Geothermal Resources Under the Mining Law Regime--Problems & Possibilities

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GEOTHERMAL RESOURCES UNDER THE MINING LAW REGIME:
PROBLEMS & POSSIBILITIES

I. INTRODUCTION

As efforts to transition away from fossil fuels become increasingly urgent, so will a need for legal protection and optimization of all renewable energy resources. Geothermal is one key piece of the renewable energy puzzle, with an estimated capability to supply 75 percent of the total energy requirements of the United States.

The Geothermal Steam Act of 1970 was intended to spur rapid development of this vast reservoir of untapped geothermal energy and capture its great potential for economical production of clean electricity at a time of increasingly critical power shortages. The policy drivers informing the initial drafting and passage of the legislation have not changed in the intervening years, and if anything have become more pronounced, as both demand for energy per unit of GDP and environmental consciousness regarding extractive activities have intensified. Unfortunately, however, the promise of this legislation has not obtained.

Instead, the development of geothermal resources has been greatly hampered by the legal and institutional framework governing geothermal energy resources. This framework has been plagued by conflicting mining and water laws, anachronistic common law systems of property rights, problematic legal classifications of geothermal resources, and jurisdictional variances from state to state and between states and the

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Federal government. These issues have combined to significantly hinder the
development of what will be a vital resource for our nation’s future energy needs.

This thesis concerns one way to address the suboptimal development of
geothermal energy resources. Using the Federal acquisition of exclusive airspace
jurisdiction as a guiding model, I propose that a similar exercise of Federal jurisdiction
over the heat energy under the territorial United States has the real potential to solve
several nagging problems that have hindered the development of geothermal energy
resources.

This proposal is not without its own potential problems, and there may be
additional solutions to the problems in geothermal development. The purpose here is to,
at a minimum, spark a dynamic, critical, and progressive legal dialogue regarding how to
achieve a critical national energy interest.

The substantive portion of this paper is divided into two broad sections. Section
Two explores some of the problematic aspects of the mining law context in which
geothermal resource extraction currently operates, and specifically treats some of the
classification, severed estate, and jurisdictional problems within that milieu. Section
Three then offers a proposal to address these problems: similar to what occurred in the
commercial airspace context, the exercise of exclusive Federal jurisdiction over the
geothermal heat resources under the United States will achieve the clarity for developers,
relief of jurisdictional tensions, and uniformity that any successful legal framework
should necessarily address.
II. THE MINING LAW MILIEU—CLASSIFICATION, SEVERANCE, & JURISDICTIONAL PROBLEMS ON PUBLIC AND PRIVATE LANDS

Many current and prospective mining operations involve lands subject to a hodgepodge of ownerships and laws: some are private (purely private or having previously been patented under the Mining Law, SRHA, railroad land grants or other Federal disposal laws); some are state-owned (remnants of school trust and other Federal land grants to states); and some are Federal lands. Unfortunately, this has resulted in much uncertainty about of security of tenure for mining claims and prospective activities. This section treats the variety of problems for geothermal resource extraction in the current mining law milieu, starting first with classification problems, and then treating some of the reservation, severed estate, and jurisdictional problems on both public and private lands. These problems will serve as a backdrop that the following section—the proposal that legislation be enacted to exercise exclusive Federal jurisdiction over all heat resources of the U.S.—seeks to address.

A. The classification problem

Confusion as to whether the geothermal resource is a mineral, water, or *sui generis* has slowed its development. If it is a mineral, was it reserved to the government when surface title passed reserving the minerals? To the extent that this answer is not clear, neither are the rights of surface owners. Are geothermal resources properly categorized as water? If so, state water allocation systems (particularly in the West) will have implications for geothermal development activities that, where unclear, results in ambiguities which will likely cloud rights and thereby disincentivize development.

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Geothermal resources are classified as “water” in many states, and the legal results are often problematic. While geothermal steam does consist of water, there is no irreducible or necessary hydrological component to geothermal resources. Indeed, the key resource to be exploited is the heat energy of the earth, to which water is incidental. Though the legal treatment may vary according to whether the heat energy is commercially viable, the fundamental nature of the resource as heat does not. Exploitation of “dry rock” formations, for example—one of the most abundant sources of geothermal energy—frequently requires a conductive medium (such as water). And while many known geothermal reserves have fluid components, the fluid is not the source of the energy, but instead is simply a conductive medium. Geothermal energy is neither water nor mineral because it is not a substance at all, but such technical or scientific definitions have not always proven attractive for legal classifications.

A good example of the problematic classification effects for geothermal resources can be seen in the case of Vogel v. Cobb. Because water was a different chemical composition from the other listed minerals (coal, oil, petroleum, gas, and asphalt), differed greatly in value from them, and varied in surface usage, underground water was found by the court not to be of the same species and thereby not included in the estate.

A completely different legal result could have easily obtained in this case, however, if the court had chosen to emphasize any of a number of other shared characteristics: they could be similar in terms of subterranean location, an identical

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8 Hearings, supra n.7, at 17, 26.
10 Id. at 280.
extraction method (e.g. drilling), or by being found in the same physical state (e.g. liquid or gaseous). So the outcome of a geothermal case might simply turn upon the unpredictable and potentially idiosyncratic choices of emphasis by the particular reviewing court. The uncertainty fostered by the indeterminacy of legal treatment is an avoidable hindrance that increases costs and risks to the developer and burdens courts with fact-intensive analyses.

The reservation and severed estate problems on public and private lands (treated infra) are both due at least in part to these various classifications of the geothermal resource. The essential nature of a resource may have legally controlling implications for property interests. To the extent that the classification is unclear or subject to uncertainty, so too are the ownership rights.

**B. The “reservation” and severed estate problems**

Current Federal and state geothermal laws also present potential barriers to development, in part because they are based on principles of two different and sometimes contrasting bodies of natural resources law: mining law, which encourages development by holders of private interests in land, and water law, which creates usufruct rights in a shared public resource.

The Federal government began to provide land grants to settle the West11 and serve the national economy by incentivizing the development of both surface and subsurface estates.12 This severance policy was designed to generate a healthy supply of

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12 See Watt v. W. Nuclear, 462 U.S. 36, 50 (1983) (stating the purpose of the SRHA); H.R. Rep. No. 64-35, at 4, 18 (1916) (stating the primary function of the SRHA is to encourage the development of both mineral and surface estates); Hill & Ripley, supra n.11, at 597-600 (discussing the SRHA provisions and its regulatory amendments).
minerals and their derivative energy, while also allowing for use of the surface.\textsuperscript{13} Developers on public lands have typically relied on the Mineral Location Act of 1872.\textsuperscript{14} The primary uncertainty facing them was the statutory language that only “valuable mineral deposits” were open to exploration and development.\textsuperscript{15} The classification status of geothermal energy and whether it is a “mineral” under the meaning of the statute thereby becomes crucial. Because the statute does not define “minerals,” various judicial tests have been developed to address this inquiry, but the very fact of varied case law treatments introduces unpredictability, uncertainty, and attendant transaction costs sufficient to disincentivize full development of geothermal resources.

In addition to classification issues, water law issues can be troublesome as well. The Desert Land Act of 1877\textsuperscript{16} affected a severance of all waters on unappropriated public lands from the land itself.\textsuperscript{17} The legal effect of this was to give the geothermal lessee only a “naked right” to the steam until a demonstration of full compliance with state water laws.\textsuperscript{18} Once public land is reserved by the Federal government, all state water rights thereafter will be subject to a superior Federal water right.\textsuperscript{19} A large portion of Federal land has been reserved with this characteristic,\textsuperscript{20} and represents yet another complication to the efficient development of geothermal resources.

\begin{itemize}
\item \textsuperscript{13} See Hill & Ripley, \textit{supra} n.11 (discussing the Federal approach to land grants during the early twentieth century). According to one court, the bifurcation “opened the surface for immediate agricultural use while preserving whatever mineral potential lay buried in the subsurface for later development.” at 597-98 (discussing the objectives of the Federal government in passing severance legislation).
\item \textsuperscript{14} 30 U.S.C. § 23 (1964).
\item \textsuperscript{15} See 30 U.S.C. § 22 (1964).
\item \textsuperscript{16} 43 U.S.C. § 321 (1964).
\item \textsuperscript{17} \textit{California Oregon Power Co. v. Beaver Portland Cement Co.}, 295 U.S. 142, 162 (1935).
\item \textsuperscript{19} \textit{Id.} at 526.
\item \textsuperscript{20} \textit{Id.}
\end{itemize}
Regardless of the extent to which a given state’s geothermal laws and regulations refer explicitly to the fluid that is used to extract the heat energy, they will reflect to varying degrees the sometimes inconsistent and conflicting principles of water laws, which regulate and limit the use of a shared public resource, and mining laws, which encourage discovery and extraction of resources. The result is risk for the developer, including uncertainty regarding which regulatory agency is responsible for permitting, which laws and regulations apply to project development and operation, and who owns or controls the resource.

In the current regime there is little question as to the ownership of geothermal resources underlying private land acquired without grant (i.e. “purely private” land), but what about lands that were once public and became private under granting statutes?

Under the traditional property law *ad inferos* maxim, the fee simple owner of the surface holds legal title to the valuable minerals and other substances under her land, including geothermal resources. This has been complicated in most states, however, by a severance of surface and mineral estates through both private grants and public disposals with reservations of the mineral estate to the U.S.

As we have seen in cases such as *Union Oil*, the applicability of mineral reservation clauses to geothermal resources can introduce ownership problems and other uncertainties that can disincentivize full development. After the GSA, geothermal resources will be included in most mineral reservations. However, where the surface has already been conveyed, the problem still remains regarding whether the grantor intended to retain an interest specifically in geothermal resources in the conveyance instrument.

Though the GSA does address this issue by empowering the Attorney General to quiet

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title on any reserved lands ripe for geothermal development,\textsuperscript{22} this type of adjudicatory resolution only adds transaction costs and ultimately does little to reduce disincentives.

Beginning almost immediately after independence from the English crown and continuing into the 20th c., the U.S. began transferring large amounts of public land into private ownership and reserving the mineral estate.\textsuperscript{23} The Stock Raising Homestead Act of 1916 (SRHA)\textsuperscript{24} was particularly successful at disposing of public lands, and contains a reservation of minerals to the United States.

Partially in response to these problems, Congress enacted what is currently the primary Federal law governing the development of geothermal resources, the Geothermal Steam Act of 1970 (GSA).\textsuperscript{25} One of the many problems informing the passage of the GSA and the other geothermal legislation has been the question of title to geothermal resources underlying lands the surface of which has passed from Federal ownership but in which the mineral estate has been reserved to the United States.\textsuperscript{26} Prior to 1970, private lands had been the main source of geothermal resource development. The Department of the Interior (DOI) had eschewed development on public lands, arguing that because geothermal resources were not minerals, DOI lacked authority to dispose of geothermal steam contained in the public domain it controlled.\textsuperscript{27} Three fundamental pieces of legislation informed DOI’s position: the Mineral Location Law of 1872,\textsuperscript{28} the

\begin{footnotesize}
\begin{enumerate}
\item \textsuperscript{22} 30 U.S.C. § 1020(b) (1970).
\item \textsuperscript{23} Hill & Ripley, supra n.11, at 590 (citing 28 J. of the Continental Cong. 1774-1789, at 378).
\item \textsuperscript{24} 43 U.S.C. §§ 291 et seq. (1970).
\item \textsuperscript{27} John W. Brooks, “Legal Problems of the Geothermal Industry,” 6 Nat. Res. J. 511, 524 (1966). The Department of the Interior in 1961 took the position that although geothermal resources were not locatable under the mining laws, they were subject to leasing under the Materials Act of 1947, 30 U.S.C. §§ 601 et seq. (1970). This decision was reversed by the Department by declaring some months later that the geothermal steam was not a “mineral material under the Materials Act.” Brooks, supra.
\end{enumerate}
\end{footnotesize}
Mineral Leasing Act of 1920, and the Materials Policy Act of 1947. In short, this controlling statutory framework would require geothermal resources to be classified as “mineral” in order to allow their development on public lands. Since geothermal resources are not “minerals,” the DOI reasoned it lacked the authority to develop these resources.

The Geothermal Steam Act of 1970 (GSA) provided precisely this needed classification, and in doing so created explicit authority for developing geothermal resources on public lands under the mineral acts. Similar to the Mineral Leasing Act (development of oil, gas and other nonmetalliferous minerals), the GSA also grants leasing authority to the Secretary of the Interior for geothermal development on public lands. Section 21(b) of the GSA was intended to resolve the question of title to the subsurface geothermal resources under now privately-owned lands by expressly granting leasing authority to the Secretary of the Interior for the development of lands conveyed by the U.S. subject to a reservation of geothermal resources.

But there was disagreement during the drafting process as to whether the SRHA’s reservation of “all the coal and other minerals” and the right to prospect for them included a reservation of “geothermal steam and associated geothermal resources.” To address this ambiguity, Section 21(b) of the GSA directed the Attorney General to initiate appropriate proceedings to quiet title to the United States of geothermal resources on

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SRHA land if and when development of such resources occurs or is imminent.\textsuperscript{37}

\textit{United States v. Union Oil of California} was a key test of this proposition that geothermal resources are properly a part of the mineral estate and should belong to the United States under the mineral reservation of the SRHA.\textsuperscript{38} The U.S. argued that patents granted under the Act affected a complete severance of the subsurface mineral estate and reserved ownership rights in the geothermal resources being produced by Union Oil on land leased from parties whose predecessors in interest had received patents under the SRHA.\textsuperscript{39} The court dismissed by concluding that “Congress did not intend to reserve geothermal steam and associated geothermal resources because such fluids would not have come within the definition of ‘minerals' in force and usage at that time.”\textsuperscript{40}

This is one small but good illustration representative of a key problem with the legal framework currently governing geothermal resources: prior land grants, both private and by reservation of the mineral estate for publicly granted lands, have and continue to create confusion, uncertainty, and clouding as to respective ownership rights.

What is also instructive here is the court’s \textit{treatment} of geothermal resources: the court simply analogized geothermal resources to water, and since water is not considered a mineral, the court reasoned that geothermal energy is not a mineral and therefore not reserved under the Act.\textsuperscript{41} As discussed above, classification of a material can be controlling as to how the material is treated legally, and this particular classification of geothermal resources is problematic in several important ways.

\textsuperscript{38} For other cases treating the nature of the estate passed by patent under the SRHA and whether the surface and subsurface estates were intended to be severed by the mineral reservation provision, see \textit{Skeen v. Lynch}, 48 F. 2d 1044 (10th Cir. 1931) and \textit{Bourdieu v. Seaboard Oil Corp.}, 38 Cal. App. 2d 11 (1940).
\textsuperscript{39} 369 F. Supp. at 1290.
\textsuperscript{40} \textit{Id.} at 1293.
\textsuperscript{41} 369 F. Supp. at 1297-98.
Once the premise is accepted that geothermal energy is a water resource, much law can be cited showing that water is not usually considered a mineral, and that traditional common law and statutory treatments of water resources should apply to geothermal resources.\footnote{Kenneth R. Bjorge, “The Development of Geothermal Resources and the 1970 Geothermal Steam Act—Law in Search of Definition,” 46 U. Colo. L. Rev. 1 (1974).} This, in turn, raises substantial uncertainty regarding the legal status of geothermal energy. If considered a water resource (as in \textit{Union Oil}), it is likely subject to state water laws. This is of particular import on Federal lands, where an appropriation doctrine may govern the acquisition of geothermal resources and displace the extensive Federal system for geothermal leasing and development under the GSA and subsequent related acts. The GSA explicitly leaves unresolved the issue of the jurisdiction of state water laws over geothermal resource development on public lands.\footnote{In relevant part, the GSA states, “…nothing in this [Act] shall constitute an express or implied claim or denial on the part of the Federal government as to its exemption from state water laws.” 30 U.S.C. § 1021.}

\textit{Geothermal Kinetics, Inc. v. Union Oil Co.} provides an excellent example of additional limitations and problems with the legal treatments of geothermal mining in the current regime. The court in \textit{Geothermal Kinetics} relied substantially on distinguishing between the usual ground water system and geothermal waters.\footnote{75 Cal. App. 3d 56, 63 (1977).} The court also emphasized that the similarity of the energy extraction method to those used for substances traditionally included in the mineral estate.\footnote{Scott M. Farnsworth, “Including Geothermal Resources Within the Mineral Estate: The Need for a Statutory Rule of Presumption,” 1978 BYU L.Rev. 593 (1978).} Deciding the ownership of geothermal resources in this way by looking at their form or by comparing methods of
extraction with other minerals can and does lead to problematic results and, consequently, ambiguous ownership.46

C. Jurisdictional and regulatory problems

Another set of problems which has hindered the development of geothermal resources stems from the fact that Federal, state, and local governments and a multiplicity of agencies are involved in various stages of geothermal acquisition, exploration, and development. Each division of government has a different set of rules and regulations, and the result has often been confusion for geothermal developers.47

The first problem is the uncertainty about the legal status of geothermal energy. If they are treated as water resources (as in Union Oil), they are likely subject to state water laws. This is of particular import on Federal lands, where geothermal resources could perhaps be acquired under an appropriation doctrine—the right of an entity to take and use water for other than overlying or riparian uses—thereby displacing the extensive Federal system for geothermal leasing and development under the GSA and subsequent related acts. The GSA explicitly leaves unresolved the issue of the jurisdiction of state water laws over geothermal resource development on public lands.48

Under Federal statute,49 individual states are empowered to promulgate rules for acquiring rights to use water within the state and have appropriation powers for water

46 "The form in which energy exists is without legal significance; otherwise, title to every resource would be uncertain ... [T]he development of any resource would be impeded and costly because of this cloud." Sato & Crocker, “Property Rights to Geothermal Resources,” 6 Ecology L.Q. 247, 295 (1977).
47 The contribution of state, local, and multiple agency regulation to the uncertainty and other costs hindering geothermal development is appropriate to explore, but a proper treatment of this very real question is unfortunately outside the scope of this paper. Part of the positive thesis of this paper, however, is that exclusive Federal jurisdiction over the heat resources under the territorial U.S. would allow a centralized, streamlined regime to be implemented that would avoid many of these issues altogether.
48 The GSA states in relevant part, “...nothing in this [Act] shall constitute an express or implied claim or denial on the part of the Federal government as to its exemption from state water laws.” 30 U.S.C. § 1021.
contained on public lands as well.\textsuperscript{50} At first blush, there appears to be the potential to avoid jurisdictional issues via a preemption argument: because the Federal government has enacted a comprehensive scheme to control the acquisition and development of geothermal resources on public lands, those resources should not be subject to any state water laws. One commentator has even opined “That the power to ignore state water laws exists in the Federal government seems no longer to be a subject of dispute.”\textsuperscript{51}

However, in light of the concessions to state appropriative power made in the Desert Land Act of 1877 and other Federal statutes, it is questionable whether the U.S. could validly assert exclusive jurisdiction over this particular resource under a preemption argument. Moreover, as we have seen, the classification of geothermal resources as “water” is deeply problematic to begin with.\textsuperscript{52}

Either way, classification has the potential to subject geothermal resources to state water and property laws in significant ways, greatly hindering the development of this increasingly important resource. As the next section demonstrates, another major industry vital to national interests has also faced similar hinderance, and how these issues were addressed in that context may provide a vast improvement if applied to the geothermal resource context.

III. THE AIRSPACE ANALOGY: FEDERAL JURISDICTION OVER U.S. GEOTHERMAL HEAT RESOURCES

Through analogy to the exercise of Federal jurisdiction over national airspace, this section argues that Federal jurisdiction could similarly be accomplished over the geothermal heat resources under the territorial U.S., and that such an exercise may

\begin{footnotesize}
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\item \textsuperscript{52} See Sec. IIA, supra.
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alleviate many of the problems that currently bedevil the optimal development of those resources.

Though at first blush this proposition may seem radical, the concept of primary Federal jurisdiction over private property interests has substantial precedent. Exclusive governmental jurisdiction over airspace above the surface estate and government control of radio frequencies are but two recent examples of antecedents that go back centuries. The focus here is on explicit Congressional recognition of a significant public interest in airspace through the Air Commerce Act of 1926 and the resulting legal limitations of a landowner’s previously protectable aerial property interests. This section will focus on Federal jurisdiction over sovereign airspace as a model, and suggest that a similar exercise can and should be done in the case of geothermal heat resources to substantially reduce barriers to its development.

A. Erosion of traditional property rights to serve important public interests

Any proper treatment of this proposal, and the airspace analogy it relies on, first requires at least a brief review of the history of aerial property rights. The foundational maxim of property ownership in the West is usually assumed to be *cujus est solum, ejus est esque ad coelum et ad inferos* (“The owner of the soil owns everything from the sky to the depths”). An examination of legal history shows that these traditional *ad coelum* and *ad inferos* maxims, while certainly important, are not as inviolable or fundamental as is often presumed.

In fact, we have a long legal history of subordinating private property interests in the service of important national interests. Though Roman law is frequently cited as an

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authoritative basis for the *ad coelum* and *ad inferos* maxims, the Roman landowner did not necessarily control the space below or above the surface,\(^{55}\) and air was considered *res communis*, a thing incapable of appropriation.\(^{56}\) As a general proposition, statutes naturally trump common law, and legislative modifications of property rights are common.\(^{57}\) Ridding government lands of stale, inactive, nuisance, or abusive claims is another way in which there has been a legal erosion of private property interests attached to those lands.\(^{58}\) And Congress long ago effectively confirmed an expansive application of the executive’s substantive power to make land withdrawals irrespective of private property interest.\(^{59}\)

In the courts, it is fair to characterize judicial treatments as having been, at most, “modestly deferential” to the traditional *ad coelum* and *ad inferos* maxims. In the airspace context prior to 1926, the unauthorized use of airspace, though technically a trespass, was regularly held unlawful only if it interfered with the surface owner’s quiet enjoyment or amounted to a nuisance.\(^{60}\) In a subsurface context, recent environmental sensitivity has combined with a century-old line of decisions allowing the abatement of private property interests, in favor of vesting the government with broad power to regulate mining activity, without compensation and without running afoul of the

\(^{55}\) Justinian, for example, enjoined building that prevented wind from reaching a neighbor, and Constantine supported free quarry rights. See Luigi Miraglia, *Comparative Legal Philosophy Applied to Legal Institutions*, trans. John Lisle (New York: Macmillan Co., 1921), 474-75.


\(^{57}\) *Silver v. Silver*, 280 U.S. 117, 122 (1929) (“[T]he Constitution does not forbid the creation of new rights, or the abolition of old ones recognized by the common law, to attain a permissible legislative object.”).


\(^{59}\) See 36 Stat. 847 (1910), which prohibited withdrawals for minerals “other than coal, oil, gas and phosphates,” was narrowed in 1912 to include only “metalliferous minerals” (37 Stat. 497 (1912)), and was repealed in 1976 by FLPMA § 704(a) (90 Stat. 2792 (1976)).

Constitution. The Surface Mining Control and Reclamation Act (SMCRA), for example, placed major new constraints on many private coal interests, yet takings challenges were unanimously rejected by the Supreme Court. And as the Supreme Court put it in 1978, the Mining Law “surely was not intended to be a general real estate law.” Constitutionally, it is the essence of the property right, not the form (e.g. lease, contract, or something else), that is controlling, and in a mining claim that essence is the opportunity to mine in a manner that does not seriously jeopardize other important values.

Quite significantly, in United States v. Locke the Supreme Court observed that the government has the power, “with respect to vested property rights....to impose new regulatory constraints on the way in which those rights are used, or to condition their continued retention on performance of certain affirmative duties.” Such requirements pass constitutional muster if they are “reasonable” and “designed to further legitimate legislative objectives.” Specifically, the United States retains “substantial regulatory power” over mining claims because, as the underlying title holder, it “maintains broad powers over the terms and conditions upon which the public lands can be used. . .and acquired.” That there is a continuing trend toward increasing Federal control over subsurface resources seems beyond serious dispute, and this control is frequently

64 See e.g., Chambers v. Harrington, III, U.S. 350, 353 (1884) (holding that the core property right in an unpatented mining claim is the opportunity to engage in mineral activity).
66 Id. at 104.
67 Id.
68 Id. Three Justices dissented on wholly non-constitutional grounds that did not dispute the majority’s holding that Congress properly wields power over unpatented mining claims.
accomplished through the subordination of private property interests to the public interest.

B. Use of the Commerce Power in airspace jurisdiction context

From the 19th c. onward, technological developments renewed an old debate about aerial property rights. Long before airplanes, questions about the conceptual coherence and violability of airspace ownership took on increased prominence in the face of new developments such as balloons, dirigibles, and telegraph lines, to name but a few.

The early legal questions centered on trespass, nuisance, and the potential remedies attached to them, and were particularly vexing as related to air travel. The traditional ad coelum and ad inferos maxims suggested that a landowner owns both the airspace over their land and everything underneath to the center of the earth. Most commentators and scholars agreed that an airplane flying several thousand feet over private land technically constituted an actionable trespass, but thorny legal questions remained. How does one bring an action against a pilot who has already passed over? Would the action be in ejectment, or for injunction, and could she recover damages? And, most importantly for our purposes here, to what extent is society willing to protect its private property interests in airspace at the expense of its important security, economic development, and other crucial national interests? These and other related issues were very real legal and policy conundrums at the time. The specific form of their resolution was an open question, and the law of the air resulting from that resolution provides an instructive tool in analyzing how to significantly lower the current barriers relating to geothermal development.
With the passage of the Air Commerce Act of 1926, Congress subjected the entire field of aeronautics to Federal control. This was far from a foregone conclusion, though, and there were many debates leading up to its passage regarding whether Congress had adequate authority in which to ground the act. Among other rationales, the House in its report on the Air Commerce Act stated: “The public right of flight in the navigable air space owes its source to the same constitutional basis which, under decisions of the Supreme Court, has given rise to a public easement of navigation in the navigable waters of the United States, regardless of the ownership of adjacent or subjacent soil.” In the end, the Commerce Power proved ample, and it is all-important to note that this legislation was premised on that power, not on actual Federal ownership of national airspace.

Instead of attempting to gain actual Federal ownership over national airspace, the Act established a public easement for aerial navigation and directed the Department of Commerce to establish uniform rules for the industry. This had a tremendously positive effect on the commercial aviation industry. Insurance rates dropped, private investment skyrocketed, and commercial air travel quickly flourished.

C. The importance of uniformity

71 Bogert, “Problems in Aviation Law” (1921) 6 CORN. L. Q. 271, 308. See also MacCracken, in an address reprinted in LEGISLATIVE HISTORY OF THE AIR COMMERCE ACT OF 1926, at 65: “Uniform regulation of aeronautics is admittedly not only desirable, but absolutely indispensable to the effective development of aerial transportation…”
72 Both national security—and the need for sovereign control over national airspace as a philosophical and practical precursor to enforcing any private aerial ownership rights—were also prominent rationales.
In recognition of the ease with which air travel crossed both private property and jurisdictional boundaries, proponents of exclusive Federal airspace jurisdiction thought it crucial to create a uniform law of the air. Each state had the power to enact its own unique aviation laws, and this potential for variation in aerial law state to state was immediately recognized as being impractical and crippling to the industry’s development.

Centralized Federal control was the way to harmonize inconsistent state laws that either existed or were bound to develop. What would be the effect on the development of the industry if states had differing minimum altitude requirements, or if one state followed the *ad coelum* maxim and another did not? Likewise, would each land owner need to expressly permit trespass through their airspace, and would compensation be due to all the surface landowners for use of that airspace? If Congress were to establish a single uniform law of the air, pilots would be spared the difficulties of trying to comply with multiple sets of rules in the course of an interstate trip. Rather than seeking licenses for every state through which one would travel, it was far more desireable and efficient to receive a single Federal license.

The key point of uniform Federal aviation law was to eliminate inconsistent state regulation and the impossibility of accommodating this new resource exploitation within the old property framework. The simplicity, clarity, and certainty achieved with a Federal rules and legal requirements allowed aviators to reliably identify and price risk and optimally develop the industry. Congress recognized the social desirability of uniform airspace regulation and accordingly enacted sweeping legislation to that end, in
spite of very real private property interests in the airspace over which Federal jurisdiction
was being exercised.\textsuperscript{75}

Congressional legislation abrogated the common law \textit{ad coelum} rule that a
landowner’s right to exclude extends to the sky,\textsuperscript{76} created a public right over navigable
airspace, and established centralized Federal jurisdiction and regulation.\textsuperscript{77} Just as in the
airspace context, where technological developments drove legal developments and an old
legal schema acquiesced to accommodate important new public needs, so too can
exclusive Federal jurisdiction over geothermal heat resources relax individual property
rights and accommodate evolving national needs and conceptions of what constitutes
valid Federal jurisdiction in the public interest. Just as the doctrine of \textit{ad coelum}
crumbled with the invention of the airplane, so too should the \textit{ad inferos} doctrine yield to
new public energy needs subsurface technologies and capabilities to viably exploit
energy resource in the service of those needs.\textsuperscript{78}

\textbf{D. The airspace analogy: Federal jurisdiction over U.S. geothermal heat resource}

Perhaps it is best to preface my positive thesis by clarifying what this paper is \textit{not}
claiming: this thesis is not necessarily proposing an assertion of complete Federal
\textit{ownership} over all national heat resources. Even if such an assertion passed
Constitutional muster, the condemnation proceedings and other associated machinations
required seem almost certain to be hopelessly impractical, expensive, and politically
imprudent. Also, simple fairness mandates a strong accounting of the considerable

\textsuperscript{76} \textit{See Hinman v. Pac. Air Transport}, 84 F.2d 755, 757 (9th Cir. 1936).
\textsuperscript{77} This suggests that perhaps the real problem with existing property claims is a political, not a
Constitutional, one, centering on whether Congress could marshal sufficient political will to subject
existing claims to the adoption of the new federal geothermal regime in this proposal. This is likely an
inquiry of substantial practical importance, but is outside the narrower scope of this paper.
reliance on the current schema of mining and other property rights. If a Federal ownership assertion is potentially workable and fruitful, others will hopefully explore it beyond the confines of this paper.

At the same time, however, the complicated and uncertain interactions of private property interests, water rights, water laws, and mining laws (*supra* Sec. II) have been major impediments to the development of geothermal energy. Centralized Federal regulation of the geothermal heat resources under the U.S. would provide the authority to prevent this anachronistic complex of laws and private property interests from hindering the legal uniformity and clarity required to capitalize on the collective learned wisdom regarding the regulation of extractive activities in the public interest.79 Geothermal resources, I would like to submit, face many of the same private property, varied state legal treatments, and other issues that airspace did. We could benefit from many of the same solutions, and can rest those solutions on much the same legal authority.

There appears to be no legal difference in the treatments of one part of the property interest, the *ad coelum* interest in the airspace context, and the subsurface *ad inferos* interest in the geothermal context. There would still be debate and conflict regarding nuisance and takings, but the legal grounds and methodology could be identical, based on the Commerce Power, and the resulting management in a cooperative federalism regime, as with the airspace analogy, would likely play out similarly as well. This type of clear jurisdiction over and regulation of the public airspace eliminated many of the tensions and practical problems that accompanied increased exploitation of airspace in the national interest.

79 Writing on a clean legislative slate, one could fairly easily design a leasing system that operated much like a location system, such as some Canadian provinces have. *See*, e.g., 6 American Law of Mining, Chapter 213 (2d ed. 1987), describing generally the Canadian provincial approaches.
E. Cooperative Federalism

As with many Federal regulatory programs, particularly in the environmental law context, there is an irreducible need, both as a matter of practicality and of principle, to develop a role for state and local governments in the execution and maintenance of the Federal regulatory schema. Accordingly, this proposal still contemplates an important role for states. This is particularly important in the West, where geothermal resources are most abundant, water is often a scarce resource, and geothermal heat extraction is a water-intensive activity. States have an important interest in managing their local resources, and principles of Federalism are important to consider carefully in any large scale Federal action such as the one proposed here.

In the same way that states work out their individual and respective property rights regimes for airspace—while the Federal government retains ultimate jurisdiction to regulate the airspace in the national interest—here too states could maintain a central role in managing the interplay of geothermal extraction activities with property and water interests.

The “devil is in the details,” as the saying goes, and there is certainly much more to say here regarding more precisely what the respective Federal and state roles would involve. Additional research could follow to unpack these details and further develop the model.

F. Complete federal jurisdiction and centralized regulation will not damage the industry

On a final note, it seems prudent to address at least one of what are likely to be many criticisms of this unique proposal. A standard criticism of any exercise of Federal jurisdiction and centralized regulation is that it will significantly damage the industry.
During the Clinton Administration, for example, the hardrock mining industry regarded Secretary of the Interior Bruce Babbitt as its worst nightmare. Secretary Babbit regularly attacked the Mining Law’s patenting provisions as a special privilege for industry, and openly promised to use his authority to require stricter adherence to details in the law. The mining industry had long predicted that increased regulation would strangle the domestic market and send mining investment abroad. Yet, this period nevertheless saw vast increases in hardrock mining production on Federal lands. Gold, in particular, reached its highest level of production in nearly a century, despite steady declining gold prices.

This is not to argue that regulation cannot or necessarily could not have detrimental effects—but if history is any indicator, there is often a substantial gap between industry rhetoric and reality. Since the current regime hinders more profitable and expansive development of geothermal resources, a change that clarifies, centralizes, and makes more efficient the jurisdictional and regulatory schema should be welcome.

IV. CONCLUSION

Federal jurisdiction, and its concomitant regulatory authority, over heat resources would provide the opportunity for a truly central, uniform system of rules. The ownership rights involved are not fundamentally different from what occurred in the airspace context, and this type of legislation could have the positive effects of streamlining regulation, reducing ownership uncertainties, and ultimately lowering the

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80 J. Leschy, “Mining Law Reform Redux, Once More,” 42 Natural Resources Journal 461, 485 (Summer 2002).
81 Id.
82 Id.
83 Id.
84 Id.
transaction costs that slow the development of geothermal resources. Though not without its own potential issues to explore and work out, this schema would provide certainty and efficiency through streamlining the process in ways that the current system does not and cannot.