mineral leases held by others at the same location. In the United States, a complex ownership scheme exists which may establish separate rights to the land surface, geothermal resources, water, and mineral resources. Property interests in minerals may be held by governmental entities, surface landowners, mineral claimants or mineral lessees, separately from interests in the land surface or rights to geothermal resources. Rights to minerals claimed at the same location as the geothermal power plant should be evaluated to assess potential effects on the right of the geothermal lessee to remove mineral byproducts.

While conditions in the geothermal lease may explicitly grant to the geothermal leaseholder the first right to the removal and use or sale of minerals, if there is a mineral claim or mineral lease associated with the same surface ownership, the common law principle, “first in time is first in right”, will likely determine prior rights to resources. If there is a disagreement among the holders of leases or claims at the same location, BLM will generally avoid entering into the disagreement beyond acknowledging that the earlier claimant or lessee will have the prior right to the resource, so long as that prior rights holder has an approved plan of operation and is pursuing that plan with the required diligence and consistent with applicable laws. According to BLM staff the parties will be expected to address disagreements among themselves regarding their right to minerals. If they cannot resolve issues informally, the parties may seek judicial resolution at the Interior Board of Land Appeals (IBLA) and on further appeal to the federal courts.
2.2 Energy Policy Act of 2005

The Energy Policy Act of 2005 (EPAct), Subtitle B, Geothermal Energy, adjusts royalty rates on the production of electricity and attempts to provide incentives for renewable energy development. Section 228 of the Act (Royalty on Byproducts) provides that leasable minerals produced as a byproduct of a geothermal lease are subject to royalties under the Mineral Leasing Act (30 U.S.C. 181). In general, pre-EPAct lessees will pay 5% of the gross value at the point of shipment for hard-rock minerals. For converted and EPAct leases, no royalty is due for hard rock minerals produced as a byproduct. Pre-EPAct regulations and the post-EPAct regulations should be consulted to determine which rates apply. See 43 CFR 3200 regulations by year at gpo.gov.

3. Treatment of Minerals under Federal Mining Laws

The regulatory requirements and royalties charged for the disposition of mineral byproducts will be based on identification of the specific category of mineral involved. Categories of minerals include locatable minerals, leasable minerals and saleable minerals.

3.1 Locatable Minerals under the General Mining Laws

Locatable minerals have been characterized as “hard to find” metallic minerals, or uncommon varieties of sand, stone, gravel, cinders or pumicite. The distinction of minerals as locatable is important, since no royalties are due for such minerals claimed under the General Mining Law.

Federal regulation at 43 CFR 3820.11 defines “locatable mineral” as “(a) Subject to the General Mining Law; (b) Not leasable under the Mineral Leasing Acts; and (c) Not saleable under the Mineral Materials Act of 1947 and Surface Resources Act of 1955, 30 U.S.C. 601-615 (see parts 3600 through 3620 of this chapter).” The General Mining Law means the Act of May 10, 1872, as amended in 1955, codified as 30 U.S.C. 22-54.

In order to be locatable, the mineral claim must be “found on Federal lands open to mineral entry.” 43 CFR 3830.12(a). Land “Closed to mineral entry” means that the land is not available for the location of mining claims or sites because Congress, BLM, or another surface managing agency has withdrawn or otherwise segregated the lands from the operation of the General Mining Law.” 43 CFR 3830.5.

The Bureau of Land Management (BLM) has provided additional guidance on the characteristics of locatable minerals in two regulations. In combination, the regulations provide that locatable minerals must be (1) recognized as a mineral by the scientific community; (2) found on federal lands open to mineral entry; (3) subject to the general mining law; (4) not leasable under the mineral leasing laws; and (5) not saleable under the mineral materials act and the surface resources act. 40 CFR 3820.11 and 43 CFR 3820.12.

Courts have also distinguished minerals as “locatable” under the General Mining Law if they are “uncommon”, that is, they possess a distinct and special value. … [determined based on] (1) Comparing the mineral deposit in question with other deposits general; (2) Determining whether the mineral deposit in question has a unique physical property; (3) Determining whether the unique property gives the deposit a distinct and special value; (4) Determining whether, if the
special value is for uses to which ordinary varieties of the mineral are put, the deposit has some distinct and special value for such use; and (5) Determining whether the distinct and special value is reflected by the higher proceed that the material commands in the market place.” 43 CFR 3830.12 (b) citing to McClarty v. Secretary of Interior, 408 F.2d 907 (9th Cir. 1969).

A mining claimant enjoys the exclusive right to minerals within the vertical plane of the claim location (30 U.S.C. 26). However, the holder of an unpatented (unvested) mining claim must meet the notice of intent requirements or work requirements of 43 U.S.C. 1744.

The definition of locatable minerals is the subject of substantial litigation that may be relevant in the geothermal context. Certain geothermal byproducts, such as high-value silica might be considered uncommon and potentially locatable under the General Mining Law.

3.2 Leasable Minerals under the Mineral Leasing Acts

“Leasable minerals” are minerals authorized for federal lease under the mineral leasing acts including the Mineral Leasing Act of 1920, as amended (30 U.S.C. 181 et seq.); the Geothermal Steam Act of 1970, as amended (30 U.S.C. 1001 et seq.); the Mineral Leasing Act for Acquired Lands of 1047, as amended (30 U.S.C 351 et seq.); and all Acts referenced in 30 U.S.C. 505. The definition pertains to all minerals that BLM administers under Groups 3100, 3200, 3400, and 3500 of [43 CFR Subtitle B Chapter II].” 43 CFR 3830.5. The leasable minerals include the fuel minerals (e.g., oil, gas, and coal, but excluding uranium), phosphate, potash, sodium salts, and sulfur.

Since geothermal resources are leasable minerals under the mineral leasing act, those resources, including byproducts, are not subject to location under the general mining law. However, if the value of the resource is expected to be greater than 75% of the value of the steam, filing a claim under the General Mining Law should be considered.

When a leasable mineral is found chemically distinct but comingled with locatable minerals, for example, where brines contain locatable minerals as well as leasable minerals, the focus is on which mineral is the primary valuable mineral. See 43 CFR 3832.21(b)(3), which provides, “if you are mining the brine primarily for the leasable salts content and are also extracting locatable minerals BLM considers these those minerals co-products under the Mineral Leasing Act, and you must obtain a lease and pay royalties under 43 CFR part 3500.” While this regulation may be definitive in some circumstances, it leaves open the question of whether royalties are due for valuable minerals extracted from geothermal brines and exceeding 75% of the value of the steam.

3.3 Saleable Minerals under the Mineral Materials Act and Surface Resources Act

“Saleable minerals” are certain common materials such as sand, gravel, and stone that are developed and distributed under a commodities disposal system. “Mineral materials are those materials that (a) BLM may sell under the Mineral Materials Act of July 31, 1947 (30 U.S.C. 601 – 604), as amended by the Surface Resources Act of 1955 (30 U.S.C. 601. 603, and 611 – 615); and (b) BLM administers under Part 3600 of this chapter.” 43 CFR 3830.5. Payments for this category of mineral are based on the calculated volume or weight of materials sold (as saleable minerals). Low grade silica would likely be considered saleable if mined outside of the context
of a geothermal lease; if extracted under a geothermal lease, the terms of the lease and royalty rates will likely apply.

4. Other Federal Legal and Regulatory Issues

4.1 The Effect of Multiple Leases at the Same Location

The Bureau of Land Management (BLM) is charged under the Federal Land Policy and Management Act (FLPMA) to encourage multiple uses of the land under its control, so long as the long-term value of the land and its resources can be maintained, and the multiple uses are compatible with each other. BLM may issue multiple leases at the same location for oil and gas, geothermal, surface mining, sodium, or other resource exploitation at the same location. FLPMA requires approval of a mining plan of operations prior to initiating mining operations. 43 CFR 3809.11; see also 3809.400 et seq. A company holding an approved mining plan of operations may apply for a noncompetitive geothermal lease. See 43 CFR 3204.12, which implements provisions of 30 U.S.C. 1003(b)(3).

If there is a dispute among competing lessees, BLM staff will likely review the plans of operation for the competing lessees, and if each lessee is actively pursuing its plan, acknowledge which has priority. Beyond that, it is the general policy of the agency that lessees work out their differences with other mineral claimants or lessees. Cooperative arrangements between lessees are encouraged through informal means, which may include a unit agreement establishing terms of shared use of resources. Absent informal resolution, mineral claimants and lessees may seek judicial resolution through the Interior Board of Land Appeals (IBLA) and the federal courts.

4.2 The Federal Interest in Preserving Geothermal Resources

The Bureau of Land Management will be concerned about the effect of the mineral extraction process on the long-term preservation of geothermal resources, based on the agency’s mandate to preserve resources under their jurisdiction. It will be important that the extraction process not cause or contribute to cooling of the resource, which may result in reduced power production. BLM will likely require the lessee to provide information on the design of the proposed mineral extraction facilities, brine chemistry, the extraction process, the effect of extraction on energy production; the delta T at injection, any chemical or physical changes in the brine at injection or other disposal; and the engineering and function of the separate loop and cycle. With respect to reporting requirements during operation, the geothermal lessee and/or mineral extraction operator may be required to report temperature and chemistry of reinjected fluids over time.

If the geothermal lessee or operator is not the same as the mineral extraction operator, the geothermal lessee/operator will have a business interest in the cost and benefit of mineral extraction, the benefits of improved efficiency if that is the goal of the mineral extraction project, potential revenue streams from extracted minerals, changes to discharge characteristics, potential impacts on the geothermal reservoir, and potential impacts on related lease and permit conditions. The operator will seek assurance that extraction of byproducts will not interrupt existing operations or cause an unacceptable decline in resource temperature, flow rate, or megawatts produced.
The ideal scenario is that the removal of minerals will either maintain the geothermal resource as contemplated in the lease or will actually enhance power production and preservation of the resource through increases in efficiency.

4.3 Unitization

If there is a concern about preservation of the resource in the context of multiple leases or claims detrimentally impacting the long-term preservation of the resource, federal regulations provide for establishment of unit agreements among multiple lessees. See 43 CFR 3280. A model agreement provided in the regulation focuses on geothermal power output and royalties related to power output, leaving open the terms of costs and revenues associated with extraction and disposition of byproducts by unit participants. 43 CFR 3280.3 enunciates BLM’s general policy regarding the formation of unit agreements, as follows:

- For the purpose of more properly conserving the natural resources of any geothermal reservoir, field, or like area, or any part thereof, lessees and their representatives may unite with each other, or jointly or separately with others, in collectively adopting and operating under a unit agreement for the reservoir, field, or like area, or any part thereof, including direct use resources, if BLM determines and certifies this to be necessary or advisable in the public interest.

Unitization agreements are agreements between private parties for the management of the resource and allocation of royalties; BLM will not generally be a party to such agreements.

4.4 Underground Injection Control

The requirements of the federal or state Underground Injection Control (UIC) program, and possibly other water quality programs, may come into play if the mineral extraction process modifies the physical or chemical characteristics of the injectate or otherwise results in disposal of wastewater that may increase the potential for detrimental impacts on sources of drinking water supply or other water bodies.

Since the enactment of the federal Safe Drinking Water Act (SDWA) in 1974, the Federal government has taken an active role in protection of drinking water sources or potential drinking water sources through programs including the Underground Injection Control (UIC) program. In 1986, Congress created a larger Federal role in the protection of groundwater from sources other than underground injection; however, UIC remains an important tool to protect groundwater.

Underground injection is defined in the SDWA as “the subsurface emplacement of fluids by well injection.” The SDWA states that underground injection may “endanger[s] drinking water sources if such injection may result in the presence in underground water which supplies or can be reasonably expected to supply any public water system of any contaminant, and if the presence of such contaminant may result in such system’s not complying with any national primary drinking water regulation or may otherwise adversely affect the health of persons.” SDWA Section 1421(d)(2).

The authority for the UIC program is the Safe Drinking Water Act, 42 U.S.C. 300f et seq.; and the Resource Conservation and Recovery Act, 4 U.S.C. 6901 et seq. Regulations are found at 40 CFR Part 144. Under 40 CFR144.81 (11), injection wells associated with the recovery of
geothermal energy for heating, aquaculture and production of electricity are identified as Class V wells under the law.

Following the model of the National Pollutant Discharge Elimination System (NPDES) program in the Clean Water Act, the SDWA designed the UIC program to be implemented by the states. Section 1422 of the Act provides for program delegation to the states, with accompanying grants to fund the creation and operation of UIC agencies. EPA provides oversight for states that have been delegated primacy. In states that choose not to assume the program, EPA operates the program itself (i.e., direct implementation). In California, the program is jointly operated by the federal EPA and by the state. In Nevada and Utah, the states have been delegated the authority to implement the UIC program.

In most cases, whether subject to federal or state oversight, Class V geothermal injections wells are "authorized by rule." "Authorized by rule" means that an injection well may be operated without a permit as long as the owners or operators:

- Submit inventory information to their permitting authority and verify that they are authorized to inject. The permitting authority will review the information to be sure that the well will not endanger an underground source of drinking water (USDW).
- Operate the wells in a way that does not endanger USDWs. The permitting authority will identify specific requirements.
- Properly close their Class V well when it is no longer being used. The well should be closed in a way that prevents movement of any contaminated fluids into USDWs.

After reviewing an owner or operator's inventory information the permitting authority may determine that an individual permit is necessary to prevent drinking water source contamination.

4.5 Current Issues at the Federal Level Potentially Affecting Mineral Extraction

The federal Energy Policy Act of 2005 allocated one-half of lease and royalty revenue from geothermal development on public land to the state in which the development is located, and a quarter of the revenue to the local county. The current royalty rates set by the federal government are 1.75% of gross income for the first ten years of a project and 3.5 % after that.

The federal budget for 2018 for the Department of Interior proposed elimination of the benefits provided to the state and local governments. For many of these governments, this revenue provides essential support to local schools as well as state-wide institutions of higher learning. To give the reader an idea of the scale of benefits to state and local governments, in one recent 3-year period, the state of Nevada received $35.6 million from geothermal lease and royalty revenue, and the counties received $17.8 million.

While local revenue-sharing is not an issue that directly affects the geothermal lessee or mineral extraction proponent, elimination of payments to state and local governments would likely reduce staff availability and eliminate incentives of state and local governments to provide assistance to geothermal developers, increasing the time needed for review and approval of mineral extraction proposals.
Another issue potentially affecting mineral extraction projects is the U.S. Department of Interior’s proposal to relocate BLM offices from Washington, D.C. to regional offices in the West. While most BLM administered lands are in the western U.S., making the relocated offices potentially more accessible, the proposed regional offices would be based on watersheds or other natural boundaries, rather than state or county boundaries, making coordination among federal, state and local authorities potentially difficult. The states are concerned about the practical effects of the planned regional approach. The uncertainty resulting from this proposed restructuring may result in delays and unclear authority for review of mineral extraction projects.

5. Mineral Extraction under a Federal Geothermal Lease in California

In California, the grant of rights to mineral byproducts to a lessee under a federal geothermal lease may be subject to federal or state mineral claims predating the lease. A federal lessee will be subject to federal oversight by US EPA Region 9 in San Francisco, for the underground injection program. Underground injection will likely be “rule authorized” for the geothermal project as a whole. If there is a possibility that chemical or physical changes resulting from the mineral extraction process may detrimentally impact potential sources of drinking water or other water sources, California’s regulations may come into play, requiring the proponent to provide an assessment of environmental, water quality or engineering issues. In some locations, the availability of water to maintain the reservoir and support cooling and other operational needs may be a limiting factor in terms of project life; as water becomes less available, changes in chemistry may affect mineral extraction over time.

5.1 Definition of Geothermal Resources

California classifies geothermal resources as mineral resources and claims ownership of these resources where they occur on state-owned land; otherwise, the resource is the property of the owner of the mineral estate. Public Resources Law Chap 4, Sections 3700 – 3776 governs management of geothermal resources. The definition of “geothermal resources” is found at Public Resources Code, Division 6, Section 6903:

For the purposes of this chapter, “geothermal resources” shall mean the natural heat of the earth, the energy, in whatever form, below the surface of the earth present in, resulting from, or created by, or which may be extracted from, such natural heat, and all minerals in solution or other products obtained from naturally heated fluids, brines, associated gases, and steam, in whatever form, found below the surface of the earth, but excluding oil, hydrocarbon gas or other hydrocarbon substances.

California’s geothermal program is under the authority of the Department of Oil, Gas, and Geothermal Resources (DOGGR). DOGGR issues permits for the drilling, operation, plugging, and abandonment of all production and injection wells [emphasis added].

5.1 Underground Injection Control

California’s UIC program is jointly managed by the federal government and the state. Under California law, “‘Underground Injection Control Program’ means “a program covering Class II wells for which the division has received primacy from the United States Environmental
Protection Agency pursuant to Section 1425 of the federal Safe Drinking Water Act (42 U.S.C. Sec. 300h-4).” See California Public Resources Law Chap 1, Article 2.5, 3130 – 3132 (Underground Injection Control).

Regulation and approval of underground injection at Class V (geothermal injection wells) has not been delegated to the state. Therefore, USEPA Region 9 requirements and oversight will apply. EPA has established minimum requirements to prevent injection wells from contaminating underground sources of drinking water (USDWs). If any chemicals will be added to the injectate, state authority will be brought to bear pursuant to regulations and guidance promulgated by state Water Resources Boards. This may result in delays of UIC approvals.

6. Mineral Extraction under a Federal Geothermal Lease in Nevada

A mineral extraction project under a federal lease in Nevada will be subject to two principal state programs. The first is a program being developed under a 2017 law that encourages extraction of minerals from water. Although the law explicitly exempts geothermal resources from its provisions, there is a potential for conflicts between those subject to the law and geothermal project developers. Also, state-level approval is required for underground injection under the state’s UIC program, potentially including review of physical or chemical changes that may be anticipated as a result of mineral extraction.

6.1 Definition of Geothermal Resources

Under Nevada law, “Geothermal resource” is defined as “the natural heat of the earth and the energy associated with that natural heat, pressure and all dissolved or entrained minerals that may be obtained from the medium used to transfer that heat but excluding hydrocarbons and helium.” NRS 534A.010.

6.2 Requirement of a Water Right

Under Nevada’s definition of geothermal resources the medium for heat transfer, water, is closely associated with geothermal resources, but separately regulated. With limited exceptions, the geothermal lessee will require a water right under Nevada’s water code. That legal framework is based on the prior appropriation doctrine, a property-based water law doctrine developed in the western U.S. in the 19th century. While this may not directly affect the mineral extraction project, there is the potential for competitive mineral extraction projects affecting the geothermal lessee under a 2017 Nevada law.

6.3 Potential Competitive Claims Under Assembly Bill 52

In Nevada the potential for mineral claims competing for the resource is compounded by the 2017 enactment of a law by the Nevada legislature encouraging mineral extraction from water. Nevada is very interested in extraction of minerals, notably lithium, from fluids. Assembly Bill 52 (“AB 52”) was signed into law in June 2017. The purpose of the legislation is to define a permitting path for dissolved mineral exploration, including lithium brines, and to develop regulations to ensure exploration drilling for dissolved minerals is protective of groundwater, as well as oil and gas and geothermal resources.
Section 3 of the bill provides that “dissolved mineral resource” means “all dissolved or entrained minerals that may be obtained from the naturally occurring liquid or brine in which they are found, including, without limitation, lithium. The term does not include a geothermal resource as defined in NRS 534A.010.”

Because the new law is expressly inapplicable to geothermal resources, the geothermal project is not subject to its requirements and extensive regulations currently in draft form. However, because the medium to extract heat from the earth is technically water under Nevada law, and not part of the geothermal resource under the state’s definition, there is a risk of unintended conflicts between geothermal lessees extracting minerals from geothermal fluids and holders of mineral rights under the new law.

Elaborate regulations have been proposed for fluid mineral extraction that would require a setback of 250 feet from geothermal power production facilities; however, that does not necessarily eliminate the possibility of potential conflicts over rights to minerals. It will be important for any developer to identify existing or planned mineral leases or claims that may compete with geothermal operations, and to file claims to secure priority interests in minerals. Nevada mining records are currently moving online, which will facilitate that work.

6.4 State Approval of Underground Injection

The Nevada Department of Conservation and Natural Resources, Division of Water Resources (DWR) is responsible for issuing water rights and is also involved in the review of injection proposals under the UIC program. The State Department of Conservation and Natural Resources Bureau of Water Pollution Control oversees administration of UIC wells as well as the administration of surface disposal of waste water, including geothermal fluids. See Attachment 4, a fact sheet on Nevada UIC requirements.

As discussed above, the federal Safe Drinking Water Act of 1977 authorized the U.S. Environmental Protection Agency to establish regulations for underground injection control. The Nevada UIC Program regulates injection wells under the authority of the Nevada Revised Statutes (NRS) 445A.300 - 445A.730 and the Nevada Administrative Code (NAC) 445A.810 - 445A.925, inclusive. The Division of Environmental Protection (DEP) within the Department of Conservation and Natural Resources, was designated as the lead agency in administering the State UIC program and has authority under NRS 445A to regulate all classes of injection wells. Primacy for the federal UIC program was granted to Nevada in October 1988.

One of the major differences between the federal and State of Nevada UIC regulations is that a state permit is required in Nevada for all injection activities, regardless of well class. State UIC and Division of Health regulations provide that “no chemical additives shall be added to the geothermal fluids prior to injection or disposal without prior written approval by the Division”.

Nevada has taken steps to coordinate the efforts of the multiple agencies involved in UIC review and approval. However, the regulatory framework remains complicated. Class II and Class V geothermal injection wells are permitted and regulated by the Division of Environmental Protection (DEP), the Division of Minerals (DOM), Division of Water Resources (DWR) and/or the Bureau of Land Management (BLM). The DEP has Memorandum of Understanding with DOM and BLM and works closely with DWR on Class V wells.
Each of the agencies approach the regulation of injection wells from a different perspective but with certain areas of overlapping interest. The DOM and BLM regulate the construction and operation of oil and gas wells and geothermal wells within the State. This includes injection wells that are used to enhance production or to dispose of produced water. The DEP has separate regulatory authority to regulate all underground injection in the State, and its regulations are much more detailed and comprehensive in that area. Although both the DOM and BLM are concerned about protecting the waters of the state, their regulatory authorities are centered around well safety, mineral rights and resources, and royalties. The Division of Water Resources also regulates geothermal wells with regard to water rights and plugging & abandonment.

Nevada has worked to build staff capacity and streamline geothermal injection well licensing and UIC approval; however, given the complex approval process, lengthy timeframes may be needed to gather the required information, conduct required analysis, and secure approval from the diverse agencies involved.

7. Mineral Extraction under a Federal Geothermal Lease in Utah

In Utah, key issues include (1) the treatment of the resource as water under state law; (2) unitization involving multiple participating parties, and (3) state permitting for underground injection.

7.1 Definition of Geothermal Resources

Chapter 22 of Utah laws, the Utah Geothermal Conservation Act defines “geothermal resource” as “(i) the natural heat of your temperature is greater than 120°C; and (ii) the energy in whatever form including pressure present in, resulting from, created by, or which may be extracted from the natural heat, directly or through a material medium.” URS 73-22-5A.

State law defines “geothermal fluid” as “water and steam at temperatures greater than 120°C naturally present in the geothermal system.” Section 4 of URS 73-22-3. Subsection 6 of that statute defines “geothermal system” as “any strata, pool, reservoir, or other geologic formation containing geothermal resource.”

7.2 Geothermal Resources Regulated as a Shared Resource

For regulatory purposes, Utah treats geothermal resources as water. Ownership of geothermal resources derives from ownership of mineral rights or surface rights, which are usually obtained by direct ownership or leasing. URS 73-22-4(1). The underlying legal basis for the regulatory treatment and use of geothermal resources is the theory of correlative rights. Unlike the prior appropriation doctrine that underpins the water laws of Nevada and most Western states, this is an ancient common law theory of the use of groundwater. Under this theory, water resources appurtenant to the land may be put to reasonable use, subject to reasonable use by others who share the same resource.

In Utah, an application for use of geothermal fluids requires submittal of an application for water rights. URS 73-22-3(2)(a). The Utah Department of Natural Resources Division of Water Rights has jurisdiction and authority over all geothermal resources and issues water rights and well
construction permits. The Utah division of water quality oversees fluid disposal plans and permits. Utah has established a geothermal state working group to address these issues, led by the Utah Geological Survey.

7.3 Unitization as an Essential Element of Geothermal Development and Use

Because of the shared nature of the geothermal resource, Utah’s regulatory framework is built around the concept of ensuring fair and equitable use of geothermal resources among multiple users. Unit agreements involving participation by federal, state and fee landowners may be required, and state regulations establish a detailed framework for management of the geothermal unit.

An example is the extensive documentation associated with Roosevelt Hot Springs showing that unit agreements have been an essential element defining the relationships between holders of interests in resources and the developers of geothermal resources. Notably, a December 1976 document approving a unit agreement for development of the resource stated that “all formations are unitized”, equivalent at that time to approximately 26,000 acres; that 79% of the land under the unitization agreement was federal, 10% was state, and 11 were patented (private) lands, and that benefits would be allocated to the lands in proportion to the acreages identified in the unit agreement, consistent with rates identified in the lease. Costs of improvements are also allocated proportional to acreage per unit participant. Maps of property interests in the unit show the complex nature of the relationships involved.

These documents indicate that royalty payments will be made based on acreages in the participating unit as approved by the USGS. For federal regulatory purposes, and for geothermal leases generally, royalties under unit agreements are typically in “K-lbs.” or MW produced and are not based on mineral extraction costs or benefits.

7.4 Sharing Costs and Proceeds from the Unit

URS 73-22-7(9)(b) provides, “All property, whether real or personal, that is acquired in the conduct of unit operations, is acquired for the accounts of the owners within the unit area and is the property of those owners in proportion that the expenses of unit operations are charged.” At sites with multiple unit participants, the unitization scheme generally allocates costs and benefits to the parties on a proportional basis, consistent with the acreages of the participants. This raises the question of the cost-benefit to the lessee associated with the mineral extraction project.

In the context of a proposed mineral extraction project, existing agreements should be examined regarding cost-share and benefits-sharing. Depending on the terms between the geothermal unit participants and the mineral extraction entity that is partnering with a participating lessee, new terms may be needed to address the sharing of costs and benefits of the unit on a per-acre basis. Treatment of mineral extraction costs and royalties in the context of unit agreements would be an important concern of the mineral extraction enterprise.

7.5 State Permit for Underground Injection

As mandated by the Safe Drinking Water Act (SDWA), the Utah Bureau of Water Pollution Control (BWPC) (now the Utah Division of Water Quality) received primacy from EPA on February 10, 1983 to administer the UIC program in Utah under section 1422 of the Safe
Drinking Water Act for Class I, III, IV and V wells (“the Utah 1422 UIC Program”). Under regulation R317-7-3(M), Class V injection wells includes “Injection wells associated with the recovery of geothermal energy for … electric power.”

With respect to injection approval, unlike other UIC approvals, which may authorize injection “by rule”, Utah’s water resources authorities require application for a permit for all Class V wells, with permits issued for a term of 10 years. The developer should communicate with regulators to ensure that renewal will be automatic so long as permit conditions are met. Both the Bureau of Water Pollution Control and the Division of Water Rights must approve plans for injection wells; the applicant should contact the Division of Water Rights, which will coordinate the approvals of the two agencies.

Utah law at URS 72 – 22 – 6(1)(d) provides that the state Division of Water Resources has the authority to require operation of wells so as to prevent pollution of surface and groundwater and premature cooling of any geothermal system and reduction of the ultimate economic recovery of geothermal resources. If any chemical or physical changes to the injectate are proposed, a hydrogeological analysis may be needed, analyzing the relationship between the geothermal reservoir and any local groundwater aquifers.

8. Conclusions

Mineral extraction from geothermal resources has attracted significant attention recently, due to the increased demand for valuable minerals and improvements in technology that may make mineral extraction more technically and financially feasible. For geothermal lessees the possibility of both more efficient operation and the production of valuable minerals is attractive.

The geothermal lessee will generally have the right to byproducts, providing no competing mineral claims or leases exist that present realistic challenges. The proponent of geothermal mineral extraction should carefully evaluate the possibility of competing mineral claims and be prepared to argue for priority if competing claims are raised. Filing a mineral claim should be carefully considered.

The federal interest in preservation of the resource may require a showing of the effect of mineral extraction on operations and reservoir productivity. In general, calculation of royalties will be consistent with royalty requirements under the lease; however, if the value of extracted minerals exceeds 75% of the value of the power production or direct use, federal and state mining laws may be applicable.

Unit agreements should be evaluated to determine their bearing on a proposed mineral extraction enterprise’s costs and derived benefits.

The federal geothermal lessee seeking to extract minerals from geothermal fluids should pay close attention to differences between states, such as differences in definitions of water and geothermal resources, which may significantly affect the feasibility of the project and the time and resources required to secure approvals.
Underground injection and wastewater discharge may be subject to federal or state oversight, depending on the state; regulators will be concerned about any chemical additions or physical changes to the injectate potentially affecting sources of potable water supply.

Appropriate contacts with federal and state regulatory bodies should be identified as part of a legal and economic evaluation of a mineral extraction project associated with a geothermal power generation or direct use project. Developers should contact BLM’s state geothermal leads for more information.

REFERENCES

Federal and state laws and regulations (cited in the text)
Personal communications with BLM staff at headquarters and regional offices
Files for federal geothermal leases in California, Nevada and Utah