# GEOTHERMAL'S PRIOR APPROPRIATION PROBLEM

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*Geothermal energy production is an attractive way to help meet our nation's future energy needs due to its low emissions, minimal environmental impact, and ability to serve as a baseload power. In the 1960s, Congress recognized our nation's abundant geothermal resources and authorized their development on public lands through the Geothermal Steam Act of 1970. However, geothermal development did not take off as Congress anticipated. One reason for this is that state water laws in the West inhibit its growth.*

*This Comment begins with a primer on geothermal energy production. Next, it looks at how state water laws hinder geothermal development and gives a state-by-state depiction of how these laws apply to geothermal resources. Ultimately, this Comment argues for regulatory reform and focuses on ways around state water laws through the doctrine of federal reserved water rights, preemption, and coproduction.*



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> "Geothermal power . . . stands out as a potentially invaluable untapped natural resource. It becomes particularly attractive in the age of growing consciousness of environmental hazards and increasing awareness of the necessity to develop new resources to help meet our Nation's future energy requirements. The Nation's geothermal resources promise to be a relatively pollution-free source of energy, and their development should be encouraged."[1]
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> - John P. Saylor, United States Congressman, 1970

## INTRODUCTION

The words spoken by former Representative Saylor in 1970 are only truer today than when he advocated for the passage of the Geothermal Steam Act of 1970 (Geothermal Steam Act).[2] Growing concerns over energy independence, global warming, a lack of water, and pollution are all reasons to advocate for the development of geothermal resources. However, geothermal resources have become the forgotten cousin of wind and solar and are all too often left out of the discussion of renewable resources, even though they are a viable domestic resource that can help meet our nation's energy needs.[3] This Comment argues that it is essential for the United States to develop more geothermal resources in the transition to an energy portfolio that incorporates more renewable resources (renewables) because of the advantages that geothermal resources provide over other means of producing electricity, including other renewables.[4]

This Comment focuses on one particular impediment to the production of geothermal resources in the western United

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1. 116 CONG. REC. H34858 (daily ed. Oct. 5, 1970) (comments by former Rep. Saylor on the soon-to-be-passed Geothermal Steam Act of 1970).

2. Geothermal Steam Act of 1970, Pub. L. No. 91-581, 84 Stat. 1566 (1970) (codified at 30 U.S.C. §§ 1001–1027 (2006)).

3. While the federal government does support geothermal resources through providing grants and a structure for the development of geothermal resources on public lands, geothermal energy is rarely mentioned in discussions about renewables. *See, e.g.*, Barack Obama, Remarks at a Town Hall in Cedar Rapids, Iowa (July 31, 2008) ("I'll invest in renewable energies like wind power, solar power, and the next generation of homegrown biofuels. That's how America is going to free itself from our dependence on foreign oil—not through short-term gimmicks, but through a real, long-term commitment to transform our energy sector.").

4. *See infra* Part I.C.

States: state water laws.[5] While many factors have contributed to the slow development of geothermal resources, state water laws have long been recognized as a significant hindrance.[6] Some states have already adapted their laws to encourage geothermal resource development.[7] However, over forty years after the passage of the Geothermal Steam Act,[8] it is still unclear if state water laws bind geothermal developers, and the presumption that state water laws are binding should be challenged. If state laws are not preempted under the current state of the law, regulatory reform should be accomplished in order to foster further development of this invaluable resource. This Comment addresses solutions to the "prior appropriation problem."[9] It takes a broad approach and suggests solutions for states, the Bureau of Land Management (BLM), and geothermal developers.

Part I gives a basic overview of how geothermal energy production works, why it should be promoted, and its current status in the United States, including recent federal statutory and administrative developments. This Part is designed to encourage interest in and enthusiasm for geothermal energy production and to serve as a primer on the history and science thereof. This background gives the lay reader an understanding of the technical aspects of geothermal energy production so as to better understand the legal arguments addressed later in this Comment.

Part II discusses how state water laws sometimes impede the development of geothermal resources. First, it gives a background on the prior appropriation doctrine. Then it demonstrates how the doctrine frustrates the development of geothermal resources. Next, it proposes that state-imposed "renewable portfolio standards" obligate western states to help

5. This Comment focuses on geothermal development in the western United States because more valuable geothermal resources are found closer to the surface in western states as a result of more active tectonic plates. JAN G. LAITOS & JOSEPH P. TOMAIN, ENERGY AND NATURAL RESOURCES LAW IN A NUTSHELL 487 (1992).

6. *See infra* Part II.

7. *See infra* Part III.B.3.

8. The Geothermal Steam Act authorized and developed a leasing scheme for the development of geothermal resources on public lands. 30 U.S.C. §§ 1001–27 (2006). The Act is discussed in more detail below in Part IV.

9. This paper coins the phrase "geothermal's prior appropriation problem," which refers to state water laws that inhibit the growth of geothermal energy development.

foster the development of more geothermal electricity within their respective borders.

Part III argues for state regulatory reform as one solution to the prior appropriation problem. It builds on Part II by depicting how individual states apply the prior appropriation doctrine to the development of geothermal energy production. Specifically, this Part identifies and analyzes the geothermal regulatory structures of Wyoming, Utah, Colorado, New Mexico, Oregon, Idaho, Nevada, and California. Thereafter, this Part suggests regulatory reform in all of these states except California.

Part IV gives a background on the doctrine of federal reserved water rights and explains how the doctrine could be used as a way around the prior appropriation doctrine. This Part looks to the Geothermal Steam Act, the Homestead Act of 1916, and past executive and administrative withdrawals to identify public lands that may have federal reserved water rights for geothermal development, which would avoid the need for appropriating water under state water laws. This Part also suggests that geothermal developers may be immune from state water laws on public lands after land is leased to them, notwithstanding the BLM's interpretation of the applicability of state water laws.

Part V focuses on a basic Supremacy Clause challenge to state water laws. This Part admits that a challenge to state water laws is not currently feasible due to regulations promulgated by the BLM. However, this Comment suggests that the BLM should change its regulations to recognize that federal law preempts certain state water laws. Such an interpretation of the Geothermal Steam Act is more reasonable than the BLM's current policy stance, albeit politically difficult to assert. This Comment contends that under the proposed policy, the BLM's stance would more appropriately align with congressional intent relating to state water laws, and it would also encourage more development of geothermal resources on public lands, which was Congress's general objective in passing the Geothermal Steam Act. To help make this case, this Comment analyzes the intent of Congress in passing the Geothermal Steam Act, as well as the language contained in the Act regarding state water laws, and compares the preemption issues surrounding the Geothermal Steam Act to past federal public land law cases where courts held that federal laws preempted state laws.

Lastly, Part VI introduces and analyzes coproduction—and the use of holes already bored for oil and gas extraction—as a way for geothermal developers to use already appropriated water for the production of geothermal energy and to significantly reduce the economic costs associated with geothermal resource development. This Part evaluates potential legal implications and advantages of developing coproduction systems.[10] In doing so, this Part seeks to increase scholarly interest in coproduction and encourage a more thorough analysis of the legal implications of coproduction in the future.

## I. GEOTHERMAL BASICS

### *A. Defining Geothermal Resources*

Geothermal resources come in many forms, but the easiest way to think about them is as thermal heat typically found under the earth's surface.[11] Geothermal resources are naturally occurring and abundant.[12] They can be found as hot liquids, dry rocks, or steam, and their temperatures vary significantly.[13] Some geothermal resources flow naturally to the earth's surface in the form of geysers or hot springs, while others are trapped beneath the earth's surface.[14]

Geothermal resources are found around the globe.[15] However, only in a few places is the thermal heat hot enough and close enough to the earth's surface to allow for power production.[16] Luckily for developers in the western United States, 1.3 million acres of land in the United States have the

10. There is little scholarly work on coproduction (also spelled co-production). The following are notable exceptions and appear to comprise a somewhat comprehensive list of non-governmental articles on the topic: ALYSSA KAGEL, GEOTHERMAL ENERGY ASS'N, THE STATE OF GEOTHERMAL TECHNOLOGY, PART II: SURFACE TECHNOLOGY 46 (2008); Kurt E. Seel, *Legal Barriers to Geothermal Development*, ROCKY MTN. MIN. L. FOUND., Sept. 10–11, 2009, at 8-7 to 8-8; Karl Schulz, *Evaluating the Energy Independence and Security Act of 2007: Inclusions, Exclusions, and Problems with Implementation*, 38 ENVTL. L. REP. NEWS & ANALYSIS 10763, 10765 (2008).

11. Carl F. Austin, *Technical Overview of Geothermal Resources*, *in* GEOTHERMAL RESOURCES DEVELOPMENT INSTITUTE 2-1 (1977).

12. DOUGLAS M. SACARTO, STATE POLICIES FOR GEOTHERMAL DEVELOPMENT: UNCOVERING A MAJOR RESOURCE 7 (1976).

13. Austin, *supra* note 11, at 2-1 to 2-2.

14. *See* SACARTO, *supra* note 12, at 7.

15. *Id.* at 2 fig.1 (Geothermal Regions of the World).

16. LAITOS & TOMAIN, *supra* note 5, at 487.

potential to produce electricity from geothermal resources,[17] a significant portion of which exists in the West[18] and on federal public lands.[19]

Geothermal resources can be used in a variety of ways. On the small scale, some people use them for heating single-family homes.[20] Other times they are used commercially to heat greenhouses[21] or for aquaculture.[22] However, the scope of this Comment is limited to geothermal resources used to generate electricity.

### *B. Producing Electricity from Geothermal Resources*

Three different systems are currently used to generate electricity from geothermal resources: hot water, vapor-dominated, and binary systems.[23] Typically a geothermal developer must bore a hole, and the resource found will determine which system will be used.[24] Hot water systems are used when a developer finds geothermal fluids hot enough to produce electricity without the use of a secondary fluid.[25] These liquids are piped to the surface where some of the water "flashes" into steam and powers turbines,[26] thereby generating electricity.[27] Vapor-dominated systems work the same way but

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17. *Id.*

18. SACARTO, *supra* note 12, at 2 fig.1. It is significant that these resources exist in western states because most federal public lands are in the West due to the federal government conditioning statehood upon retention of a significant portion of those lands. *See* GEORGE CAMERON COGGINS, CHARLES F. WILKINSON, JOHN D. LESHY, & ROBERT L. FISCHMAN, FEDERAL PUBLIC LAND AND RESOURCES LAW 69 (6th ed. 2007).

19. *See* BUREAU OF LAND MGMT., U.S. DEP'T OF THE INTERIOR, GEOTHERMAL RESOURCES LEASING PROGRAMMATIC EIS, http://www.blm.gov/wo/st/en/prog/energy/geothermal/geothermal_nationwide.html (last visited January 15, 2011) [hereinafter PEIS].

20. WENDELL A. DUFFIELD & JOHN H. SASS, U.S. GEOLOGICAL SURVEY, U.S. DEP'T OF THE INTERIOR, GEOTHERMAL ENERGY–CLEAN POWER FROM THE EARTH'S HEAT, Circular 1249, at 7 (2003).

21. *See* Rosette Inc. v. United States, 277 F.3d 1222, 1225 (10th Cir. 2002).

22. Geothermal Resources Council, *Gators in the Sage*, GRC BULLETIN 246, 247 (Nov./Dec. 2001), *available at* www.geothermal.org/articles/alligators.pdf. In fact, Idaho's first geothermal fish farmer, Leo Ray, opened shop in 1973. Although Ray began with and continues to grow catfish and tilapia, Ray now also grows alligators for their skin and meat. *Id.* at 246–59.

23. DUFFIELD & SASS, *supra* note 20, at 11.

24. *Id.*

25. *Id.*

26. *See* FRED BOSSELMAN ET AL., ENERGY, ECONOMICS AND THE ENVIRONMENT 847 (3d ed. 2010).

27. DUFFIELD & SASS, *supra* note 20, at 11.

are more efficient because steam found within the earth's surface is routed directly to the turbines to generate electricity.[28] Lastly, binary systems are used when geothermal temperatures are not hot enough to produce enough steam to generate electricity.[29] Geothermal fluids are brought to the earth's surface where the heat is transferred to a secondary fluid with a lower boiling point capable of producing steam at a lower temperature.[30] After the heat is transferred, the secondary fluid produces steam that turns turbines.[31] In all three systems, some or all of the fluids extracted from the ground are eventually pumped back into the ground through reinjection wells.[32] Hot water and vapor-dominated systems lose some water through evaporation, but binary systems reinject all groundwater.[33] Figure 1 below demonstrates these three systems:

28. *Id.*
29. *Id.*
30. *Id.* Isobutane is an example of a secondary fluid used in binary systems. *Id.*
31. *Id.*
32. *Id.*
33. ALYSSA KAGEL ET AL., GEOTHERMAL ENERGY ASS'N, A GUIDE TO GEOTHERMAL ENERGY AND THE ENV'T 43–44 (2007), *available at* http://www.geo-energy.org/pdf/reports/AGuidetoGeothermalEnergyandtheEnvironment10.6.10.pdf.

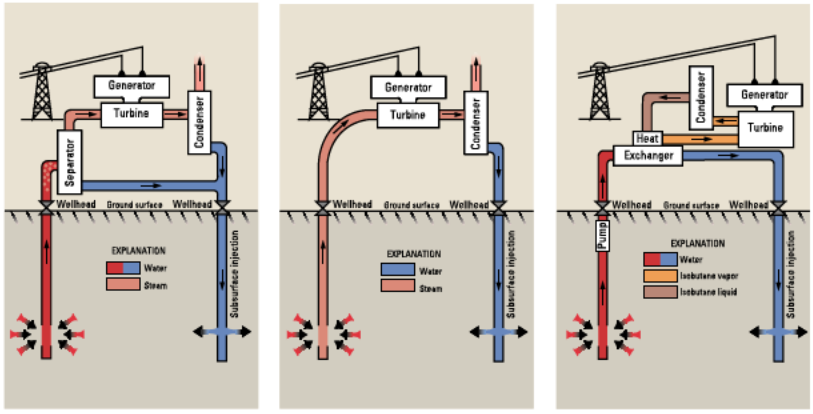


Diagram showing how electricity is generated from a hot-water hydrothermal system. The part of the hydrothermal water that flashes to steam is separated and used to drive a turbine generator. Wastewater from separator and condenser is injected back into the subsurface to help extend the useful life of the hydrothermal system.

Diagram showing how electricity is generated from a vapor-dominated hydrothermal system. Steam is used directly from wells to drive a turbine generator. Wastewater from the condenser is injected back into the subsurface to help extend the useful life of the hydrothermal system.

Diagram showing how electricity is generated from a moderate-temperature hydrothermal system using a "binary" system. The geothermal water is used to boil a second fluid (isobutane in this example) whose vapor then drives a turbine generator. The wastewater is injected back into the subsurface to help extend the useful life of the hydrothermal system

FIGURE 1: United States Geological Survey [34]

### *C. The Attraction of Geothermal Energy*

Concerns over climate change and energy security, as well as the recognition of geothermal energy's value as a clean, renewable, baseload energy source,[35] drive the development of geothermal resources in the United States.[36] Geothermal energy is a very clean source of energy.[37] Generally, the environmental impact of a geothermal electricity plant is much less significant than that of other types of electricity generation.[38] For example, in terms of emissions, a hot water

34. DUFFIELD & SASS, *supra* note 20, at 11 (The diagrams and accompanying text are both from the U.S. Geological Survey.).

35. Baseload power refers to power plants that typically can run without interruption. BOSSELMAN ET AL., *supra* note 26, at 1010.

36. *See* DAN JENNEJOHN, GEOTHERMAL ENERGY ASS'N, U.S. GEOTHERMAL POWER PRODUCTION AND DEVELOPMENT UPDATE 17 (2010), http://www.geo-energy.org/pdf/reports/April_2010_US_Geothermal_Industry_Update_Final.pdf; *see also* Seel, *supra* note 10, at 8-1 (declaring that the environmental benefits of geothermal energy development "greatly outweigh the environmental impacts").

37. BOSSELMAN ET AL., *supra* note 26, at 847.

38. George Vranesh & John D. Musick, Jr., *Geothermal Resources: Water and Other Conflicts Encountered by the Developer*, GEOTHERMAL RES. DEV. INST., 1977, at 6-1, 6-10; *see also* Steven Ferrey, *Environmental Regulation of*

or steam geothermal plant emits about 1% of the sulfur dioxide, less than 1% of the nitrous oxides, and 5% of the carbon dioxide of a coal-fired power plant of similar generating capacity.[39] When binary systems are used, virtually no emissions are released into the atmosphere because geothermal gases and fluids are all reinjected into the ground.[40]

There is also much less physical damage to the environment, even in comparison with other renewables. We now recognize the harsh, and sometimes irreversible, impacts of damming rivers to produce hydropower.[41] Wind turbines are often criticized for harming birds[42] and significantly changing the aesthetics of a landscape or ocean view.[43] Wind farms also use much more land than the typical geothermal power plant.[44]

Geothermal power plants also use significantly less water than some other forms of energy production.[45] Geothermal power plants, on average, consume about 20 liters of water per megawatt hour (MWh[46]).[47] In comparison, solar power plants require significantly more water.[48] Some types of solar power

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*Independent Power*, 1 L. INDEP. POWER § 6:17 (2010) (discussing geothermal energy's low impacts due to low emissions and comparatively low noise pollution).

39. DUFFIELD & SASS, *supra* note 20, at 26.

40. *Id.*; JOHN W. LUND, GEO-HEAT CTR., OR. INST. OF TECH., CHARACTERISTICS, DEVELOPMENT AND UTILIZATION OF RESOURCES 8 (2007), *available at* geoheat.oit.edu/pdf/tp126.pdf.

41. *See* BOSSELMAN ET AL., *supra* note 26, at 848.

42. Robert Johns, *Wind Power Could Kill Millions of Birds Per Year by 2030*, AM. BIRD CONSERVANCY, http://www.abcbirds.org/newsandreports/releases/110202.html (last visited July 10, 2011) ("[T]he build-out of wind energy proposed by the federal government to meet a Department of Energy target of generating 20% of the nation's electricity through wind power is expected to kill at least one million birds per year by 2030, and probably significantly more.").

43. Katherine Q. Seeyle, *Big Wind Farm off Cape Gets Approval*, N.Y. TIMES, Apr. 29, 2010, at A1 (noting that the Cape Cod wind project was long resisted by the late Senator Ted Kennedy and others because many thought it "would create an industrial eyesore in a pristine area").

44. A typical geothermal power plant uses 404 square meters of land per gigawatt hour (GWh) in comparison with the average wind farm that uses 1335 square meters per GWh, and the average coal plant uses 3632 square meters per GWh. LUND, *supra* note 40, at 8.

45. LUND, *supra* note 40, at 8.

46. One MWh is calculated as one MW generated for one hour.

47. LUND, *supra* note 40, at 8. Admittedly, some types of geothermal energy production require much more water. Kathleen Callison, *Water and Geothermal Energy Development in the Western U.S.: Real World Challenges, Regulatory Conflicts and Other Barriers, and Potential Solutions*, 22 PAC. MCGEORGE GLOBAL BUS. & DEV. L.J. 301, 305 (2010) (discussing comparative amounts of water used in different types of geothermal energy production).

48. *See* NAT'L RENEWABLE ENERGY LAB., U.S. DEP'T OF ENERGY, PARABOLIC TROUGH FAQS tbl.1 (June 9, 2011), http://www.nrel.gov/csp/troughnet/faqs.html.

require about 3000 liters per MWh for cooling and mirror washing.[49] Coal-fired power plants use about 1370 liters per MWh.[50] Combined-cycle natural gas power plants require about 750 liters per MWh.[51] Additionally, although precise numbers are not known for how much water is lost in the production of hydropower generated with dams, it is well established that a significant amount of water is lost due to evaporation from the increased surface area of water in reservoirs.[52]

Another attractive aspect of geothermal power production is that it can be utilized more efficiently than solar or wind power.[53] A geothermal power plant can run almost all of the time because the supply of energy is constant. This is known as "baseload power."[54] Comparatively, solar panels only produce energy while the sun shines, and wind only produces electricity while the wind blows at the right speed. This makes these sources of energy less efficient and less economical.[55] To make matters worse, intermittent sources of electricity like solar and wind are problematic due to the complex way our energy grid works.[56] For these reasons, the economics and practicality of

49. U.S. DEP'T OF ENERGY, CONCENTRATING SOLAR POWER COMMERCIAL APPLICATION STUDY: REDUCING WATER CONSUMPTION OF CONCENTRATING SOLAR POWER ELECTRICITY GENERATION 4 [hereinafter U.S. DEP'T OF ENERGY, SOLAR POWER STUDY], *available at* http://www1.eere.energy.gov/solar/pdfs/csp_water_study.pdf (showing these estimates in gallons per MWh).

50. LUND, *supra* note 40, at 8.

51. U.S. DEP'T OF ENERGY, SOLAR POWER STUDY, *supra* note 49.

52. *See* United Nations Environmental Programme, *More Water Evaporates from Reservoirs than is Consumed by Humans*, http://maps.grida.no/go/graphic/more-water-evaporates-from-reservoirs-than-is-consumed-by-humans (last visited Mar. 12, 2011).

53. *See* Ned Farquhar, *Energy, Security, Climate: Converging Solutions*, 29 J. LAND RESOURCES & ENVTL. L. 1, 10 (2009).

54. *See* Farquhar, *supra* note 53, at 10; *see also supra* note 35 and accompanying text (providing an overview of baseload power).

55. This, of course, is unless the energy from solar and wind is stored, which is currently not economically feasible. *See* ARJEN MAKHIJANI, CARBON-FREE AND NUCLEAR-FREE: A ROADMAP FOR U.S. ENERGY POLICY 37–45 (2007), *reprinted in* BOSSELMAN ET AL., *supra* note 26, at 840.

56. Power is managed in real time in our electricity grid and the energy supply must equal the energy demand. Scheduling intermittent sources of energy like solar and wind can be difficult because they are unpredictable and therefore sometimes the energy produced is wasted. Also, because these resources are unreliable, it is necessary to have the ability to produce enough electricity to meet "peak demand" without these resources. Peak demand is the greatest amount of electricity that might be used at any given time. If there is not enough electricity to meet that demand, blackouts and brownouts occur. *Id.* (discussing how solar energy's intermittent output causes problems but is nonetheless more predictable than wind power).

geothermal make more sense than those of other renewables in many circumstances. This is especially true compared to solar, which continues to be economically impracticable in most circumstances.[57] While this Comment is not attempting to discourage the development of wind, solar, and other renewables, it is attempting to show that geothermal can be more beneficial in some circumstances and that, despite these benefits, it is often left by the wayside.[58]

### *D. A Brief History and Current Developments*

#### 1. Technology

Geothermal resources were first used to produce electricity in Italy as early as 1904.[59] In 1922 the first geothermal power plant in the United States was put into production at a hotel resort in Lake County, California.[60] It had the generating capacity of 0.25 MW, which was enough electricity to light the buildings and the streets at the resort.[61] However, this geothermal power plant fell into disuse as other, more competitive sources of electricity came into use.[62]

Since then, technological advancements have made geothermal energy production much more viable and will continue to make it more affordable as technology advances. By 1960, the first large-scale geothermal power plant in the United States went into operation, with a generating capacity of 11 MW.[63] This is enough electricity for about 11,000 homes.[64] There have also been significant advancements in

57. *See id.* at 838.

58. Admittedly, geothermal development has its own deleterious environmental effects resulting from drilling, clearing land for power plants, and other minimal environmental effects as discussed above. 4 GEORGE C. COGGINS & ROBERT L. GLICKSMAN, PUBLIC NATURAL RESOURCES LAW § 40:21 (2d ed. 2011).

59. United States v. Union Oil, 549 F.2d 1271, 1273 (9th Cir. 1977) (citing John W. Brooks, Jr., *Legal Problems of the Geothermal Industry*, 6 NAT. RESOURCES J. 511, 514–15 (1966)).

60. U.S. DEP'T OF ENERGY, A HISTORY OF GEOTHERMAL ENERGY IN THE UNITED STATES (2011), *available at* http://www1.eere.energy.gov/geothermal/history.html.

61. *Id.*

62. *Id.*

63. *Id.*

64. *See* Craig D. Galli, Steven W. Snarr & Michael N. Thatcher, *Getting Into Hot Water: Current Hot Topics in Geothermal Development*, 55 ROCKY MTN. MIN. L. INST. 6-1, 6-4 (2009) (indicating that 725 MW can produce enough electricity for 725,000 homes).

lowering the temperatures needed for geothermal power production. Until recently, only temperatures over 93ºC (200ºF) were deemed commercially viable for successful power generation from geothermal resources.[65] However, in 2006, the Chena Hot Springs Resort in Alaska successfully generated power using 74ºC (165ºF) water and a binary system.[66] This technology proved very useful for the resort owner as it allowed him to produce electricity for less than a quarter of the cost.[67]

Binary plant designs have also allowed power developers to substantially reduce plant construction lead times. One noteworthy example is the Hatch Power Plant in Utah, completed in November 2008. The plant is capable of producing at least 10 MW of net electricity.[68] The entire project was built and brought online[69] in less than one year, with construction completed in just six months instead of the typical three years it takes for a hot water or vapor-dominated geothermal power plant.[70]

The Hatch Power Plant project is remarkable not only because of its rapid construction, but also because of the flexibility of its modular approach, which allows it to be adapted to various locations.[71] This plant design can be scaled to the local geothermal resource, energy demand, and available financing.[72] Its inventors claim that the geothermal resource at Hatch has the potential of generating more than 200 MW.[73] To help reach this production capacity, the company plans to add ten more geothermal power plants in the area.[74]

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65. JONATHON CROSS & JEREMIAH FREEMAN, U.S. DEP'T OF ENERGY, 2008 GEOTHERMAL TECHNOLOGIES MARKET REPORT 16 (2009), *available at* http://www1.eere.energy.gov/geothermal/pdfs/2008_market_report.pdf.

66. *Blowing Hot and Cold: Geologists Are Getting More Juice out of the Ground*, ECONOMIST, Sept. 14, 2006, *available at* http://www.economist.com/node/7905301?story_id=7905301.

67. JOHN W. LUND, GEO-HEAT CTR., CHENA HOT SPRINGS 2, 3 (2006), *available at* http://geoheat.oit.edu/bulletin/bull27-3/art2.pdf. Beforehand, the resort used diesel generators. *Id.*

68. *See* JENNEJOHN, *supra* note 36, at 17.

69. To be brought "online," as used in this Comment, means that the power plant is sending electricity to the grid.

70. CROSS & FREEMAN, *supra* note 65, at 17.

71. *Id.*

72. *Id.*

73. *Id.*

74. *Id.*

### 2. Federal Statutory and Administrative Regulations

In addition to the technological developments mentioned above, federal programs have also caused a renewed interest in geothermal energy production.[75] More specifically, the Energy and Policy Act of 2005[76] (EPAct of 2005) and the BLM's overhaul of its regulatory leasing policy[77] have increased interest in[78] and production of geothermal energy.[79]

#### *a. Energy and Policy Act of 2005*

In the omnibus EPAct of 2005,[80] the federal government laid much of the groundwork for the current upswing in interest and investment in geothermal energy production through its new leasing system.[81] Under the EPAct of 2005, if a developer wants to lease land, she must nominate the land to be leased.[82] Thereafter a competitive bidding process is required.[83] Once the land is leased, the developer has exclusive rights to develop that resource for ten years with the ability to extend the lease.[84]

Aside from the regulatory restructuring, the federal government has recently increased its support of geothermal power production through grants,[85] investment credits,[86] and a directive to the BLM to (1) identify lands as open or closed to geothermal energy production and (2) address the growing interest in geothermal resources on public lands.[87]

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75. *Id.* (noting the federal role in increasing interest in geothermals).

76. Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594 (2005).

77. *See* BUREAU OF LAND MGMT., U.S. DEP'T OF THE INTERIOR, RECORD OF DECISION AND RESOURCE MANAGEMENT PLAN AMENDMENTS FOR GEOTHERMAL LEASING IN THE WESTERN UNITED STATES, at Abstract (2008) [hereinafter U.S. DEP'T OF THE INTERIOR, ROD], *available at* http://www.blm.gov/pgdata/etc/medialib/blm/wo/MINERALS__REALTY__AND_RESOURCE_PROTECTION_/energy/geothermal_eis/final_programmatic.Par.90935.File.dat/ROD_Geothermal_12-17-08.pdf.

78. Galli et al., *supra* note 64, at 6-4 to -5.

79. *See* JENNEJOHN, *supra* note 36, at 4.

80. Energy Policy Act of 2005, 42 U.S.C. §§ 221–237 (2005).

81. *See* Galli et al., *supra* note 64, at 6-8.

82. *See* 30 U.S.C. § 1003 (2006).

83. *See id.* § 1003(b).

84. *See id.* § 1005.

85. *See, e.g.*, 42 U.S.C.A. § 17195(c) (West 2010).

86. Energy Policy Act of 1992, Pub. L. No. 102-486, § 1916, 106 Stat. 2776, 3024 (1992).

87. *See* PEIS, *supra* note 19.

### *b. The BLM's Record of Decision (ROD)*

At the direction of the EPAct of 2005,[88] the BLM created a Programmatic Environmental Impact Statement (PEIS).[89] Based on the PEIS, in December 2008 the BLM released a ROD,[90] which announced that, as a result of its analysis, federal public lands in twelve western states could be leased for geothermal energy production.[91] It did this in order to facilitate geothermal leasing in an environmentally responsible way while also addressing the growing interest in geothermal energy production on federal lands.[92] The BLM estimated that public lands open for geothermal development have a reasonable potential of producing 12,210 MW of electricity from 244 plants by 2025.[93] Currently, the BLM administers 480 geothermal leases on public lands, and 54 of those are producing electricity from geothermal resources.[94]

A lessee of a geothermal lease is endowed the non-exclusive right to explore the area and the exclusive right to use and produce geothermal energy in the area.[95] However, the lease issuance does not authorize "ground disturbing activities." [96] Rather, site-specific approval is still needed for

88. *See* Energy Policy Act of 2005, 42 U.S.C. §§ 211, 221–37 (2005) (encouraging development of geothermal energy and requiring administrative agencies "to ensure timely completion of administrative actions . . . necessary to process applications for geothermal leasing"). *Id.* § 222(d)(I).

89. *See* PEIS, *supra* note 19. A programmatic EIS differs from an ordinary EIS because it assesses a broader, overarching plan whereas an EIS is site-specific. *See* Amending Land Use Plans with Programmatic EISs, BLM 2009 National Land Use Planning Conference "Keeping Pace with Change" 3–5, *available at* http://www.blm.gov/pgdata/etc/medialib/blm/wo/Planning_and_Renewable_Resources/presentations.Par.49126.File.pdf/Amending_LUPs_with_Programmatic_EISs_2.pdf.

90. "[A] ROD is the final step for agencies in the EIS process. The ROD is a document that states what the decision is; identifies the alternatives considered, including the environmentally preferred alternative; and discusses mitigation plans, including any enforcement and monitoring commitments." EXEC. OFFICE OF THE PRESIDENT, COUNCIL ON ENVTL. QUALITY, A CITIZENS GUIDE TO THE NEPA: HAVING YOUR VOICE HEARD 19 (2007), *available at* http://ceq.hss.doe.gov/nepa/Citizens_Guide_Dec07.pdf.

91. U.S. DEP'T OF THE INTERIOR, ROD, *supra* note 77, app. A, at A-1 to -7 tbl. A-1, (showing public lands in each of the twelve states that are open for leasing).

92. *See id.* at 1-4 to -5.

93. *Id.* at 1-9.

94. *Id.* at 1-1.

95. *Id.* at 1-7.

96. *Id.*

these activities.[97] In addition, some states require geothermal developers to appropriate water under that state's water laws in order to develop geothermal resources, even on federal public lands.[98]

### *c. Other Federal Encouragement*

The 2009 American Recovery and Reinvestment Act (ARRA)[99] provided further support for geothermal development by appropriating up to $338 million in new funding for implementation by the Geothermal Technologies Program for research, development, demonstration, and deployment activities.[100]

On March 11, 2009, Interior Secretary Ken Salazar issued Order 3285,[101] which created an Energy and Climate Change Task Force. Its purpose is to identify, quantify, and prioritize geothermal and other renewable energy projects and transmission projects and to streamline compliance with the National Environmental Policy Act, Endangered Species Act, and other applicable laws that might burden geothermal developers.[102] On May 5, 2009, Secretary Salazar announced that he would open four renewable energy-permitting offices and smaller renewable energy teams in other western states in order to encourage and expedite development of renewable energy projects, including geothermal.[103]

## *E. Summary*

Due in large part to the factors discussed above, the United States now leads the world in online geothermal energy capacity and continues to increase production.[104] Currently, the United States has a total installed capacity of 3086.6 MW, and since 2006 the number of projects in development has

97. *Id.* Site-specific approval is often needed by states because of states' police powers over environmental concerns. *See* BOSSELMAN ET AL., *supra* note 26, at 13 (discussing the role that state agencies have in regulating power production).

98. *See infra* Part III.

99. American Recovery and Reinvestment Act of 2009, Pub. L. No. 111-5, 123 Stat. 115 (2009).

100. JENNEJOHN, *supra* note 36, at 22.

101. *See* SEC'Y OF THE INTERIOR, U.S. DEP'T OF THE INTERIOR, ORDER NUMBER 3285 (2009), *available at* http://solareis.anl.gov/documents/docs/SOenergy.pdf.

102. Galli et al., *supra* note 64, at 6-5.

103. *Id.* at 6-5 to -6.

104. *See id.* at 6-4.

continued to increase at a steady rate.[105] The Geothermal Energy Association found that from March 2009 through April 2010, the number of identified and confirmed projects in development rose from 121 to 152, an increase of 26%.[106]

In 2008, geothermal electrical production reached 15 million MWh, representing approximately 0.36% of the United States' total electrical production and 12.13% of electricity generated from renewables, not including hydropower.[107] However, a study issued by the United States Geological Survey estimates that there are enough geothermal resources to generate up to 10% of the United States' total energy needs.[108] While the current trend is encouraging, the current rate of development must increase in order to make a significant impact on our domestic electricity use.

## II. DEFINING GEOTHERMAL'S PRIOR APPROPRIATION PROBLEM

This Part begins by explaining the prior appropriation doctrine in order to provide the necessary legal background for understanding the allocation of water rights in western states and how this allocation affects geothermal development. Next, this Part analyzes how the prior appropriation doctrine impedes geothermal resource development and why the prior appropriation doctrine is a poor fit for the production of geothermal electricity. Lastly, this Part recognizes western states' commitments to increasing the development of renewable resources—particularly in the area of renewable portfolio standards (RPS) and cap-and-trade legislation—as another reason why reform is necessary.

### *A. The Prior Appropriation Doctrine*

Prior appropriation is the primary water allocation system in the western United States.[109] The system is premised on the

105. *See* JENNEJOHN, *supra* note 36, at 3–4.
106. *Id.* at 19.
107. CROSS & FREEMAN, *supra* note 65, at 12.
108. Galli et al., *supra* note 64, at 6-4.
109. JAMES RASBAND ET AL., NATURAL RESOURCES LAW AND POLICY 777 (2d ed. 2009). This system developed in strong contrast to riparianism. *See* CHARLES F. WILKINSON, CROSSING THE NEXT MERIDIAN 232 (1992). Under riparianism, water rights derive from an ownership of land. *See* JOSEPH L. SAX ET AL., LEGAL CONTROL OF WATER RESOURCES 28–29 (4th ed. 2006).

idea of "first in time, first in right."[110] That is, whoever is first to divert and make beneficial use of water obtains vested rights to use that same amount of water in the future.[111] Once a water right is established, it is superior to claims by all subsequent appropriators; the person who diverted before another is the "senior" and the person who diverted water afterwards is the "junior" for purposes of priority.[112] This system allows for the senior to divert water whenever it is available, whereas the junior cannot divert water if the diversion would leave a senior's water rights unmet.

This system developed partly because of the arid nature of lands west of the 100th Meridian and partly as a result of history.[113] As Americans moved west after the 1848 discovery of gold in California, those who made use of water for mining, farming, ranching, and development needed assurance that their efforts would not be futile.[114] Investments of time and money would have been much less attractive without the guarantee of future access to water. Prior appropriation provided the legal backdrop necessary for western settlement and development and remains the law today in most western states.[115]

In all of the states discussed in this section, groundwater is typically subject to the prior appropriation doctrine.[116] Generally, water laws in these states require a permit to appropriate groundwater.[117]

### *B. Impediments to the Developer*

The problem of subjecting the use of geothermal fluids to the prior appropriation doctrine is multifaceted. First, the administrative burdens on geothermal developers on federal lands are excessive, as geothermal resources are usually not potable and cannot be used for agriculture, ranching, or

110. *See* WILKINSON, *supra* note 109, at 233.
111. SAX ET AL., *supra* note 109, at 125.
112. SAX ET AL., *supra* note 109, at 126; WILKINSON, *supra* note 109, at 234.
113. *See* RASBAND ET AL., *supra* note 109.
114. *See id.*
115. Scott L. Campbell & Davis Wright Tremaine, *Examination of Title to Western Water Rights*, 31B ROCKY MTN. MIN. L. INST. 9 (1992).
116. *Id.*
117. *Id.*; *see also* COLO. REV. STAT. § 37-90-107(1) (2010).

drinking due to their temperature and mineral content,[118] and geothermal energy production by use of binary systems is nonconsumptive.[119] Furthermore, "[geothermal] resources are usually sufficiently physically separate from aquifers used for normal consumptive purposes to merit separate treatment."[120] Even though these resources may not be in great demand by other appropriators,[121] a lack of water in the West makes it difficult to appropriate these resources for fear that use of the resources will impact other water users.[122]

Second, complying with some state processes can be discouraging for geothermal developers. Meeting the requirements can be extremely burdensome because prior appropriation was not developed with the use of geothermal resources in mind.[123] Indeed, scholars have identified prior appropriation as an ill-fitting system for geothermal development precisely for this reason.[124]

Lastly, in states like Colorado—where there is little case law, a lack of guiding secondary sources, and little to no development of geothermal resources—geothermal developers may be unsure of what geothermal laws require. Therefore, even though a geothermal developer may be exempt from prior appropriation laws for certain types of geothermal development, such laws may be unclear to a developer. Without administrative guidance or clear statutes, a geothermal developer will likely be discouraged.

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118. DANIEL JENNEJOHN ET AL., GEOTHERMAL ENERGY ASS'N, GEA ISSUE BRIEF: GEOTHERMAL ENERGY AND WATER CONSUMPTION 1 (2009), *available at* http://www.geo-energy.org/reports/Geothermal_Energy_and_Water_Consumption_Issue_Brief.pdf; *see also*, ALYSSA KAGEL ET AL., GEOTHERMAL ENERGY ASS'N, A GUIDE TO GEOTHERMAL ENERGY AND THE ENVIRONMENT 43–44 (2007), *available at* http://www.geo-energy.org/pdf/reports/AGuidetoGeothermalEnergyandtheEnvironment10.6.10.pdf.

119. *See supra* Part I.B.

120. A. DAN TARLOCK, LAW OF WATER RIGHTS AND RESOURCES § 6:6 (2010); Ralph B. Kostant, *Geothermal Law—The Last and Next 23 Years*, 37 ROCKY MTN. MIN. L. INST. 2-1, 2-3 to -4 (1991).

121. Owen Olpin, *The Law of Geothermal Resources*, 14 ROCKY MTN. MIN. L. INST. 123, 134 (1968).

122. *See generally* Kathleen Callison, *Water and Geothermal Energy Development in the Western U.S.: Real World Challenges, Regulatory Conflicts and Other Barriers, and Potential Solutions*, 22 PAC. MCGEORGE GLOBAL BUS. & DEV. L.J. 301, 307 (2010) (addressing the noteworthy lack of water and desire for water in the West and discussing the prediction of a "potential water supply crises by 2025").

123. *See* Joseph W. Aidlin, *Representing the Geothermal Client*, 19 ROCKY MTN. MIN. L. INST. 3, 38–39 (1974).

124. *See id.*; SACARTO, *supra* note 12, at 2.

For example, imagine being a geothermal developer who wants to build a geothermal power plant on public lands. First, obtaining water rights in the arid West will be difficult because often there is little to no water to appropriate.[125] Further, as Joseph Aidlin once recognized, it will be difficult "to know in advance how many gallons of geothermal water or how many pounds of geothermal steam will be required to produce one kilowatt hour of electricity [and] to know in advance what the rate of heat decline will be over the years," and therefore it will be difficult to fill out the necessary permit applications.[126] Conversely, it would be much more enticing to develop geothermal resources in a state that does not require developers to go through an arduous and often unnecessary prior appropriation permitting process. It is precisely for these reasons that some legislatures and courts classify geothermal resources as minerals and explicitly exempt developers from prior appropriation laws.[127]

### *C. State Obligations Regarding Renewables*

Understanding RPSs and cap-and-trade legislation is important for the policy argument below, which asserts that states are legally obligated by their own legislation to support the development of more renewables within their borders.[128] RPSs are state targets that require a certain percentage of the electricity generated or bought and sold in a state to come from renewable energy sources.[129] For example, Colorado, with some exceptions, requires 30% of all retail electricity sales to be generated from renewable resources by 2020.[130] As of August 2011, twenty-nine states, the District of Columbia, and Puerto

125. *See* Callison, *supra* note 122, at 307 (discussing water shortages in the West).

126. *See* Aidlin, *supra* note 123, at 38.

127. *See* TARLOCK, *supra* note 120, § 6:6.

128. *See infra* Part III.C.

129. *See* INTERSTATE RENEWABLE ENERGY COUNCIL, U.S. DEP'T OF ENERGY, RPS POLICIES (2011), http://dsireusa.org/summarymaps/index.cfm?ee=1&RE=1 (showing states with RPS standards, their percentage targets, and the dates to reach those targets).

130. *See* COLO. REV. STAT. § 40-2-124(1)(c)(I)(E) (2010). Cooperative electric associations and municipally owned utilities have the lower standard of generating 10% of their electricity from renewables by 2020. *Id.* § 40-2-124(1)(c)(V)(D).

Rico have adopted RPS mandates, and another eight states have "renewable portfolio goals."[131]

Cap-and-trade legislation might also drive the development of renewables. Cap-and-trade proposals function in various ways. However, they all share a common element: The amount of emission of carbon or other greenhouse gases is capped at a certain amount of pollutants, and if a state or entity wants to emit more carbon, they must then buy it from an entity that emits less carbon than the given amount. Some eastern states are in the process of implementing cap-and-trade legislation,[132] and western states are currently considering similar measures.[133] As demonstrated below, geothermal energy development has a significant role to play in helping states meet these goals.

## III. SOLUTION ONE: STATE-BY-STATE REGULATORY REFORM

This Part classifies western states into three categories based on how those states apply the prior appropriation doctrine to geothermal resource development. Indeed, not all states subject geothermal development to the prior appropriation doctrine. Rather, states vary significantly in their respective approaches to regulating geothermal resource development.[134]

For this analysis, I propose a new taxonomy based on how states' water law systems treat geothermal resources.[135] The

131. *See* INTERSTATE RENEWABLE ENERGY COUNCIL, U.S. DEP'T OF ENERGY, RPS POLICIES (2011), http://dsireusa.org/summarymaps/index.cfm?ee=1&RE=1. The U.S. Congress has also proposed legislation to create a federal standard. *See* Renewable Electricity Promotion Act of 2010, S. 3813, 111th Cong. § 2 (2010). The current federal proposals would not supplant state goals, but generally would require that all load serving entities (a "load serving entity" is an electric company that buys power on the wholesale market and provides electricity services to customers such as residences) in the country to get 15% of their energy from renewables by 2039. *Id.* § 610(b)(1)(B) (2010).

132. *See* REG'L GREENHOUSE GAS INITIATIVE, EXECUTIVE SUMMARY, http://www.rggi.org/docs/RGGI_Executive_Summary.pdf (last visited July 25, 2011).

133. *See* W. CLIMATE INITIATIVE: DESIGN FOR THE WCI REGIONAL PROGRAM 1 (2010), *available at* http://westernclimateinitiative.org/component/remository/func-startdown/282/.

134. Galli et al., *supra* note 64, at 6-9.

135. Past scholars have simply classified states based on whether states treat geothermal resources as minerals, water, or *sui generis*, which is Latin for "[o]f its own kind or class." BLACK'S LAW DICTIONARY 1602 (4th ed. 1968). From there, these scholars analyze the impacts of these classifications. *See, e.g.*, Galli et al., *supra* note 64, at 6-12 to -14. Here, I do not use this typical classification because I

first category represents the most hostile approach, where developers are subject to the prior appropriation doctrine without exception. Utah, Wyoming, and Montana[136] follow this model. This Comment also places Colorado in this section. Even though Colorado statutes declare that geothermal developers may be exempted from acquiring a permit to appropriate water, the implementing regulations do not mention this exemption, and it appears that the State Engineer has never granted any of these waivers.[137] The second category is for states that conditionally exempt geothermal developers from the prior appropriation doctrine based on the temperature of the geothermal resource. New Mexico, Oregon, and Idaho fit into this category.[138] The third category consists of states that classify geothermal resources as minerals, either implicitly or explicitly, to foster the growth and development of the industry.[139]

### *A. Classifications*

#### 1. Prior Appropriation

The following states do not make prior appropriation exceptions for the development of geothermal resources. As the

find the classification that I have laid out more helpful and accurate for the purposes of identifying how states apply the prior appropriation doctrine. This is mainly because "*sui generis*" is not really its own classification. For example, Montana calls geothermal resources *sui generis* but then treats geothermal resources as water for purposes of water rights acquisition, like Utah and Wyoming. *See infra* Part III.A.1. On the other hand, in Idaho, where geothermal resources are also classified as *sui generis*, geothermal resources are exempt from Idaho's water laws so long as the water is above 212°F, and therefore the classification more closely resembles the systems used in New Mexico and Oregon. *See infra* Part III.A.2. Admittedly, any classification of states based on geothermal laws is an oversimplification as geothermal laws are complex and extremely diverse.

136. Montana's geothermal resource laws are not discussed in-depth below. While Montana classifies geothermal resources as *sui generis*, MONT. CODE ANN. § 77-4-104 (2010), Montana still subjects all geothermal development to the prior appropriation doctrine. *Id.* § 77-4-108 (2010); *Id.* §§ 85-2-102(1), (8), (19).

137. The Colorado State Engineer was unable to state if these waivers have ever been granted because "[t]o date, geothermal development in Colorado that is diversionary is not usually reinjected and is not applied to energy development." E-mail from Kevin G. Rein, Assistant State Engineer, Colorado Division of Water Resources, to Justin Plaskov, Author (Jul. 25, 2011, 07:52 MDT) [hereinafter Rein E-mail] (on file with the University of Colorado Law Review).

138. *See infra* Part III.A.2.

139. Owen Olpin, A. Dan Tarlock & Carl F. Austin, *Geothermal Development and Western Water Law*, 1979 UTAH L. REV. 773, 804.

numbers show, states that subject geothermal development to the prior appropriation doctrine without making exceptions lag behind other states in terms of current generation of geothermal energy production.[140]

Utah defines geothermal resources as "heat energy."[141] Ownership of heat associated with geothermal resources "derives from an interest in land and not from an appropriative right to geothermal fluids."[142] However, it expressly excludes any ownership rights to subsurface waters associated with heat.[143] Rather, geothermal resources are deemed a special kind of groundwater resource.[144] As such, development of those resources requires the developer to publicly advertise the application and to have a hearing for any protests of such appropriation.[145] Utah currently has an installed capacity of 42 MW and another 628–883 MW in development.[146]

In Wyoming, the use of water for the purpose of extracting heat is considered a "beneficial use" subject to the prior appropriation doctrine.[147] Geothermal resources are defined as groundwater.[148] A groundwater developer must apply for and obtain a permit in Wyoming before constructing a well.[149] A developer may bore a hole for "mineral exploration, oil and gas exploration, stratigraphic information or any other purpose not related to groundwater development."[150] While one may argue that geothermal energy development is not "groundwater development," and therefore should be exempt from the prior appropriation permit requirement, this argument is unlikely to persuade a court.[151] Therefore, developers must get a permit

140. This Comment does not contend that prior appropriation is the sole reason why these states lag behind other states in terms of geothermal development. Naturally, the amount of resources found within a state, the location of those resources, administrative guidance, and other factors also play a role in geothermal development.

141. *See* UTAH CODE ANN. § 73-22-3(5) (West 2010).

142. *Id.* § 73-22-4 (West 2010).

143. *Id.* § 73-22-8 (West 2010).

144. *Id.*

145. *Id.*

146. JENNEJOHN, *supra* note 36, at 16.

147. WYO. STAT. ANN. § 41-3-101 (2010).

148. *Id.* § 41-3-901 (2010).

149. *Id.* § 41-30-930(a) (2010).

150. *Id.*

151. *See* Lawrence J. Wolfe & Jennifer G. Hager, *Wyoming's Groundwater Laws: Quantity and Quality Regulation*, 24 LAND & WATER L. REV. 39, 47 (1989) (explaining that anyone in Wyoming who wants to withdraw groundwater for a beneficial use must obtain a permit before drilling).

before drilling. The application for a permit must contain the "estimated depth of the proposed well, the quantity of water proposed to be withdrawn and beneficially utilized in gallons per minute and acre-feet per calendar year."[152] These requirements inevitably present many obstacles to a geothermal developer because such specifics are difficult to accurately predetermine.[153] However, the State Engineer has discretion to issue any permits "subject to such conditions as he may find to be in the public interest."[154] Thus, one could argue that it is in the public interest to develop more geothermal resources and that such strict standards should not apply to geothermal developers. Wyoming has a current installed capacity of 0.25 MW and another 0.28 MW in development.[155]

Colorado is an anomaly in that its statutes provide for exemption from the prior appropriation permitting system, but the corresponding implementing regulations make no mention of the exemption. Consequently, there is uncertainty surrounding the geothermal laws in the state and little geothermal development in the state. This is especially true since it appears unlikely that the State Engineer will grant these waivers in the future.[156]

In Colorado, appropriation of any water used for geothermal development is recognized as a beneficial use of water.[157] As such, a geothermal developer must apply for and obtain a permit from the State Engineer to appropriate geothermal fluids.[158] However, the legislature declared that the prior appropriation doctrine "should be modified to permit the full economic development of the resource."[159] Therefore, the required appropriation permit "may be waived by the State Engineer for a diversionary utilization method which is nonconsumptive and which will not impair valid, prior water

152. WYO. STAT. ANN. § 41-30-930(a) (2010).
153. *See* Aidlin, *supra* note 123.
154. WYO. STAT. ANN. § 41-3-933 (2010).
155. JENNEJOHN, *supra* note 36, at 18.
156. The Assistant State Engineer, Kevin Rein, stated that "with the concern about impacts from ground water diversions in the state, I believe that it is unlikely that the Division of Water Resources would waive the permit requirement for a significant diversion of a geothermal resource for energy production, even if it was to be 100 percent reinjected." Rein E-mail, *supra* note 137.
157. COLO. REV. STAT. § 37-90.5-107(1) (2010).
158. *Id.* § 37-90.5-107(1), (2)(a).
159. *Id.* § 37-90.5-102(1)(c).

rights."[160] This language appears to indicate that geothermal developers can use binary systems without needing to appropriate water under Colorado's geothermal statutes, because binary systems are nonconsumptive.

However, the lack of administrative regulations addressing this exemption suggests that these waivers are not being granted because they are within the discretion of the State Engineer. The rules themselves recognize that they "are required to enable the State Engineer to carry out the provisions of the Colorado Geothermal Resources Act."[161] They state that a "permit issued by the State Engineer shall be obtained prior to construction or use of any geothermal well."[162] A variance may be requested "[w]hen the strict application of any provision of these Rules presents practical difficulties or unusual hardship."[163] Nevertheless, these regulations do not make it clear that a variance may be given for nonconsumptive uses. Nor do they make it clear how nonconsumptive geothermal projects will be treated.[164]

Colorado currently does not have any installed capacity of geothermal energy and has only 10 MW in development.[165] Most troubling about the meager amount of geothermal resources in production in Colorado is the great potential within the state. A recent Massachusetts Institute of Technology study found that Colorado has the greatest potential of any state to produce geothermal electricity between the depths of 10,000 and 13,000 feet, a depth currently reachable with oil drilling rigs.[166]

### 2. Exemption Based on Temperature

Some states, recognizing that geothermal resources over a certain temperature are unlikely to be used by other appropriators, exempt very hot geothermal fluids from the prior appropriation doctrine. In those states, development of geothermal resources is moderate.

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160. *Id.* § 37-90.5-102(2)(a).
161. COLO. CODE REGS. § 402-10, 3.1 (2011).
162. *Id.* § 402-10, 6.1.2 (2011).
163. *Id.* § 402-10, 14.1 (2011).
164. *See id.* §§ 402-10, 1 to 18 (2011).
165. JENNEJOHN, *supra* note 36, at 8.
166. Press Release, U.S. Dep't of the Interior, Bureau of Land Management, Colorado Collaborate to Advance Efficient Geothermal Development (Mar. 15, 2011) (on file with the University of Colorado Law Review).

New Mexico classifies geothermal resources as a hybrid between a mineral and water resource and thus sometimes subjects geothermal development to the prior appropriation doctrine. If the fluid has a temperature over 250°F, then the resource is considered a mineral.[167] However, geothermal resources at or below 250°F are considered water resources and therefore subject to the prior appropriation doctrine.[168] New Mexico has a currently installed capacity of 0.24 MW and another 35 MW in development.[169]

Oregon also exempts water above 250°F from the prior appropriation doctrine.[170] Uniquely, Oregon's laws state that if interference between a geothermal well and an existing water appropriation occurs, the Water Resources Director is required to resolve the conflict considering the most beneficial use of the water and heat resources.[171] This allows existing users to continue to use those resources to the greatest extent possible while also protecting the public's interest in the efficient use of water and heat resources. By contrast, most states do not have this sort of balancing process. Oregon has a currently installed capacity of 0.28 MW and another 342–473 MW in development.[172]

Idaho, a state with considerable geothermal resources,[173] defines geothermal resources as heat resources above 212°F found inside the earth.[174] Idaho classifies geothermal resources as *sui generis*—neither a mineral resource nor a water resource—while recognizing that the resource is "closely related to and possibly affecting and affected by water and mineral resources in many instances."[175] This avoids the need for a developer to demonstrate that a geothermal well will not impair other existing water rights, as required under the water appropriation statutes.[176] Developers also are not required to

167. N.M. STAT. ANN. § 71-5-2.1 (West 2010).
168. *Id.*
169. JENNEJOHN, *supra* note 36, at 14.
170. *See* OR. REV. STAT. § 522.025 (2010).
171. *Id.* § 522.255.
172. JENNEJOHN, *supra* note 36, at 15.
173. Laura MacGregor Bettis, Comment, *In Hot Water: Can Idaho's Ground Water Laws Adequately Govern Low Temperature Geothermal Resources?*, 39 IDAHO L. REV. 113, 113–16 (2002).
174. IDAHO CODE ANN. § 42-4002(c) (2010).
175. *Id.*
176. *See id.*

specify how much water will be used.[177] The statute requires a developer to give "the character and composition of the material expected to be derived from the well," rather than an account of how much water is expected to be used.[178] Under the Idaho system, a developer does not need a permit to appropriate water. A developer need only conform to Idaho's groundwater permitting process if the proposed permit will decrease the groundwater.[179] Idaho has a currently installed capacity of 15.8 MW and another 413–676 MW in development.[180]

### 3. More Favorable Approaches

Nevada and California have well-established geothermal laws that provide exemptions from the states' prior appropriation laws. Due in part to these exemptions, these states produce a significant amount of electricity from geothermal resources.

In Nevada, "[t]he owner of real property owns the rights to the underlying geothermal resources unless they have been reserved by or conveyed to another person."[181] Nevada exempts geothermal wells from the prior appropriation process as long as all of the water is reinjected into the same source.[182] Unlike Colorado's statute, which gives discretion to the State Engineer to exempt geothermal developers from the state permitting process,[183] Nevada's language is mandatory.[184] However, "if

177. *See generally id.* § 42-4003 (describing requirements for geothermal resource well permits).

178. *Compare id.* § 42-4003(a)(4), *with* WYO. STAT. ANN. § 41-3-930(a) (2010) (requiring prospective permittees to specify "the quantity of water proposed to be withdrawn and beneficially used in gallons per minute and acre-feet per calendar year").

179. *See* IDAHO CODE ANN. § 42-4005(e) (2010).

180. JENNEJOHN, *supra* note 36, at 9.

181. NEV. REV. STAT. § 534A.050 (2010).

182. Telephone Interview with Thomas K. Gallagher, P.E., Manager II, Section Chief, Drilling Regulation and Special Projects, Nev. Div. of Water Res., (Mar. 5, 2011 17:02 MST ) [hereinafter Gallagher Interview] (email confirming the content of the interview is on file with the author and the Colorado Law Review) (if the water is reinjected but is diversionary, then this exemption does not apply); *see* NEV. REV. STAT. § 534A.040(1)–(2). Nevada also allows for a reasonable amount of water to be lost during well testing and for temporary system failures. *Id.*

183. *See* COLO. REV. STAT. § 37-90.5-107(b) (2010).

184. The Nevada statute states that:

> A consumptive use of water brought to the surface outside of a geothermal well is subject to the appropriation procedures of chapters 533 and 534 of NRS, except for:

water is brought to the surface as a by-product of geothermal development for a consumptive use, the groundwater appropriation statute applies."[185] This means that binary systems are exempt from groundwater appropriation statutes.[186] Nevada formerly subjected all geothermal resources to the prior appropriation doctrine[187] but amended its statutes to help foster the development of geothermal energy in the state.[188] Nevada has a currently installed capacity of 433.4 MW and another 2120.4–3686.4 MW in development.[189]

California case law has determined that geothermal energy is properly defined as a mineral and therefore is a part of the mineral estate.[190] The holdings in *Pariani* and *Geothermal Kinetics* rejected the arguments that geothermal resources are merely water and therefore are not part of a reserved mineral estate.[191] In *Pariani*, the court noted that "[t]he fluid component of the resource, including the steam, is *distinctly separate and different from, and is in fact not the 'water' which is the subject of the California water law*."[192] Similarly, in *Geothermal Kinetics*, the court noted that "there [is] a sound geologic basis for distinguishing between the usual ground water system and geothermal waters."[193] Therefore, it is not necessary to appropriate groundwater for geothermal resource development in California.[194]

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1. Water that is removed from an aquifer or geothermal reservoir to develop and obtain geothermal resources if the water is returned to or reinjected into the same aquifer or reservoir.

NEV. REV. STAT. § 534A.040 (2010).

185. Galli et al., *supra* note 64, at 6-11.

186. Gallagher Interview, *supra* note 182.

187. *See* LARRY J. GARSIDE, NEV. BUREAU OF MINES AND GEOLOGY REP. NO. 21, GEOTHERMAL EXPLORATION AND DEVELOPMENT IN NEVADA THROUGH 1973, at 8 (1974) (indicating that the Attorney General of Nevada considered geothermal resources as water resources and that geothermal development was under the jurisdiction of the Division of Water Resources).

188. *See* NEV. REV. STAT. § 534A.040(1)–(2) (2010).

189. JENNEJOHN, *supra* note 36, at 11.

190. Pariani v. State, 164 Cal. Rptr. 683, 687, 691 (Cal. Ct. App. 1980); Geothermal Kinetics, Inc. v. Union Oil Co. of Cal., 141 Cal. Rptr. 879, 880 (Cal. Ct. App. 1977); Seel, *supra* note 10, at 8-3 (citing United States v. Union Oil Co. of Cal., 549 F.2d 1271 (9th Cir. 1977)).

191. *Pariani*, 164 Cal. Rptr. at 691; *Geothermal Kinetics*, 141 Cal. Rptr. at 880.

192. *Pariani*, 164 Cal. Rptr. at 690 (emphasis added) (internal quotation marks omitted).

193. *Geothermal Kinetics*, 141 Cal. Rptr. at 883.

194. *See generally* CAL. CODE REGS. tit. 23 (2010); ROCKY MTN. MIN. L. INST., STATE GEOTHERMAL REGULATORY APPROACHES § 6.09 app. I, *available at*

It is likely that California's judicial recognition of geothermal resources as minerals rather than water has helped make California the leading producer of geothermal energy. Of course, California's large supply of geothermal resources also plays a significant role.[195] "In 2007, 4.5% of California's electric energy generation came from geothermal power plants," amounting to a net total of 2565.5 MW and another 1609.7–1997.7 MW in development.[196]

### *B. A Case for Reform*

States must significantly increase development of renewable energy resources to meet their RPS targets.[197] For example, Colorado must install an additional 7.7 million MWh of renewable-energy generating capacity before 2025 in order to meet its RPS goals.[198]

States wishing to meet their RPS mandates would be wise to encourage geothermal development within their borders. To accomplish this, states should consider statutory and regulatory reform to encourage geothermal development. Although it is apparent that geothermal developers face many obstacles, such as dealing with environmental laws and the potential of induced seismicity,[199] conflicts with water laws may be the most significant impediment to geothermal development.[200] Statutory and regulatory changes will help to bring more geothermal power online more rapidly.[201]

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www.rmmlf.
org/AI55-Ch6-Appendix.pdf.

195. SACARTO, *supra* note 12, at 10-11 fig.6 (showing a map of known and prospective geothermal resources in western states).

196. JENNEJOHN, *supra* note 36, at 7.

197. *See* Richard Lauckhart, Black & Veatch, Need for Renewables and Gas Fired Generation in WECC 8 (Jan. 25, 2010), http://wyia.org/wp-content/uploads/2010/01/rich-lauckhart-black-veatch.pdf.

198. This estimate includes estimated growth of energy demand. DAVID HURLBUT, NAT'L RENEWABLE ENERGY LAB., U.S. DEP'T OF ENERGY, RENEWABLE RESOURCES AND TRANSMISSION: NEEDS AND GAPS 12 (2010), *available at* http://www.cleanlineenergy.com/wp-content/uploads/2010/06/NREL-ppt-from-SW-renewable-energy-transmission-conf-5-21-10.pdf.

199. Seel, *supra* note 10, at 8-5.

200. *See* SACARTO, *supra* note 12, at 2; Aidlin, *supra* note 123, at 36–37; Olpin et al., *supra* note 139, at 810–11.

201. *See* Seel, *supra* note 10, at 8-1. Seel further suggests that regulatory changes promoting geothermal development would be desirable because, on balance, geothermal power is environmentally beneficial. *Id.*

This Comment suggests a hybrid approach of Nevada's and Idaho's geothermal laws in order to facilitate development. More specifically, states should consider doing two things. First, states should exempt geothermal appropriators from the prior appropriation doctrine where the use is nonconsumptive and nondiversionary.[202] This will allow developers to use geothermal resources without the difficulty of complying with states' prior appropriation laws but will also protect other water users from the potential that geothermal appropriators would deplete their water source. Second, states should exempt geothermal developers from the prior appropriation system if the geothermal resources are above 212°F. This takes into account the scientific reality that geothermal resources above a certain temperature are unlikely to be used for other purposes[203] and that nonconsumptive uses of geothermal resources will not likely affect established water rights.[204]

In the event that states do not want to wholly exempt geothermal developers from the prior appropriation doctrine, states should create a rebuttable presumption that geothermal developers are not interfering with others' water rights.[205] However, under this scenario, if senior water rights are damaged, a developer may face litigation. This should be expected in any state. But because geothermal resources typically are physically separate from aquifers used for other purposes, and because they cannot typically be used as potable water or for agriculture or ranching, litigation is unlikely.[206] Some progressive states have already demonstrated the practicability of conditionally exempting geothermal resources from the prior appropriation doctrine.[207]

## IV. SOLUTION TWO: FEDERAL RESERVED WATER RIGHTS

This Part gives an overview of the doctrine of federal reserved water rights and demonstrates why geothermal

202. It is also suggested that states follow Nevada and allow for a reasonable amount of water to be lost lost during well testing and for temporary system failures. *See* NEV. REV. STAT. § 534A.040(1)–(2) (2010).

203. *See supra* Part I.D.1.

204. *See supra* Part II.B. It is also necessary to recognize and protect established geothermal rights under this system.

205. *See* Olpin et al., *supra* note 139, at 811.

206. *See supra* notes 118–20 and accompanying text.

207. *See supra* Part III.A.3 (addressing the applicability of the prior appropriation doctrine in Nevada and California).

developers may not need to comply with state water laws on federal public lands and split estates. First, this part gives a background on the doctrine of reserved water rights. Next, it looks at the Geothermal Steam Act of 1970[208] for legislative intent regarding withdrawals and delegation of withdrawal power. Then, it looks to past federal reservations[209] and withdrawals[210] that might have reserved water rights for geothermal energy production.[211] Lastly, it argues that the doctrine of reserved water rights should be used to identify and develop geothermal resources on federal public lands.

### *A. Federal Reserved Water Rights Doctrine*

When the federal government sets aside land for a specific purpose, e.g., a national park, national forest, or a national monument, the reserved lands generally carry with them a reservation of the amount of then-unappropriated water on or under that land necessary to fulfill the purpose of the reservation.[212] The reservation is based on federal law and often conflicts with state water law.[213]

The power of the United States to appropriate non-navigable[214] waters on federal lands generally, and on

208. Pub. L. No. 91-581, 84 Stat. 1566 (1970) (codified as amended at 30 U.S.C. §§ 1001–27 (2006)).

209. "A 'reservation' means a dedication of withdrawn land to a specified purpose, more or less permanently." COGGINS ET AL., *supra* note 18, at 416.

210. The federal government defines "withdrawal" as: "[W]ithholding an area of Federal land from settlement, sale, location, or entry . . . for the purpose of limiting activities . . . in order to maintain other public values in the area or reserving the area for a particular public purpose or program." 43 U.S.C. § 1702(j) (2006).

211. Reservations and withdrawals, as used in this sentence, are terms that are often confused because "[b]right lines do not always separate classifications, withdrawals, and reservations." COGGINS ET AL., *supra* note 18, at 417. To distinguish between the type of reservation used here, and the "reservation" of minerals that creates a split estate, only the term "reserved minerals" is used to describe the reservation of minerals rather than a designation of land.

212. *See* Cappaert v. United States, 426 U.S. 128, 138 (1976); *see also* SAX ET AL., *supra* note 109, at 904.

213. *See* SAX ET AL., *supra* note 109; *see also* Alan E. Boles, Jr. & Charles M. Elliott, United States v. New Mexico *and the Course of Federal Reserved Water Rights,* 51 U. COLO. L. REV. 209, 211–12 (1980).

214. The term "non-navigable" is a term of art. It appears the *Cappaert* Court is using "non-navigable" as a reference to "non-navigable in fact." *Cappaert*, 426 U.S. at 138. Navigable in fact means that the waterway was used for commerce at the time a state was admitted into the nation. *See* DAVID H. GETCHES, WATER LAW IN A NUTSHELL 221 (3d. ed. 1997). Title to waters that are navigable in fact is held by states in a public trust, and therefore the federal government does not

reserved lands specifically, is derived from the Interstate Commerce Clause[215] and the Property Clause[216] of the United States Constitution.[217] Once the federal government appropriates water, the Supremacy Clause protects the federally reserved water rights from extinguishment under state law.[218] Courts do not apply a balancing test to determine if federal reserved water rights can exist under state laws or if states have the power to terminate those water rights.[219] Rather, federally reserved water rights trump all state water rights vested after the creation of the federal reservation.[220] This means that if surface water or groundwater is reserved or withdrawn by the federal government, the federal government does not need to comply with state adjudicative or administrative processes of allocating water rights in order to appropriate the water.[221]

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own those waters and cannot appropriate those waters. *See* SAX ET AL., *supra* note 109, at 522–23.

215. The Interstate Commerce Clause gives Congress broad power to regulate commerce among the states. *See* U.S. CONST. art. I, § 8, cl. 3.

216. The Property Clause gives Congress the "power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States." U.S. CONST. art. IV, § 3, cl. 2.

217. *Cappaert*, 426 U.S. at 138.

218. *See* Sierra Club v. Yeutter, 911 F.2d 1405, 1419 (10th Cir. 1990). The Supremacy Clause declares that the laws of the United States "shall be the supreme law of the land." U.S. CONST. art. VI.

219. *See Cappaert*, 426 U.S. at 138.

220. *See* Jan G. Laitos, *Whose Law Governs? State and Local Regulation on Federal Lands, and Federal Regulation on State Lands*, 49 ROCKY MTN. MIN. L. INST. 17-1, 17-20 to -21 (2003).

221. *See Cappaert*, 426 U.S. at 143 (holding "that the United States can protect its water from subsequent diversion, whether the diversion is of surface or groundwater"). While the Supreme Court in *Cappaert* dodged the question of whether the federal government could reserve groundwater, the Ninth Circuit below in *Cappeart* held "the United States may reserve not only surface water, but also underground water." United States v. Cappaert, 508 F.2d 313, 317 (9th Cir. 1974), *aff'd*, 426 U.S. 128 (1976). Further, subsequent and earlier courts have applied the doctrine to groundwater. United States v. Wash. Dep't of Ecology, 375 F. Supp. 2d 1050, 1058 (W.D. Wash. 2005); Tweedy v. Tex. Co., 286 F. Supp. 383, 386 (D. Mont. 1968); *In re* Gen. Adjudication of All Rights to Use Water in Gila River Sys. & Source, 989 P.2d 739, 747 (Ariz. 1999); Confederated Salish & Kootenai Tribes of the Flathead Reservation v. Stults, 59 P.3d 1093, 1099 (Mont. 2002). Commentators also note that it appears that the doctrine applies to groundwater, GETCHES, *supra* note 214, at 325–26, or at least acknowledge that this is the majority view, *see* A. DAN TARLOCK ET AL., WATER RESOURCE MANAGEMENT 922 (6th ed. 2009); *see also* Debbie Leonard, *Doctrinal Uncertainty in the Law of Federal Reserved Water Rights: The Potential Impact on Renewable Energy Development*, 50 NAT. RESOURCES J. 611, 612, 622 (2010) (recognizing the uncertainty surrounding the doctrine of federally reserved water rights). It should be noted that the federal government can still be joined in a suit to determine the

Many federally reserved water rights have yet to be formally claimed or adjudicated.[222] For claims under the federal reserved water right doctrine, it is necessary to "determine the precise federal purposes to be served by such legislation; determine whether water is essential for the primary purposes of the reservation; and finally determine the precise quantity of water—the minimal need as set forth in *Cappaert* and *New Mexico* required for such purposes."[223]

### *B. Did the Geothermal Steam Act Reserve Water Rights?*

To determine what federal water rights might be reserved for geothermal energy production, it is logical to start by looking to the Geothermal Steam Act.[224] Until 1970, there was no comprehensive statute in the United States giving rights to developers to exploit geothermal resources on public lands.[225] By 1960, the United States Congress recognized the great potential of geothermal resources and trudged through a decade of trying to create a comprehensive licensing scheme for geothermal resource development on public lands.[226] Eventually, the federal government passed the Geothermal Steam Act in 1970.[227] "The [Geothermal] Steam Act is the

validity of the reserved water rights under the McCarran Amendment. *See* 43 U.S.C. § 666 (2006).

222. COGGINS ET AL., *supra* note 18, at 516.

223. United States v. City and County of Denver, 656 P.2d 1, 20 (Colo. 1982). In *Cappaert*, the Supreme Court looked at a federal reservation at Devil's Hole Monument. *Cappaert*, 426 U.S. at 141. The Court noted that "Devil's Hole was reserved 'for the preservation of the unusual features of scenic, scientific, and educational interest.'" *Id.* Therefore, the court determined that the amount of water to be reserved was determined by the amount "necessary to preserve its scientific interest." *Id.* In *New Mexico*, the Supreme Court looked at federal reserved water rights for national forests and determined that "Congress intended that water would be reserved only where necessary to preserve the timber or to secure favorable water flows for private and public uses under state law" because that was Congress's intent in passing the Organic Administration Act of 1897. United States v. New Mexico, 438 U.S. 696, 718 (1978).

224. Pub. L. No. 91-581, 84 Stat. 1566 (1970) (codified as amended at 30 U.S.C. §§ 1001–27 (2006)).

225. *See* 116 CONG. REC. 34,857 (1970) (statement of Rep. Saylor).

226. *See generally id.* at 34,856 (statement of Rep. Edmondson commenting on the past vetoes of the Geothermal Steam Act by President Lyndon Johnson); *see also* Owen Olpin & A. Dan Tarlock, *Water That is Not Water*, 13 LAND & WATER L. REV. 391, 405 (1978) (describing how, prior to 1970, geothermal developers attempted to use the Mining Law of 1872 and the Minerals Leasing Act of 1920 to secure rights to develop geothermal resources, to no avail).

227. Pub. L. No. 91-581, 84 Stat. 1566 (1970) (codified as amended at 30 U.S.C. §§ 1001–27 (2006)).

exclusive means of acquiring rights to develop geothermal resources on lands owned by the United States."[228]

In passing the Act, Congress hoped to create a licensing scheme that would lead to significant development of geothermal resources. Congress recognized that "[a]t the present time there is no statute that specifically provides for the development of geothermal steam on Federal lands . . . . We therefore need legislation such as this bill to handle a resource that is assuming increasing importance to the Nation as a whole."[229] In recommending the passage of the Act, the Committee on Interior and Insular Affairs recognized the great advantages of geothermal energy and its immense potential for future development on federal lands.[230]

However, the Geothermal Steam Act did not explicitly reserve water rights.[231] There are many plausible explanations for this. It is likely due, in part, to the fact that Congress was more interested in restricting administrative agencies' withdrawal power at that time.[232] In addition, Congress may not have foreseen states' abilities to impede geothermal

228. Galli et al., *supra* note 64, at 6-6.

229. 116 CONG. REC. 34,857 (statement of Rep. Saylor).

230. Ethel R. Alston, *Construction and Application of Geothermal Steam Act of 1970*, 40 A.L.R. FED. 814, at § 2[a] (1978); *see also* H.R. REP. NO. 91-1544 (1970), *reprinted in* 1970 U.S.C.C.A.N. 5113, 5119–20.

231. *See generally* Pub. L. No. 91-581, 84 Stat. 1566 (1970) (codified as amended at 30 U.S.C. §§ 1001–27 (2006)).

232. While working on a draft of the Geothermal Steam Act, on February 7, 1967, the Department of the Interior "caused to be published in the Federal Register a notice of the filing of a withdrawal of those public lands valuable for geothermal steam resource development, and also those public lands prospectively valuable for such geothermal steam development." 113 CONG. REC. 6520 (1967) (statement of Sen. Kuchel); *see also* Notice of Proposed Withdrawal and Reservation of Lands, 32 Fed. Reg. 2588 (Feb. 3, 1967). The Department of Interior attempted to withdraw the land pursuant to its implied reservation powers under the Supreme Court case *United States v. Midwest Oil*. United States v. Midwest Oil, 236 U.S. 459, 459 (1915); *see also* 113 CONG. REC. 15,328–29 (statement of Sen. Bible) (explaining where the implied power came from). The notice alarmed Congress, and therefore Congress made sure that the Department of the Interior amedended the withdrawal. *See* 113 CONG. REC. 7988 (statement of Sen. Church); Amendment of Notice of Proposed Withdrawal and Reservation of Lands, 32 Fed. Reg. 4030 (Mar. 14, 1967). On March 21, 1967, the Department of the Interior withdrew specified lands. Revised Notice of Proposed Withdrawal and Reservation of Lands, 32 Fed. Reg. 4506–08 (Mar. 21, 1967). Under the federally reserved water rights doctrine, these lands are not subject to any water rights perfected after March 21, 1967. *See* Winters v. United States, 207 U.S. 564, 568–69 (1908) (where the Supreme Court first articulated that when the federal government reserves land for a specific purpose, the date of the reservation rather than the date of the appropriation is the seniority date for water); *see also* GETCHES, *supra* note 214, at 308–19; Olpin & Tarlock, *supra* note 226, at 415.

development through the prior appropriation doctrine.[233] Another possible reason could be that Congress assumed that water would be reserved when land was leased under the Act.[234] Lastly, Congress may not have granted this express authority because it would have been politically unfavorable. Nevertheless, pursuant to its implied authority under *Midwest Oil*,[235] the Department of the Interior successfully withdrew about one million acres[236] before Congress set forth any limitations on the power of administrative agencies to withdraw land.[237] Congress eventually rewrote the process and rules for withdrawal power in the Federal Land Policy and Management Act of 1976.[238]

Despite the fact that the federal government neither explicitly reserved water rights in the Geothermal Steam Act nor explicitly delegated withdrawal power to an administrative agency, the Act arguably reserved water rights in two distinct ways.[239] First, as the Colorado Supreme Court noted, a withdrawal might occur when the land is leased under the Geothermal Steam Act.[240] If this is true, then the appropriation would be subject to the federally reserved water rights doctrine and federal lessees would not need to follow state water law procedures.[241] Second, the Geothermal Steam Act could theoretically be applied retroactively to withdrawals and reservations that took place before 1970. This would be closely

233. The Geothermal Steam Act takes the official position of neutrality with regard to state water laws. "Nothing in this chapter shall constitute an express or implied claim or denial on the part of the Federal Government as to its exemption from state water laws." Pub. L. No. 91-581, 84 Stat. 1566 (1970) (codified as amended at 30 U.S.C. § 1021 (2006)). This clause and its implications are addressed in Part IV.D.

234. Olpin & Tarlock, *supra* note 226, at 413.

235. 236 U.S. at 459.

236. 116 CONG. REC. 34,859 (statement of Rep. Johnson).

237. 43 U.S.C. § 1714 (1976).

238. *Id.*; *see also* JOHN D. LESHY, THE MINING LAW: A STUDY IN PERPETUAL MOTION 35–36 (Samuel Allen ed., 1987).

239. In rejecting the argument that the Geothermal Act withdrew lands for geothermal development, the Colorado Supreme Court recognized that "[i]t is reasonable to conclude that state appropriation law should govern until the United States has actually leased the geothermal resource." United States v. City & County of Denver, 656 P.2d 1, 34 (Colo. 1982). However, it appears no federal court has addressed this issue.

240. *See id.*

241. Olpin & Tarlock, *supra* note 226, at 418.

analogous to the holdings by the Ninth Circuit in *Union Oil*[242] and the Tenth Circuit in *Rosette*,[243] as discussed below.[244]

### *C. Reserved Minerals Under the Homestead Act of 1916*

Below is a discussion of the application of the Geothermal Steam Act to the Stock-Raising Homestead Act of 1916[245] (Homestead Act), which authorized homesteaders to enter onto 640 acres to use for homesteading.[246] As a result of the Homestead Act, in just a few years, settlers entered into over 50 million acres and the federal government patented claims to about 30 million acres.[247] However, these grants did not give fee simple title.[248] Rather, the United States retained ownership to the minerals below the patented land.[249] This created what is known as a "split estate": the settlers owned the rights to use the surface of the land, and the United States retained the right to the minerals below the surface of the

242. United States v. Union Oil Co. of Cal., 549 F.2d 1271, 1273 (9th Cir. 1977).

243. Rosette Inc. v. United States, 277 F.3d 1222, 1224 (10th Cir. 2002).

244. Even though land withdrawals and reservations are different from the reservation of a mineral estate, they are closely analogous, and both allow for federal reservations of water whether it is implied or explicit. *Compare* DAVID H. GETCHES, WATER LAW IN A NUTSHELL 311–12 (3d. ed. 1997) (explaining that the reserved water rights doctrine applies to "public lands reserved for a particular governmental purpose"), *with* United States v. Union Oil Co. of Cal., 549 F.2d 1271, 1273–74 (9th Cir. 1977) (holding that a reservation of a mineral estate can include a reservation of water used in the development of geothermal resources). Further, whereas land withdrawals and reservations preserve certain areas of federally owned land for specific purposes, COGGINS ET AL., *supra* note 18, at 416, a reservation of a mineral estate keeps the mineral rights for future use. Under either of these designations, the federal government owns the land or minerals. There is further support for this argument in the fact that a reservation of minerals only gives the government a retained interest in the subsurface, *see* 70 A.L.R.3d 383, § 2[a] (1976), whereas the government owns withdrawals and reservations in fee simple. *See generally* BLACK'S LAW DICTIONARY 1422 (9th ed. 2009) (defining a "reservation"). Both of these cases held that reservations of minerals can include geothermal resources even if they were not thought to be valuable at the time of the reservations. *See infra* Part IV.C.2.

245. 43 U.S.C. § 315 (repealed 1976).

246. *See* COGGINS ET AL., *supra* note 18, at 106.

247. *Id.* Once the federal government recognized a valid land claim under the Homestead Act, the government issued "patents" or transferred ownership to the property. *Id.* at 105.

248. *Id.* at 106. Fee simple is a property term for the ownership of property without limitation or condition, or to own a piece of property outright. BLACK'S LAW DICTIONARY 691 (9th ed. 2009).

249. *See* COGGINS ET AL., *supra* note 18, at 106.

land.[250] Both the Ninth and Tenth Circuit held that reserved minerals under the Homestead Act included geothermal resources.[251]

### 1. Legistlative History Regarding Split Estates

The issue of split estates was directly addressed by the 91st Congressional Committee on Interior and Insular Affairs (Committee) in a report on the then-proposed Geothermal Steam Act.[252] The Committee recognized that the ownership of geothermal resources on 35 million acres of land was at stake.[253] The Committee decided to take no position except that it required the Attorney General to initiate proceedings to quiet title "when development of such resources occurs or is imminent,"[254] and therefore left the question for courts to decide.[255] The Ninth Circuit eventually addressed this situation seven years later in *Union Oil*.[256]

### 2. *Union Oil* and *Rosette*

In *Union Oil*, the Ninth Circuit addressed the issue of who owned the rights to geothermal resources found under a split estate created pursuant to the Homestead Act.[257] The surface owners sought to use subsurface geothermal resources under their estates to generate electricity.[258] The court found that the grants were "subject to and contain a reservation to the United States of all the coal and other minerals in the lands so entered and patented, together with the right to prospect for, mine, and remove the same."[259] The court noted that geothermal energy production was not known at the time the federal government reserved the minerals, and therefore there was no explicit mention of geothermal resources in the Homestead Act.[260]

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250. *See id.*
251. *See infra* Part IV.C.2.
252. H.R. REP. NO. 91-1544 (1970), *reprinted in* 1970 U.S.C.C.A.N. 5113, 5119–20.
253. *Id.* at 5119.
254. *Id.*
255. *See id.*
256. United States v. Union Oil Co. of Cal., 549 F.2d 1271, 1272 (9th Cir. 1977).
257. *See id.*
258. *Id.* at 1273.
259. *Id.* (quoting Section 9 of the Homestead Act, 43 U.S.C. § 299).
260. *Id.*

Nevertheless, the court held that this was irrelevant because the government reserved "all the coal and other minerals" and this was broad enough to include geothermal resources.[261] The court stated that geothermal resources, including water, "may be classified as 'minerals'" within the meaning of the Homestead Act.[262]

By including geothermal resources in reserved minerals under the Homestead Act, the Ninth Circuit in effect retroactively applied the Geothermal Steam Act.[263] The court noted that Congress, in passing the Geothermal Steam Act, "found it unnecessary to alter the language of existing statutory 'mineral' reservations."[264] The Geothermal Steam Act simply provided that such reserved minerals "shall hereafter be deemed to embrace geothermal steam and associated geothermal resources."[265] The court examined the legislative history of the Geothermal Steam Act and found that the 89th Congress took a neutral position in determining if the term "minerals" as used in past legislation could include geothermal resources. This decision to remain neutral bound the court.[266] The court also found that including geothermal resources in the term "minerals" as found in the Homestead Act would further the intent of that Act.[267] In 2002, the Tenth Circuit used the same reasoning as *Union Oil* and held that geothermal resources are "minerals" within the meaning of the Homestead Act.[268]

This line of logic and its ultimate conclusion lends significant precedent to the idea that geothermal resources can be included in many federal withdrawals that are termed broadly, such as lands withdrawn for mining of minerals or lands withdrawn to preserve fuel sources for future

261. *Id.*

262. *Id.* at 1273–74.

263. Although one may argue that this is not retroactive application, the court allowed for geothermal resources to be reserved even though geothermal resources likely were not considered at the time of the creation of the split estate. *See id.*

264. *Id.* at 1274 (referring to the Geothermal Steam Act of 1970, 30 U.S.C. § 1024 (2006)). As used in this sentence, the court is referring to what this Comment refers to as "reserved minerals." *See supra* note 211.

265. *Id.* (citing the Geothermal Steam Act of 1970, 30 U.S.C. § 1024).

266. *Id.* at 1274 n.6 (citing *Disposition of Geothermal Steam: Hearing on H.R. 7334, H.R. 10204, S. 1674 and Related Bills Before the Subcomm. On Mines & Mining of the H. Comm. on Interior & Insular Affairs*, 89th Cong. 295–96 (1966)).

267. *Id.*

268. Rosette Inc. v. United States, 277 F.3d 1222, 1224 (10th Cir. 2002).

generations. In addition, based on this precedent, geothermal developers may be exempt from state water laws while on lands disposed of under the Homestead Act because the Ninth Circuit stated that even water itself might have been reserved under the Act.[269] The areas with reserved minerals constitute large landmasses. For example, in Colorado, over 8.4 million acres were patented under the Homestead Act.[270] In Wyoming, over 18 million acres include federal mineral reserves.[271]

### *D. Other Withdrawn Lands*

In 1930, President Herbert Hoover issued an executive order that withdrew land for hot baths and hot springs. [272] This demonstrates one example of land that may include federally reserved water rights for geothermal energy development. In 1961, the Department of the Interior interpreted this withdrawal broadly and indicated that it could encompass geothermal resources for energy production.[273]

This specific withdrawal constitutes just one example of federal land that may include reserved water rights available for appropriation by geothermal developers. However, if a geothermal developer intends to exploit geothermal resources on withdrawn lands, it is worth investigating why the government withdrew those lands and if that purpose may encompass geothermal energy production.

### *E. Guiding the Developer*

When a geothermal developer is looking for public lands to develop, the first inquiry should be to see if those lands are designated by the BLM as opened or closed to geothermal development.[274] If the lands are open to development, the next step is to comply with the federal leasing statutes and to analyze the state water laws. Assuming that the state water laws would significantly frustrate the development of the resources, a developer should identify the land in question, find out when it was reserved, and see if an argument can be made

269. *See Union Oil*, 549 F.2d at 1273–74.
270. SACARTO, *supra* note 12, at 19 fig.21 (this figure contains state-by-state images of land patented under the Homestead Act through 1948).
271. *Id.*
272. *See* Exec. Order No. 5389 (July 7, 1930).
273. Solicitor's Opinion M-36625 (Aug. 28, 1961).
274. *See* U.S. DEP'T OF THE INTERIOR, ROD, *supra* note 77, at 1-1.

that there are federally reserved water rights. To do so, it is necessary to investigate the intent of the federal government in withdrawing the land. If the federal government withdrew the land for energy purposes or for the development of minerals, then one could argue that the government reserved water rights for geothermal development on the land. If this is the case, a developer could seek a declaratory judgment stating that there are reserved water rights for this purpose.[275]

Another starting point for a developer is to find lands disposed of under the Homestead Act of 1916. *Rosette* and *Union Oil* lend support for the argument that compliance with state water laws is not necessary on these lands because the geothermal resources, including water, were reserved for the development of minerals.[276]

## V. SOLUTION THREE: THE SUPREMACY CLAUSE

This Part argues that state law could be preempted under a traditional Supremacy Clause[277] analysis of public lands, but that it is currently impracticable to do so under BLM regulations.[278] This argument is unique in that it appears no scholars have yet addressed the impact of the BLM's new policy regarding the applicability of state water laws to geothermal development on public lands.[279] First, this Part provides a background on how courts view preemption issues on public lands when Congress left a clear ambiguity in the law. Next, it analyzes the development of geothermal resources on public land as it relates to state water laws. Lastly, it proposes that the BLM promulgate new regulations that more appropriately reflect the congressional intent behind the Geothermal Steam Act[280] by encouraging more development of geothermal

275. While such a lawsuit would likely be more expensive and time consuming than just complying with state water laws in any given instance, such a test case, if won, could have profound implications for the future development of geothermal resources.

276. *See supra* Part IV.C.2.

277. U.S. CONST. art. VI, cl. 2.

278. This stands in stark contrast to the viability of the arguments that scholars made in the 1970s. At that time, the BLM had not yet taken a stance on this question, and therefore the analysis was different. *See, e.g.*, Olpin & Tarlock, *supra* note 226, at 419–21.

279. A search under multiple criteria on Westlaw yields no results for such an analysis.

280. Pub. L. No. 91-581, 84 Stat. 1566 (1970) (codified as amended at 30 U.S.C. §§ 1001–27 (2006)).

resources in states that require geothermal developers to comply with the prior appropriation doctrine.

### *A. The Applicable Supremacy Clause Analysis*

Under the Supremacy Clause[281] of the U.S. Constitution, Congress can preempt state and local authority on public lands.[282] Federal law trumps state law under three circumstances. First, if Congress expressly preempts state law, the inquiry ends, and state law is preempted.[283] If Congress has not explicitly preempted a state law, the next question to ask is if a federal regulatory scheme is "so pervasive as to make reasonable the inference that Congress left no room for the States to supplement it."[284] This is traditionally the case with such areas as immigration and Indian law, where uniformity is preferred.[285] Lastly, courts ask if a state law "stands as an obstacle to the accomplishment and execution of the full purposes and objectives of Congress."[286] This last test is very commonly used in preemption cases for public lands issues.[287]

### *B. Federal Regulation on Public Lands*

The Property Clause gives the federal government the power to control the disposition of lands it owns.[288] This clause has been interpreted very broadly by the Supreme Court, which has held that Congress's power to dispose of its public lands is "without limitation."[289] State and local regulations that

281. U.S. CONST. art. VI, cl. 2.

282. *See* Kleppe v. New Mexico, 426 U.S. 529, 546 (1976) (upholding the Wild Free-Roaming Horses and Burros Act, 16 U.S.C. §§ 1331–1340 (2006)); Ventura Cnty. v. Gulf Oil Corp., 601 F.2d 1080, 1086 (9th Cir. 1979), *aff'd*, 445 U.S. 947 (1980) (mem.) (holding that local zoning laws were preempted because they frustrated the purpose of the Mineral Lands Leasing Act of 1920).

283. COGGINS ET AL., *supra* note 18, at 180.

284. *Id.* at 181 (quoting Rice v. Santa Fe Elevator Corp., 331 U.S. 218 (1947) (internal quotation marks omitted)).

285. *Id.*

286. *Id.* (quoting Hines v. Davidowitz, 312 U.S. 52 (1941) (internal quotation marks omitted)).

287. *See, e.g.*, Cal. Coastal Comm'n v. Granite Rock Co., 480 U.S. 572, 592–93 (1987).

288. *See* U.S. CONST. art. IV, § 3, cl. 2. ("Congress shall have Power to dispose of and make all needful Rules and Regulations respecting the Territory or other Property belonging to the United States.").

289. Kleppe v. New Mexico, 426 U.S. 529, 539 (1976); *see* United States v. Gratiot, 39 U.S. 526, 534 (1840).

are inconsistent with federal law on public lands are generally preempted.[290]

However, states traditionally control the allocation of water within their borders, even if the water is located on public lands.[291] In fact, under the McCarran Amendment, the federal government allows itself to be joined in state water rights adjudications to determine the validity of federally-owned water rights within that state's borders.[292] However, states do not own the water on or under their soil.[293] Additionally, the Supreme Court has suggested that Congress, through the Commerce Clause,[294] can directly regulate water in states, even off of federal public lands.[295]

### *C. The Supremacy Argument Needs Help from the BLM*

Like most preemption questions regarding federal lands, one must ask whether state water laws conflict with or obstruct Congress's purpose in enacting the Geothermal Steam Act. This is because Congress has left the question open.[296] In the Act, Congress addressed state water laws and declared: "Nothing in this chapter shall constitute an express or implied claim or denial on the part of the Federal Government as to its exemption from State water laws."[297] This patent ambiguity leaves the question of preemption for the courts to decide.[298] When a "court reviews an agency's construction of the statute which it administers," and the statute is ambiguous on its face, then the court must ask, "whether the agency's answer is based on a permissible construction of the statute."[299] If the interpretation is reasonable, then the court should grant significant deference to the agency's interpretation.[300] Under

290. *See* Laitos, *supra* note 220, at 17-7.
291. *See* S. REP. NO. 755, at 3, 6 (1951).
292. 43 U.S.C. § 666 (2006).
293. *See* Sporhase v. Nebraska *ex rel.* Douglas, 458 U.S. 941, 950–51 (1982).
294. U.S. CONST. art. I, § 8, cl. 3.
295. *Sporhase*, 458 U.S. at 954.
296. *See generally* Pub. L. No. 91-581, 84 Stat. 1566 (1970) (codified as amended at 30 U.S.C. § 1021 (2006)). Congress often leaves open these hard questions for political reasons. *See* COGGINS ET AL., *supra* note 18, at 186.
297. Pub. L. No. 91-581, 84 Stat. 1566 (1970) (codified as amended at 30 U.S.C. § 1021 (2006)).
298. COGGINS ET AL., *supra* note 18, at 181.
299. Chevron, U.S.A., Inc. v. Natural Res. Def. Council, Inc., 467 U.S. 837, 842–43 (1984).
300. *See id.* at 844.

this deferential standard, the BLM's interpretation of the Geothermal Steam Act should be upheld, and therefore the BLM is well-positioned to facilitate further geothermal development.

Until recently, it was possible to pursue a lawsuit challenging the applicability of some state water laws to geothermal developers.[301] However, in 2005, the BLM foreclosed this possibility when it addressed the applicability of state water laws to geothermal development on federal lands.[302] In its ROD of 2005, addressing geothermal development on public lands, the BLM declared that "[i]n coordination with State regulatory agencies the operator will comply with all State and Federal surface and ground water rules and regulations for all phases of geothermal exploration, development, and reclamation."[303]

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301. *See* U.S. DEP'T OF THE INTERIOR, ROD, *supra* note 77, at app. B-5 (taking the position that developers are bound by state water laws). For example, in *Vesterso*, the Eighth Circuit interpreted a similar ambiguity, but from a different statute. United States. v. Vesterso, 828 F.2d 1234, 1240 (8th Cir. 1987). There, the court asked whether a North Dakota water law frustrated the congressional intent of the Wildlife Refuge Act, 16 U.S.C. § 668dd(a)(1). *Id.* at 1238. The court found that Congress left it to the courts to decide if a state water law would be preempted because the statute was neutral on its face. *See id.* at 1240 n.5; *see also* Wyoming v. United States, 279 F.3d 1214, 1233 (10th Cir. 2002). Ultimately, the court held that the state water law was preempted because its application would frustrate congressional intent. *Vesterso*, 828 F.2d at 1245. The court also declared that preemption should be dealt with on a case-by-case basis. *Id.* at 1240 n.5. Other courts have also held that similar statutes—ones that are facially neutral as to whether the state law is preempted—can preempt state law where the laws conflict with congressional intent. *See, e.g.*, Ventura Cnty. v. Gulf Oil Corp., 601 F.2d 1080, 1086 (9th Cir. 1979) (holding that the Mineral Lands Leasing Act preempted state laws), *aff'd*, 445 U.S. 947 (1980) (mem.).

302. Some scholars suggest that a strict scrutiny standard might be more appropriate for preemption claims arising from agency decisions. *See* COGGINS ET AL., *supra* note 18, at 185. However, there appear to be no courts on record applying this standard.

303. U.S. DEP'T OF THE INTERIOR, ROD, *supra* note 77, app. at B-5. However, one could nonetheless litigate a case under the following analysis. "The purpose of Congress is the ultimate touchstone" in deciding if a state law is preempted. Gade v. Nat'l Solid Wastes Mgmt. Ass'n, 505 U.S. 88, 96 (1992) (internal quotation marks omitted) (citing Allis-Chalmers Corp. v. Lueck, 471 U.S. 202, 208 (1985)). While it is most important to determine if Congress intended to override state law, where a statute is ambiguous as to that specific point, the general intent of the statute becomes significant. *See* Wyoming v. United States, 279 F.3d 1214, 1230–31 (10th Cir. 2002). While congressional intent is clearly ambiguous as to trumping state law, the congressional purpose behind the Geothermal Act is generally clear: Congress wanted to increase national geothermal energy production. *See supra* notes 229–30 and accompanying text.

The ultimate purpose of Geothermal Steam Act was to "encourage in every way possible, the development of the geothermal resources of the publicly

Additionally, the BLM extended this policy specifically to Colorado in a nonbinding Memorandum of Understanding (MOU) released in March 2011.[304] In the MOU, the BLM declared that "[p]rior to and during all lease operations including exploration, development, and utilization of a geothermal resource, a federal-geothermal-resources lessee must comply with Colorado appropriations law."[305] While this agreement is not binding on the BLM,[306] the BLM should not continue to enter into such agreements because these agreements stand as further obstacles to future development of geothermal resources.

This Comment shows that the BLM's declaration that geothermal developers must comply with all state laws is bad policy.[307] For the same reasons that this Comment argues for states to change their policies to promote geothermal resources, the BLM should also change its regulations. It would be more reasonable for the BLM to create a comprehensive regulation that is state-specific, identifies state water laws that are unduly restrictive for geothermal developers, and takes the position that geothermal developers are exempt from those restrictive laws on federal public lands. To accomplish this change in regulations, the BLM would need to go through a notice and comment procedure.[308] If the BLM promulgates such regulations, it is likely that courts will grant large deference to such regulations and will only ask if the rulemaking was arbitrary and capricious[309] and "whether the agency's answer

owned lands." *See* S. REP. NO. 683, at 1 (1965), *reprinted in* 111 CONG. REC. 22,917 (1965) (explaining the purposes of the bill). Congress believed that "geothermal steam is a resource of the United States which should be used." 116 CONG. REC. 34,857 (1970) (statement of Rep. Saylor). As discussed above, state water laws significantly impede geothermal development in states that do not exempt geothermal resources from the prior appropriation doctrine. *See supra* Part II.B. If geothermal fluids are not tapped and used, then the heat resources will not be utilized. Olpin & Tarlock, *supra* note 226, at 418. This frustrates the intent of Congress in passing the Geothermal Steam Act. *Id.*

304. Memorandum of Understanding Between Bureau of Land Management, Colorado State Office, and the Colorado Department of Natural Resources, Concerning Geothermal Leasing, Permitting, and Admin. in Colo. 3 (Mar. 14, 2011) (on file with the Colorado Law Review).

305. *Id.*

306. *Id.* (declaring that the Memorandum of Understanding is nonbinding).

307. *See supra* Part II.B.

308. Notice and comment procedures allow for public input when federal agencies attempt to adopt new regulations or amend existing regulations. *See* 5 U.S.C. § 553(b)–(c) (2006).

309. COGGINS ET AL., *supra* note 18, at 229.

is based on a permissible construction of the statute."[310] Assuming that the BLM's interpretation was neither arbitrary nor capricious, there should be no reason for courts to reject the regulations. The end result would be that the BLM's regulations could preempt some restrictive state laws because, as seen in the past, "agency regulations implementing federal statutes [can] pre-empt state law under the Supremacy Clause."[311]

### *D. Obvious Problems with Arguing for Preemption*

For federal law to preempt state water laws, courts would need to take a rare jurisprudential step. Courts and Congress are generally protective of states' rights to control the water within their borders.[312] This is partly based on the entrenched history of water law and our federalist system, but it is also a result of the reliance on current water appropriation systems.[313] It would be somewhat drastic to depart from this system by declaring that a federal statute preempts state water laws when Congress took a neutral position as to preemption of water laws. For example, in *Vesterso*, the Eighth Circuit ruled that Congress must explicitly manifest its intent to change the status quo before the court will interpret a facially-neutral law as changing the status quo.[314] Here, there is no clear manifestation of congressional intent to override state water laws.[315] Additionally, the *Vesterso* court ruled that preemption cases should be dealt with on a case-by-case basis, which provides precedent that discourages courts from ruling that a state law is *per se* preempted rather than preempted in just a specific instance.[316] *Granite Rock* also presents an obstacle. The

310. Chevron, U.S.A., Inc. v. Natural Res. Def. Council, Inc., 467 U.S. 837, 844 (1984).

311. Chrysler Corp. v. Brown, 441 U.S. 281, 295–96 (1979).

312. *See generally* California v. United States, 438 U.S. 645 (1978); *see also* 43 U.S.C. § 666 (2006) (allowing for the U.S to be joined in state adjudication of water rights); COGGINS ET AL., *supra* note 18, at 486–88.

313. *See* COGGINS ET AL., *supra* note 18, at 487–88 (discussing the origins of state water laws).

314. *See* United States v. Vesterso, 828 F.2d 1234, 1240 n.5 (8th Cir. 1987).

315. *See supra* note 231 and accompanying text.

316. This has obvious implications for any potential test case because a future court could distinguish a future case based on the facts of that case. A test case is a "lawsuit brought to establish an important legal principle or right." BLACK'S LAW DICTIONARY 244 (9th ed. 2009).

Court's holding there showed that facial challenges[317] under the preemption doctrine present an uphill battle for the challenger of state or local laws.[318]

## VI. COPRODUCTION OF GEOTHERMAL RESOURCES AND FOSSIL FUELS

This last Part argues that the coproduction of geothermal resources at existing gas and oil wells is another way to avoid the prior appropriation doctrine. This Part is by no means a complete analysis of all the issues surrounding coproduction, but serves as an introduction to this undeveloped area of the law, with the goal of encouraging academics, litigators, and entrepreneurs to analyze this area more thoroughly. This Part begins with a background on coproduction. Next, it analyzes how this new technology can increase the development of geothermal resources by using already-appropriated water and decreasing the cost of generating electricity from geothermal resources. Lastly, it argues that states should encourage coproduction through regulatory reform.

### *A. What is Coproduction?*

The coproduction of geothermal resources at fossil fuel wells is a new technology that could significantly increase the development of geothermal resources[319] and provide a way around state water laws. Coproduction is possible at gas and oil wells where the oil produced from the well is extracted with hot fluids, which is commonplace at many wells throughout the country.[320] Currently, this water is treated as waste and its disposal is quite costly. [321] Utilization of this thermal energy can have significant environmental benefits.[322] The first step in coproduction is bringing oil and water mixtures to the surface

317. A facial challenge is a challenge claiming "that a statute is unconstitutional on its face." BLACK'S LAW DICTIONARY 261 (9th ed. 2009).

318. *See* Cal. Coastal Comm'n v. Granite Rock Co., 480 U.S. 572, 594 (1987) (holding that a facial challenge to a state law did not sufficiently show an actual conflict with federal laws even though the state law may have been preempted under certain scenarios).

319. *See* KAGEL *supra* note 10, at 46.

320. *Id.*

321. *Id.*

322. *See supra* Part I.C. (discussing the environmental benefits of geothermal energy).

and separating the oil from the water.[323] This process is necessary in order to utilize the oil, whether a developer chooses to use the hot water or dispose of it as wastewater.[324] If the wastewater is sufficiently hot, a power plant could use the wastewater by sending it through turbines to generate electricity, which can provide power for the on-site operation of the wells.[325] Also, as noted earlier, binary systems can be utilized when the temperatures are not hot enough to utilize a hot water system.[326]

The Rocky Mountain Oil Testing Center is a successful model of a coproduction system. There, developers installed a 0.25 MW geothermal hydrocarbon coproduction unit at its facilities near Casper, Wyoming.[327] This coproduction system is estimated to pay for itself in seven years; over the period of twenty-five years, it could turn a $2.5 million profit.[328]

### *B. Why Coproduction?*

There are two main reasons why this technology has a bright future. First, boring holes for geothermal exploration and production is one of the most expensive and risky aspects of geothermal resource development.[329] Drilling can constitute up to 50% of a total project budget.[330]

Therefore, in addition to coproducing geothermal electricity at existing wells, geothermal developers should strongly consider investigating abandoned wells to test the temperature and composition of the local groundwater source and consider utilizing the well for geothermal energy

323. *See* KAGEL, *supra* note 10, at 46.

324. *See* Wyoma Groenenberg, *Using Geothermal Energy in Oilfield Picking up Steam*, WYO. BUS. REP., Aug. 20, 2010, http://www.wyomingbusinessreport.com/article.asp?id=53165.

325. *Id.* Using this electricity on-site is also very efficient. This is because the resource and need for electricity are in the same place. Therefore, it avoids the need to connect the grid to the site or to run the oil wells using electricity from expensive diesel-powered generators. Likewise, this model avoids the need to run transmission lines from the geothermal power plant to an urban area.

326. *See supra* notes 29–31 and accompanying text.

327. JONATHAN CROSS & JEREMIAH FREEMAN, U.S. DEP'T OF ENERGY, 2008 GEOTHERMAL TECHNOLOGIES MARKET REPORT 16 (2009).

328. *See* Groenenberg, *supra* note 324.

329. JENNEJOHN, *supra* note 36, at 26.

330. *Id.*

production.[331] Gas and oil developers should also consider retrofitting abandoned or marginal wells to produce hydrocarbons and geothermal to make these wells more profitable.[332] However, although geothermal development at these locations may be economically advantageous, the legal background surrounding this development option is unsettled.[333]

Next, because the developers at these sites have already applied for and received permits to drill and extract fluids from the ground, a developer can argue that the water associated with the pumping is thereby appropriated.[334] Even if the water is not appropriated, current practice often wastes this water, where instead it can be utilized for geothermal energy production and then pumped back into the ground through a reinjection well.[335] This is a win-win situation. Currently, disposal of water brought to the surface in oil and gas wells "is at best a nuisance. It is difficult to handle, costs money to pump, and has to be re-injected at an additional cost. Capturing this waste heat and running it through a binary cycle offers the possibility of a revenue stream."[336]

### *C. Government Encouragement of Coproduction*

Numerous proposals are currently circulating to design systems to utilize inactive oil and gas wells for geothermal energy production exclusively or through coproduction.[337] Although the federal government has increased investments

331. Karl Schulz, *Evaluating the Energy Independence and Security Act of 2007: Inclusions, Exclusions, and Problems with Implementation*, 38 ENVTL. L. REP. NEWS & ANALYSIS 10763, 10765 (2008).

332. *Id.*

333. *See* Seel, *supra* note 10, at 8-7 to 8-8 (referring to current proposals to develop these resources, the uncertainty and complexity of determining who owns these resources, and how they can be developed); *see also* Kurt M. Peterson, *Wellbores*: *Shedding Light on a Transactional Black Hole*, 48 ROCKY MTN. MIN. L. INST. 13-1, 13-7 (2002) (discussing the process of "[w]ell [t]ake [o]ver and [f]orfeiture").

334. *See* Seel, *supra* note 10, at 8-7 (discussing the uncertainty of who owns which resources when geothermal and oil or gas are found in the same reservoir).

335. *Id.* Seel also discusses the potential that geothermal developers could "force pool their way into an existing oil and gas well located in the same area" by using state laws that prohibit waste. *Id.* at 8-7 to 8-8.

336. KAGEL, *supra* note 10, at 46. Kagel also states that in "certain water-flood fields in the Gulf Coast region of the United States, 95 percent of the production out of an oil and gas well is water." *Id.*

337. *See id.*; *see also* Peterson, *supra* note 333, at 13-7.

for coproduced systems through the American Recovery and Reinvestment Act of 2009,[338] coproduction remains an area ripe for innovation by enterprising entrepreneurs wanting to make use of this promising new technology. Both the federal and state governments should encourage the use of coproduction systems through regulations and incentives designed to attract innovative thinkers to this method of geothermal energy production.

## CONCLUSION

When Congress passed the Geothermal Steam Act, many thought that geothermal resources were the answer to many of our nation's problems, such as energy independence and pollution.[339] Even though there has been some development of geothermal resources, geothermal has become the forgotten cousin of wind and solar.

In the 1970s, many scholars concluded that states' prior appropriation laws would hinder the development of geothermal resources.[340] Since then, few have written about this hindrance, likely in part because many western states clarified whether or not the state water laws applied to geothermal resources when the states developed and revised their licensing schemes for geothermal development.[341] Nevertheless, geothermal's prior appropriation problem has not gone away. States have not yet done enough to foster the development of geothermal resources, and promising new technological advances make regulatory reform necessary to realize geothermal's full potential.[342]

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338. One part of the Act proposes to invest up to $20.7 million in eleven coproduction, geopressured, and low-temperature projects. *See* JENNEJOHN, *supra* note 36, at 22. For a list of projects and awards, see TIM REINHARDT, U.S. DEP'T OF ENERGY, LOW TEMPERATURE/COPRODUCED/GEOPRESSURED SUBPROGRAM OVERVIEW 6–7 (2010).

339. *See* 116 CONG. REC. 34,858 (1970) (statement by Rep. Saylor on the soon-to-be-passed Geothermal Steam Act of 1970).

340. Aidlin, *supra* note 123, at 38–39; Olpin & Tarlock, *supra* note 226, at 421.

341. *See* Olpin et. al. *supra* note 139, at 803–04 (identifying California and New Mexico as the first states to regulate geothermal development and noting that many states regulated geothermal resources after 1970); *see also* Olpin, *supra* note 121, at 150 (identifying California and New Mexico as the only states authorizing leasing of state lands for geothermal development).

342. The development of binary power plants makes regulatory reform essential because it allows for nonconsumptive use of geothermal resources to produce electricity. *See supra* notes 29–34 and accompanying text.

Geothermal energy development stands as a promising way for our country to meet its future energy needs while addressing legitimate concerns about the environment, the economy, and national security. Geothermal energy not only stands as a way to help revolutionize the energy sector in our county, but it also is a favorable alternative to other renewables because of its cost efficiency, ability to generate energy without consuming water, low environmental impact, abundance, and ability to serve as a baseload power source.[343]

Although the federal government continues to promote geothermal development, its efforts are not enough. The BLM can and should do more to encourage the development of geothermal resources. In addition, even though individual states recognize the benefits of geothermal resources,[344] they must do more to foster geothermal development through regulatory reform. Lastly, because there has been little litigation on many of the issues discussed in this Comment, it is likely that developers are being cautious about the steps they take. Now is the time to address some of the unresolved issues regarding the development of geothermal resources.

343. *See supra* Part I.C.

344. For example, Colorado declares that "development of geothermal resources is in the public interest because it enhances local economies and provides an alternative to conventional fuel sources." COLO. REV. STAT. § 37-90.5-102(1)(a) (2010).