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Getting Steamy with Property Law: Are Geothermal Resources a Mineral Right in West Virginia?

Joshua A. Lanham
West Virginia University College of Law

GETTING STEAMY WITH PROPERTY LAW: ARE GEOTHERMAL RESOURCES A MINERAL RIGHT IN WEST VIRGINIA?

I. INTRODUCTION

West Virginia has long been an innovative and leading energy-producing state.[1] Before West Virginia became its own state, the area that would later become West Virginia produced commercial quantities of salt brine.[2] In 1815, while drilling for salt, Captain James Wilson struck the United States' first-ever natural gas well in Charleston, West Virginia.[3] In modernity, West Virginia's natural gas market has once again flourished as horizontal fracturing has allowed West Virginia to access more of its abundant natural gas resources.[4] West Virginia's petroleum oil reserves, another original by-product of salt production,[5] have also been commercially extracted throughout West Virginia's history.[6] Without a doubt, West Virginia's most lucrative and iconic natural resource has been its vast reserves of bituminous coal.[7]

Recently, however, researchers discovered that West Virginia has another valuable resource deep beneath its mountains and valleys.[8] According to

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1 *See West Virginia: State Profile and Energy Estimates*, U.S. ENERGY INFO. ADMIN. (July 20, 2017), https://www.eia.gov/state/?sid=WV (stating that West Virginia ranked fourth in total energy produced in 2013).

2 *See History of West Virginia Mineral Industries – Salt*, W. VA. GEOLOGICAL & ECON. SURV. (July 19, 2004), http://www.wvgs.wvnet.edu/www/geology/geoldvsa.htm.

3 *See First Natural Gas Well*, WVEXP.COM (Dec. 10, 2005), http://www.wvexp.com/index.php/First_Natural_Gas_Well.

4 *See* Casey Junkins, *West Virginia natural gas production numbers 'shocking'*, WASH. TIMES (Jan. 23, 2016), http://www.washingtontimes.com/news/2016/jan/23/west-virginia-natural-gas-production-numbers-shock/ ("Overall, with traditional vertical drilling included with horizontal fracking, West Virginia produced more than 1 trillion cubic feet of natural gas in 2014.").

5 *See History of WV Mineral Industries – Oil and Gas*, W. VA. GEOLOGICAL & ECON. SURV. (July 16, 2004), http://www.wvgs.wvnet.edu/www/geology/geoldvog.htm.

6 *See West Virginia State Profile and Energy Estimates: Profile Analysis*, U.S. ENERGY INFO. ADMIN. (July 20, 2017), https://www.eia.gov/state/analysis.cfm?sid=WV ("The state's first oil field began producing just before the Civil War, and peak production of 16 million barrels per year was reached in 1900.").

7 *See generally History of West Virginia Mineral Industries – Coal*, W. VA. GEOLOGICAL & ECON. SURV. (June 20, 2017), http://www.wvgs.wvnet.edu/www/geology/geoldvco.htm.

8 *See First Google.Org-funded geothermal mapping report confirms vast coast-to-coast clean energy source*, SMU (Oct. 25, 2011) [hereinafter SMU Study],

a recent study funded by Google and conducted by a group of Southern Methodist University ("SMU") scientists, West Virginia is uniquely situated as an eastern state that has a tremendous amount of potentially viable geothermal resources.[9] The study found that "the largest geothermal hot spot in the eastern United States" is located in West Virginia.[10] The SMU study also "revealed the existence of geothermal resources under the state of West Virginia equivalent to the state's existing (primarily coal-based) power supply."[11] The study shows that West Virginia has "tremendous potential" to utilize geothermal resources[12] in the future.[13]

How will West Virginia's existing law handle this newly discovered, valuable property right? West Virginia's widespread severed surface and mineral estates make addressing the issue of property ownership a far more complex endeavor than it would be in other states.[14] There are hundreds, if not thousands, of variations on how mineral conveyances, reservations, and exceptions have been drafted over the past two centuries in West Virginia.[15] To further complicate the matter, West Virginia, like most eastern states,[16] has not yet contemplated geothermal resources as a valuable legal right.[17]

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https://www.smu.edu/News/2011/geothermal-24oct2011 ("Areas of particular geothermal interest include the Appalachian trend (Western Pennsylvania, West Virginia, to north Louisiana) . . . .").

9 *Id.*

10 Andrew Chiasson, *The Economic, Environmental, and Social Benefits of Geothermal Use in the Eastern United States*, GEO-HEAT CTR. Q. BULL., Aug. 2011, at 4, http://www.oit.edu/docs/default-source/geoheat-center-documents/quarterly-bulletin/vol-30/30-2/30-2-bull-all.pdf?sfvrsn=4 ("West Virginia sits atop geothermal hot spots, some as warm as 392°F at depths as shallow as five kilometers . . . . If this geothermal energy could be feasibly tapped, the state could become a significant producer of geothermal energy for the region.").

11 SMU Study, *supra* note 8.

12 Throughout this Note, the term "geothermal resources" means "underground reservoirs of hot water or steam created by heat from the earth, as well as subsurface areas of dry hot rock." Craig D. Galli et al., *Getting into Hot Water: Current Hot Topics in Geothermal Development*, 55 ROCKY MTN. MIN. L. INST. 6-1, § 6.01 (2009).

13 SMU Study, *supra* note 8.

14 Faith United Methodist Church and Cemetery of Terra Alta v. Morgan, 745 S.E.2d 463, 469 (W. Va. 2013) (noting that "[t]here are a significant number of surface deeds in West Virginia"); *The Complicated Mineral Rights Issue (Mess?) in WV*, MARCELLUS DRILLING NEWS (Mar. 24, 2014), http://marcellusdrilling.com/2014/03/the-complicated-mineral-rights-issue-mess-in-wv/ ("Mineral rights in West Virginia are complex, to say the least . . . . Statewide there are 352,247 owners of mineral rights that have been separated from surface rights.").

15 Watt v. W. Nuclear, Inc., 462 U.S. 36, 42–43 (1983) (observing that the term "minerals" in conveyances has been used in many different ways over the years).

16 In this Note, the phrase "eastern states" is referencing those states east of the Mississippi River.

17 Most eastern states have not contemplated geothermal resources because "exploration and utilization of [geothermal] resources has [only] occurred generally in the western part of the

This Note argues that existing West Virginia case law would likely classify geothermal resources as a mineral interest in broad mineral conveyances or reservations and that this is the most effective classification for stimulating geothermal resource development. Section II.A will explain West Virginia's geothermal potential in greater detail. Section II.B will explain exactly what a geothermal resource is and surveys the methods by which it is extracted. Section II.C briefly surveys how other United States jurisdictions have classified geothermal resources as a property right. Section II.D will take a look at existing West Virginia jurisprudence surrounding severed estates property ownership. In Part III, this Author will argue that West Virginia should classify geothermal resources as a part of the mineral estate in cases of broad mineral grants, exceptions, or reservations.

As the Supreme Court of Appeals of West Virginia has emphasized, it is important that resource-laden states have uniform and predictable laws regarding property ownership.[18] Thus, the West Virginia Legislature or West Virginia courts should clarify property ownership of geothermal resources in the near future.[19] The mineral-based approach would have a basis in West Virginia's precedent[20] and would create an easy-to-understand rule of law.

II. BACKGROUND

Section II.A will discuss several reasons why West Virginia will likely utilize its geothermal resources in the future. Section II.B will define what a geothermal resource is and will give a brief description of the methods by which geothermal resources are extracted. Section II.C will survey the different approaches adopted by United States jurisdictions in the classification of geothermal resources. Finally, Section II.D will explore West Virginia's mineral ownership jurisprudence in order to develop a framework for how West Virginia courts will likely classify geothermal resources in the future.

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nation." Geothermal Kinetics, Inc. v. Union Oil Co. of Cal., 141 Cal. Rptr. 879, 879–80 (Cal. Ct. App. 1977).

[18] *See* W. Va. Dep't of Transp. v. Veach, 799 S.E.2d 78, 94 (W. Va. 2017) (Ketchum, J., concurring) (stating that a goal of the Supreme Court of Appeals of West Virginia in land dispute cases is to "eradicate confusion from land titles"); *Faith United*, 745 S.E.2d at 475 ("Unquestionably, uniformity and predictability are important in the formulation and application of [West Virginia's] rules of property.").

[19] *See generally* George Vranesh & John D. Musick, Jr., *Geothermal Resources: Water and Other Conflicts Encountered by the Developer – An Alternative Energy Source Which is "Gathering Steam"*, ROCKY MTN. MIN. L. INST. 6-1, Part I (1977) ("Litigation of geothermal resources is as yet a very small body of law though it is certain to increase.").

[20] For a discussion of West Virginia case law concerning what constitutes a mineral for purposes of ownership, see *infra* Section II.D.1.

A. The Future Potential of West Virginia's Newfound Geothermal Resources

The 21st century presents a world starting to transition away from fossil fuels to more sustainable and green fuel sources.[21] For a variety of reasons, West Virginia's fossil fuel industries—aside from its natural gas industry[22]—have taken a very large hit in recent years.[23] For instance, southern West Virginia's coal production declined by 61% in the eight-year period between 2008 and 2016.[24]

It is no secret that West Virginia currently lags behind a large majority of the nation in producing renewable energy.[25] However, for several reasons, West Virginia will almost certainly utilize its tremendous geothermal resource potential at some point in the future. First, some studies have found that the earth's potential geothermal resources are more than adequate to supply all of humanity with energy.[26] Second, geothermal resources provide an excellent source of baseload power,[27] which is an important capability of energy

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21 *Paris Agreement*, EUR. COMM'N: CLIMATE ACTION (July 10, 2017), http://ec.europa.eu/clima/policies/international/negotiations/paris/index_en.htm ("At the Paris climate conference (COP21) in December 2015, 195 countries adopted the first-ever universal, legally binding global climate deal.").

22 *See* Junkins, *supra* note 4.

23 *See generally* Bill Archer, *Current coal slump one of industry's most challenging in history of W. Va. coalfields*, REGISTER-HERALD (July 24, 2015), http://www.register-herald.com/current-coal-slump-one-of-industry-s-most-challenging-in/article_a063895d-0b47-5ab1-8478-db4b845ea0c5.html.

24 *See Coal mine output totals 80 million short tons in 2016*, DOMINION POST (July 3, 2017, 5:02 PM), http://www.dominionpost.com/Coal-mine-output-totals-80-milli; *see also* Clifford Krauss, *Coal Production Plummets to Lowest Level in 35 Years*, N.Y. TIMES (June 10, 2016), http://www.nytimes.com/2016/06/11/business/energy-environment/coal-production-decline.html?_r=0 ("Coal was once the dominant source of the nation's electricity generation, but consumption of the fossil fuel has declined by nearly a third since its peak in 2007."); Suzanne Goldenberg, *The death of US coal: industry on a steep decline as cheap natural gas rises*, GUARDIAN (Apr. 8, 2016), https://www.theguardian.com/environment/2016/apr/08/us-coal-industry-decline-natural-gas.

25 While it is outside the scope of this Note, in 2015, West Virginia was the first state to repeal its Alternative Renewable Energy Standard. *See* Jeff Jenkins, *Senate votes 33-0 to repeal controversial alternative fuel law*, METRONEWS (Jan. 21, 2015), http://wvmetronews.com/2015/01/21/senate-votes-33-0-to-repeal-controversial-alternative-fuel-law/. For a discussion of policies that West Virginia could implement to stimulate renewable energy growth, see generally James M. Van Nostrand, *An Energy and Sustainability Roadmap for West Virginia*, 115 W. VA. L. REV. 879 (2013).

26 Mathias Aarre Maehlum, *How a Geothermal Power Plant Generates Electricity*, ENERGYINFORMATIVE (May 3, 2013), http://energyinformative.org/how-a-geothermal-power-plant-generates-electricity/.

27 *See generally* Steven Meredith, *Why Everyone is Talking About Baseload Power*, RENEWABLE ENERGY WORLD (Oct. 18, 2016),

production.[28] The baseload power potential of geothermal resources "distinguishes it from several other renewable technologies that produce variable power."[29] Third, as coal's influence dwindles,[30] West Virginia will need to find resources to replace some of the energy that was traditionally produced by coal. Finally, geothermal resources provide clean[31] and renewable energy potential, which are increasingly desired traits of potential fuel sources.[32]

B. What Is a Geothermal Resource, Anyway?

In order to properly classify geothermal energy as a resource in a legal sense, it is important to have an understanding of exactly what a geothermal resource is and how it is used to produce commercial-scale energy. Geothermal resources can be simply characterized as "heat from the Earth."[33] Scientists estimate "that 42 million megawatts (MW) of power flow from the Earth's interior, primarily by conduction."[34] The heat radiating from the earth's core will

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http://www.renewableenergyworld.com/articles/2016/10/why-everyone-is-talking-about-baseload-power.html (stating that baseload power refers to electrical generation sources that can produce electricity 24 hours a day).

28 INT'L ENERGY AGENCY, TECHNOLOGY ROADMAP: GEOTHERMAL HEAT AND POWER 7 (2011) [hereinafter TECHNOLOGY ROADMAP], https://www.iea.org/publications/freepublications/publication/Geothermal_Roadmap.pdf ("Geothermal typically provides base-load generation, since it is generally immune from weather effects and does not show seasonal variation. Capacity factors of new geothermal power plants can reach 95%.").

29 *Id.*

30 *See generally* Ewa Krukowska, *Global Coal Consumption Heads for Biggest Decline in History*, BLOOMBERG (Nov. 8, 2015, 6:01 PM), https://www.bloomberg.com/news/articles/2015-11-08/global-coal-consumption-headed-for-biggest-decline-in-history.

31 This is not to suggest that the extraction of commercial quantities of geothermal resources poses no potential problems for the environment. Several potential impacts of geothermal resource development include: "Subsidence and seismic effects; thermal pollution to either air or water; air pollution in the form of odorous gases and particulate matter; noise pollution, land use planning; resource conservation; and most significantly, effect on the hydrologic systems of underground and surface waters." Vranesh & Musick, *supra* note 19, at Part III.

32 *Geothermal FAQs*, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, https://energy.gov/eere/geothermal/geothermal-faqs#why_geothermal_energy_renewable (last visited Nov. 11, 2017).

33 4 AMERICAN LAW OF MINING § 133.02[1] (Rocky Mountain Mineral Law Foundation ed., 2d ed. 1984) ("[T]he heat energy of the geothermal resource is more an occurrence than it is a physical substance.").

34 GEOTHERMAL ENERGY ASS'N, GEOTHERMAL BASICS: Q&A 6 (2012) [hereinafter GEOTHERMAL ENERGY ASS'N], http://www.geo-energy.org/reports/Gea-GeothermalBasicsQandA-Sept2012_final.pdf.

continue to radiate for billions of years.[35] Thus, the earth's heat provides humans with "an inexhaustible supply of [potential] energy."[36]

There are several different methods by which geothermal resources can be extracted and utilized to produce electricity. Three things are required before geothermal resources can generate electricity: "[F]luid, heat, and permeability."[37] Essentially, all of the different methods of producing electricity via geothermal involve pulling "hot water and steam from the ground" to generate electricity before the water is returned to the geothermal reservoir for reuse.[38]

Section II.B.1 will discuss direct-use geothermal, which has been utilized by humans for thousands of years.[39] Section II.B.2 will discuss geothermal dry steam extraction, which is the process of catching naturally forming underground steam and using it directly to turn turbines to generate electricity.[40] Section II.B.2 will also discuss flash-steam geothermal resource extraction, which takes high-pressured water from deep beneath the earth and converts it to steam at the surface.[41] Section II.B.3 will briefly discuss binary cycle systems, which utilize moderately heated geothermal fluid to heat up a secondary fluid that has a lower boiling point.[42] Section II.B.4 will discuss a modern process known as Enhanced Geothermal Systems ("EGS"), which allows developers to artificially create geothermal resources almost anywhere in the world by utilizing a process similar to hydraulic fracturing.[43]

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35 *Id.*

36 *Id.*

37 *Hydrothermal Resources*, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://energy.gov/eere/geothermal/hydrothermal-resources (last visited Nov. 11, 2017).

38 *How Geothermal Energy Works*, UNION OF CONCERNED SCIENTISTS (Dec. 22, 2014), http://www.ucsusa.org/clean_energy/our-energy-choices/renewable-energy/how-geothermal-energy-works.html#.V-iBjDKZPYI.

39 *See generally A History of Geothermal Energy in America*, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY [hereinafter *A History of Geothermal Energy*], https://energy.gov/eere/geothermal/history-geothermal-energy-america (last visited Nov. 11, 2017).

40 *See generally Geothermal Explained: Geothermal Power Plants*, U.S. ENERGY INFO. ADMIN. (Nov. 3, 2016), http://www.eia.gov/energyexplained/index.cfm?page=geothermal_power_plants.

41 *See generally Electricity Generation*, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, https://energy.gov/eere/geothermal/electricity-generation (last visited Nov. 11, 2017).

42 *Id.*

43 *How an Enhanced Geothermal System Works*, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://energy.gov/eere/geothermal/how-enhanced-geothermal-system-works (last visited Nov. 11, 2017).

1. Direct Use of Geothermal Resources at the Surface

Direct use of geothermal resources refers to the use of geothermal heat for a specific purpose, such as heating homes or sidewalks, rather than using the heat to generate electricity.[44] Humans have directly used the earth's heat for purposes such as agriculture, recreation, and industry for nearly all of human history.[45] The 21st century has brought forward a new wave of ways to directly use geothermal resources.[46] For instance, geothermal resources may be directly used to "heat buildings, grow plants in greenhouses, dehydrate onions and garlic, heat water for fish farming, pasteurize milk, and for many other applications."[47] While direct use of geothermal resources is increasingly utilized for a variety of purposes, this Note will instead focus on larger-scale commercial geothermal resources utilized to produce electricity.

2. Flash and Dry Steam Methods

Extracting geothermal resources by the dry steam method is the oldest method utilized to produce electricity from geothermal resources.[48] In dry steam systems, steam is extracted directly from the geothermal reservoir and piped to the surface where it turns a turbine to generate electricity.[49] While this is a relatively simple process, it is very dependent upon the geological location.[50] Dry steam systems require a geothermal reservoir that is naturally under extreme pressure and heated to the point that the water inside the reservoir is boiled naturally into steam.[51] There are only two known dry steam underground resources in America—the Geysers in California and Yellowstone National Park in Wyoming.[52]

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44 *See generally* OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, GEOTHERMAL TECHNOLOGIES PROGRAM: DIRECT USE (2004) [hereinafter GEOTHERMAL TECHNOLOGIES PROGRAM], https://www.nrel.gov/docs/fy04osti/36316.pdf (stating that "[d]irect use of geothermal resources is the use of underground hot water" that is readily accessible at the surface).

45 WENDELL A. DUFFIELD & JOHN H. SASS, GEOTHERMAL ENERGY – CLEAN POWER FROM THE EARTH'S HEAT 2 (2003), https://pubs.usgs.gov/circ/2004/c1249/c1249.pdf.

46 *See* GEOTHERMAL TECHNOLOGIES PROGRAM, *supra* note 44, at 3.

47 *Id.*

48 Maehlum, *supra* note 26.

49 *See Geothermal Electricity Production Basics*, NAT'L RENEWABLE ENERGY LABORATORY, https://www.nrel.gov/workingwithus/re-geo-elec-production.html (last visited Nov. 2, 2017).

50 *Id.*

51 *Id.*

52 *Id.*

Producing electricity from geothermal resources via flash steam is a popular method utilized to produce commercial-scale electricity.[53] Flash steam power plants operate by pumping geothermal fluid with temperatures greater than 360°F to the surface geothermal power plant under immensely high pressure.[54] The super-heated geothermal fluid comes to rest in a lower-pressured tank at the surface, which causes the geothermal fluid to vaporize.[55] The flashed vapor then turns a turbine to generate electricity.[56] Flash steam geothermal power plants are limited to geographical areas where geothermal fluid is naturally at a temperature exceeding 360°F.[57]

3. Binary Cycle Systems

Binary cycle systems "constitute the fastest-growing group of geothermal plants, as they are able to use the low- to medium-temperature [geothermal] resources, which are more prevalent" around the world.[58] Binary cycle power plants utilize heated geothermal fluids, from geothermal reservoirs, to heat up a secondary fluid that has a lower boiling point.[59] The heated geothermal fluid flash vaporizes the secondary fluid, which subsequently drives the turbines to generate electricity.[60]

4. Enhanced Geothermal Systems

Enhanced Geothermal Systems ("EGS") are the most recent development[61] in geothermal energy production, and EGS offers extraordinary potential for future wide-scale geothermal energy deployment.[62] EGS are

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53 *See What is Geothermal?*, GEOTHERMAL RESOURCE COUNCIL, https://geothermal.org/what.html (last visited Nov. 2, 2017) ("Most [modern] geothermal power plants are flash steam plants.").

54 *Types of Geothermal Power Plants*, CAL. ENERGY COMM'N, http://www.energy.ca.gov/almanac/renewables_data/geothermal/types.html (last visited Nov. 11, 2017).

55 *Id.*

56 *Id.*

57 *Id.*

58 TECHNOLOGY ROADMAP, *supra* note 28.

59 *Id.*

60 *Id.*

61 *See Enhanced Geothermal Systems*, CTR. FOR CLIMATE AND ENERGY SOLUTIONS, http://www.c2es.org/technology/factsheet/EGS (last visited Nov. 2, 2017) ("EGS remains in the research and development stage . . . [and] [r]ealizing the full potential of EGS will take some time . . . .").

62 *How an Enhanced Geothermal System Works*, *supra* note 43 (stating that EGS offers "great potential for dramatically expanding the use of geothermal energy").

essentially man-made geothermal reservoirs that are created to produce energy from geothermal resources that are otherwise not economical due to lack of water and/or permeability.[63] The EGS method "is to extract heat [from the earth] by creating a subsurface fracture system to which water can be added through injection wells."[64] EGS is particularly effective in rock formations that do not naturally have permeable rocks.[65] Once the water or fluid is artificially injected into the fractured rock formation, it "is heated by contact with the rock" before it is returned "to the surface through production wells" in the form of steam or super-heated liquid.[66] While EGS offers a very promising future, the research and development of these systems is still in the early stages.[67]

C. *A Brief Survey of Geothermal Resources Ownership Classifications in the United States*

Several states, and even the federal government, have classified geothermal resources as a property right.[68] Many different approaches have been used to classify geothermal resources.[69] In fact, in United States jurisprudence there is "considerable controversy of the ownership of geothermal energy" resources.[70]

Geothermal resources are inherently difficult to define as a property right because they could reasonably be classified in multiple ways.[71] For instance, geothermal resource development "shares much in common with oil and gas development."[72] However, in other ways, geothermal resource development could be "viewed as tapping a large underground water resource, and not a 'mineral resource.'"[73]

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63 *Enhanced Geothermal Systems*, OFF. OF ENERGY EFFICIENCY & RENEWABLE ENERGY, http://energy.gov/eere/geothermal/enhanced-geothermal-systems-0 (last visited Nov. 11, 2017).

64 *How an Enhanced Geothermal System Works*, *supra* note 43.

65 *Id.*

66 *Id.*

67 *Enhanced Geothermal Systems*, *supra* note 61 (stating that EGS is still in the research and development phase).

68 *See* Terry L. Anderson & Peter J. Hill, Establishing Property Rights in Energy: Efficient vs. Inefficient Processes, 1 CATO J. 87, 101–02 (Spr. 1981), https://object.cato.org/sites/cato.org/files/serials/files/cato-journal/1981/5/cj1n1-5.pdf.

69 *Id.*

70 *Id.*

71 *See* AMERICAN LAW OF MINING, *supra* note 33, § 133.02[1] ("[T]he heat energy of the geothermal resource is more an occurrence than it is a physical substance."); *see also* Anderson & Hill, *supra* note 68, at 101 ("[I]t is not entirely clear whether a geothermal resource is water or mineral, [thus] it is difficult to know which laws apply to property rights in it.").

72 Galli et al., *supra* note 12.

73 *Id.*

Furthermore, different states have legally classified geothermal resources as different types of property rights because each state's existing jurisprudence and geological situation is unique. For instance, the arid western states have had to grapple with "how geothermal resource development will interact with existing state water law" while still "addressing the unique nature of geothermal resources."[74]

Section II.C.1 will survey jurisdictions that have classified geothermal resources as a mineral property interest. Section II.C.2 will survey jurisdictions that have classified geothermal resources as a water right subject to applicable appropriation laws. Section II.C.3 will briefly survey jurisdictions that have classified geothermal resources based upon its temperature or depth. Finally, Section II.C.4 will survey jurisdictions that have classified geothermal resources *sui generis*.

1. Mineral Classification

The federal courts have expressly held that geothermal resources are considered a "mineral" resource for purposes of federal laws like the Stock-Raising Homestead Act of 1916.[75] Further, several states, including California, currently classify geothermal resources as a mineral property right.[76]

Naturally, California has extraordinary geothermal capability due to its geological proximity to the Ring of Fire.[77] In fact, commercial development of the geothermal resources at The Geysers in California served as the birthplace of United States geothermal jurisprudence.[78] Currently, California produces far more geothermal energy than any other state,[79] so a look at its geothermal

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74 *Id.*

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

76 *See* Paul McDevitt & Del Wells, *Energy Market Impacts of the Legal Definition of Geothermal Energy in the Western United States*, 22 NAT. RESOURCES J. 391, 396 (1982), http://digitalrepository.unm.edu/cgi/viewcontent.cgi?article=2214&context=nrj (stating that at least "[f]ive western states, including Hawaii, California, Colorado, New Mexico, and Arizona, classify . . . [geothermal resources] as a mineral").

77 *See Geothermal Energy in California*, CAL. ENERGY COMM'N, http://www.energy.ca.gov/geothermal/background.html (last visited Nov. 11, 2017).

78 *See The Geysers Geothermal Field, California, United States of America*, POWERTECHNOLOGY, http://www.power-technology.com/projects/the-geysers-geothermal-california/ (last visited Nov. 11, 2017) ("The Geysers is also the area where the US's first geothermal power plant was put into commercial operation."); McDevitt & Wells, *supra* note 76, at 392 ("The California legislature enacted the nation's first geothermal statute in 1965."); *see also Geothermal Energy in California*, *supra* note 77 (stating that in 1960, California first produced electricity by means of geothermal resources).

79 *Geothermal Electricity*, CTR. FOR CLIMATE AND ENERGY SOLUTIONS, https://www.c2es.org/technology/factsheet/geothermal (last visited Nov. 11, 2017).

jurisprudence would be a great place to start for any state considering the issue of geothermal resource ownership for the first time.

California's mineral-based geothermal resource classification has been successful in spurring development of the state's abundant geothermal resources.[80] California's geothermal resources have been steadily developed for over four decades now.[81] In 2015, California had 44 total geothermal power plants with installed capacity exceeding 2,700 megawatts; this was 6.08 percent of total energy produced in the state that year.[82] In 2011, California "accounted for 82 percent of U.S. geothermal electric generation."[83]

In *Geothermal Kinetics, Inc. v. Union Oil Co. of California*,[84] California first decided the rights to geothermal resources when the surface and mineral estates are severed by a "general grant of minerals in, on or under the property."[85] The dispute between the surface and mineral estate owners was over the geothermal resources beneath the surface of 408 acres of the Geysers.[86] The mineral estate owner claimed it derived its title from a deed that gave the mineral estate an interest in all "minerals in, on or under the property."[87] The surface estate owner claimed it derived title to the geothermal resources solely from "their interest in the surface estate."[88] The court held "the general grant of minerals in, on or under the property includes a grant of geothermal resources . . . ."[89]

The *Geothermal Kinetics* court gave several policy reasons for why it ruled for the mineral estate.[90] First, the court found that geothermal resources were not "useful to surface owners."[91] Second, the court determined that extracting geothermal resources from the mineral estate does not "substantially destroy the surface of the land."[92] Third, the court acknowledged that the

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80 *See* Leslie Blodgett, *California's Geothermal Market In Flux, Part 1*, RENEWABLE ENERGY WORLD (Aug. 14, 2012), http://www.renewableenergyworld.com/articles/2012/08/key-decisions-ahead-to-affect-californias-geothermal-market-part-1.html ("California is, in many ways, the world's greatest geothermal success story.").

81 *See generally California Geothermal Energy Statistics & Data*, CAL. ENERGY COMM'N, http://www.energy.ca.gov/almanac/renewables_data/geothermal/ (last visited Nov. 2, 2017).

82 *Id.*

83 *Geothermal Electricity*, *supra* note 79.

84 141 Cal. Rptr. 879 (Cal. Ct. App. 1977).

85 *Id.* at 879.

86 *Id.* at 879–80.

87 *Id.* at 879.

88 *Id.* at 880.

89 *Id.* at 879.

90 *Id.* at 881.

91 *Id.*

92 *Id.*

methods used to produce energy from geothermal resources are very similar to the methods used to produce energy from other minerals such as coal, oil, and natural gas.[93] Fourth, the court noted that technically all the elements that constitute geothermal resources could be classified as minerals in a scientific sense.[94] Finally, the court found the geothermal fluid in dispute was unfit for "surface, agricultural or domestic use" because it contained toxins.[95]

2. Water Classification

Several western states "have amended their groundwater statutes to include geothermal resources so that the method of acquisition of rights to geothermal resources is identical to that applicable to groundwater."[96] Geothermal resources consist of steam or water vapor inside superheated rock formations, so it makes sense for a state to determine that geothermal resources should be treated as a water resource.[97] Further, by tying the utilization of geothermal resources into the water appropriation system these states attempt to reconcile two potentially conflicting goals of (1) allowing geothermal resources to be developed in a well-defined regulatory regime, and (2) ensuring that geothermal resource utilization does not inhibit others from having access to the state's water resources.[98]

3. Classification Based upon Temperature or Depth

Several states, like Maryland and Oregon, have designated benchmark levels of depth and temperature to determine whether a geothermal resource should be classified as a water right or mineral right.[99] Within these states, some geothermal resources could be classified as a water right, subject to any applicable appropriation laws, while others could be classified as a part of the broad mineral owner's estate.[100]

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93 *Id.* For further explanation of how geothermal resource production is similar to oil and gas production, see generally Phillips Petroleum Co. v. Cty. of Lake, 18 Cal. Rptr. 2d 765, 766–67 (Cal. Ct. App. 1993).

94 *Geothermal Kinetics*, 141 Cal. Rptr. at 880, 882.

95 *Id.* at 883.

96 Sho Sato & Thomas D. Crocker, *Property Rights to Geothermal Resources*, 6 ECOLOGY L.Q. 481, 490 (1977), http://scholarship.law.berkeley.edu/cgi/viewcontent.cgi?article=1125&context=elq.

97 MARIANNE M. JENNINGS, REAL ESTATE LAW 53 (8th ed. 2008).

98 *See* McDevitt & Wells, *supra* note 76, at 396–97.

99 *See id.*

100 *Id.*

4. *Sui Generis* Classification

At least three states have defined geothermal resources as *sui generis* resources.[101] For instance, in Idaho, geothermal resources are classified as "*sui generis*, being neither a mineral resource nor a water resource."[102] Under this approach, the geothermal resource "is a unique commodity and is not necessarily a mineral or water."[103] Classifying geothermal resources as *sui generis* "allows the states the option to treat the resource as water, as a mineral, or as neither."[104]

D. A Look at West Virginia Case Law

This Section will look at West Virginia case law surrounding ownership disputes that arise when an estate is severed into individual surface and mineral estates. West Virginia is certainly no stranger to disputes over who owns a certain substance when the surface and mineral estates have been severed.[105] In fact, West Virginia courts have been asked to resolve these very issues for almost two centuries.[106] An exploration of West Virginia's mineral jurisprudence is necessary in order to set an appropriate framework for how geothermal resources would likely be classified within West Virginia's property law regime.

1. The Term "Mineral" in a Severance Deed Is Presumed to Include All Inorganic Substances

West Virginia—because it is a mineral-laden state[107]—has often had to consider what constitutes a "mineral" when the surface and mineral estates have

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101 Robert P. Wright, *Geothermal Property Rights: Maximizing Successful Site Control*, SMU GEOTHERMAL LAB. 2011 CONF. (June 14–15, 2011), https://www.smu.edu/-/media/Site/Dedman/Academics/Programs/Geothermal-Lab/Conference/PastPresentations_pdf/2011/Wright_GeothermalPropertyRights_2011.ashx?la=en (stating that Idaho, Washington, and Montana classify geothermal resources as a *sui generis* resource).

102 IDAHO CODE ANN. § 42-4002 (West 2017) (emphasis added).

103 McDevitt & Wells, *supra* note 76, at 396.

104 *Id.*

105 Faith United Methodist Church and Cemetery of Terra Alta v. Morgan, 745 S.E.2d 461, 468–69 (W. Va. 2013) ("This Court has 'often been asked to address disputes between surface owners and mineral owners[.]'").

106 *Id.* at 475 (quoting another source) ("In the eastern states, mineral interests were often severed from surface interests during the Nineteenth Century. Thus, many of these interests are now more than 100 years old . . . ."); J. Thomas Lane, *Fire in the Hole to Longwall Shears: Old Law Applied to New Technology and Other Longwall Mining Issues*, 96 W. VA. L. REV. 577, 589 (1994) ("In the eastern states, severances of ownership of minerals with the surface began in the mid-1800s.").

107 For a brief discussion of West Virginia's mineral history, see *supra* Part I.

been severed by an instrument of conveyance.[108] West Virginia jurisprudence contains a plethora of authority that delineates what constitutes a "mineral" when ownership of said "mineral" is at issue.[109]

In West Virginia, it is "firmly established" law that the term "mineral" by its plain and ordinary usage "is a comprehensive term, including every substance which can be reached underneath the surface, and, if the intention to reserve or convey minerals exists, it is immaterial whether the parties knew what minerals were or were not present."[110] The term "mineral" has been succinctly defined as follows:

> The term "*mineral*," when employed in conveyancing in this state, is understood to include every inorganic substance which can be extracted from the earth for profit, whether it be solid, as stone, fire clay, the various metals and coal; or liquid, as for example, salt and other mineral waters and petroleum oil; or gaseous, unless there are words qualifying or limiting its meaning, or unless from the deed, read and construed as a whole, it appears that the intention was to give the word a more limited application.[111]

While the above-mentioned rule of law on what constitutes a mineral in West Virginia is the general rule, West Virginia courts over the years have carved out several exceptions, so to say, to the general rule that every inorganic substance that is capable of being extracted from inside the earth for profit is included by the inclusion of a catch-all "mineral" phrase in a severance deed.[112]

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[108] For a discussion of West Virginia's jurisprudence surrounding mineral severances, see generally *supra* Section II.D.

[109] *See supra* Section II.D.

[110] Stowers v. Huntington Dev. & Gas Co., 72 F.2d 969, 972–73 (4th Cir. 1934).

[111] Horse Creek Land & Mining Co. v. Midkiff, 95 S.E. 26, 27 (W. Va. 1918); *see also* Campbell Brown & Co. v. Elkins, 93 S.E.2d 248, 260 (W. Va. 1956) (citation omitted) (holding "the ordinary meaning of 'mineral' in a deed includes [all] substances which can be [extracted from underneath] the surface"); Bruen v. Thaxton, 28 S.E.2d 59, 62 (W. Va. 1943) (stating that a broad mineral conveyance without limiting language on what constituted a mineral would be construed "to include coal, oil, gas, iron and all other substances, liquids or gases, partaking of mineral qualities underneath the earth's surface"); Burdette v. Bruen, 191 S.E. 360, 360 (W. Va. 1937) (stating that unqualified term "minerals" in a severance deed contains all inorganic substances found under the ground except ones that when extracted would destroy the surface estate); Waugh v. Thompson Land & Coal Co., 137 S.E. 895, 897 (W. Va. 1927) ("The word 'mineral' in its ordinary and common meaning is a comprehensive term including every description of stone and rock deposit, whether containing metallic or non-metallic substances."); Sult v. A. Hochstetter Oil Co., 61 S.E. 307, 310 (W. Va. 1908) ("Mineral will therefore *prima facie* include, not merely such articles as coal and ironstone and freestone, but fire clay and china clay or porcelain clay, and also every kind of stone, flint, marble, slate, brick earth, chalk, gravel, and sand: provided only that these articles are under the surface, and do not lie loosely upon it.").

[112] *See infra* Sections II.D.2–5.

2. Rules of Construction Used to Interpret Conveying Instruments that Sever the Surface and Mineral Estates

West Virginia interprets ambiguous severance deeds within the four-corners of the document using rules of construction to aid courts in ascertaining the original parties' intent.[113] This longstanding rule of interpretation means the language used in mineral severance deeds is of monumental importance in determining ownership interests between the severed surface and mineral estates.

At times, catch-all "mineral" phrases in conveying documents have been limited by West Virginia courts by virtue of the *ejusdem generis* canon of construction.[114] *Ejusdem generis* is a rule of construction that is utilized by courts when a "drafter has tacked on a catchall phrase at the end of an enumeration of specifics . . . ."[115] Essentially, the doctrine of *ejusdem generis* is applied to aid the court in determining what the drafting party intended to include in the catch-all phrase at the end of the enumeration of specifics.[116] This doctrine is often relevant in property ownership disputes because instruments of conveyance throughout America's long mineral severance history have often cited specific minerals that are to be granted or reserved while also including catch-all phrases like "and other minerals" or "and minerals."[117]

For instance, in *West Virginia Department of Highways v. Farmer*,[118] the Supreme Court of Appeals of West Virginia used the *ejusdem generis* rule of construction to aid its holding that a grant of "oil, gas and other minerals in and under said land" did not include a grant of the sand and gravel.[119] Applying the rule of construction, the court found that sand and gravel are not similar-in-kind to oil and gas because sand and gravel are not petroleum products.[120]

Further, a look at how West Virginia has treated plain language in severance deeds that seemingly qualifies or limits the operative language in the

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113 *See* Rock House Fork Land Co. v. Raleigh Brick & Tile Co., 97 S.E. 684, 685 (W. Va. 1918) (stating that the first step of deed construction is to "presume[] that the parties intended the language to have its ordinary and accepted meaning, unless there is a clear expression of intent that the language was used in a different sense").

114 *See* W. Va. Dep't of Highways v. Farmer, 226 S.E.2d 717, 719–20 (W. Va. 1976).

115 ANTONIN SCALIA & BRYAN A. GARNER, MAKING YOUR CASE: THE ART OF PERSUADING JUDGES 46 (2008).

116 *Id.*

117 *See* Brant M. Laue, Note, *Interpretation of 'Other Minerals' in a Grant or Reservation of a Mineral Interest*, 71 CORNELL L. REV. 618, 618 (1986) ("When property owners wish to convey or reserve mineral interests in their property, they enumerate the specific minerals in the deed, lease, or other instrument. The phrase 'and other minerals' commonly follows the list of specific minerals granted or reserved.").

118 226 S.E.2d 717 (W. Va. 1976).

119 *Id.* at 719.

120 *Id.* at 720–21.

deed is also important in order to classify geothermal resources as a property interest. If there is not qualifying or limiting language in the severance deed that modifies the term "mineral," then the term "mineral" presumptively includes all inorganic substances underneath the surface, whether or not they were expressly contemplated in the severance deed.[121] The following West Virginia cases have addressed what sort of operative language in a severance deed will limit or qualify the term "mineral."

In *Horse Creek Land and Mining Co. v. Midkiff*,[122] the Supreme Court of Appeals of West Virginia held that the use of the words "all the minerals, coals" reserved only the coals.[123] It held that only the coal minerals were reserved because the word "coals" used after the term "minerals" restricted and limited the meaning of the word "minerals."[124] In *Bruen v. Thaxton*,[125] the court held that a reservation of "all the coal and iron minerals" did not reserve the oil or gas.[126] Through dicta, it acknowledged that if the word "iron" was not used to modify the term "minerals," and, instead, just the world "minerals" was used, it would have reserved every inorganic substance below the surface estate.[127] In fact, the *Thaxton* court pointed to existing case law in *Burdette v. Bruen*,[128] which held that a reservation of "all the coal, iron and mineral" was a reservation of the entire mineral estate.[129]

From a quick survey of West Virginia's case law, it appears that catch-all "mineral" phrases utilized in severance deeds are usually only qualified or limited in scope in two different ways: (1) by rules of construction, like *ejusdem generis*, when the writing is ambiguous, and (2) by plain language in the severance deed that narrows or limits the term "mineral."

3. Surface Estate Defined

The legal definition of the surface estate is often important in determining property rights in severed surface and mineral estates because many deeds grant or reserve the surface to one party without further explanation as to

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121 For a discussion of the unqualified definition of "minerals" in a severance deed, see *supra* Section II.D.1.

122 95 S.E. 26 (W. Va. 1918).

123 *Id.* at 27.

124 *Id.*

125 28 S.E.2d 59 (W. Va. 1943).

126 *Id.* at 68.

127 *Id.* at 62.

128 191 S.E. 360 (W. Va. 1937).

129 *Id.* at Syl. Pt. 1.

what exactly constitutes the "surface."[130] West Virginia had an unorthodox surface ownership jurisprudence[131] before the *Faith United Methodist Church and Cemetery of Terra Alta v. Morgan*[132] court clarified what constitutes the surface estate in West Virginia.

In *Faith United*, the chief dispute was over language in a deed that conveyed a 1/7 interest in "the surface only" to the 225-acre tract of land.[133] The parties, successors in interest to the surface and mineral estates in dispute, asked the court to determine whether the conveyance of "the surface only" also conveyed the oil and gas rights or the oil and gas rights remained vested in the grantor of the surface.[134] The *Faith United* court went on to hold that the word "surface" has the following meaning when used in an instrument of conveyance in West Virginia:

> The word "surface," when used in an instrument of conveyance, generally means the exposed area of land, improvements on the land, and any part of the underground actually used by a surface owner as an adjunct to surface use (for example, medium for the roots of growing plants, groundwater, water wells, roads, basements, or construction footings.)[135]

The court intended to clear up ownership issues that arise from litigation over ownership of a certain inorganic substance in severed estates.[136] After *Faith United*, the legal definition of the word "surface" in West Virginia takes on its ordinary layperson meaning, which the court hoped will make property ownership clearer in the future.[137]

4. The Doctrines of Reasonable Use and Necessity

The Supreme Court of Appeals of West Virginia has acknowledged that over time new minerals will be discovered and new technology will be utilized

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130 *See generally* Jason W. Turner, *Scratching the Surface: "Uncertainty and Confusion" in* Faith United Methodist v. Morgan, 117 W. VA. L. REV. ONLINE 10 (2015), http://wvlawreview.wvu.edu/west-virginia-law-review-online/2015/01/16/scratching-the-surface-uncertainty-and-confusion-in-faith-united-methodist-v-morgan.

131 *See* Ramage v. S. Penn Oil Co., 118 S.E. 162, 170 (W. Va. 1923) (holding that the term "surface" was inherently ambiguous when used in instruments of conveyance), *overruled by* 745 S.E.2d 461 (W. Va. 2013) (holding that the term "surface" is unambiguous and has a definitive definition when used in instruments of conveyance).

132 745 S.E.2d 461 (W. Va. 2013).

133 *Id.* at 464.

134 *Id.* at 464–65.

135 *Id.* at Syl. Pt. 2.

136 Turner, *supra* note 130.

137 *Id.*

to extract minerals from beneath the surface.[138] As these advancements occur, the courts have been, and will be, asked to resolve these new disputes between surface and mineral owners.[139]

West Virginia courts have usually allowed mineral estate owners to utilize new technology to extract minerals so long as it is by means of "shafting or tunneling"[140] that does not utterly destroy the surface estate.[141] The courts have allowed mineral estate owners to extract new minerals and utilize new technologies when the methods utilized to extract the minerals makes reasonable and necessary use of the surface estate. Thus, the question is whether any new method of extracting minerals will (1) make reasonable use of the surface estate, and (2) utilize the surface "for purposes reasonably necessary to the extraction of the minerals."[142]

In West Virginia, there are both express and implied mining rights.[143] The distinction is important because "where implied as opposed to express rights are sought" the test of what is considered a reasonable and necessary use of the surface estate will be more exacting.[144] Implied mining rights are particularly relevant in this Note's inquiry as most future producers of West Virginia's geothermal resources will assert the implied right to extract those geothermal resources through their broad mineral reservations. Express mining rights will not be as readily available because geothermal resources were most likely not expressly contemplated at the time of the original severance.[145]

Mineral estate owners will only be able to extract minerals by implied rights if the method of extracting minerals utilized by the mineral estate makes necessary and reasonable use of the surface estate and does not "unduly burden the surface owner's use."[146] Naturally, the next question becomes what is a reasonable and necessary use of the surface estate by the mineral estate when the

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138 *Faith United*, 745 S.E.2d at 469 n.26 (quoting Don Emery, *What Surface is Mineral and What Mineral is Surface*, 12 OKLA. L. REV. 499, 500 (1959) ("[A]dvances in technology portend and may well accelerate the discovery of substances that may be held ultimately to be 'surface' or 'minerals,' depending upon a variety of circumstances.").

139 *Id.* at 469.

140 West Virginia-Pittsburgh Coal Co. v. Strong, 42 S.E.2d 46, 49 (W. Va. 1947); *see also* Phillips v. Fox, 458 S.E.2d 327, 335 (W. Va. 1995).

141 For more on this line of West Virginia case law, see *infra* Section II.D.4.

142 Buffalo Mining Co. v. Martin, 267 S.E.2d 721, 723 (W. Va. 1980).

143 *Id.* at 725.

144 *Id.*

145 *A History of Geothermal Energy*, *supra* note 39. The United States did not have its first geothermal system until 1904. *Id.* Many mineral estates in West Virginia were already severed by this time. *See* Faith United Methodist Church and Cemetery of Terra Alta v. Morgan, 745 S.E.2d 461, 475 (W. Va. 2013) (internal quotation omitted) (stating that most of the eastern states' mineral severances occurred in the 19th century).

146 *Buffalo Mining*, 267 S.E.2d at 725.

mineral estate is asserting an implied right to mine a certain mineral or utilize a certain method to extract minerals.

West Virginia courts have adopted a two-part framework to determine whether a particular method of extracting minerals makes reasonable and necessary use of the surface estate.[147] The first type of conflict between mineral and surface estate owners is "where the mineral estate owner engages in activity that disturbs, perhaps permanently and negatively, the surface."[148] The second type of conflict between mineral and surface estate owners is "where the mineral estate owner engages in activity that 'virtually destroy[s]' the surface or is otherwise 'totally incompatible with the rights of the surface owner.'"[149]

In the former type of conflict, courts will allow owners of broad mineral estates to engage in a particular activity that disturbs the surface estate as long as that activity does not "substantially burden" the surface estate and it is "reasonably necessary" to extract the mineral.[150] In the latter type of conflict, courts will not allow owners of the broad mineral estate to engage in activity that would permanently destroy the surface of the earth for the surface owner's intended purposes.[151]

There are certain inorganic substances that lie just underneath the surface and may only be extracted in commercial quantities by quarrying[152] or by other surface-destroying means.[153] In West Virginia, it has been held as a general rule that extracting near-surface minerals destroys the surface and "unduly burden[s]

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147 *See id.*; *see also* Whiteman v. Chesapeake Appalachia, L.L.C., 729 F.3d 381, 390 (4th Cir. 2013) (stating that the *Buffalo Mining* court "harmonized the 'reasonable necessity' standard as it applies to two divergent types of conflict between mineral estate owners and surface estate owners").

148 *Whiteman*, 729 F.3d at 390; *see also* Adkins v. United Fuel Gas Co., 61 S.E.2d 633, 635 (W. Va. 1950) (discussing question of whether operator "exceeded its rights"); Squires v. Lafferty, 121 S.E. 90, 91 (W. Va. 1924) (finding that operator use resulted in "no injury" to the surface owner and that coal ownership also has "as incident . . . the right to use the 'surface' . . . in such a manner . . . as would be fairly necessary"); Porter v. Mack Mfg. Co., 64 S.E. 853, 853 (W. Va. 1909) (stating that a surface owner cannot obstruct a material owner from "the use of the surface" that is "fairly useful and necessary").

149 *Whiteman*, 729 F.3d at 390 (quoting *Buffalo*, 267 S.E.2d at 725); *see also* Brown v. Crozer Coal & Land Co., 107 S.E.2d 777, 783 (W. Va. 1959); West Virginia-Pittsburgh Coal Co. v. Strong, 42 S.E.2d 46, 50 (W. Va. 1947).

150 *Whiteman*, 729 F.3d at 393.

151 *Id.* at 391.

152 The West Virginia Legislature has noted the destructive nature of quarrying, which is a process that involves ripping up the surface estate to extract minerals that lie just below the surface's soil. W. VA. CODE ANN. § 22-4-2 (West 2017) ("[T]he very character of quarry operations precludes complete restoration of the land to its original condition.").

153 *Strip Mining*, GREAT MINING, http://www.greatmining.com/strip-mining.html (last visited Nov. 11, 2017) (describing the steps of strip mining, which includes removing all trees and plants on the ground's surface).

the surface owner's use."[154] For that reason, near-surface minerals are not included in a broad grant or reservation of minerals.[155] For instance, the court in *Farmer* held that sand and gravel were not part of a broad mineral reservation.[156] It concluded that the surface owner's estate would be completely useless if sand and gravel were to be classified as minerals reserved to the mineral estate owners as sand and gravel lay "principally on the surface."[157] The court determined that if the mineral estate owners could rightfully take all the sand and gravel, the surface estate owners would be deprived entirely of the use of the surface—and, surely, that was not the intent of the original parties to the conveyance.[158]

Put simply, West Virginia courts will not give a broad mineral rights owner an implied right to extract a substance when the process utilized would utterly destroy the surface estate.[159] The mineral estate can only claim rightful ownership to near-surface minerals if the severance deed contains express language that allows for the destruction of the surface estate by the mineral estate.[160] The surface-destruction test is just a natural extension of the doctrine of reasonable and necessary use of the surface estate, which does not allow a mineral owner to use implied mining rights to permanently destroy the surface estate.[161]

5. Original Parties' Knowledge and Contemplation of Mineral in Dispute

It is apparent that at the time most surface and mineral estates were being severed in West Virginia, most contracting parties had no knowledge of existing geothermal resources and, even if they did, could not have fathomed extracting it to produce electricity.[162] Therefore, it is important to discuss how West Virginia's jurisprudence has handled minerals disputes in the past that were not within the original parties' knowledge or contemplation.

The West Virginia Supreme Court of Appeals has been steadfast in holding that in cases of broad mineral severances, the original parties' knowledge

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154 Buffalo Mining Co. v. Martin, 267 S.E.2d 721, 725 (W. Va. 1980) ("Our past cases have demonstrated that any use of the surface by virtue of rights granted by a mining deed must be exercised reasonably so as not to unduly burden the surface owner's use.").

155 W. Va. Dep't of Highways v. Farmer, 226 S.E.2d 717, 720–21 (W. Va. 1976); *see generally Buffalo Mining*, 267 S.E.2d 721.

156 *Farmer*, 226 S.E.2d 717, 721 (W. Va. 1976).

157 *Id.* at 720.

158 *Id.*

159 *See id.* at 720–21 (citing case law affirmatively holding implied mining rights do not extend to processes and minerals that destroy the surface of the land).

160 Whiteman v. Chesapeake Appalachia, L.L.C., 729 F.3d 381, 390 (4th Cir. 2013).

161 *Id.*

162 *A History of Geothermal Energy*, *supra* note 39.

of particular minerals located underneath the land is immaterial.[163] In fact, even the knowledge of the "existence of the substance at the time a conveyance was executed" is immaterial to its "inclusion or exclusion" from the mineral estate.[164] The only important inquiry is whether the original parties to the mineral conveyance intended to "convey or reserve the mineral."[165] As aforementioned, if the mineral is not expressly stated, then the court will look to see how the term "mineral" was used in the severance deed.[166] If it is not limited by language in the severance deed, then the court will include all minerals, known or not, in the definition of what was meant by "minerals" in the severance deed.[167]

For several policy reasons, West Virginia courts have been flexible in allowing newly discovered minerals to be included in broad mineral estates created by ancient severance deeds. The court in *Thaxton* acknowledged a few of these reasons in its majority opinion:

> The world moves on, and we cannot permit the customs and usages of the past to place too much of a curb on its progress. Old ways and old expressions pass and give way to the new. Rights developed and vested in the past should be protected, but we should not permit the technical meaning of ancient words or phrases, as applied to situations then existing, to hold their place as against new terms, words and expressions brought into common use by the changing years, and the expanding development of resources not known to exist in days when such ancient expressions were used, or, if known to exist, their value and importance was not recognized.[168]

III. ANALYSIS

The day will eventually come when West Virginia's abundant geothermal resources will be extracted and utilized to produce commercial quantities of electricity. When that time comes, West Virginia should develop a clear and concise geothermal jurisprudence so that developers will be more inclined to develop West Virginia's untapped geothermal energy potential. This Author argues that under existing West Virginia case law, a general grant of

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163 *See* Faith United Methodist Church and Cemetery of Terra Alta v. Morgan, 745 S.E.2d 461, 469 n.26 (W. Va. 2013); Waugh v. Thompson Land & Coal Co., 137 S.E. 895, 897 (W. Va. 1927) ("[I]t is immaterial what minerals were known to be under the land, or were not known to be thereunder, if it was the intention to convey or reserve the mineral.").

164 *Faith United*, 745 S.E.2d at 483 n.125 (quoting Moser v. United States Steel Corp., 676 S.W.2d 99, 102 (Tex. 1984)).

165 *Waugh*, 137 S.E. at 897.

166 *See generally supra* Section II.D.2.

167 *See generally supra* Section II.D.1.

168 Bruen v. Thaxton, 28 S.E.2d 59, 68 (W. Va. 1943).

minerals should also include a grant of geothermal resources. Not only is this a natural extension of existing West Virginia case law, but the mineral classification has also been successful in spurring geothermal development in other United States jurisdictions—like California.[169] It is true that states have classified geothermal resources in four different ways;[170] however, the three other classifications do not fit squarely within West Virginia's jurisprudence because those classifications were intended to address unique resource issues in those states that do not apply to West Virginia.

Geothermal resources should fall squarely within the mineral estate presumption unless plain language of the conveying instrument shows the parties intended the term "mineral" to take a less expansive meaning. As shown below, West Virginia courts should not have a problem holding that geothermal resources should presumptively be classified as a part of the mineral estate in cases where the term "mineral" is not limited in its scope by the plain language of the severing instrument.

Section III.A will analyze how geothermal resources fall within West Virginia's mineral presumption. Section III.B will discuss how West Virginia's clarification of what constitutes the surface estate will make geothermal resource classification easy in many cases. Section III.C will analyze how geothermal resource extraction fits within West Virginia's reasonable and necessary use jurisprudence. Section III.D will address the issue of geothermal resources not being a known resource at the time that most mineral grants and reservations were made in West Virginia. Finally, Section III.E will acknowledge that limiting and qualifying language should continue to exclude geothermal resources from the mineral estate on a case-by-case basis.

A. Geothermal Resources Fall Within the Comprehensive Term "Mineral" Unless Plain Language of the Severance Deed Indicates Otherwise

Geothermal resources consist of three things: solid rock deep below the surface, radioactive heat radiating from the center of the earth, and a water resource, either preexisting or artificially injected.[171] All three of these are inorganic in nature. As discussed in Section II.D.1, the unqualified term "mineral" in a severance deed in West Virginia includes all solids, liquids, and gases that can be found beneath the earth's surface.[172] It is evident that the super-heated rock formations in which geothermal resources reside would be considered a solid, and, therefore, presumptively included as a part of the mineral

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169 *See generally supra* Section II.C.1.

170 *See generally supra* Section II.C.

171 *See generally* GEOTHERMAL ENERGY ASS'N, *supra* note 34.

172 *See generally supra* Section II.D.1.

estate.[173] Even more evident would be that any mineral liquid resources, which make up the geothermal resource, would presumptively be included as a part of the mineral estate.[174] It would also not be hard to classify any steam residing in geothermal resources as a presumptive part of the mineral estate because steam is a gas.[175] The radioactive heat that creates and maintains geothermal resources is the only somewhat tricky part of classifying geothermal resources under the traditional rules of what constitutes a mineral. Heat from the core of the earth is not a solid, it is not a gas, and it is not a liquid—rather, it is a phenomenon.[176] Thus, the heat itself, which is absolutely necessary for geothermal resources to form, is technically outside the traditional framework of what inorganic substances constitute a "mineral" in the mineral estate.[177]

While it is true that geothermal resources rely on radioactive heat from deep beneath the earth to form,[178] this should not preclude geothermal resources from being presumptively classified as a part of the mineral estate in broad grants or reservations of minerals. First, in a technical sense, heat from deep beneath the earth creates most minerals. For instance, coal is formed by intense pressure and heat over long periods of time.[179] Second, the radioactive heat is not necessarily the valuable substance that is extracted to produce electricity. While radioactive heat is an inextricable part of the process of utilizing geothermal resources for energy generation, it is actually the super-heated steam or super-heated water that serves as the valuable mineral resource that is extracted to produce electricity.[180] Third, it would make little sense to allow a broad-mineral rights owner to possess all inorganic substances beneath the surface except for the heat radiating from the earth's core. Fourth, the mineral estate, as the dominant estate,[181] is in a better position to utilize any heat located deep beneath the earth's surface.

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173 *See generally infra* Section II.D.1.

174 *See generally infra* Section II.D.1.

175 *See generally infra* Section II.D.1.

176 Mary H. Dickson & Mario Fanelli, *What is Geothermal Energy?*, INT'L GEOTHERMAL ASS'N (July 14, 2016), https://www.geothermal-energy.org/what_is_geothermal_energy.html (stating that heat from the earth's core is a "phenomena on a planetary scale").

177 However, one court has found that "[a]ll of the elements of a geothermal system—magma, porous rock strata, and even water itself—maybe classified as 'minerals.'" United States v. Union Oil Co. of Cal., 549 F.2d 1271, 1273–74 (9th Cir. 1977).

178 *See generally* Dickson & Fanelli, *supra* note 176.

179 *See generally How is coal formed?*, KY. COAL EDUC., http://www.coaleducation.org/q&a/how_coal_formed.htm (last visited Nov. 2, 2017) (explaining that coal forms over millions of years of constant heat and pressure applied to organic matter).

180 *See supra* Section II.B.

181 A dominant estate is an estate that benefits from an easement. *Dominant Estate*, BLACK'S LAW DICTIONARY (10th ed. 2014).

For these reasons, this Author is led to the initial conclusion that there is no reason why geothermal resources should not be included in the comprehensive unqualified definition of "minerals" when used in a severance deed.

B. Owners of the "Surface Only" Cannot Claim Title to Geothermal Resources

Many severance deeds in West Virginia have reserved or granted an interest in the "surface only" to one party without further explaining what constitutes the surface estate.[182] Property ownership surrounding what constitutes the "surface" was unclear in West Virginia for nearly a century[183] before the *Faith United* court gave the term "surface" a definite meaning when it is used in severance deeds.[184]

The *Faith United* court's clarification of what constitutes the "surface" will make ascertaining property ownership of geothermal resources an easy prospect in many cases. Before *Faith United*, the surface estate owner could claim a property interest in any mineral not specifically enumerated in the severance deed by virtue of the *Ramage v. South Penn Oil Co.*[185] decision, which held that "surface" was not capable of a particular definition, and it was up to the courts to define what was meant by the term "surface" on a case-by-case basis.[186] Even when *Ramage* was still good law, it was rarely utilized by the courts as they often distinguished *Ramage* from the case at hand.[187] The *Faith United* court went at length to discuss how *Ramage* was bad law because it "injected" too much uncertainty into property ownership and was contrary to the bulk of American jurisprudence on the matter.[188]

Under the *Faith United* regime, it is clear that the broad mineral estate will possess the geothermal resources in cases where the "surface only" has been severed from the mineral estate.[189] The mineral estate would own the geothermal resources located deep beneath the earth because they fall outside of the scope of the "surface" definition given in *Faith United*.[190] Essentially, under *Faith*

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182 Turner, *supra* note 130.

183 *See* Ramage v. S. Penn Oil Co., 118 S.E. 162 (W. Va. 1923), *overruled by* Faith United Methodist Church and Cemetery of Terra Alta v. Morgan, 745 S.E.2d 461 (W. Va. 2013).

184 *See generally* Faith United Methodist Church and Cemetery of Terra Alta v. Morgan, 745 S.E.2d 461 (W. Va. 2013).

185 118 S.E. 162 (W. Va. 1923).

186 *Id.* at 170.

187 Turner, *supra* note 130 (stating that the *Ramage* precedent had been "only distinguished or ignored" by the courts).

188 *Faith United*, 745 S.E.2d at 467–69.

189 Turner, *supra* note 130.

190 *Faith United*, 745 S.E.2d at Syl. Pt. 2.

United's precedent, any severance deed containing a grant or reservation of the "surface only" serves as a broad reservation of the mineral estate.[191] As discussed above, geothermal resources should be presumptively included in a broad mineral reservation that is not limited by language in the severance deed.

This is not to say that "surface only" owners cannot utilize any sort of geothermal resource. As discussed in Section II.A.1, there are various ways by which the surface estate can utilize geothermal heat residing just below the surface estate. For instance, many homes and businesses in West Virginia already utilize geothermal heating and cooling pumps that make use of consistent temperatures from just underneath the surface to help heat and cool buildings.[192] These sorts of uses of geothermal potential by the surface estate would be appropriate in any circumstance because *Faith United*'s definition of the surface allows for the use of "any part of the underground actually used by a surface owner as an adjunct to surface use."[193] If the surface estate is utilizing shallow geothermal resources to heat and cool a home or perhaps maintain a greenhouse, then this seemingly falls within a part of the underground that is utilized as an adjunct to the surface's use.

C. *The Doctrines of Reasonable Use and Necessity Do Not Preclude Broad Mineral Estate Owners from Extracting Geothermal Resources*

As discussed above, future developers of geothermal resources in West Virginia will likely derive their authority to extract geothermal resources from implied rights contained in the original severance deed.[194] These future geothermal resource developers will have to show that (1) geothermal resources were either expressly or impliedly included in the original mineral severance;[195] (2) extracting the geothermal resources by the method chosen makes only reasonably necessary use of the surface estate;[196] and (3) the surface estate would

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191 Turner, *supra* note 130.

192 *See generally* Matthew Umstead, *New Berkeley County school geothermal systems to save energy, money*, HERALD-MAILMEDIA (Aug. 8, 2016), http://www.heraldmailmedia.com/news/tri_state/west_virginia/new-berkeley-county-school-geothermal-systems-to-save-energy-money/article_a8224dc4-5dce-11e6-a457-8b1fe19ef112.html.

193 *Faith United*, 745 S.E.2d at 480–81.

194 Developers of geothermal resources in West Virginia will derive their authority from implied mining rights, and not express mining rights, because geothermal resources have not normally been expressly contemplated in severance deeds and mineral leases on the east coast. *See generally supra* Section II.D.4.

195 *See generally* Buffalo Mining Co. v. Martin, 267 S.E.2d 721 (W. Va. 1980).

196 *Id.*

not be substantially burdened by the method chosen to extract geothermal resources.[197]

As discussed in Section II.D.4, the Supreme Court of Appeals of West Virginia in *Buffalo Mining* developed a two-part inquiry to determine whether a particular method of extracting minerals makes reasonable and necessary use of the surface estate.[198] Essentially, the reasonable use and necessity inquiry is used to determine whether the method of extraction simply "disturbs" the surface or whether it "virtually destroy[s]" the surface for the surface owner's purposes.[199] The *Buffalo Mining* reasonable use and necessity doctrine "discern[s] between a case where a mineral estate owner drill[s] a hole into the surface and a case where a mineral estate owner all but remove[s] the surface."[200]

As discussed in Section II.D, there are some substances that are mineral in nature and would ordinarily fall within the comprehensive, unqualified definition of the term "mineral," but for the undue burden and permanent damage extracting these minerals would cause the surface estate.[201] These minerals have two things in common—they are all located near the surface estate and cannot be extracted by traditional means of mining or shafting.[202]

West Virginia's geothermal resources are very different from those near-surface minerals. Geothermal resources are located very deep beneath the surface estate. Further, as explained in Section II.B, geothermal resources are extracted by, more or less, traditional means of extracting minerals—shafting pipes beneath the surface.

Extracting geothermal resources, by any means, does not utterly destroy the surface of the earth.[203] Geothermal resources are located deep below the near-surface minerals that the Supreme Court of Appeals of West Virginia was concerned with in its line of surface-destruction test cases, so these cases should not preclude geothermal resources from being included in a broad mineral severance.[204]

While extracting geothermal resources does not result in the destruction of the surface estate, it most certainly would permanently disturb the surface. Geothermal power plants must be located near the geothermal resource extraction point in order to be economically viable.[205] These geothermal power plants can be quite large at times, depending upon the method of extracting

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197 *Id.*

198 *Id.*

199 *Id.* at 725.

200 Whiteman v. Chesapeake Appalachia, L.L.C., 729 F.3d 381, 390–91 (4th Cir. 2013).

201 *See generally supra* Sections II.D.1, II.D.4.

202 *See generally supra* Section II.D.4.

203 *See generally supra* Section II.B.

204 *See supra* Section II.D.4.

205 For a discussion of how geothermal resources are extracted, see *supra* Section II.D.4.

geothermal resources being utilized by the developer.[206] For several reasons, this Author believes that West Virginia's jurisprudence would most likely lead to the same conclusion—geothermal power plants constitute a reasonable and necessary use of the surface by the mineral estate.

First, if the geothermal developer derives her geothermal resource ownership and her implied right to extract the geothermal resources from a broad mineral reservation or grant, then the geothermal developer also carries "an implied right to use the surface in such manner and with such means as would be fairly necessary for the enjoyment of the mineral estate."[207] The only way for the mineral estate to extract geothermal resources in commercial quantities, which is arguably what the court means when it uses the phrase "enjoyment of mineral estate," is to construct a geothermal power plant on the surface above where the geothermal resources are being extracted. Not only is constructing a geothermal power plant a necessary use of the surface estate, it is a reasonable one as well because it is "fairly necessary"[208] in order for the geothermal resource owner to enjoy and extract its geothermal resources in commercial quantities.

Second, West Virginia courts have often allowed mineral estate owners to permanently disturb the surface estate if the disturbance is reasonably necessary for the mineral estate to extract said mineral. For instance, courts have allowed mineral owners to do the following under an implied right to mine: construct tram roads to transport mined clay and other materials;[209] drill test holes and allow machinery to be transported across the surface estate;[210] and place above-ground pipes and cut open ditches through surface farmland for drainage of mineral refuse.[211] On the other hand, courts have not allowed mineral owners to do the following under an implied right to mine: auger mine the surface estate when it was clear the method would destroy the surface for its intended purposes[212] or strip mine the surface estate.[213]

Thus, under existing West Virginia case law, an owner of geothermal resources would most likely be able to construct anything necessary on the surface, including geothermal power plants, in order to extract geothermal resources. While geothermal power plants may disturb the surface estate, in most cases they will not substantially burden the surface estate. West Virginia courts have typically only found the surface estate to be substantially burdened by the

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206 *Id.*

207 Whiteman v. Chesapeake Appalachia, L.L.C., 729 F.3d 381, 388 (4th Cir. 2013) (internal quotation marks omitted) (citations omitted).

208 Squires v. Lafferty, 121 S.E. 90, 91 (W. Va. 1924).

209 Porter v. Mack Mfg. Co., 64 S.E. 853, 855 (W. Va. 1909).

210 *Squires*, 121 S.E. at 90–91.

211 Adkins v. United Fuel Gas Co., 61 S.E.2d 633, 636 (W. Va. 1950).

212 Brown v. Crozer Coal & Land Co., 107 S.E.2d 777, 787 (W. Va. 1959).

213 West Virginia-Pittsburgh Coal Co. v. Strong, 42 S.E.2d 46, 52 (W. Va. 1947).

mineral estate's use of the surface when the mineral estate owner attempts to permanently destroy the surface estate for its intended purposes in order to extract minerals under an implied right to mine.[214]

D. It Is Immaterial Whether Geothermal Resources Were a Known or Contemplated Resource at the Time the Mineral and Surface Estates Were Severed

Most of West Virginia's surface and mineral severances occurred in the 19th century.[215] At that time, no party in West Virginia could have possibly contemplated geothermal resources as a cognizable property interest.[216] Even to this day, geothermal resources are not likely contemplated in modern West Virginia severance deeds because geothermal resources have not been utilized on the east coast of the United States as a commercial source of energy.

As stated above, West Virginia courts have often had to deal with new mineral resources that were not contemplated by the original parties to the severance.[217] In these cases, courts have held that it does not matter whether the original parties had knowledge of a particular substance when estates were severed.[218] The only material inquiry is whether the original parties intended to convey only particular minerals or the entire mineral estate.[219] As mentioned above, courts will look to the language of the severance deed to make a determination as to whether the original parties intended to convey the entire mineral estate.[220]

Thus, this case law will make it almost impossible for surface estate owners to argue that geothermal resources cannot be included in a broad grant of minerals because geothermal was not a contemplated resource at the time of conveyance. To some, this may seem like an unjust windfall to a broad mineral estate because it is a growing new and valuable resource that was not and could not have been contemplated in the original severance deed. These opponents would likely ask the court to look at the customs of the country at the time of the severance to find that geothermal resources were not a cognizable property interest that could have been contemplated at the time, and as such, geothermal resources could not possibly have been conveyed.

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214 *See generally* Buffalo Mining Co. v. Martin, 267 S.E.2d 721 (W. Va. 1980).

215 *See* Faith United Methodist Church and Cemetery of Terra Alta v. Morgan, 745 S.E.2d 461, 475 (W. Va. 2013) (internal quotation marks omitted) (stating that most of West Virginia's mineral severances occurred in the 19th century).

216 The United States did not have its first commercial geothermal power plant until 1904. *See A History of Geothermal Energy*, *supra* note 39.

217 *See generally supra* Section II.D.5.

218 *See generally supra* Section II.D.5.

219 *See generally supra* Section II.D.1.

220 *See generally supra* Sections II.D.1, II.D.2.

However, this would be asking the Supreme Court of Appeals of West Virginia to rewind time and put itself in the place of the original parties to the severance to ascertain whether or not they were aware of the existence of particular minerals.[221] This extrinsic evidence would go outside the four corners of the conveying instrument, which is typically impermissible, and would result in increased litigation costs to determine property rights.[222]

Further, the opponents to including geothermal resources in broad and often ancient mineral severances would be overlooking the fact that the original parties likely knew that over the years new technology and know-how would result in new minerals being extracted via new methods.[223] This would be especially true for West Virginians, who have always been on the cutting edge of extracting minerals via new methods and extracting new minerals by newly developed technology.[224] Thus, most parties were likely aware that a broad grant of all minerals under the surface would include not only known minerals and known methods of extracting said minerals but would also accommodate changing times and circumstances.

E. Limiting or Qualifying Language Should Continue to Limit the Scope of the Term "Mineral" in Severance Deeds

Not all severance deeds contain a "surface only" clause or a broad catch-all mineral clause like "and all other minerals." In these types of severance deeds the plain language defining the term "mineral" is of utmost importance in determining property ownership. For instance, suppose a fee simple owner severs her interests in only the "coal, oil, and gas." In this instance, the fee simple owner would retain an interest in both the surface and every mineral not specifically enumerated. In this hypothetical, the fee simple owner did not reduce her ownership interests to the "surface only," and the mineral estate owner did not obtain a broad mineral grant because the severance deed was limited in its scope by its plain language. Therefore, in cases like this, the surface estate would retain legal title to the geothermal resources located deep beneath the surface.

Further, many mineral estates in West Virginia have been severed into several distinct estates. For instance, one person may own the Pittsburgh coal seam and another may own all other coal seams. A person may own all oil and gas, while another owns all the coal and other minerals. In cases like these, courts should look to the severance deeds' plain language and utilize case law to make a determination as to who would own the geothermal resources. If none of the severed mineral estates contains a catch-all mineral phrase, then the geothermal

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221 Bruen v. Thaxton, 28 S.E.2d 59, 67 (W. Va. 1943).

222 *Id.* at 64.

223 Faith United Methodist Church and Cemetery of Terra Alta v. Morgan, 745 S.E.2d 461, 469 (W. Va. 2013).

224 *See generally supra* Part I.

resources should remain with the surface estate, no matter how many different mineral estate owners there are.

However, West Virginia courts should avoid utilizing the *ejusdem generis* rule of construction when geothermal resource ownership is disputed. *Ejusdem generis* means "similar in kind" and no existing minerals extracted for commercial profit in West Virginia are "similar in kind" to geothermal resources. Thus, this rule of construction would always exclude geothermal resources from a broad mineral estate granted by a catch-all mineral phrase like "and other minerals." Further, this construction would almost certainly violate the original parties' intent because the parties would have limited or qualified the term "mineral" in some other way if they did not intend to convey all inorganic substances beneath the surface that can be extracted for profit.

IV. CONCLUSION

Currently, West Virginia law is silent as to geothermal resources' classification as a property right. Geothermal resources are a cognizable, valuable property interest in West Virginia. The West Virginia Legislature or courts should clarify geothermal resource ownership with all due speed. As long as there remains uncertainty in ownership of geothermal resources, they will not be significantly developed in West Virginia.

This Author proposes that West Virginia classify geothermal resources as a part of the mineral estate. This classification would have strong precedent in existing West Virginia case law and would create a clear and easy-to-follow rule of law. The mineral classification of geothermal resources has proven to be effective as it has promoted significant development of geothermal resources in California for decades.[225]

There would be many benefits associated with West Virginia's development of geothermal resources. Geothermal power plants employ approximately two people per megawatt produced.[226] These jobs would be well-suited for displaced coal miners and citizens of rural counties where adequate employment opportunities are limited. Further, over the course of a geothermal power plant's lifespan, it could pay tens of millions of dollars in property taxes, severance taxes, and royalties. West Virginia will continue to miss out on these promising opportunities until it clarifies property ownership of geothermal resources and incentivizes renewable energy growth within the state.

*Joshua A. Lanham**

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225 *Geothermal Energy Potential, State of California,* GEOTHERMAL ENERGY ASS'N (Apr. 2016), http://geo-energy.org/pdf/Guides_2015/California.pdf.

226 *Id.*

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