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(RE-)DRILL, BABY, DRILL! WHY CONGRESS AND BLM SHOULD ENCOURAGE GEOTHERMAL VIA OLD OIL WELLS

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I. Introduction

The United States is beset by a shocking number of abandoned oil wells.¹ These idle structures bear latent environmental hazards by leaking toxic substances that pollute nearby air and groundwater, and by emitting methane, a greenhouse gas.² The air pollution can cause or exacerbate

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1. See Brady Dennis, *There Could Be Millions of Abandoned Wells in the U.S. Plugging Them Is a Monumental Task*, WASH. POST (April 11, 2023), <https://www.washingtonpost.com/climate-solutions/2023/04/11/plugging-abandoned-oil-wells/>; see also Nichola Groom, *Special Report: Millions of Abandoned Oil Wells are Leaking Methane, a Climate Menace*, REUTERS (June 16, 2020), <https://www.reuters.com/article/us-usa-drilling-abandoned-specialreport/special-report-millions-of-abandoned-oil-wells-are-leaking-methane-a-climate-menace-idUSKBN23N1NL>.

2. See Sarah Kaplan & Dino Grandoni, *EPA to Regulate Methane Leaks from Oil and Gas to Fight Climate Change*, WASH. POST, Nov. 11, 2022, <https://www.washingtonpost.com/climate-environment/2022/11/11/methane-regulation-epa-cop27-egypt/> (“Methane traps about 80 times as much heat as carbon dioxide during its first 20 years in the atmosphere”).

individual health problems.³ The Biden Administration and Congress addressed abandoned oil wells in 2021 with a near \$4.7 billion appropriation to “plug, remediate, and reclaim”⁴ these wells across federal,⁵ state,⁶ private⁷, and tribal⁸ lands.

Plugging and retiring an unproductive oil well is costly and cumbersome.⁹ For many abandoned oil wells, this is an appropriate solution. But what if that existing infrastructure could be retrofitted and repurposed to drill for an energy supply not only clean and renewable, but virtually weather- *and* depletion-proof? Groundbreaking innovation¹⁰ in geothermal energy may show that the solution has been beneath our feet all along.

As a form of energy derived from the Earth’s inner heat,¹¹ geothermal offers numerous environmental advantages. Geothermal is not only sustainable but also has a far less damaging impact on the environment than fossil fuels.¹² This has led scientists to explore repurposing abandoned wells as a potential means of harnessing geothermal energy.¹³ The conversion could significantly reduce air pollution and greenhouse gas emissions and lead to job creation, all while saving construction and drilling costs. Scientists have expressed optimism about and spent at least the last

3. Dennis, *supra* note 1 (citing analysis that found 14 million people—including 1.3 million with asthma—live within a mile of an orphaned well).

4. *See* Infrastructure Investment and Jobs Act § 40601, Pub. L. 117-58, 135 Stat 429, Sec. 40601 (2021), <https://www.congress.gov/bill/117th-congress/house-bill/3684/text> (codified at 42 U.S.C. § 15907 (2024)).

5. *See* 42 U.S.C. § 15907(b) & (h)(1)(A).

6. *See id.* § 15907(c) & (h)(1)(B)-(D).

7. *Id.*

8. *See id.* § 15907(d) & (h)(1)(E).

9. Dennis, *supra* note 1 (it “can cost \$30,000 to plug a single well — and sometimes far more”).

10. *See* Press Release, U.S. Dep’t of Energy, DOE Awards \$8.4 Million for Accessing Geothermal Potential from Inactive or Unproductive Oil and Gas Wells (Jan. 12, 2022), <https://www.energy.gov/eere/articles/doe-awards-84-million-accessing-geothermal-potential-abandoned-oil-and-gas-wells>.

11. *See* Kelly MacGregor, *Full Steam Ahead: Unearthing the Power of Geothermal*, NATIONAL RENEWABLE ENERGY LABORATORY (March 7, 2023), <https://www.nrel.gov/news/features/2023/full-steam-ahead-unearting-the-power-of-geothermal.html> (“If you were to journey to the center of the Earth, you would find it is as hot as the surface of the sun”).

12. *Id.* (“The Earth itself has the potential to address a variety of hurdles in the transition to a clean energy future”).

13. *See* Press Release, U.S. Dep’t of Energy, *supra* note 10.

decade¹⁴ researching this technology's promise, and now real momentum seems to exist. Still, difficult, nascent legal challenges always accompany new technology, and this promises to be no different.

The possible avenues for legal research in geothermal energy development through oil and gas technology could each engender rich, fascinating exploration. What happens if, while seeking only to pull up hot water to use for geothermal steam, you discover that some of that water contains lithium or another valuable mineral?¹⁵ There is the complicated question of geothermal property ownership, which varies depending on jurisdiction.¹⁶ Royalties, liability, agency regulation, and the intersections between geothermal and state water laws all present complex questions worthy of independent legal research. This comment focuses mostly on federal geothermal leasing—specifically, recent changes in the law that could help expand the economic viability and practicality of converting aging oil and gas wells into geothermal wells. An estimated 90% of the United States' geothermal resources are beneath federally managed land.¹⁷

In December 2020, President Trump signed a year-end omnibus spending bill.¹⁸ The bill amended existing law to make federal land “under an oil and gas lease”¹⁹ available for noncompetitive leasing to the oil and gas lessee if they plan to use a well “for the coproduction of geothermal energy with oil and gas.”²⁰ This change is significant because it could allow an oil and gas lease holder with a well capable of coproduction to dip into a new potential revenue stream while avoiding another complicated leasing

14. See, e.g., Xianbiao Bu et al., *Geothermal Energy Production Utilizing Abandoned Oil and Gas Wells*, 41 RENEWABLE ENERGY 80 (2012), <https://ideas.repec.org/a/eee/renene/v41y2012icp80-85.html>.

15. Compare CAL. PUB. RES. CODE § 6903 (West 2024) (“Geothermal resources” definition under California law includes “all minerals in solution or other products obtained from naturally heated fluids, brines, associated gases, and steam, in whatever form, found below the surface of the earth, but excluding oil, hydrocarbon gas or other hydrocarbon substances”) with TEX. NAT. RES. CODE ANN. § 141.004(c)(1) (West 2024) (Texas geothermal laws expressly do not “apply to minerals dissolved or otherwise contained in groundwater, including in hot brines[.]”).

16. See discussion, *infra* Sec. II.B.iii.

17. See Press Release, U.S. Dep’t of Interior, Federal Agencies Move to Ease Development of Geothermal Energy and Increase Power Generation (Dec. 18, 2008) (“About 90 percent of U.S. geothermal resources occur on federal lands”), https://www.doi.gov/sites/default/files/archive/news/archive/08_News_Releases/121808a.html.

18. See Consolidated Appropriations Act, 2021, Pub. L. 116-260, 134 Stat 1182 (Dec. 27, 2020), <https://www.congress.gov/bill/116th-congress/house-bill/133>.

19. *Id.*, Div. Z, Energy Act of 2020 § 3105 (codified at 30 U.S.C. § 1003(b)(4) (2024)).

20. *Id.*

process. It also represents years of work by a bipartisan coalition of senators; this language was first introduced in the Senate in 2011.²¹

However, the language leaves a gap regarding wells on federal lands that are no longer capable of oil and gas production but might be useful as a retrofitted, repurposed geothermal well.²² The Bureau of Land Management (“BLM”) could attempt to promulgate a rule that would allow for noncompetitive leasing in that situation without requiring coproduction using the same well, but it is unclear whether the 2020 amendment can be interpreted that broadly.²³ It is likely that Congress would need to act again to explicitly allow such noncompetitive leasing. This comment argues that Congress should broaden 30 U.S.C. § 1003(b)(4)²⁴ to do so and create a new combined lease that covers oil and gas as well as geothermal resource leasing on federal lands.²⁵ Taking these steps could further incentivize the relevant stakeholders to invest in this technology and hopefully, one day, expand its use as a means of attacking problems associated with more dangerous idle wells.²⁶

II. Background

Abandoned oil wells are not a new problem, but they’ve sparked growing concern in recent years due to potential health and environmental hazards sometimes associated with them.²⁷ Geothermal energy is not a new idea; it has been used in certain areas of the United States with the requisite natural conditions for decades.²⁸ But because of the few such areas, America gets less than half of one percent of its electricity from

21. See discussion, *infra* Secs. III.C, III.D.

22. See discussion, *infra* Sec. III.D.

23. See discussion, *infra* Sec. IV.A.

24. See discussion, *infra* Sec. IV.B.i.

25. See discussion, *infra* Sec. IV.B.ii.

26. See discussion, *infra* Sec. IV.C.

27. See, e.g., Jeff Turrentine, *Millions of Leaky and Abandoned Oil and Gas Wells Are Threatening Lives and the Climate*, NATIONAL RESOURCES DEFENSE COUNCIL (July 26, 2021), <https://www.nrdc.org/stories/millions-leaky-and-abandoned-oil-and-gas-wells-are-threatening-lives-and-climate>.

28. See Brad Plumer, *There’s a Vast Source of Clean Energy Beneath Our Feet. And a Race to Tap It*, N.Y. TIMES (Aug. 28, 2023), <https://www.nytimes.com/2023/08/28/climate/geothermal-energy-projects.html> (“Traditional geothermal plants, which have existed for decades, work by tapping natural hot water reservoirs underground to power turbines that can generate electricity 24 hours a day. Few sites have the right conditions for this, however[.]”).

geothermal.²⁹ These two long-running conundrums have collided in new technology being explored around the world.

Section II.A will generally summarize abandoned oil wells in the United States, the problems they can cause, and potential danger they may pose.

Section II.B will provide a broad overview of geothermal energy, including (1) why scientists and activists have long seen it as a solution to problems created by reliance on hydrocarbons, (2) the different methods for extracting geothermal resources, and (3) the different ways “geothermal resources” are classified in terms of legal property ownership.

Section II.C will explore some ways that geothermal research and development has expanded in recent years, including attempts being made to use unproductive oil wells to extract geothermal resources.

A. Idle threats: Abandoned oil wells in America

Wells left uncapped after their productive life can pose threats to both human health³⁰ and the environment.³¹ Generally, these wells are often categorized as orphaned, idle, or abandoned, and the definitions for these terms vary depending on jurisdiction.³² At the federal level, an “idle” well is defined as one that “has been nonoperational” for at least four years and “for which there is no anticipated beneficial future use.”³³ Federal law defines an “orphaned” well as one on federal or tribal land that “is not used for an authorized purpose,”³⁴ and meets one of three conditions: (1) it has no known operator,³⁵ (2) it has an operator unable to plug the well and remediate the site³⁶, or (3) it is within the National Petroleum Reserve-Alaska.³⁷

29. *Id.*

30. *See* Dennis, *supra* note 1.

31. *See* Groom, *supra* note 1 (“More than 3.2 million abandoned oil and gas wells together emitted 281 kilowatts of methane in 2018. . . . [t]hat’s the climate-damage equivalent of consuming about 16 million barrels of crude oil . . . or about as much as the United States . . . uses in a typical day”).

32. *See* Jade Boutot et al., *Documented Orphaned Oil and Gas Wells Across the United States*, 56, 20 ENV’T SCI. TECH. 14228, 14229 (Oct. 18, 2022) (“Orphaned well definitions and statuses, as well as the content of well databases, vary widely among states”), <https://pubs.acs.org/doi/10.1021/acs.est.2c03268>.

33. 42 U.S.C. § 15907(a)(2).

34. *Id.* § 15907(a)(5)(A)(i)(I).

35. *Id.* § 15907(a)(5)(A)(i)(II)(aa).

36. *Id.* § 15907(a)(5)(A)(i)(II)(bb).

37. *Id.* § 15907(a)(5)(A)(i)(II)(cc).

Regardless of their classification, these wells remain open holes in the ground, leaking dangerous pollutants into the environment. Some leaks have come from abandoned wells that were not properly plugged.³⁸ These wells can emit methane³⁹ and leak chemicals including arsenic, benzene, and hydrogen sulfide which can contaminate the air, soil, and groundwater.⁴⁰

The health hazards associated with these leaks are concerning, particularly for individuals residing near abandoned wells.⁴¹ Methane is odorless and can seep into nearby homes, schools, and offices, posing severe health risks.⁴² When a well goes dry or its operator goes bankrupt, the wells are often left uncapped.⁴³ With the inability to locate former owners or operators in many cases, these wells become a persistent problem,⁴⁴ and taxpayers are often left on the hook.⁴⁵ The concentration of abandoned oil wells varies across the United States, but certain regions and states are particularly affected, including Appalachia, the Gulf and Central states, the Rocky Mountains, and California.⁴⁶ Four states—Texas, Pennsylvania, Kansas, and West Virginia—account for the majority of

38. Groom, *supra* note 1 (“[The EPA] believes most of the methane comes from the more than 2 million abandoned wells it estimates were never properly plugged”).

39. Turrentine, *supra* note 27.

40. *Id.* (“Among the chemicals that can seep out and contaminate air, soil, or groundwater are hydrogen sulfide, benzene, and arsenic. Even the smallest leaks can adversely affect the local environment if they go unaddressed or undetected for many years”).

41. Groom, *supra* note 1 (“[Abandoned wells] have been linked to dozens of instances of groundwater contamination by research commissioned by the Groundwater Protection Council”).

42. Turrentine, *supra* note 27 (“When concentrated in enclosed spaces—such as a basement or a bedroom, for instance—methane will take the place of oxygen in the lungs and can cause weakness, nausea, vomiting, and convulsions”).

43. *Id.*

44. *Id.*

45. *See* Groom, *supra* note 1 (“A school district . . . was saddled with a bill of at least \$11 million to plug 19 oil wells on the property of its high school, after a judge in 2017 absolved [a bankrupt oil company that had been operating the wells] of any responsibility for clean-up because other creditors took priority. The city . . . is contributing another \$11 million to the job”).

46. U.S. Dep’t of the Interior, *Assessing Methane Emissions from Orphaned Wells to meet Reporting Requirements of the 2021 Infrastructure Investment and Jobs Act (BIL): Federal Program Guidelines* (April 11, 2022), <https://www.doi.gov/sites/doi.gov/files/federal-orphaned-wells-methane-measurement-guidelines-final-for-posting-v2.pdf>.

these wells.⁴⁷ Abandoned oil wells are located everywhere, from backyards to farmland to the Louisiana bayous.⁴⁸

In January 2023, the Department of the Interior established the Orphaned Wells Program Office⁴⁹ to oversee the disbursement of federal well plugging and remediation funding.⁵⁰ Within the first year, the program oversaw the plugging and abandonment of more than 6,000 wells on federal, state, and private land.⁵¹ The office had, as of November 2023, distributed 15 percent of the \$4.7 billion allocated by Congress for plugging wells and remediating sites,⁵² meaning many more dangerous wells will be cleaned up in the coming years. But in other parts of the federal government, additional uses for old, unproductive, and possibly even orphaned have gained steam.⁵³

B. Geothermal: The white whale of clean, renewable energy

1. A brief history

Geothermal energy can provide heating, cooling, and power.⁵⁴ The hot water it generates underground may also contain rare minerals like lithium.⁵⁵ Geothermal energy was used in prehistoric civilizations for

47. *Id.*

48. Dennis, *supra* note 1 (“They have been found under sidewalks and driveways, houses and apartment buildings — and in at least one Wyoming schoolyard.”)

49. Press Release, U.S. Dep’t of Interior, *Secretary Haaland Establishes Orphaned Wells Program Office to Implement Historic Investments from Bipartisan Infrastructure Law* (Jan. 10, 2023), <https://www.doi.gov/pressreleases/secretary-haaland-establishes-orphaned-wells-program-office-implement-historic>.

50. *See* Infrastructure Investment and Jobs Act § 40601, Pub. L. 117-58, 135 Stat 429, Sec. 40601 (2021), <https://www.congress.gov/bill/117th-congress/house-bill/3684/text> (codified at 42 U.S.C. § 15907 (2024)).

51. U.S. Dep’t of Interior, Orphaned Wells Program Office, *Orphaned Wells Program Annual Report to Congress* at vi. (November 2023), <https://www.doi.gov/media/document/fy-2023-orphaned-wells-congressional-report-pdf> [hereinafter *Orphaned Wells Report to Congress*].

52. *Id.* at 6.

53. *See, e.g.*, Press Release, U.S. Dep’t of Energy, *supra* note 10.

54. *See* MacGregor, *supra* note 11 (“With the ability to provide electricity, heating, cooling, and storage . . . the natural heat of the Earth is a powerhouse ready to be tapped”).

55. *Id.* (“Only 1% of lithium used in the United States currently comes from domestic sources. An NREL analysis focused on lithium found that it is economically feasible for geothermal brines to yield approximately 24,000 metric tons of lithium per year, enough to establish a secure, domestic supply”).

“cooking, heating, and therapeutic bathing.”⁵⁶ Iceland gets nearly 100% of its electricity from renewable sources, and around 90% of its homes are heated with geothermal energy.⁵⁷ In the early 20th century, before spending the next century studying, investing in, and harnessing the geothermal energy beneath it, Iceland was one of the poorest countries in Europe.⁵⁸ Now, its people are among Europe’s richest.⁵⁹

American geothermal plants that have been in operation for many decades rely on natural hot water reservoirs underground, but only 0.4% of America’s electricity production comes from geothermal because of the few places with those natural conditions.⁶⁰

It has also proven difficult for many geothermal developers to get financing because banks consider it a risky investment.⁶¹ But using new techniques like those discussed in this comment could supply an endless amount of geothermal energy across almost the entire United States.⁶²

56. U.S. Dep’t of Energy, *GeoVision: Harnessing the Heat Beneath Our Feet*, at 10 (May 2019) [hereinafter *GeoVision Report*], <https://www.energy.gov/sites/default/files/2019/06/f63/GeoVision-full-report-opt.pdf>.

57. United Nations Environment Programme, *Iceland, a world leader in clean energy, supports Africa’s push for geothermal power* (June 24, 2020), <https://www.unep.org/news-and-stories/story/iceland-world-leader-clean-energy-supports-africas-push-geothermal-power>.

58. *Id.*

59. *Id.*

60. See Plumer, *supra* note 28.

61. See Michael Reed, *LPO Tech Talk: Next-generation Geothermal*, U.S. DEP’T OF ENERGY (March 4, 2024), <https://www.energy.gov/lpo/articles/lpo-tech-talk-next-generation-geothermal> (Discussing geothermal energy within the context of breakthrough technologies that need a “bridge to bankability ... and de-risking ... at early stages of investment so they can be deployed at commercial scale”).

62. See Rhett Allain, *How Long Could the World Run on Geothermal Power?* WIRED (Mar. 10, 2020), <https://www.wired.com/story/how-long-will-earths-geothermal-energy-last/>; (physics professor showing that theoretically, if the entire world switched to geothermal power, “we should be able to get 17 billion years of free power—without any carbon dioxide emissions or nuclear waste. That’s longer than the sun will survive”) (emphasis in original); see also *GeoVision Report*, *supra* note 56, at 19 (“[Enhanced Geothermal Systems are] theoretically sufficient to heat every U.S. home and commercial building for at least 8,500 years”).

2. *Methods for extracting and using geothermal resources*

Natural geothermal energy development depends on the presence of hot rocks, fluid, and permeability underground.⁶³ Small pathways like fractures facilitate the movement of fluids through hot rocks.⁶⁴ This comment focuses on methods of extraction known as enhanced geothermal systems (“EGS”), but it’s important to understand the basics of how geothermal energy is used because these are the processes that EGS methods attempt to mimic. There are four, generally: Direct-use methods and three main types of geothermal power plants (dry steam, flash steam, and binary cycle).

a) *Direct use*

Direct-use geothermal systems typically require temperatures of 300°F (150°C) or lower.⁶⁵ Because direct-use systems harness geothermal resources located closer to the earth’s surface, these systems are usually not hot or powerful enough to generate electricity.⁶⁶ Direct-use systems are most commonly associated with geothermal heat pumps (“GHPs”) for residential and commercial use, proving useful in providing consistent, efficient, year-round home heating and cooling.⁶⁷ These systems can also provide district-wide heating and cooling. The oldest such system, in Boise, Idaho, has operated since the 1890s.⁶⁸ Direct-use systems have also been used in settings like greenhouses and breweries.⁶⁹

b) *Dry Steam*

Dry steam capitalizes on hydrothermal fluids predominantly in steam form.⁷⁰ The only two known underground resources of dry steam in the

63. U.S. Dep’t of Energy, Geothermal Tech. Office, *Electricity Generation* [hereinafter *GTO Electricity Overview*], <https://www.energy.gov/eere/geothermal/electricity-generation> (last visited Jan. 22, 2024).

64. *Id.*

65. U.S. Dep’t of Energy, Geothermal Tech. Office, *Low Temperature & Coproduced Resources* [hereinafter *GTO Direct Use Overview*], <https://www.energy.gov/eere/geothermal/low-temperature-coproduced-resources> (last visited Jan. 22, 2024).

66. *But see id.* (“Increasingly, low-temperature resources below 150°C—once reserved for direct-use applications such as heating, greenhouses, fisheries, and mineral recovery—can now be used for power generation under the right conditions using binary cycle electricity generating technology”).

67. U.S. Dep’t of Energy, Geothermal Tech. Office, *Geothermal Heat Pumps*, <https://www.energy.gov/eere/geothermal/geothermal-heat-pumps> (last visited Jan. 22, 2024).

68. *GTO Direct Use Overview*, *supra* note 65.

69. *Id.*

70. *GTO Electricity Overview*, *supra* note 63.

United States are The Geysers and Yellowstone National Park.⁷¹ The steam is directly channeled to turbines, which drive generators to produce electricity.⁷² The steam is often reinjected into the reservoir.⁷³

c) Flash Steam

Flash steam power plants are the most common geothermal power plants in operation.⁷⁴ High-pressure fluids at temperatures exceeding 360°F (182°C) are pumped from deep underground and transferred to a low-pressure tank at the surface.⁷⁵ Fluid “flashes” into vapor, which propels turbines that generate electricity.⁷⁶ Any remaining liquid in the low-pressure tank may be subjected to a second flashing process, extracting additional energy.⁷⁷

d) Binary Cycle

Binary-cycle geothermal power plants are specifically designed to tap into lower temperature geothermal resources (below 360°F (182°C)).⁷⁸ This helps enable geothermal electricity production in more locations.⁷⁹ With binary-cycle plants, geothermal reservoir fluids are not directly exposed to the turbine units.⁸⁰ Instead, low-temperature geothermal fluids undergo a heat exchange process with a secondary fluid known as the binary fluid, which has a boiling point lower than water.⁸¹ The fluid flashes, turns into vapor, and drives turbines.⁸²

3. Who “owns” heat?

The old common law rule that a property owner in fee simple is the “owner of everything above and below the surface from the sky to the

71. Nat’l Renew. Energy Lab’y, *Geothermal Electricity Production Basics*, <https://www.nrel.gov/research/re-geo-elec-production.html> (last visited Jan. 22, 2024) (“Since Yellowstone is protected from development, the only dry steam plants in the country are at The Geysers”).

72. *GTO Electricity Overview*, *supra* note 63.

73. *Id.*

74. *Id.*

75. *Id.*

76. *Id.*

77. *Id.*

78. *Id.*

79. *Id.*

80. *Id.*

81. *Id.*

82. *Id.*

center of the earth”⁸³ is obviously complicated by the severance of mineral and surface estates. The very nature of geothermal energy makes this a complicated question: How, exactly, does one classify “heat,” particularly when it comes from one place but often manifests in very different forms? Ownership of geothermal resources varies across jurisdictions, with many considering it a mineral, others considering it part of the surface estate, and still others taking different approaches. Because the crux of this paper involves federal law, that is where we will focus.

Federal law broadly defines “geothermal resources”⁸⁴ and considers geothermal resources to be part of the mineral estate.⁸⁵ Federal courts have held that geothermal resources are “minerals” for purposes of the Stock-Raising Homestead Act of 1916 (“SRHA”), which conveyed federal land to private owners but reserved mineral rights.⁸⁶ In 1983, the Supreme Court developed a test to determine what qualifies as a “mineral” under the SRHA.⁸⁷ It must be “1) mineral in character, i.e. inorganic, 2) removable from the soil, 3) usable for commercial purposes, 4) and of such a character that there was no reason to suppose Congress intended it to be included in the surface estate.”⁸⁸ Applying this test, the Tenth Circuit Court of Appeals in 2002 held that geothermal energy is a “mineral” for purposes of the

83. *Veldhuis v. Abboushi*, 886 S.E.2d 766, 770 (Ct. App. Va. May 9, 2023).

84. 30 U.S.C. § 1001(c) (2024) (““geothermal resources” means (i) all products of geothermal processes, embracing indigenous steam, hot water and hot brines; (ii) steam and other gases, hot water and hot brines resulting from water, gas, or other fluids artificially introduced into geothermal formations; (iii) heat or other associated energy found in geothermal formations; and (iv) any byproduct derived from them”).

85. *See id.* § 1020 (“Geothermal resources in lands the surface of which has passed from Federal ownership but in which the minerals have been reserved to the United States shall not be developed or produced except under geothermal leases made pursuant to this chapter”).

86. *See, e.g., U.S. v. Union Oil Co. of California*, 549 F.2d 1271 (9th Cir. 1977) (holding that mineral reservation in patents granted pursuant to the Stock-Raising Homestead Act of 1916 (“SRHA”) reserved geothermal resources under the patented land to the United States).

87. *See Watt v. Western Nuclear, Inc.*, 462 U.S. 36, 53 (1983) (In *Watt*, the Court did not address geothermal energy, but created the test and held that gravel is a mineral reserved to the United States under the SRHA).

88. *Rosette Inc. v. U.S.* 277 F.3d 1222, 1227 (10th Cir. 2002) (citing *Watt*, 462 U.S. 36, 53 (1983)).

SRHA.⁸⁹ The Supreme Court denied certiorari in that case and has not considered the question.⁹⁰

States differ in their approaches to geothermal energy development and regulation, but Western states, generally, have the most comprehensive statutory schemes because that is where geothermal energy has historically been most prevalent.⁹¹ The Geysers contain the world's largest geothermal field, and California also contains many other major geothermal hotspots.⁹² Globally, the U.S. leads in geothermal electricity generation, largely because of Western states like California and Nevada.⁹³ In 2023, the U.S. produced about 17 billion kilowatt-hours of geothermal electricity, representing 0.4% of its total utility-scale electricity generation.⁹⁴ California alone accounted for a 66.6% share of total U.S. geothermal electricity generation in 2023.⁹⁵ A 2020 state energy commission report described the reasons that geothermal development in the state has “dramatically slowed down,”⁹⁶ although many of those issues could be resolved through the use of converted wells.⁹⁷

89. *Id.* at 1234-35 (“By virtue of being the surfaceholder, [Plaintiff] does not acquire the right to use the geothermal resources . . . for use in providing heat for its commercial greenhouse operation. The right to the resources remains in the federal government”).

90. *Rosette Inc. v. U.S.*, 537 U.S. 878 (2002) (denying cert. to petitioners).

91. See U.S. Energy Info. Admin., *Geothermal Explained: Use of Geothermal Energy* [hereinafter *EIA Statistics*], map, <https://www.eia.gov/energyexplained/geothermal/use-of-geothermal-energy.php> (last visited July 1, 2024).

92. See Calif. Energy Comm’n, *Geothermal Energy*, <https://www.energy.ca.gov/data-reports/california-power-generation-and-power-sources/geothermal-energy> (last visited Jan. 22, 2024).

93. See *EIA Statistics*, *supra* note 91.

94. *Id.*

95. *Id.*

96. Calif. Energy Comm’n, *Closed-Loop Geothermal Demonstration Project*, at 7–8 (June 2020) [hereinafter *2020 CEC Report*], <https://www.energy.ca.gov/sites/default/files/2021-05/CEC-300-2020-007.pdf> (citing several reasons for slowing geothermal development in California, including: (1) “The best and most obvious sites for conventional hydrothermal projects . . . have already been developed;” (2) A combination of federal policies, combined with state subsidies and battery storage mandates, have accelerated the development of solar and wind projects and associated battery storage;” (3) “Geothermal is more expensive, and geothermal plant operators must pay property taxes” whereas solar energy projects do not; (4) “Conventional hydrothermal projects require six to seven years before first revenue compared to fewer than two years for most wind and solar projects”).

97. *Id.* at 8 (“The heat available from California’s geothermal resources is effectively unlimited, so with improved technology, geothermal power can become a more significant part of California’s electricity portfolio”).

California classifies geothermal resources as part of the mineral estate, even if geothermal resources weren't considered at the time of conveyance.⁹⁸ Within its geothermal energy statutory scheme, California broadly defines “geothermal resources” to mean “the natural heat of the earth, the energy, in whatever form[.]”⁹⁹ In Nevada—which in 2023 accounted for 26.1% of United States geothermal electricity generation¹⁰⁰— “[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.”¹⁰¹ Texas amended its law in June 2023 to clarify that geothermal resources are part of the surface estate, even where the mineral estate has been severed.¹⁰² West Virginia passed a law in 2022 explicitly granting ownership of “any geothermal resources” to the owner of the surface estate “unless severance of the geothermal resource is clear and unambiguous[.]”¹⁰³ The statute goes on to further emphasize the point.¹⁰⁴ Other states including Idaho¹⁰⁵ and South Carolina¹⁰⁶ employ unique ways of classifying geothermal resources.

C. A possible solution to multiple problems

The concept of using oilwells for geothermal energy production has been explored¹⁰⁷ for more than a decade, but as technology has advanced, these ideas have become more practical. The concept has been explored in

98. *See* *Pariani v. California*, 105 Cal.App.3d 923, 937 (Ct. App. Cal. 1980) (holding that geothermal resources underlying patented land were “mineral deposits” and “mineral water” reserved to the state).

99. CAL. PUB. RES. CODE § 6903 (West 2024).

100. *See EIA Statistics*, *supra* note 91.

101. NEV. REV. STAT. § 534A.050 (2024).

102. TEX. NAT. RES. CODE § 141.004(a) (West 2024).

103. W. VA. CODE § 22-33-4(a) (2024).

104. *Id.* at § 22-33-4(b) (“No mineral or water estate shall be construed to include any geothermal resource unless clearly and unambiguously included in an instrument reserving or conveying the geothermal resource”).

105. *See* IDAHO CODE § 42-230(2)(c) (2024) (Temperature thresholds determine how hot groundwater must be for it to be a “geothermal resource” as opposed to a “water” resource. If the temperature of groundwater is 212 degrees Fahrenheit or higher—the boiling point—it is classified as a geothermal resource).

106. *See* S.C. CODE ANN. § 10-9-310 (2024) (defining geothermal resources as “the natural heat of the earth at temperatures greater than forty degrees Celsius”).

107. *See* Alexander Conser, *Double Dipping: Utilizing Oil Wells for Geothermal Energy*, 37 WM. & MARY ENV'T. L. & POL'Y REV. 813 (2013); *See also* Joshua P. Fershee, *The Geothermal Bonus: Sustainable Energy as a By-Product of Drilling for Oil*, 85 N.D. L. REV. 893 (2009).

Canada,¹⁰⁸ Europe,¹⁰⁹ and Indonesia.¹¹⁰ A group of oil and gas companies led by Baker Hughes in Houston recently explored these technologies.¹¹¹

Retrofitting an oil and gas well for geothermal requires repairing the equipment,¹¹² inserting a downbore heat exchanger into the existing well,¹¹³ and pumping water into it, “where it is warmed by the earth and drawn back to the surface to power a thermoelectric generator.”¹¹⁴

In 2020, the Department of Energy (“DOE”) launched its “Wells of Opportunity” Initiative that focuses on using existing infrastructure to “lower costs and reduce development timelines.”¹¹⁵ As part of that effort, DOE selected four projects to receive funding for developing technology to use idle or low-production oilwells for geothermal energy production.¹¹⁶ University of Oklahoma researchers plan to develop four idle oilwells into heat for local public schools, and other, similar projects in Texas, California, and Nevada also received funding.¹¹⁷

This continues a general trend toward increased federal funding for geothermal energy research and projects. The December 2020, year-end

108. Tony Seskus, *Alberta urged to remove hurdles to turning dormant oil wells into ‘major’ opportunity*, CBC NEWS, (Apr. 26, 2021), <https://www.cbc.ca/news/canada/calgary/repurposing-dormant-wells-1.5993265>.

109. Press Release, German Research Centre for Geosciences, *Transforming abandoned wells for geothermal energy production* (May 31, 2023), <https://www.gfz-potsdam.de/en/press/news/details/geothermische-nachnutzung-stillgelegter-bohrloecher> (“The [European Union] co-funded project TRANSGEO [involves] 11 partners from 5 countries”).

110. M. Syarifudin et al, *Feasibility of Geothermal Energy Extraction from Non-Activated Petroleum Wells in Arun Field*, IOP CONF. SERIES: EARTH & ENV’T SCIENCE 42 012023 (2016), <https://iopscience.iop.org/article/10.1088/1755-1315/42/1/012023/pdf>.

111. Press Release, Baker Hughes, *Baker Hughes Launches Consortium Exploring Technologies to Transform Abandoned Wells for Geothermal Energy Production* (Dec. 8, 2022), <https://www.bakerhughes.com/company/news/baker-hughes-launches-consortium-exploring-technologies-transform-abandoned-wells>.

112. U.S. Dep’t of Energy, Geothermal Tech. Off., *Wells of Opportunity* (Last visited Jan. 22, 2024), <https://www.energy.gov/eere/geothermal/wells-opportunity>.

113. *2020 CEC Report*, *supra* note 96, at 15–16 (“The [downbore heat exchanger (“DBHE”)] is hung from the existing wellhead. Modifications to the wellhead are provided so that the transport fluid can be introduced. ... The [DBHE] consists of a liner inserted into the well with a plugged end at the lowest point. The geothermal brine can flow around this liner and may be produced to the surface”).

114. *Wells of Opportunity*, *supra* note 112.

115. Press Release, U.S. Dep’t of Energy, *supra* note 10.

116. *Id.*

117. *Id.*

omnibus spending bill contained the Energy Act of 2020¹¹⁸, which represented the biggest advancement in federal energy policy in more than a decade.¹¹⁹ The bipartisan energy legislation included parts of 37 bills and “reflect[ed] the priorities of nearly 70 senators.”¹²⁰ The package included a reauthorization of DOE’s research, development, demonstration, and commercial application program for geothermal.¹²¹ The Act also called for an oil and gas technology transfer initiative between the DOE, several government agencies, and the private sector to develop “relevant advanced technologies and operation techniques used in the oil and gas sector for use in geothermal energy development.”¹²² The 2021 Infrastructure Investment and Jobs Act that set up the federal orphaned wells program¹²³ also included an \$84 million appropriation for geothermal projects.¹²⁴ In 2022, the Inflation Reduction Act renewed tax credits for geothermal development.¹²⁵

III. The slow build toward increased federal geothermal leasing and investment

More than 90% of the United States’ geothermal resources are located on federal land.¹²⁶ Congress has spent more than 50 years attempting to harness this potentially world-changing energy source,¹²⁷ but there has been

118. Consolidated Appropriations Act, 2021, Pub. L. 116-260, 134 Stat 1182, Div. Z, Energy Act of 2020 (codified in scattered sections of 15, 25, 30, & 42 U.S.C. (Dec. 27, 2020), <https://www.congress.gov/bill/116th-congress/house-bill/133>).

119. Rich Powell et. al, *The Energy Act of 2020: A Monumental Climate and Clean Energy Bill*, CLEARPATH.ORG (April 1, 2021), <https://clearpath.org/our-take/the-energy-act-of-2020-a-monumental-climate-and-clean-energy-bill/>.

120. Press Release, U.S. Senate Comm. on Energy & Nat. Res., *ICYMI: What They’re Saying About the Energy Act of 2020* (Dec. 29, 2020), <https://www.energy.senate.gov/2020/12/icymi-what-they-re-saying-about-the-energy-act-of-2020>.

121. Consolidated Appropriations Act, 2021, Pub. L. 116-260, 134 Stat 1182, Div. Z, Energy Act of 2020 (codified in scattered sections of 15, 25, 30, & 42 U.S.C. (Dec. 27, 2020), <https://www.congress.gov/bill/116th-congress/house-bill/133>).

122. *Id.* at Sec. 3002(b) (codified at 42 U.S.C. § 17193(d) (2024)).

123. *See* discussion, *supra* Sec. II.A.

124. Infrastructure Investment and Jobs Act, Pub. L. 117-58, 135 Stat 429, Sec. 41006 (2021), <https://www.congress.gov/bill/117th-congress/house-bill/3684/text>.

125. Inflation Reduction Act, 2021, Pub. L. 117-169, 136 Stat 1818, Sec. 13101(c) (Aug. 16, 2022), (codified at 26 U.S.C. § 45(d)(4) (2024)), <https://www.congress.gov/bill/117th-congress/house-bill/5376/text>.

126. *See* Press Release, U.S. Dep’t of Interior, *supra* note 17.

127. *See, e.g.*, Kenneth R. Bjorge, *The Development of Geothermal Resources and the 1970 Geothermal Steam Act—Law in Search of Definition*, 46 U. COLO. L. REV. 1 (1974).

only one major overhaul to the Geothermal Steam Act of 1970 since its passage. Section III.A will provide historical background for the federal geothermal leasing statutory scheme under the Geothermal Steam Act of 1970. Section III.B will discuss the 2005 overhaul of the geothermal leasing statutory scheme, and Section III.C will look at early, persistent efforts to allow noncompetitive geothermal leases for oil and gas lessees who want to attempt coproduction. This all leads into Section III.D, which details the December 2020 change that allows for coproduction for lessees holding oil and gas leases on federal land.¹²⁸ This change, though, still leaves unclear what a lessee should do if she wants to use a nonproductive well exclusively for geothermal energy. This creates the possibility that she would need to go through a competitive leasing process to use a well she already owns on land she already leases.

A. Geothermal Steam Act of 1970

Congress passed the Geothermal Steam Act of 1970¹²⁹ in response to both the exciting potential of geothermal energy and widespread confusion over the federal government's authority to dispose of geothermal resources on public lands.¹³⁰ A statement accompanying the Act read that geothermal energy is a "potentially invaluable untapped natural resource" and "relatively pollution-free source of energy."¹³¹ The 1970 law required those seeking to lease federal land for geothermal usage to go through a competitive bidding process¹³², but only if the proposed lease was in a "known geothermal resource area" ("KGRA"), as determined by the Secretary of the Interior.¹³³ If the proposed geothermal lease was on non-KGRA federal land, the first qualified person to apply received a

128. See 30 U.S.C. § 1003(b)(4)(B) (2024).

129. See Geothermal Steam Act of 1970, Pub. L. No. 91-581, 84 Stat. 1566 (codified as amended at 30 U.S.C. §§ 1001–1028), <https://www.congress.gov/91/statute/STATUTE-84/STATUTE-84-Pg1566.pdf>.

130. Bjorge, *supra* note 127, at 5–6 ("The Department of the Interior [regularly took the position] that geothermal resources were not minerals and [that it] lacked authority to dispose of geothermal steam contained in public lands under its control").

131. *Id.* at 4–5 (quoting H.R. REP. 91-1544 (Sept. 30, 1970)).

132. See 73A C.J.S. *Public Contracts* § 14 (2023) ("The primary purpose of the competitive bidding process is to promote or protect the public interest and assure that taxpayers receive the best possible price by preventing fraud, collusion, favoritism, and improvidence in the administration of public business. A secondary purpose of such statutes is to provide bidders with a fair forum for the award of public contracts or an open and honest procedure for competition for public contracts").

133. Bjorge, *supra* note 127, at 7.

noncompetitive lease.¹³⁴ The Act included a provision allowing anyone with a prior federal mineral or mining lease to convert that lease to a geothermal lease over the same land, although this was limited in several respects.¹³⁵

B. Energy Policy Act of 2005

It took 35 years, but Congress finally updated the federal geothermal leasing scheme with the Energy Policy Act of 2005.¹³⁶ This reflected Congress's desire to expand the usage of geothermal leases on federal land and clear a long backlog of geothermal lease applications.¹³⁷ The law eliminated KGRAs and made the vast majority of federal lands subject to competitive bidding for geothermal leases.¹³⁸ It eliminated all references to the "right to convert" an old mineral or mining lease to a geothermal lease.¹³⁹ The 2005 Act also greatly expanded the acreage limitations placed on a federal geothermal lessee.¹⁴⁰

With one notable exception to be discussed¹⁴¹, the 2005 Act's language regarding the general procedures for geothermal leasing on federal land remains unchanged.¹⁴² Developers may nominate land to be leased for geothermal development "at any time,"¹⁴³ and BLM must conduct a

134. *Id.* at 8.

135. *Id.* at 8 ("The conversion right is narrowly restricted in terms of the total number of acres allowed to be converted and by the requirement that the lessee satisfy the Secretary that 'substantial expenditures for the exploration, development, or production of geothermal steam have been made.' If the lands are within a KGRA and thus subject to competitive bidding, then the 'grandfather' is given the right to match the highest bid" (internal citations omitted)).

136. *See* Energy Policy Act of 2005, Pub. L. 109-58, 119 Stat. 594 (2005), <https://www.congress.gov/bill/109th-congress/house-bill/6/text>.

137. *See* Ben Tannen, *Capturing the Heat of the Earth: How the Federal Government Can Most Effectively Encourage the Generation of Electricity from Geothermal Energy*, 37-SPG ENVIRONS ENV'T. L. & POL'Y J. 133, 160-161 ("From 1997 to 2001, BLM issued final decisions on only twenty geothermal lease applications throughout the entire United States").

138. *Id.*

139. Energy Policy Act of 2005, Pub. L. 109-58, 119 Stat. 594, Sec. 222 (2005), <https://www.congress.gov/bill/109th-congress/house-bill/6/text>.

140. *Id.*, Sec. 235 (codified at 30 U.S.C. § 1006 (2024)) (Increasing the acreage limitation on single leases from 2,560 to 5,120 and increasing the total amount of land one person can lease for geothermal purposes in any one state from 22,480 acres to 51,200).

141. *See* discussion, *infra* Sec. III.D.

142. *See* 30 U.S.C. § 1003 (2024).

143. *Id.* at § 1003(a).

competitive lease sale at least once every two years for federal land in a state “that has nominations pending ... if the land is otherwise available for leasing.”¹⁴⁴ If there aren’t any bids made on nominated land, noncompetitive leasing may be available.¹⁴⁵ The 2005 Act also created the possibility of noncompetitive leasing sometimes—for direct use¹⁴⁶ of geothermal resources,¹⁴⁷ and on lands already subject to an approved mining claim.¹⁴⁸ But soon, an idea for another possible circumstance for allowing noncompetitive geothermal leasing percolated.

C. Early attempts to encourage coproduction

As early as 2007, DOE considered the possibility of using existing oil and gas infrastructure for geothermal resource development.¹⁴⁹ Congress turned its attention to the possibility of using aging oil and gas wells to produce geothermal energy in 2010¹⁵⁰, when a bipartisan group of senators began work on legislation¹⁵¹ to push the ball further forward. New Mexico Senator Jeff Bingaman introduced a version of the bill in 2011.¹⁵² While the bill focused almost entirely on oil and gas production, it included a proposed amendment to the Geothermal Steam Act to open another path to noncompetitive geothermal leasing on federal land. Under the proposal, if a current oil and gas lessee had a well capable of producing oil and gas and wanted to use that well to co-produce oil and gas with geothermal, he may

144. *Id.* § 1003(b)(2).

145. 43 C.F.R. § 3204.5(a) (2023) (“Lands offered at a competitive lease sale that receive no bids will be available for noncompetitive leasing for a 2-year period beginning the first business day following the sale”).

146. *See* discussion, *supra* Sec. II.B.ii.1.

147. 30 U.S.C. § 1003(f) (2024).

148. *Id.* § 1003(b)(3).

149. Press Release, Sen. Lisa Murkowski, *Senator Murkowski Announces Major Grant to Test Alternative Electricity Generation from Oil Production* (Oct. 16, 2007), <https://www.murkowski.senate.gov/press/release/senator-murkowski-announces-major-grant-to-test-alternative-electricity-generation-from-oil-production> (The grant was to “prove the feasibility of generating alternative electricity from the hot water separated from fossil fuels during production at oil and gas wells”).

150. Press Release, U.S. Senate Comm. on Energy & Nat. Res., *Advancing Two Key Energy Priorities* (May 10, 2011), <https://www.energy.senate.gov/2011/5/press-CCA5CB55-5565-4799-903B-06697EB14820> (Noting that “because of the widespread support for this bill” it was being introduced in 2011 “exactly as reported last year.”)

151. Oil and Gas Facilitation Act of 2011, S. 916, Sec. 102, 112th Cong. (2011), <https://www.congress.gov/bill/112th-congress/senate-bill/916/text?s=1&r=31>.

152. Press Release, U.S. Senate Comm. on Energy & Nat. Res., *supra* note 150.

have been eligible for noncompetitive leasing.¹⁵³ In a floor speech regarding the legislation, Bingaman mentioned geothermal energy only once, saying, “[c]o-production of geothermal energy by existing oil and gas leaseholders is encouraged by making leases available for that purpose on a non-competitive basis.”¹⁵⁴ Later that year, another bill including the same language¹⁵⁵ passed narrowly through the Senate Energy Committee¹⁵⁶ but never received a floor vote. In 2015, a bipartisan group of senators pushed legislation with almost¹⁵⁷ the exact same language *again* regarding noncompetitive geothermal leases for oil and gas lessees interested in co-production.¹⁵⁸ That bill passed the Senate but was stripped of the noncompetitive geothermal leasing section before it passed the House¹⁵⁹ and never became law.

153. Oil and Gas Facilitation Act of 2011, S. 916, Sec. 102, 112th Cong. (2011), <https://www.congress.gov/bill/112th-congress/senate-bill/916/text?s=1&r=31>.

154. Press Release, U.S. Senate Comm. on Energy & Nat. Res., *supra* note 150.

155. Geothermal Exploration and Technology Act of 2011, S. 1142, Sec. 4, 112th Cong. (as reported by S. Energy Comm., Feb. 7, 2012), <https://www.congress.gov/bill/112th-congress/senate-bill/1142/text/rs?s=1&r=98>.

156. Press Release, U.S. Dep’t of Energy, *Senate Energy Committee Passes New Geothermal Legislation* (Dec. 16, 2011), <https://www.energy.gov/eere/geothermal/articles/senate-energy-committee-passes-new-geothermal-legislation>.

157. *Compare* Geothermal Expl. & Tech. Act of 2011, S. 1142, Sec. 4, 112th Cong. (as reported by S. Energy Comm., Feb. 7, 2012), <https://www.congress.gov/bill/112th-congress/senate-bill/1142/text/rs?s=1&r=98> with N. Am. Energy Sec. & Infrastructure Act of 2016, S. 2012, Sec. 3007, 114th Cong. (as passed by Senate, April 20, 2016), <https://www.congress.gov/bill/114th-congress/senate-bill/2012/text/es?s=1&r=98> (The 2011 proposal would have allowed for noncompetitive geothermal leasing of land by an oil and gas lessee upon a determination that “the public interest will be served by the issuance of a lease,” while the 2016 proposal changed that language to “national energy security will be improved by the issuance of such a lease”).

158. N. Am. Energy Sec. & Infrastructure Act of 2016, S. 2012, Sec. 3007, 114th Cong. (as passed by Senate, April 20, 2016), <https://www.congress.gov/bill/114th-congress/senate-bill/2012/text/es?s=1&r=98>.

159. *See* N. Am. Energy Sec. & Infrastructure Act of 2016, S. 2012, 114th Cong. (as passed by House, May 25, 2016), <https://www.congress.gov/bill/114th-congress/senate-bill/2012/text/eah?s=1&r=98> (Sec. 3007 on coproduction of geothermal energy on oil and gas leases stripped from bill).

D. Noncompetitive leases for coproduction, but what about well conversion?

A large bipartisan coalition came together in December 2020 to deliver the “first major update of America’s energy policy in 13 years.”¹⁶⁰ Congress included the Energy Act of 2020 (“Energy Act”) in a year-end omnibus spending bill.¹⁶¹ The Energy Act addressed an array of forms of energy including fossil fuels,¹⁶² nuclear,¹⁶³ water,¹⁶⁴ solar,¹⁶⁵ wind,¹⁶⁶ and geothermal.¹⁶⁷ As part of its geothermal and oil and gas reforms, Congress finally—after a decade of trying—amended the Geothermal Steam Act and codified noncompetitive geothermal leasing for oil and gas lessees who want to attempt coproduction.¹⁶⁸ And it did so with less restrictive language than had been present in earlier versions.¹⁶⁹

If federal land is under an oil and gas lease and the developer has received a permit to drill, that developer may be given a noncompetitive lease, but only if it is determined that “geothermal energy will be produced from a well producing or capable of producing oil and gas,”¹⁷⁰ and “to provide for the coproduction of geothermal energy with oil and gas.”¹⁷¹ This amendment might provide an excellent incentive for oil and gas lessees to try new things with their older, less-productive wells rather than

160. Press Release, Republican Members of H.R. Comm. On Sci., Space, & Tech., 116th Cong., *Fact Sheet: A Smart Clean Energy Package* (December 2020), <https://republicans-science.house.gov/cache/files/4/6/46424c8c-7a33-48e6-b90b-d3825a0e4920/1C24093962A5817A530409533779F07E.energy-act-of-2020-fact-sheet---for-release.pdf>.

161. Consolidated Appropriations Act, 2021, Pub. L. 116-260, 134 Stat 1182, Div. Z, Energy Act of 2020 (codified in scattered sections of 15, 25, 30, & 42 U.S.C. (Dec. 27, 2020), <https://www.congress.gov/bill/116th-congress/house-bill/133>).

162. *Id.* at Sec. 4001.

163. *Id.* at Secs. 2001–2008.

164. *Id.* at Sec. 3001.

165. *Id.* at Sec. 3004.

166. *Id.* at Sec. 3003.

167. *Id.* at Secs. 3002, 3105.

168. *Id.* at Sec. 3105.

169. *See supra*, note 159 (The version of this provision that was finally enacted did not have any conditional language attached regarding “public interest” or “national energy security,” indicating additional willingness on the part of Congress to remove past barriers to geothermal production).

170. Consolidated Appropriations Act, 2021, Pub. L. 116-260, 134 Stat 1182, Div. Z, Energy Act of 2020, Sec. 3105 (codified at 30 U.S.C. § 1003(b)(4)(A) (2024)) (Dec. 27, 2020), <https://www.congress.gov/bill/116th-congress/house-bill/133>.

171. *Id.* (codified at 30 U.S.C. § 1003(b)(4)(B) (2024)).

simply allowing them to dry up, and either be abandoned¹⁷² or require the expensive remediation process.¹⁷³ When considered alongside recent investments in geothermal research¹⁷⁴, the amendment shows the relevant stakeholders recognize the opportunity geothermal presents. If oil and gas lessees take advantage, it could deliver a powerful message to leaders, financial institutions, and the public at large about geothermal energy's potential to steer energy production onto a clean, renewable, sustainable path using existing infrastructure—including the millions of orphaned wells¹⁷⁵ in America—and labor.¹⁷⁶

Congress did not directly address what a lessee should do if they have a non-functioning well—no longer useful for much if any oil and gas production—and wish to retrofit it exclusively for geothermal. Before a lessee can consider the technical aspects of that transition, they would need to know if they can obtain noncompetitive geothermal leasing on the land.

IV. The present—and future—of federal geothermal leasing

So, you're a federal oil and gas lessee with an old well that isn't productive anymore. You've heard about this technology and want to get in on the ground floor of a new, forward-thinking revenue stream. As the law is written and likely to be interpreted by BLM, acquiring a geothermal lease over the same land is possible. But it would probably require a lengthy, frustrating competitive leasing process that might not be worth it. This section examines the current state of things for such an oil and gas lessee and explores steps that Congress could take to make this a more attractive and less tedious option.

Section IV.A analyzes 30 U.S.C. § 1003(b)(4), as amended by the Energy Act,¹⁷⁷ to determine whether a current federal oil and gas lessee can

172. See discussion, *supra* Sec. II.A.

173. See Dennis, *supra* note 1 (It “can cost \$30,000 to plug a single well — and sometimes far more”).

174. See discussion, *supra* Sec. II.C.

175. See Dennis, *supra* note 1.

176. See Neel Dhanesha, *Clean Energy is Buried at the Bottom of Abandoned Oil Wells*, VOX (Apr. 19, 2022), <https://www.vox.com/recode/23024204/geothermal-energy-heat-oil-gas-wells> (One person attempting to co-produce geothermal with oil and gas said, “I think geothermal is a really great place for [oil and gas workers] to land. Oil and gas workers know how to safely, efficiently, and economically produce fluid”).

177. Consolidated Appropriations Act, 2021, Pub. L. 116-260, 134 Stat 1182, Div. Z, Energy Act of 2020, Sec. 3105 (codified at 30 U.S.C. § 1003(b)(4)(A) (2024)) (Dec. 27, 2020), <https://www.congress.gov/bill/116th-congress/house-bill/133>.

noncompetitively lease the same land for geothermal resource extraction if they repurpose an old oil well. This analysis hinges on (1) the meaning “capable of producing oil and gas,” (2) the meaning of “coproduction,” and (3) legislative history. Section IV.B proposes steps Congress can take to explicitly allow for noncompetitive leasing for any oil and gas lessee that wishes to use its existing infrastructure for geothermal—even if it means using different wells for different purposes. Finally, Section IV.C explains how these steps, along with more research and innovation, can show relevant stakeholders what is possible with dangerous abandoned wells.

A. Under current law, noncompetitive geothermal leasing is probably unavailable to an oil and gas lessee seeking to convert a well rather than coproduce with it

In March 2022, a National Renewable Energy Laboratory (“NREL”) representative hosted a virtual meeting to discuss barriers to geothermal development with members of the Geothermal Interagency Collaboration Task Force (“Task Force”).¹⁷⁸ During a forum, participants asked questions, including two specifically about the permitting timeline for “repurposing” of old wells for geothermal.¹⁷⁹ The responses indicated that the relevant stakeholders haven’t thought that far in advance. Interestingly, in one response, NREL stated that the Energy Act of 2020 allows for noncompetitive leasing “for geothermal wells at existing oil and gas fields,”¹⁸⁰ and that permitting questions and analysis related to that technology might be resolved as DOE’s recent funding opportunities¹⁸¹ get off and running.¹⁸²

Of course, one answer from one NREL representative at a Task Force forum does not constitute binding law, and it is not clear that the Energy Act’s 2020 coproduction amendment actually allows noncompetitive leasing in such situations. The law on geothermal leasing remains mostly

178. Aaron Levine and Faith Martinez Smith, *Geothermal Interagency Collaboration Task Force: Summary of Findings*, NAT’L RENEWABLE ENERGY LAB’Y, at app. B3 (Jan. 2023), <https://www.nrel.gov/docs/fy23osti/84684.pdf>.

179. *Id.* at app. B4.

180. *Id.*

181. *See* discussion, *supra* § II.C.

182. *See* Levine, *supra* note 178, at app. B4 (“There has been some interest shared in [analyzing permitting timelines based on the repurposing of old wells] and it may occur in the future, but not currently. For example, the Energy Act of 2020 allows for non-competitive leasing for geothermal wells at existing oil and gas fields. [DOE] released several funding opportunities for geothermal development at existing gas wells, which may allow for that analysis to occur”).

unchanged since the 2005 Act,¹⁸³ other than the addition of noncompetitive leasing for oil and gas lessees attempting coproduction.¹⁸⁴ As current federal law and regulations are written, an oil and gas lessee seeking to repurpose a well for geothermal—without coproducing oil and gas using the same well—would probably need to acquire a separate geothermal lease through either the competitive bidding process¹⁸⁵, or via conveyance if geothermal rights have been leased by the government. If BLM interpreted the statute more broadly, though, it could theoretically create a rule¹⁸⁶ allowing noncompetitive leasing for any oil and gas lessee that wants to use existing infrastructure for geothermal production.

Federal agencies receive their powers to interpret and apply legislation through the Administrative Procedures Act.¹⁸⁷ Federal courts have the power to review agency decisions and “shall . . . hold unlawful and set aside agency action, findings, and conclusions found to be . . . arbitrary, capricious, an abuse of discretion, or otherwise not in accordance with law.”¹⁸⁸ Courts are no longer required to give deference to agency interpretations of ambiguous statutes.¹⁸⁹

There are two prominent theories¹⁹⁰ of statutory interpretation: purposivism and textualism. For purposivists, the most important consideration is legislative purpose,¹⁹¹ examining “the problem that Congress was trying to solve by enacting the disputed law and asking how

183. See discussion, *supra* § III.B.

184. See 30 U.S.C. § 1003(b)(4)(B)) (2024).

185. See 43 C.F.R. § 3203.5 (2024) (describing the “general process for obtaining a geothermal lease”).

186. See *generally* Library of Congress, Rules and Rulemaking, <https://guides.loc.gov/administrative-law/rules> (describing the federal rulemaking process) (last visited Jan. 22, 2024).

187. Administrative Procedures Act, ch. 324, 60 Stat. 237 (1946) (codified as amended at 5 U.S.C. §§ 551, et seq. (2024)).

188. 5 U.S.C. § 706(2)(A) (2024).

189. See *Loper Bright Enterprises v. Raimondo*, 144 S. Ct. 2244, 2269–70 (2024) (overruling *Chevron, U.S.A., Inc. v. Nat. Res. Def. Council, Inc.*, 467 U.S. 837 (1984)) (*Editor’s note*: Because this comment concludes that, even under *Chevron*, 30 U.S.C. § 1003(b)(4) cannot be interpreted more broadly than its plain language, *Chevron* being overruled is not relevant to this discussion).

190. Valerie C. Brannon, CONG. RSCH. SERV., R45153, *Statutory Interpretation: Theories, Tools, and Trends*, at 10. (2018), <https://crsreports.congress.gov/product/pdf/R/R45153/2>.

191. *Id.* at 11.

the statute accomplished that goal.”¹⁹² Textualists are less likely to consider legislative history at all.¹⁹³ They focus instead on the words in a statute, “emphasizing text over any unstated purpose”¹⁹⁴ and looking for “the meaning that a reasonable person would gather from the text of the law, placed alongside the remainder of the [body of law].”¹⁹⁵ General tools judges use in interpreting statutes include the “ordinary meaning, statutory context, legislative history, and evidence of the way a statute is implemented.”¹⁹⁶

A potential BLM rule that would allow noncompetitive geothermal leasing for oil and gas lessees who want to convert an oil well rather than coproduce with it likely would not pass a thorough analysis and interpretation of 30 U.S.C. § 1003(b)(4). The law, as amended in December 2020, applies to an oil and gas lease “subject to an approved application for permit to drill and from which oil and gas production is occurring.”¹⁹⁷ But the statute lists two additional requirements for such noncompetitive leasing. First, there must be “a determination that geothermal energy will be produced from a well producing or capable of producing oil and gas,”¹⁹⁸ and second, the geothermal lease must “provide for the coproduction of geothermal energy with oil and gas.”¹⁹⁹ Our analysis largely hinges on the interpretation of two phrases that are undefined: “well . . . capable of producing oil and gas” and “coproduction of geothermal energy with oil and gas.”

A purposivist could argue for a more expansive definition that considers wells that could previously produce oil and gas, especially given the increasing Congressional investment and interest in geothermal energy.²⁰⁰

192. *Id.* at 11–12 (citing Henry M. Hart, Jr. & Albert M. Sacks, *THE LEGAL PROCESS: BASIC PROBLEMS IN THE MAKING AND APPLICATION OF LAW* 1182 (William N. Eskridge, Jr. & Phillip P. Frickley eds., 1994)).

193. *Id.* at 15 (citing John F. Manning, *Textualism and Legislative Intent*, 91 VA. L. R. 419, 420 (2005)).

194. *Id.* at 13 (citing George H. Taylor, *Structural Textualism*, 75 B.U. L. REV. 321, 327 (1995)).

195. *Id.* at 14 (modifications in original) (quoting Antonin Scalia, *Common-Law Courts in a Civil-Law System: The Role of the United States Federal Courts in Interpreting the Constitution and Laws*, in *A MATTER OF INTERPRETATION: FEDERAL COURTS AND THE LAW* 22, at 17 (Amy Gutmann ed., 1997)).

196. *Id.* at 18.

197. *See* 30 U.S.C. § 1003(b)(4) (2024).

198. *Id.* § 1003(b)(4)(A).

199. *Id.* § 1003(b)(4)(B).

200. *See* discussion, *supra* Sec. II.C.

Allowing noncompetitive geothermal leasing for oil and gas lessees may align with broader legislative goals and evolving Congressional interests, even if the language is not explicit. Still, that would mean largely discarding the legislative history—which purposivists detest doing—and that history strongly suggests that the phrase “well . . . capable of producing oil and gas”²⁰¹ is unlikely to include wells *previously capable* of producing oil and gas. Congress spent close to a decade crafting, refining, and considering this provision²⁰², and could have clarified that language had they intended it so broadly.²⁰³ The legislative history²⁰⁴ shows there was never a significant effort to include—or much if any discussion about including—wells *previously capable* of oil and gas production in the proposed noncompetitive lease. The original 2011 bill containing this language was titled the “*Oil and Gas Facilitation Act of 2011*.” The bill’s caption read: “A bill to facilitate appropriate oil and gas development on Federal land and waters, to limit dependence of the United States on foreign sources of oil and gas, and for other purposes.”²⁰⁵

From any statutory interpretation perspective, it’s difficult to imagine the phrase “well . . . capable of producing oil and gas” being interpreted to include wells that are not presently capable of doing so. Similarly, little²⁰⁶ in the public sphere from that time demonstrates a Congressional intent for “coproduce” to be interpreted more broadly than the plain language of the statute. The DOE’s “Wells of Opportunity” program describes coproduction as involving “oil and gas wells that are still active.”²⁰⁷ A 2012 DOE “fact sheet” about geothermal and oil and gas “coproduction”

201. 30 U.S.C. § 1003(b)(4)(A) (2024).

202. See discussion, *supra* Sec. III.

203. See, e.g., *Foster v. U.S.*, 303 U.S. 118, 120 (1938) (“Courts should construe laws in harmony with the legislative intent and seek to carry out legislative purpose”).

204. See discussion, *supra* Sec. III.

205. Oil and Gas Facilitation Act of 2011, S. 916, Sec. 102, 112th Cong. (2011), <https://www.congress.gov/bill/112th-congress/senate-bill/916/text?s=1&r=31>.

206. See Press Release, Sen. Jon Tester, *Tester’s New Geothermal Energy Bill Gets Senate Hearing* (July 12, 2011), <https://www.testersenate.gov/newsroom/press-releases/pr-2433/> (Expressing that Sen. Tester’s bill with similar language to the coproduction provision eventually enacted “encourages leasing with production oil and gas wells along side [sic] of the geothermal wells.” This is a rare public statement explicitly acknowledging a regime allowing for production of oil and gas and geothermal on the same lease but using different wells).

207. *Wells of Opportunity*, *supra* note 112 (Also noting that “because the water is continuously recycled by injecting it back into the reservoir, co-production has a near-zero additional carbon footprint and can create wells that produce two types of energy simultaneously”).

opportunities only considers wells that would produce both types of energy simultaneously.²⁰⁸ Had Congress intended for “coproduction” to be interpreted broadly enough to include separate wells on the same leased land, it could have said so, or at least clarified it over the near-decade it spent on the provision.

The original 2011 bill was to encourage oil and gas production, with the noncompetitive geothermal leasing proposal likely included to incentivize operators to continue producing oil and gas from wells that were becoming unproductive by adding geothermal as a carrot. The provision itself was eventually included in a bill encompassing overall energy policy rather than primarily oil and gas, which may suggest Congress had a broader intent for the provision in 2020 than in 2011. But the language eventually enacted at 30 U.S.C. § 1003(b)(4) remains largely unchanged from its original form.²⁰⁹ Further, in the time since the noncompetitive provision on coproduction became law, there has not been a corresponding agency regulation promulgated.²¹⁰ At another session during the 2022 Task Force meeting, a lack of knowledge on this specific issue was cited as a “gap in information, data, or knowledge.”²¹¹ If BLM has not even promulgated a rule to account for coproduction—something explicitly allowed by statute—would it take any eventual rule further than the plain language of the statute, especially while this technology remains in its infancy? That seems unlikely.

B. If BLM cannot act on its own, Congress should consider further changes to explicitly allow noncompetitive geothermal leasing or combined leasing for qualified current oil and gas lessees

Without a noncompetitive leasing option, an oil and gas lessee in this situation would probably need to go through the competitive leasing process. Federal law allows “multiple use[s] of land and resources”²¹² and

208. U.S. Dep’t of Energy, *Geothermal Power/Oil & Gas Coproduction Opportunity*, Feb. 2012 (last accessed Aug. 6, 2024), <https://www.energy.gov/eere/geothermal/articles/geothermal-technologies-program-coproduction-fact-sheet> (Noting that “823,000 oil and gas wells in the U.S. produce hot water concurrent with oil and gas production” and “the water produced annually by oil and gas fields could generate up to 3 GW of clean, base-load power using binary geothermal units”).

209. *See supra*, note 157.

210. *See* 43 C.F.R. § 3204.5 (2024) (list of situations where an applicant can receive a noncompetitive geothermal lease includes the other noncompetitive leasing options listed at 30 U.S.C. 1003(b), but not the coproduction option).

211. *See* Levine, *supra* note 178, at app. B5-B6.

212. 30 U.S.C. § 1016 (2024) (“Geothermal leases shall, insofar as feasible, allow for coexistence of other leases of the same lands for deposits of minerals under the laws

specifically envisions geothermal leases co-existing with other mineral leases.²¹³ So while there might be no specific mechanism for an oil and gas lessee to noncompetitively obtain geothermal rights over the same land, there is nothing in the law to prevent an oil and gas lessee from competing for those rights.²¹⁴

Under the Geothermal Steam Act²¹⁵ and its associated regulations,²¹⁶ entities can nominate lands to the BLM for inclusion in a competitive lease sale,²¹⁷ or the BLM can put land up for a sale on its own.²¹⁸ The BLM must hold a competitive lease sale at least once every two years in a state with nominations pending,²¹⁹ but can also structure the sales to include land across multiple states.²²⁰ Any land offered at a competitive sale that receives no bids becomes available for noncompetitive leasing for two years.²²¹ The ideal outcome for an oil and gas lessee in this situation under current law and regulations would be to nominate the land and hope no one else bids on it. That is possible because this technology is still in its infancy²²² and because of the difficulty geothermal projects have in obtaining credit.²²³ Perhaps the current oil and gas lessees, with ownership of the existing infrastructure and a right to use the land, are in the best position to take on the investment and risk. But as it stands under federal law today, there does not seem to be any easy, simple path to experimenting with this technology with an unproductive well.

applicable to them, for the location and production of claims under the mining laws, and for other uses of the areas covered by them” but operations under any one lease can’t “unreasonably interfere with or endanger operations” of another).

213. *Id.*

214. See 43 C.F.R. § 3202.10 (2023) (Allowing any United States citizen over 18, any business entity organized under U.S. law, and any “domestic governmental unit” to hold a geothermal lease on federal land).

215. See Geothermal Steam Act of 1970, Pub. L. No. 91-581, 84 Stat. 1566 (codified as amended at 30 U.S.C. §§ 1001–1028), <https://www.congress.gov/91/statute/STATUTE-84/STATUTE-84-Pg1566.pdf>.

216. See 43 C.F.R. §§ 3200.1–3279.11 (2024).

217. *Id.* § 3203.5(a)(1)(i).

218. *Id.* § 3203.5(a)(1)(ii).

219. *Id.* § 3203.13.

220. *Id.*

221. *Id.* § 3204.5(a).

222. See Dhanesha, *supra* note 176 (Explaining that the four DOE projects approved for funding, see Press Release, U.S. Dep’t of Energy, *supra* note 10, will need time to prove viability and will be considered successful if they “continuously produce at least one megawatt of energy over a year—which is roughly enough to power a few hundred homes”).

223. See Reed, *supra* note 61..

Congress should add a noncompetitive geothermal leasing option for current oil and gas lessees that explicitly considers oil and gas wells and geothermal wells operating on the same leased land, but not necessarily both forms of energy being produced from the same well. Another possibility would be to create a new combined lease for geothermal and oil and gas development, modeled in some ways after an already existing, but rarely used, combined hydrocarbon lease. These changes have downsides and would come with legitimate debate and criticism but are worth exploring both for their potential to ramp up geothermal exploration and development, and to show relevant stakeholders what might be possible with orphaned wells.

1. Congress should add a noncompetitive option for oil and gas lessees that considers converted wells

Congress has clearly decided that geothermal energy is a worthy pursuit that could be valuable economically and environmentally with more investment.²²⁴ Congress could take the next step by changing only a couple more words of the Geothermal Steam Act.²²⁵ Adding language to § 1003(b)(4)(A) to allow noncompetitive geothermal leasing for oil and gas lessees with wells that were once, but no longer are, capable of producing oil and gas, and making §1003(b)(4)(B)'s coproduction requirement an option for producing geothermal rather than a requirement might do the trick.

Possible language for such an amendment could be constructed as follows (*proposed changes in italics*):

(4) Land subject to oil and gas lease

Land under an oil and gas lease issued pursuant to the Mineral Leasing Act (30 U.S.C. 181 et seq.) or the Mineral Leasing Act for Acquired Lands (30 U.S.C. 351 et seq.) that is subject to an approved application for permit to drill and from which oil and gas production is occurring may be available for noncompetitive leasing under subsection (c) by the holder of the oil and gas lease—*(A) to provide for the coproduction of geothermal energy with oil and gas; or (B) on a determination that geothermal energy will be produced from a well producing, capable of*

224. See discussion, *supra* § III.C–III.D.

225. See Geothermal Steam Act of 1970, Pub. L. No. 91-581, 84 Stat. 1566 (codified as amended at 30 U.S.C. §§ 1001–1028), <https://www.congress.gov/91/statute/STATUTE-84/STATUTE-84-Pg1566.pdf>.

producing, or that has ever been capable of producing oil and gas.

This broadened language would open the door to more geothermal exploration using existing infrastructure beyond coproduction. If entrepreneurial operators want to take a turn toward renewable energy without the massive upfront costs of drilling a well, they could receive a noncompetitive lease to give it a shot. Perhaps DOE could identify research applicants and use the Task Force²²⁶ to connect them with operators needing technical assistance to make this transition smoother. Funding could also be provided through the DOE.²²⁷ If this technology works, it will prevent many wells from becoming abandoned and possibly unplugged years later, exacerbating that problem.²²⁸

This proposal wouldn't be without critics who could raise legitimate points about its downside(s). Geothermal resources probably were not part of these oil and gas leases, nor were they likely considered when many of these leases were first negotiated. Would such a proposal, if it took off, grant oil and gas companies a *de facto* monopoly over large swaths of federal geothermal resources? Further, if the federal geothermal law already considers the possibility of multiple mineral leases over the same land²²⁹, then why shouldn't a different company with a good plan for geothermal resource extraction be given an opportunity to lease the land if its plan can coexist with the oil and gas lease? New players in the geothermal industry may face unfair competition, as established oil and gas companies could leverage their existing infrastructure and financial resources to dominate the geothermal sector. This could hinder market diversity and innovation. However, the mere existence of a competitive process does not preclude BLM from using that process to determine that the oil and gas lessee is the most qualified applicant. That is a likely outcome, and ultimately why a competitive process in such a situation would merely delay the inevitable or, worse, disincentivize major oil and gas players from investing in the technology.

226. See discussion, *supra* Sec. IV.A.i.

227. See discussion, *supra* Sec. II.C.

228. See Kaplan, *supra* note 2 (“Methane traps about 80 times as much heat as carbon dioxide during its first 20 years in the atmosphere”).

229. See 30 U.S.C. § 1016 (2024) (“geothermal leases shall, insofar as feasible, allow for coexistence of other leases of the same lands for deposits of minerals under the laws applicable to them, for the location and production of claims under the mining laws, and for other uses of the areas covered by them” but operations under any one lease can't “unreasonably interfere with or endanger operations” of another).

Drilling a new well is expensive²³⁰, but in these cases, that part is done. If an oil and gas lessee nominated land²³¹ for a competitive bid and lost to another developer, the new geothermal lessee would not only have to co-exist with the oil and gas lessee but would also be forced to make their project profitable with no existing infrastructure unless they purchased it from the oil and gas lessee, who likely knows better how to use that equipment. The law should be clarified, because unless another bidder has some exceptionally good reason their plan is better, the existing well should get priority.

Potential lessees already use the same form²³² for competitive bidding whether bidding on an oil and gas lease or a geothermal lease. The respective lease offer forms are, in many ways, identical.²³³ Making this simple change in the statute would cause no massive disruption to the BLM's leasing scheme but would instead clarify and streamline the process while encouraging oil and gas companies to be creative as they phase out aging equipment. Congress should explicitly put geothermal energy development by current oil and gas lessees via converted wells on the same footing as coproduction by adding a new noncompetitive leasing option for oil and gas lessees.

2. Congress should create a combined lease and a conversion regime for current oil and gas lessees

Adding a new noncompetitive leasing option is likely the quickest and simplest way to encourage geothermal development using existing infrastructure on federal lands. But looking toward the future, Congress should also create a combined lease for oil and gas and geothermal development and create a way for current oil and gas lessees to convert. An already-existing regime in federal law—combined hydrocarbon leases

230. See Dhanesha, *supra* note 176 (“Drilling . . . accounts for half the cost of most geothermal energy projects”).

231. 43 C.F.R. § 3203.5(a)(1)(i) (2024).

232. See U.S. Bureau of Land Mgmt. Form 3000–002, Competitive Oil and Gas or Geothermal Resources Lease Bid, https://www.blm.gov/sites/blm.gov/files/uploads/Services_National-Operations-Center_Eforms_Fluid-and-Solid-Minerals_3000-002.pdf (last accessed Aug. 6, 2024).

233. Compare U.S. Bureau of Land Mgmt. Form 3100–011, Lease for Oil and Gas, https://www.blm.gov/sites/blm.gov/files/uploads/Services_National-Operations-Center_Eforms_Fluid-and-Solid-Minerals_3100-011.pdf (last accessed Aug. 6, 2024) with U.S. Bureau of Land Mgmt. Form 3200–24, Offer to Lease and Lease for Geothermal Resources, https://www.blm.gov/sites/blm.gov/files/uploads/Services_National-Operations-Center_Eforms_Fluid-and-Solid-Minerals_3200-024.pdf (last accessed Aug. 6, 2024).

(“CHL”) for oil and gas lessees on tar sand lands²³⁴—provides some guidance for how a combined oil and gas/geothermal leasing system could work. And in the geothermal context, many problems and concerns about tar sands simply don’t exist.

Congress passed the Combined Hydrocarbon Leasing Act of 1981²³⁵ in response to instable oil markets and worldwide shortages.²³⁶ Extraction of tar sands crude comes via “surface mining, steam injection, or other enhanced techniques instead of conventional drilling.”²³⁷ Tar sands can be mined to extract “bitumen, an oil-rich residue, which then can be refined into crude oil.”²³⁸ Tar sands are the dominant source of Canadian oil production²³⁹ and exist in some parts of the western United States.²⁴⁰ Oil and gas lessees may convert²⁴¹ to a CHL²⁴² if the lease is on federal land within a Special Tar Sand Area (“STSA”).²⁴³ The United States imports a large amount of oil produced this way from Canada,²⁴⁴ but it has not taken off domestically.²⁴⁵ The urgency with which U.S. policymakers consider

234. See Combined Hydrocarbon Leasing Act of 1981, Pub. L. No. 97-78, 95 Stat. 1070 (codified as amended in scattered sections of 30 U.S.C.).

235. *Id.*

236. Stevan R. Baxter, *Tar Sands: Worth The Energy? An Analysis of the Future of Utah’s Tar Sands*, 27 J. LAND RES. & ENV’T L. 323, 327-328 (2007).

237. Lilly Fang, *Environmental Review Problems of Cross-Border Projects Under NEPA: Lessons from Tar Sands Pipelines*, 31 STAN. ENV’T L. J. 285, 287-288 (2012).

238. Baxter, *supra* note 236, at 323, 324.

239. See Stephen Leahy, *This is the world’s most destructive oil operation—and it’s growing*, NAT’L GEOGR. (April 11, 2019), <https://www.nationalgeographic.com/environment/article/alberta-canadas-tar-sands-is-growing-but-indigenous-people-fight-back> (“If Alberta, with its population of four million people, were a country, it would be the fifth largest oil-producing nation. While it produces conventional oil, most comes from the Alberta oil sands, the world’s third largest proven oil reserve at 170 billion barrels”).

240. Baxter, *supra* note 236, at 324 (“In the United States, tar sands are found in Utah, Colorado, and Wyoming, commonly known as the Tar Sand Triangle”).

241. 30 U.S.C. § 226(n) (2024).

242. See *S. Utah Wilder. All. v. Palma*, 707 F.3d 1143, 1147 (10th Cir. 2013) (“A [combined hydrocarbon lease] allows the lease owner to extract oil from tar sands, as well as oil and gas from traditional deposits”).

243. 43 C.F.R. § 3140.0–5(c) (2024) (generally defining “Special Tar Sand Area” as federal lands “containing substantial deposits of tar sand”).

244. See *Petroleum Imports into the U.S. by Country 1985-2022*, STATISTA.COM (Aug. 25, 2023), <https://www.statista.com/statistics/201844/us-petroleum-imports-by-country-since-1985/> (“In 2022, the United States imported around 4.35 million barrels of petroleum per day from its northern neighbor”).

245. See Brian Maffly, *Feds fast-track plan to lease Uinta Basin lands for tar sands mining before Trump leaves office*, SALT LAKE TRIB. (Dec. 10, 2020), <https://www.>

domestic tar sands oil production has historically depended upon the state of an often-unstable worldwide oil market.²⁴⁶ Still, the general framework for how the United States has handled tar sands leasing on federal land is instructive as we consider how geothermal energy can be harnessed from old oil wells.

Generally, an oil and gas lessee on a STSA can either²⁴⁷ obtain a CHL²⁴⁸ or a separate tar sand lease.²⁴⁹ A lessee must have either a CHL or a separate lease to produce oil and gas from tar sand.²⁵⁰ To apply for a CHL, an operator must apply to BLM along with copies of a plan of operations that must include a development phase and may include an exploratory phase.²⁵¹ Once the plan is approved, the term²⁵² of the oil and gas lease is suspended and a CHL is prepared for execution.²⁵³

Given the new technology being researched, a combined geothermal lease may be an attractive option for current oil and gas lessees interested in pursuing geothermal. It would give BLM even more flexibility to convert these leases and allow for geothermal development from old oil wells. And a combined geothermal lease comes with virtually none of the baggage that tar sands development carries.

Geothermal resources are theoretically available almost anywhere in the United States,²⁵⁴ where domestic tar sand resources are almost limited to a

[slib.com/news/environment/2020/12/10/feds-fast-track-plan/](https://www.scribd.com/news/environment/2020/12/10/feds-fast-track-plan/) (Noting that “the tar sands industry has yet to produce substantial quantities of oil in Utah, despite decades of trying”).

246. See Baxter, *supra* note 236, at 327, 339.

247. See Leasing in Special Tar Sand Areas, 70 FED. REG. 58610 (Oct. 7, 2005) (“Section 350 of the Energy Policy Act of 2005 further amended the Mineral Leasing Act to authorize the Secretary to issue separate oil and gas leases and tar sand leases, in addition to combined hydrocarbon leases, in special tar sand areas”).

248. See 43 C.F.R. § 3140.2–2 (“Only owners of oil and gas leases issued within Special Tar Sands Areas, on or before November 16, 1981, and owners of valid claims based on mineral locations within Special Tar Sands Areas, are eligible to convert leases or claims to combined hydrocarbon leases in Special Tar Sands Areas”).

249. *Id.*; see also Energy Policy Act of 2005, H.R. 6, Sec. 350 109th Cong. (2005), <https://www.congress.gov/bill/109th-congress/house-bill/6/text>.

250. 43 C.F.R. § 3141.1(d)–(e).

251. See *id.* § 3140.2–2 (listing the CHL application requirements).

252. *Id.* § 3140.2–3(g)(1) (“Only the term of the oil and gas lease shall be suspended, not any operation and production requirements thereunder”).

253. *Id.* § 3140.4–2.

254. See *GeoVision Report*, *supra* note 56, at 19 (“EGS offer the opportunity to access enormous amounts of thermal energy in the Earth by drilling wells and connecting them with an engineered fracture network. Water can then be circulated to harness energy in the form

few states, namely Utah.²⁵⁵ Anyone with an oilwell that is drilled far enough into the ground to reach direct use²⁵⁶ temperatures could theoretically make use of this technology. The vast majority of geothermal resources are on federally managed land;²⁵⁷ there are but a few STSAs.²⁵⁸

Tar sand mining comes with several environmental hazards, including significant land disturbances, air quality issues, water consumption and contamination problems, and proximity to national parks.²⁵⁹ Geothermal energy production is clean²⁶⁰ and renewable. While there are unanswered environmental questions about repurposed oil wells being used for geothermal, it would undeniably be cleaner than oil and gas production.²⁶¹ In a closed-loop system²⁶² using two converted wells—one for injection and one for production—the same water would ideally be re-used. That would mean, in a state like California with its more advanced geothermal legal regime,²⁶³ a project could move forward with fewer water rights

of heat and convert it to electricity, district-level heating solutions, or other geothermal direct-use applications”)

255. Baxter, *supra* note 236, at 323 (“Utah . . . contains approximately ninety-three percent of the United States’ total tar sand resources”).

256. *See* discussion, *supra* Sec. II. B.ii.1.

257. *See* Press Release, U.S. Dep’t of Interior, *supra* note 17.

258. *See* Baxter, *supra* note 236, at 324 (“In the United States, tar sands are found in Utah, Colorado, and Wyoming, commonly known as the Tar Sand Triangle”).

259. *See id.* at 330-334 (discussing the various environmental concerns presented by tar sands mining); *see also* Leahy, *supra* note 239 (“Scattered along the banks of [Canada’s] Athabasca River is one of the world’s largest collections of tailings waste ponds—able to fill more than 500,000 Olympic swimming pools. These are so toxic, ducks and other birds have to be prevented from going near them”).

260. *See* U.S. Dep’t of Energy, Geothermal Tech. Office, *Geothermal FAQs* (Last visited Jan. 22, 2024), <https://www.energy.gov/eere/geothermal/geothermal-faqs> (“Reaching the target number of installed geothermal heat pumps . . . could help the U.S. avoid greenhouse gas emissions equal to the annual emissions of 20 million cars”).

261. *See* U.S. Energy Info. Admin., *Geothermal explained: Geothermal Energy and the Environment*, <https://www.eia.gov/energyexplained/geothermal/geothermal-energy-and-the-environment.php> (last visited Jan. 22, 2024) (“[g]eothermal power plants do not burn fuel to generate electricity, but they may release small amounts of sulfur dioxide and carbon dioxide. Geothermal power plants emit 97% less acid rain-causing sulfur compounds and about 99% less carbon dioxide than fossil fuel power plants of similar size”).

262. *See* Press Release, Baker Hughes, *Wells2Watts Commissions Geothermal Closed-Loop Test Facility, Enters Testing Phase to Scale Renewable Electric Power* (Oct. 11, 2023), <https://www.bakerhughes.com/company/news/baker-hughes-wells2watts-commissions-geothermal-closedloop-test-facility-enters>.

263. *See* discussion, *supra* Sec. II.B.iii.

concerns.²⁶⁴ Finally, mining tar sands differs vastly from traditional oil and gas production. Transitioning oil wells to geothermal would mean using much of the same equipment and labor.²⁶⁵

Combined leases for tar sand mining and traditional oil and gas development via drilling may not have taken off the way Congress envisioned in 1981, but they provide a convenient framework for how a combined geothermal/oil and gas lease scheme could function. And *this* form of combined lease would have a better chance to succeed.

C. These proposed changes can accelerate the cleanup and conversion of dangerous orphaned wells

Abandoned and idle oil wells on federal lands are not nearly as pressing of an issue as those on state and private lands; that is clear from funding appropriated in the 2021 infrastructure bill.²⁶⁶ The bill appropriated \$250 million²⁶⁷ for dealing with abandoned and idle wells on federal land and \$150 million²⁶⁸ for tribal lands, but \$4.275 billion²⁶⁹ for those on state and private lands. So, while the above suggested Congressional actions²⁷⁰ could jumpstart geothermal energy production on federal lands, it would not have an immediate impact where the most problems exist. Still, federal oil and gas lessees have an important role to play as energy needs and climate concerns continue to collide in the coming years. And in the long term, these suggestions may help give this technology the boost it needs to become economically viable.²⁷¹ That would encourage further innovation and hopefully one day result in widespread conversion of those the more dangerous idle and abandoned oil wells.²⁷²

264. See CAL. PUB. RES. CODE § 3742.2 (West 2024) (allowing for a “rebuttable presumption” that a geothermal developer “has absolute title to the geothermal resources reduced to his possession from such well or wells” and may reuse water—or produced water—used to harness geothermal without water appropriations).

265. See Dhanesha, *supra* note 176 (One person attempting to co-produce geothermal with oil and gas said, “I think geothermal is a really great place for [oil and gas workers] to land. Oil and gas workers know how to safely, efficiently, and economically produce fluid”).

266. See Infrastructure Investment and Jobs Act § 40601, Pub. L. 117-58, 135 Stat 429, Sec. 40601 (2021), <https://www.congress.gov/bill/117th-congress/house-bill/3684/text> (codified at 42 U.S.C. § 15907 (2024)).

267. 42 U.S.C. § 15907(h)(1)(A) (2024).

268. *Id.* § 15907(h)(1)(E).

269. *Id.* § 15907 (h)(1)(B)-(D).

270. See discussion, *supra* Sec. IV.B.

271. See Reed, *supra* note 61 (“Financing geothermal projects is often seen by banks as too risky because of uncertainties around resource viability”).

272. See discussion, *supra* Sec. II.A.

For wells determined to be idle—nonoperational and without an “anticipated beneficial future use”²⁷³—the plugging and remediation process is an appropriate, practical solution. In those situations, the newly established Orphaned Wells Program Office²⁷⁴ has a clear mandate.

An orphaned well²⁷⁵ without a known owner that can be retrofitted, though, presents more opportunities—and also unique challenges that are not present when an oil and gas lessee simply wants to add geothermal development to their lease. But recent legislative and administrative moves have made the possibility of a coordinated, effective effort to solve two long-evasive problems: (1) how to provide geothermal energy and all its benefits to the masses, and (2) what to do about America’s abundance of idle and orphaned wells.

If a well on federal land doesn’t have a known owner, it is likely that the related oil and gas lease has either been canceled or terminated²⁷⁶ by operation of law. The federal government may take possession and title of any “abandoned or unclaimed”²⁷⁷ property on federal land and can “use, transfer, or otherwise dispose of the property.”²⁷⁸

This would be a creative way to put many recent government initiatives—the Energy Act of 2020’s²⁷⁹ call for an oil and gas technology transfer initiative,²⁸⁰ the Task Force,²⁸¹ the DOE’s ongoing geothermal research and investment²⁸², and the Orphaned Wells Program Office²⁸³—to

273. 42 U.S.C. § 15907(a)(2) (2024) (defining an “idled well” as one that “has been nonoperational” for at least four years and “for which there is no anticipated beneficial future use”).

274. See discussion, *supra* Sec. II.A.

275. 42 U.S.C. § 15907(a)(5) (2024) (defining an “orphaned well” as one on federal or tribal land that “is not used for an authorized purpose,” and meets one of three conditions: (1) it has no known operator, (2) it has an operator unable to plug the well and remediate the site, or (3) it is located within the National Petroleum Reserve-Alaska).

276. 30 U.S.C. § 188(b) (2024) (describing when an oil and gas lease may be canceled or terminated by operation of law).

277. 40 U.S.C. § 552 (2024).

278. *Id.*

279. Consolidated Appropriations Act, 2021, Pub. L. 116-260, 134 Stat 1182, Div. Z, Energy Act of 2020, Sec. 3105 (codified at 30 U.S.C. § 1003(b)(4)(A) (2024)) (Dec. 27, 2020), <https://www.congress.gov/bill/116th-congress/house-bill/133>.

280. *Id.*, Sec. 3002 (codified at 42 U.S.C. § 17193(d) (2024)) (calling for the initiative between DOE, several government agencies, and the private sector to develop “relevant advanced technologies and operation techniques used in the oil and gas sector for use in geothermal energy development.”).

281. See Levine, *supra* note 178.

282. See discussion, *supra* Sec. II.C.

good use. The 2021 bill²⁸⁴ that created the Orphaned Wells office also called for the Department of Interior to cooperate on orphaned wells with the Departments of Energy²⁸⁵ and the Interstate Oil and Gas Compact Commission.²⁸⁶

The Orphaned Wells Program Office and BLM could coordinate to identify federal land ripe for geothermal development with salvageable abandoned wells and offer those lands at competitive auctions. This would be in line with the 2021 infrastructure bill's call for "a method of ... identifying, characterizing, and inventorying orphaned wells and associated pipelines, facilities, and infrastructure on Federal land,"²⁸⁷ and considering, in prioritizing those wells, "other subsurface impacts of land use priorities."²⁸⁸

Because the federal government can take possession of and title²⁸⁹ to the abandoned well, that equipment could be offered to potential lessees as added incentive. A well-coordinated approach could also encourage state²⁹⁰ legislators to either create or modernize a leasing procedure for state-managed lands. States could also incentivize investment in and development of this technology by clarifying how their statutory schemes classify "geothermal resources" in terms of property rights.²⁹¹

Dealing with these millions of abandoned oil wells will demand innovative solutions. Collaborating with existing oil and gas lessees is an important piece of that. These stakeholders possess the expertise and resources to spearhead a larger push toward repurposing old oil wells for geothermal. This aligns with recent legislative efforts while also showcasing the potential of repurposing abandoned wells for geothermal development. By helping drive this shift, these industry players can not only contribute to the need for sustainable energy but also set an inspiring precedent for widespread adoption at the state and private level, where the

283. See discussion, *supra* Sec. II.A.

284. See Infrastructure Investment and Jobs Act § 40601, Pub. L. 117-58, 135 Stat 429, Sec. 40601 (2021), <https://www.congress.gov/bill/117th-congress/house-bill/3684/text> (codified at 42 U.S.C. § 15907 (2024)).

285. 42 U.S.C. § 15907(b)(4)(B)(i) (2024).

286. *Id.* § 15907(b)(4)(B)(ii).

287. *Id.* § 15907(b)(2)(A)(i).

288. *Id.* § 15907(b)(2)(A)(ii).

289. See 40 U.S.C. § 552 (2024).

290. See discussion, *supra* Sec. II.C.

291. See discussion, *supra* Sec. II.B.iii.

vast majority of abandoned and idle wells are located.²⁹² This concerted effort, coupled with governmental support and incentives, could spur crucial steps toward more widespread use of geothermal energy challenge and toward solving the long-standing issue of abandoned wells.

V. Conclusion

The journey towards embracing geothermal leasing on federal lands has been a prolonged struggle. Over the course of decades, Congress has navigated the complexities of this issue, culminating most recently in a noncompetitive leasing option for current oil and gas lessees. This process underscores the difficulty in instigating change, as bureaucratic hurdles, conflicting interests, and economic considerations have posed substantial barriers. And that's before one even considers whether this technology is viable as a widespread solution in the long term. But the pull toward geothermal energy has persisted for decades. As one energy executive exploring geothermal technology said, "Everyone who looks into it gets obsessed with it."²⁹³

Both Democrats and Republicans recognize the immense potential of geothermal energy and have advocated and voted for further investment. The beauty of this potential lies in its universality and the ubiquity of abandoned oil wells, scattered across the nation in blue and red states. Each one—whether ultimately repurposed or plugged and remediated—presents an opportunity for a cleaner, more sustainable future. How ironic it would be if the widespread adoption of this transformative technology stemmed from the remnants of our reliance on conventional, "dirty" oil wells.

292. See *Orphaned Wells Report to Congress*, *supra* note 51 at 22–23 (Providing that 26 states seeking funding under the program reported a total of 126,806 documented orphaned wells in December 2021, while there were only 599 wells on federal lands listed in the Federal Orphaned Well Database).

293. Plumer, *supra* note 28.