Geothermal, Trespass and the Rule of Capture—a "Hot" Topic

Submitted by: Katherine H. Stepp, Deans & Lyons, LLP

This article generally discusses geothermal energy in terms of: 1) the transmission of heat; 2) the significance socially, environmentally and economically; 3) and the general legal considerations that could arise in regards to trespass and the rule of capture.[1]

I. Why Geothermal? Renewable Resource & the Environment.

As Texas' population growth[2] places pressure on water[3] and hydrocarbons, sources of renewable energy that: promote recycling[4]; utilize waste; and emit fewer greenhouse gases[5]; become more important socially and politically. Eventually, society the production of hydrocarbons may compete with a depleting life resource—water. Thus, the production of a renewable resource such as geothermal energy, in co-production with hydrocarbons, is worth development.[6]

It may economically and socially behoove the energy industry to take proactive steps to lesson greenhouse gas emissions, such as carbon-dioxide (CO_2).[7] CO_2 producing industries may support sequestering CO_2 underground. It may even be possible[8] to operate geothermal systems with supercritical CO_2, combining the "recovery of geothermal energy with simultaneous geologic storage of CO_2" by utilizing the CO_2 as a heat transmission fluid.[9] However, ownership, subsurface storage pore space, migration[10], and liability issues pertaining to CO_2 sequestration are still undetermined in Texas.

II. What is Geothermal Energy? The Science, the Texas Definition & the Obstacles.

Energy captured as a result of the natural, internal, heat stored in rock and fluid produced within the Earth is known as geothermal energy.[11] Through thermal processes, the heat is slowly transferred

---

[1] This article is meant to be of general "issue spotting" interest alone and discusses scientific hypothesis and theories in which the earth scientists who study them cannot even agree. Therefore, consult your local earth scientist or geophysicist for potentially different views. This paper is limited to information regarding Texas law and practice.

[2] Texas Water Development Board (TWBD) (January 2002) predicted, in its 2002 State Water Plan, that by 2050, the state's population will have more than doubled. *Water for Texas 2002*, p.4.

[3] Texas Renewable Energy Resource Assessment (TRERA), 2008, p.7-5 (Current Update Unpublished and subject to change) ("Billions of barrels of water are currently being produced across Texas from oil and gas wells.").

[4] Groundwater supplies approximately 58% of the water used in Texas. *Water for Texas 2002*, TWBD, p.38.

[5] Geothermal produces no air emissions other than steam. Energy Report—Geothermal, Chapter 21, p.8, available at: http://www.window.state.tx.us/specialrpt/energy/renewable/geo.php (Energy Report).

[6] Because of the depth to drill for oil and gas, the water usage, and the emissions that result from hydrocarbon production activities, co-production of geothermal energy with hydrocarbon production may prove economical. Theoretically, CO_2 and waste water fluid could be heat transmitters, both by-products from hydrocarbon production. Further, as of now, there is no applicable fuel sales taxes associated with geothermal energy and more renewable source energy incentives are being initiated. *Id*. at 8. The oil or gas well can be redesigned and/or redrilled at a lower cost than drilling a new well. Additionally, heat could be extracted from the fluids already being produced by oil and gas wells. *Id.* at 7.

[7] Federal carbon regulation could have a disproportionate impact on Texas due to its volume of fossil fuel production, providing incentives for the utilization of CO_2. TRERA, p.xvii.

[8] "CO_2…would be a poor solvent for rock minerals, thus eliminating scaling problems…[and, while] the lower mass heat capacity of CO_2 [is an unfavorable property] in comparison to water…this would be partially compensated by the greater flow capacity of CO_2 due to its lower viscosity." Pruess, Karsten, Enhanced Geothermal Systems (EGS): Comparing Water and CO_2 as Heat Transmission Fluids, Lawrence Berkeley National Laboratory, Berkeley, CA (Pruess, EGS).

[9] *Id.*

[10] For example, would the rule of capture insulate the owner from liability for drainage of CO_2? *Compare Railroad Comm'n of Texas v. Manziel*, 361 S.W.2d 560, 568-69 (Tex. 1962) *and Coastal Oil & Gas Corp v. Garza Energy Trust*, 268 S.W.3d 1 (Tex. 2008).

[11] TRERA, p.xv.

through the Earth's crust, where it can eventually be accessed for energy use.[12] Geothermal is renewable, not dependent upon cyclical forces, and is constant.[13]

There are several potential technologies to capture and utilize geothermal energy; however, this article generally refers to enhanced geothermal systems (EGS) or "hot dry rock" systems.[14] The EGS concept allows access to the vast majority of geothermal energy—within drilling reach—in dry, non-porous rock. The hot dry rock category "represents geologic formations with high temperature but limited quantities of water that can be produced if a fluid is injected into the rock to act as a carrier for the heat."[15] In ground that is hot but dry, or where water pressure is inadequate, injecting fluid may stimulate production.[16] EGS utilizes a method closely aligned with hydraulic fracturing.[17] Two boreholes are drilled into a candidate site, and the deep rock between them is fractured by high pressure water. Fluid is pumped down one borehole where it travels through the fracture network, conducts the heat and is forced out of the second borehole where it is converted into electricity via a steam turbine or binary power plant system.[18] All of the fluid, now cooled, is injected back into the subsurface closed loop to repeat the process.[19] Liquefied CO_2 may also be used as a heat transmitter to extract the heat.[20] Provided it is done properly[21] this system is, theoretically, inexhaustible.[22]

Geothermal resources and "all of the resource system components" are treated as mineral interests in Texas.[23] Discharge associated with geothermal exploration development lies with the Texas Railroad Commission[24]; however, the Texas Commission on Environmental Quality (TCEQ) has jurisdictional authority to regulate certain wastes.[25]

While recent geological studies indicate that Texas could be a major producer of geothermal energy, especially in co-production with existing or depleted oil and gas wells[26], there are still many impediments.[27] One impediment to the development of this resource is the uncertain legal status regarding heat flow.

Unresolved questions of property law, application of the law to the physical components, and nature of geothermal energy as will regulate ownership and liability are just some of the questions regarding heat flow energy. This paper explores the potential issues that arise in regard to heat flow, the

---

[12] *Id*. at 7-1.
[13] *Id*. at xv.
[14] *Id*. at xi. The focus is on this technology because EGS could potentially be utilized almost anywhere.
[15] *Id*. at 7-9.
[16] *Id*. at 7-5, 7-11.
[17] Energy Report, p.7.
[18] *Id*.
[19] *Id*.
[20] Pruess, EGS.
[21] There are many intricacies regarding the balance of extracting heat and cooling the fluid so as to truly sustain the fluid use. However, "the heat in the Earth…is for all practical purposes inexhaustible…" Energy Report, p.8.
[22] *Id*. at 7-8.
[23] Tex. Nat. Res. Code Ann. §§ 141.001(4); 141.003.
[24] Tex. Water Code Ann. § 26.131.
[25] 16 TAC § 3.30 (RRC); 30 TAC § 7.117 (TECQ) (the Memorandum of Understanding (MOU) between the TCEQ and the RRC specifies the agencies' respective jurisdictional authorities to regulate wastes). However, the broad definition of "by-product" in the Geothermal Resources Act includes waste "brought to the surface", and defines it as a "mineral". Tex. Nat. Res. Code Ann. §141.003(4), (5).
[26] Rock in East Texas has high heat flow/conductivity, establishing the best placement for EGS. TRERA, pp.7-9.
[27] *Id*. at xviii.

rule of capture and the Texas Supreme Court's recent use of that rule to preclude a trespass by hydraulic fracturing. The primary issue exposed is whether the rule of capture will, or should, apply to geothermal heat flow.

III. What's the Law? Estates, Mineral, Water, Liability, Rule of Capture.

Real property may be horizontally severed, vesting title to the surface estate and title to the mineral estate in one or more parties.[28] Each estate has certain ownership rights.[29] The surface owner owns everything above and below it and retains rights to underground water.[30] The mineral owner owns the development, executive and economic receipt rights.[31] The mineral owner's rights are dominant to that of the surface owner's rights and a mineral owner may use as much of the surface estate (including water)[32] as is reasonably necessary[33] to produce the minerals.[34]

Due to the fugacious nature of many geological resources, such as oil and gas, the ownership doctrine was modified by the rule of capture.[35] The rule acknowledges both the "ownership in place" theory, recognizing that the lessee owns the oil and gas in place produced from wells on his land, even though some of that resource may have migrated from adjoining lands, and the "non-ownership" theory, recognizing that the only way a lessee can obtain title to the oil and gas is by exerting control over it and reducing it to possession.[36] The owner of the mineral estate owns the resource in fee simple absolute and the lease is legally seen as a deed conveying a fee simple determinable[37] in the mineral to the lessee.[38] Essentially, "the rule of capture is non-liability for drainage because drainage is non-actionable."[39] The root of the rule arose from water law.

Groundwater, outside of a conservation district, is also subject to the rule of capture; i.e., subject to certain restrictions, a landowner can generally drain the percolating[40] water underlying a neighboring tract, while exploiting groundwater from the depths via a well on his own tract, without the risk of liability.[41] Because the majority of groundwater is governed by conservation districts, permit requirements[42], hydrothermal fluids, use of groundwater, and ownership issues may arise.[43]

---

[28] *Harris v. Currie*, 176 S.W.2d 302 (Tex. 1943).
[29] *Id*.
[30] *Sun Oil Co. v. Whitaker*, 483 S.W.2d 808, 811 (Tex. 1972).
[31] *Id.*
[32] *Id*.
[33] The mineral owner may not, however, wantonly, willfully or negligently injure the surface estate. *Getty Oil v. Jones*, 470 S.W.2d 618 (Tex. 1971); *Gen. Crude Oil Co. v. Aiken*, 344 S.W.2d 668, 671 (Tex. 1961). The Texas Railroad Commission is tasked with the duty to prevent waste of Texas' natural resources and protect correlative rights of interest owners. Tex. Admin. Code, Title 16, Part 1, Chapter 3.
[34] *Placid Oil Co. v. Lee*, 243 S.W.2d 860 (Tex. Civ. App.—Eastland 1951, no writ).
[35] Anderson, Owen L., Subsurface Trespass After *Coastal v. Garza*, 2009 Eugene Kuntz Chair in Oil, Gas & Natural Resources Law, pp.5-6 (Anderson, Subsurface Trespass).
[36] *Elliff v. Texas Drilling Co*., 210 S.W.2d 558, 561-62 (Tex. 1948); Anderson, Subsurface Trespass, p.4.
[37] A fee simple determinable is an estate limited only by its possible termination upon the happening of some event. *Harris*, 176 S.W.2d at 302.
[38] *Texas Co. v. Daugherty*, 176 S.W. 717 (Tex. 1915).
[39] Anderson, Subsurface Trespass, p.6.
[40] There is presumption in Texas that all groundwater is percolating. *Dennis v. Kickapoo Land Co.*, 771 S.W.2d 235, 238 (Tex. App.—Austin 1989, writ denied).
[41] *Houston & Texas Central Railway Co. v. East*, 81 S.W. 279 (Tex. 1904); *Sipriano v. Great Spring Waters of Am., Inc.*, 1 S.W.3d 75, 77 (Tex. 1999).
[42] Generally, active exploration and production activities are exempted from the conservation district permit requirements; however, there are exceptions and qualifications to the exemption. Tex. Water Code Ann. §36.113. Geothermal production is not mentioned. *Id*. §36.117(g). The conservation districts may regulate other types of water supply wells, even those used to supply water for enhanced recovery. *Id.* §36.117.
[43] TWDB, Factoids, available at http://www.twdb.state.tx.us/GwRD/GCD/factoids.htm.

III. What Does Texas Say About Subsurface Trespass by Fracturing? Not Much.

Subsurface trespass can arise in a variety of different ways.[44] This article is limited to a discussion of subsurface trespass with respect to hydraulic fracturing.

Hydraulic fracturing is a stimulation technique utilized to increase the recovery of hydrocarbons by increasing the rock permeability.[45] The technique is used in vertical wells and has proven especially effective when combined with a horizontal well.[46] The understanding is that "the fractures will follow Mother Nature's fault lines in the formation."[47]

In 2008, the Texas Supreme Court was asked to determine, essentially, whether subsurface trespass by hydraulic fracturing was an actionable tort.[48] The court punted the question, and instead responded with reasons "not to change the rule of capture."[49] While the court failed to make meaningful distinctions[50] between a physical encroachment of a well bore and a man-made encroachment by fracture, the court's holding shields subsurface trespass by fracture actions[51] regarding drainage.[52] The court *did not* state that a trespass by fracture cause of action does not exist. This may be a problem for geothermal production activities.

IV. Who Cares if Rule of Capture Applies? Operators, Attorneys, Mineral Owners.

A fracturing type procedure is used in EGS heat extraction, explained above. Because Texas operators still do not know whether a viable cause of action for subsurface trespass by fracture exists, the fundamental question for any industry conducting subsurface geological activities is whether the rule of capture will apply to their activity. If the rule applies, a subsurface trespass action may preclude the actual harm—the drainage. However, arguably, should your thermal energy migrate, it will not be your own. If the rule of capture does not apply, then drainage could be an actual harm and trespass might be a

[44] Allegations include directionally drilled or horizontal wells that intentionally or negligently enter another's property, enhanced oil recovery methods that result in injected fluids entering another's property, reinjection of hydrocarbons for storage, and seismic exploration.

[45] Fracturing is generally limited by the rock formation above and below the intended reservoir. The porosity of the rock and other factors are considered.

[46] Horizontal drilling is "the process of drilling a well from the surface to a subsurface location just above the target oil or gas reservoir…deviating the well bore from the vertical plane around a curve to intersect the reservoir…with a near-horizontal inclination, and remaining within the reservoir until the desired bottom hole location is reached." This activity exposes more reservoir rock to the well bore, and when coupled with hydraulic fracturing techniques, can increase production and recovery rates. Helms, Lynn, Horizontal Drilling, DMR Newsletter, V. 35, No. 1, p.1-3.

[47] *Garza Energy Trust*, 268 S.W.3d at 7.

[48] Owners of a natural gas royalty interest brought action against the lessee for subsurface trespass, among other allegations. Defendant leased the Plaintiffs' mineral rights but owned the adjacent property. Plaintiffs claimed that the fracture trespassed into the mineral zone and drained gas from Plaintiffs' well to Defendants. *Id*.

[49] *Id.* at 14.

[50] Anderson comments that: "Man-made fractures that encroach beneath another's subsurface are not physically different from a man-made well bore that encroaches beneath another's subsurface. That the former is caused by a drill bit and that the latter is caused by injected fluids is not a meaningful distinction. That the former involves the continued presence of production tubing and that the latter involved the continuing presence of proppants is also not a meaningful distinction….that the former is controlled and the latter is uncontrolled is not a meaningful distinction from a trespass perspective….A more convincing justification for allowing fracing across property lines, while disallowing slant drilling, is practical necessity and common sense….fracing is often a necessary well-completion technique…[and] cannot be fully controlled." Anderson, Subsurface Trespass, p.19.

[51] The argument could also be made that, because the rule protects against drainage precluding actual harm, similar causes of action, such as conversion, arising from hydraulic fracturing should likewise fail.

[52] Anderson, Subsurface Trespass, p.19.

viable cause of action. However, arguably, your thermal energy would still belong to you, despite migration.

V. Does the Rule of Capture Apply to Heat—Do I Want it To? Maybe & Maybe.

The commercially valuable aspect of the geothermal resource is the thermal energy. The thermal energy is contained within the hot dry rock. To obtain the thermal energy, fluids must transfer the heat. Through EGS, fluid is injected to extract the thermal energy stored within the rock formation.[53] The injection is similar to the secondary injecting methods utilized by the oil and gas industry in the production and/or the storage of gas.

The way heat flows differentiates it from oil, gas and water—even when the conduit of the heat is a fluid. Generally, heat flows through the Earth's crust by conduction and is not uniform across the surface.[54] Heat is generated in rocks through radioactive decay resulting in surrounding rock absorption of kinetic energy.[55] Earth's thermal energy sources depend on a variety of factors including geographic location, geologic conditions, rock type, porosity, permeability, radiogenic sources, fluid flow, fluid pressure, fluid makeup, absorption rates, etc.[56] Thus, the source (hot rock) of the mineral interest (thermal energy/heat), is always stationary. Further, the thermal energy is already in its energy state.

Exerting control over a migratory resource and reducing it to possession are required for meaningful ownership in Texas. When has a party exerted control over the geothermal corpus? When the lease to obtain "all minerals" is in place? When fluid encompasses the "hot rock"? When has the heat been reduced to possession? When the mineral estate owner has obtained ownership over the stationary rock that absorbed the kinetic energy? When conduction transfer takes place from rock to fluid? Is the thermal heat transmitter subject to capture?

Texas courts have held that injected natural gas remains the personal property of the injecting party and is no longer subject to capture *even if* the gas migrates beneath neighboring tracts.[57] The owner of the injected gas may successfully assert ownership for the injected, migrated gas into another's property.[58] But, any damage to the property could result in a viable trespass action—one that the rule of capture would not preclude. Assuming geothermal heat is analogous to natural gas in the migratory nature; thermal energy is subject to the rule of capture. However, because the heat is in its energy state upon conductive heat transfer to the thermal fluid, the energy owner (in Texas the mineral owner) is in a similar posture to the natural gas injector. In other words, not subject to the rule of capture.

Be careful what you wish for, however, because, if thermal transmission is not subject to the rule, liability may not be precluded by it either. Thus, were the geothermal heat to migrate and drain to other lands, for example, as a result of the initial hydraulic fracturing, the owner of the drainage could be subject to trespass or other claims[59], otherwise likely precluded under the Texas Supreme Court's

---

[53] *See generally*, TRERA.
[54] Beardsmore, G.R. & Cull, J.P., Crustal Heat Flow, A Guide to Measurement and Modelling, 2001, p.22 (Heat transfer through conduction is the transition of thermal energy from a higher temperature object to a cooler object).
[55] *Id*. at 22-43.
[56] TRERA, p.7-5.
[57] Tex. Nat. Res. Code Ann. §§ 91.171-91.184; *Humble Oil & Ref. v. West*, 508 S.W.2d 812, 817 (Tex. 1974); *Lone Star Gas Co. v. Murchinson*, 353 S.W.2d 870, 880 (Tex. Civ. App.—Dallas 1962, writ refused n.r.e.).
[58] *Murchinson*, 353 S.W.2d at 880.
[59] *FPL Farming Ltd. v. Tex. Nat. Res. Conservation Comm'n*, No. 03-02-00477-CV, 2003 WL 247183, *5 (Tex. App.—Austin 2003, pet. denied).

assessment of the rule of capture.[60] If the thermal transmitter fluid was, or contained, a waste such as CO_2[61], the non-liability rule of capture may come in handy.[62]

The Texas court insinuated, in *Manziel*, that waterflooding was not a trespass.[63] While it is true that *Manziel* "was not a tort action against the waterflooding party" but was "a suit to set aside a commission order" the effect—waterflooding is not a trespass—is inconsistent with other Texas cases and statutes.[64] It is inconsistent with *Murchinson*, *supra*. *Murchinson* essentially held that the rule of capture does not apply to the re-injection and storage of previously captured gas while *Manziel* suggests that the rule of capture could apply.

However reconciled, at this juncture, the question centers on whether the injection of previously utilized fluids (water or CO_2) for the transmission of heat that migrates to an adjoining tract is more closely affiliated with salt water injected for secondary recovery operations (*Manziel*) or natural gas injected for future recovery from the injecting party's own wells (*Murchison*). In other words, because secondary water injection was drainage and protected the operator from liability on the basis of a trespass claim, secondary injection or storage of oil and gas underground may be subject to the same drainage rules.

The rule of capture either applies to drainage—as a shield or a sword—or it does not. Until these inconsistencies are reconciled, it will be challenging to foresee the future liability and other legal concerns in the geothermal forecast.

VI. Is it Over? Yes. Conclusion.

Public policy dictates that, for the efficient recovery of geothermal energy, fracturing procedures/techniques are utilized. The application of co-generating energy from both oil and gas and geothermal wells is a tremendous opportunity in Texas. Geothermal energy as a heat source or as electricity prevents economic waste, utilizes harmful waste that would have to be destroyed, stored, or input into the environment and protects a valuable resource—water—by recycling the fluid transmitter through a closed loop system. If the rule of capture does not apply to geothermal energy resources then, at the very least, subsurface trespass by fracturing lawsuits should be shielded on public policy grounds. These questions, and others, should all be considered as EGS becomes a more valued, acknowledged, energy capability.

---

[60] *Garza Energy Trust*, 268 S.W.3d at 7-14.

[61] In Texas, legislation provides that the Railroad Commission will assume ownership of CO_2 sequestered under a clean coal FutureGen project and relieves the "owner or operator of the clean coal project" from liability…regarding the [CO_2] injection…" Tex. Nat. Res. Code Ann. § 119.002. Unanswered—who owns the CO_2 if utilized for transmission of geothermal energy? Who owns the heat transmitted by the fluid? Does this legislation protect the operator who performs these activities with CO_2 from liability?

[62] The Texas Geothermal Resources Act defines "geothermal energy" to include "any by-product derived from them" and the MOU requires RRC approval only where waste is injected "into a porous formation that is *not productive* of oil, gas, or geothermal resources." *Id.* at § 141.003(4). "By-product" means "any other element found in a geothermal formation which is brought to the surface, whether or not it is used in geothermal heat or pressure inducing energy generation." *Id.*

[63] *Manziel*, 361 S.W.2d at 566.

[64] Anderson, Subsurface Trespass, p.22; *See* Tex. Nat. Res. Code Ann. §§ 91.171-91.184 (2007); *West*, 508 S.W.2d at 817; *Murchinson*, 353 S.W.2d at 880.