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THE GEOTHERMAL BONUS: SUSTAINABLE ENERGY AS A BY-PRODUCT OF DRILLING FOR OIL

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I. INTRODUCTION

The role of fossil fuels in our energy future, and eventually moving away from the use of fossil fuels, is unavoidable when discussing energy policy. The desire for clean and cost-effective energy alternatives is obvious in virtually any energy policy discussion, and this holds true across party lines.[1] Even before BP's recent oil disaster in the Gulf of Mexico,[2] this made sense. The motivation for seeking new energy sources is hardly singular, ranging from national security and job creation to climate change and environmental protection.[3] The possible alternative fuel sources are similarly varied, including energy from wind, biofuels, cellulosic ethanol, solar, and geothermal sources, among others.

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1. *See* Brad Knickerbocker, *US Energy Proposal Pushes Toward Center*, CHRISTIAN SCI. MONITOR, Dec. 10, 2004, at 2.

2. *See* Justin Gillis & Henry Fountain, *New Estimates Double Rate of Oil Flowing Into Gulf*, N.Y. TIMES, June 11, 2010, at A11.

3. Joshua P. Fershee, *The Rising Tide of Climate Change: What America's Flood Cities Can Teach Us About Green Energy Policy, and Why We Should Be Worried*, 39 ENVTL. LAW 1109, 1139 (2009).

As policymakers consider how best to provide support and incentives for the next great fuel source(s), it is imperative they realize a "perfect substitute" for current sources is highly unlikely—or at least not imminent. Instead, a wide variety of fuel sources are likely to play a role in the energy mix of the future, and no single source is likely to be the sole, or even primary, source of energy. The energy future, especially during any reduction of and eventual transition away from fossil fuels, will involve multiple sources, including a variety of transitional sources.

This essay focuses on an underappreciated energy source that could play a major role in the transitional, as well as the future, fuel mix: geothermal energy. More specifically, this essay will discuss an exciting new opportunity in generating electricity from Enhanced Geothermal Systems (EGS).[4] Although perhaps over inclusive from a geologist's perspective, for purposes of this essay, EGS projects include all new geothermal technologies, including those that use geothermal energy from co-produced fluids to generate electricity (which fluids are a by-product of oil drilling),[5] and those that generate electric power from low-temperature geothermal resources (i.e., via geothermal fluids that occur in sedimentary formations).[6] The essay will then discuss the promise this technology holds and the existing hurdles and impediments to reaching that promise. Finally, this essay concludes that policymakers at every level—local, state, and federal—need to support near-term efforts like EGS that can have a role in long-term

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4. MASS. INST. OF TECH., THE FUTURE OF GEOTHERMAL ENERGY § 1.2, 1-9 (2006), *avail able at* http://geothermal.inel.gov/publications/future_of_geothermal_energy.pdf. Researchers at the Massachusetts Institute of Technology defined EGS as follows:

> The U.S. Department of Energy has broadly defined Enhanced (or engineered) Geothermal Systems (EGS) as engineered reservoirs that have been created to extract economical amounts of heat from low permeability and/or porosity geothermal resources. For this assessment, we have adapted this definition to include all geothermal resources that are currently not in commercial production and require stimulation or enhancement. EGS would exclude high-grade hydrothermal but include conduction dominated, low-permeability resources in sedimentary and basement formations, as well as geopressured, magma, and low-grade, unproductive hydrothermal resources. In addition, we have added coproduced hot water from oil and gas production as an unconventional EGS resource type that could be developed in the short term and possibly provide a first step to more classical EGS exploitation.

Id.

5. *See* U.S. Dep't of Energy, Geothermal Technologies Program, Electric Power Generation from Co-Produced Fluids from Oil and Gas Wells, http://apps1.eere.energy.gov/geothermal/projects/projects.cfm/ProjectID=182 (last visited June 6, 2010).

6. *See* U.S. Dep't of Energy, Geothermal Technologies Program, Electric Power Generation from Low-Temperature Geothermal Resources, http://apps1.eere.energy.gov/geothermal/projects/projects.cfm/ProjectID=191 (last visited June 6, 2010).

solutions and avoid stop-gap measures that provide nice sound bites, but have limited long-term value.[7]

II. TAPPING THE POTENTIAL OF GEOTHERMAL ENERGY

Although geothermal energy has long been realized as a possible clean and sustainable energy source, new technological developments have increased the possibility that geothermal energy, through EGS, could contribute significantly in ways that were not traditionally considered possible.[8] In recognition of these new opportunities, the U.S. Department of Energy (DOE) recently funded eleven projects, including two EGS projects—at five sites—proposed by researchers at the University of North Dakota, in conjunction with private partners.[9]

Without being overly naïve about the risks and hurdles of any new technology, these new EGS projects appear closer to a win-win proposition in energy development since co-generation electric plants became economically viable. Of course, EGS does not make everything perfect, and it cannot possibly make everyone happy. Then again, no energy project does or can. However, EGS projects can provide an opportunity for clean energy as a by-product, or co-product, of drilling for domestic oil, on sites where drilling is already occurring.[10] Compared to many alternative energy projects that have been pursued, this is as close to a win-win we are likely to see in the near future.

Politicians, scientists, and the general public are paying closer attention to alternative energy sources than ever before.[11] Wind and solar energy, as well as other opportunities such as geothermal energy, which is energy that comes from the heat that is available within the earth, are generating great interest and hope. This is especially true in the state of North Dakota. The state has access to a tremendous amount of energy from virtually all major sources.

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7. *See, e.g.*, Joshua P. Fershee, *Struggling Past Oil: The Infrastructure Impediments to Adopting Next Generation Transportation Fuel Sources*, 40 CUMBERLAND L. REV. 87, 91-98 (2009) (discussing the problems with a renewable fuel standard that relies on corn-based ethanol).

8. *See* WILL GOSNOLD ET AL., THE POTENTIAL IMPACTS OF CO-PRODUCED GEOTHERMAL WATERS (2007), http://www.und.nodak.edu/org/ihfc/AAPG08.ppt.

9. Press Release, University of North Dakota, US Department of Energy Awards UND Researchers $3.5 Million, http://www2.und.nodak.edu/our/news/story.php?id=2848 (last visited June 6, 2010); *see also* U.S. Dep't of Energy, Geothermal Technologies Program, http://apps1.eere.energy.gov/geothermal/projects/state_listing.cfm/state=ND (last visited June 6, 2010) (providing links to brief descriptions of the University of North Dakota geothermal projects).

10. *See* Press Release, *supra* note 9.

11. *Cf.* Press Release, Zogby Int'l, Majority Continues to Oppose Oil Drilling in Arctic National Wildlife Refuge, New Zogby Poll Reveals (Jan. 24, 2004), http://www.zogby.com/news/readnews.cfm?ID=789.

From traditional sources, North Dakota has significant lignite coal reserves;[12] major, and possibly expanding, natural gas reserves;[13] oil;[14] tremendous wind resources;[15] and, despite the general climate, geothermal resources.[16] North Dakota is often, not unreasonably, viewed as a cold part of the country. For much of the year, this is certainly accurate. Nonetheless, even in North Dakota, the heat from within the earth offers a tremendous potential resource. Perhaps most important about the geothermal resource is that some of the opportunities from geothermal energy are pragmatic solutions to the country's near-term energy resource goals.

The state of North Dakota has, over the years, supported, at least in concept, geothermal energy. In fact, the state has codified its support for geothermal energy:

> It is hereby declared to be in the public interest to encourage, and promote the proper use of geothermal resources in a manner which will prevent waste; to authorize and provide for the operation of geothermal resource extraction facilities in such manner as will achieve the optimum utilization of the geothermal resource and protect the correlative rights of all owners; to prevent contamination and pollution of surface and ground water sources; and to avoid creation of secondary hazards of a geologic nature.[17]

Ultimately, this boils down to a fairly simple policy statement: geothermal energy seems like a good idea so let us give it a try, but be careful in the process.

There are different ways for scientists, as well as entrepreneurs and politicians, to review and assess the opportunities presented by geothermal energy. For example, if geothermal potential is reviewed based on temperatures 4.5 kilometers below the earth, only about one-fourth of the United

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12. U.S. ENERGY INFO. ADMIN., ANNUAL COAL REPORT 2008 36 tbl. 14 (2008), *available at* http://www.eia.doe.gov/cneaf/coal/page/acr/acr.pdf.

13. *See Oversight Hearing on Unconventional Fuels, Part I: Shale Gas Potential, Before the H. Comm on Energy & Commerce, Subcomm. on Energy & Mineral Resources*, 111th Cong. 2 (2009) (statement of Lynn D. Helms, Director of the Department of Mineral Resources of the Industrial Commission of the State of North Dakota), *available at* http://resourcescommittee.house.gov/images/Documents/20090604/emr/testimony_helms.pdf ("[T]he North Dakota Oil and Gas Division establish the most likely range of oil and gas in-place estimates of 300-500 billion barrels of oil and 300-500 trillion cubic feet of associated natural gas.").

14. *See* ENERGY INFO. ADMIN., OFFICE OF OIL AND GAS, TECHNOLOGY-BASED OIL AND NATURAL GAS PLAYS: SHALE SHOCK! COULD THERE BE BILLIONS IN THE BAKKEN? 4 (2006) (stating that proved crude oil reserves in North Dakota increased by fifty-nine percent between 1999 and 2005).

15. *See* Am. Wind Energy Ass'n., Wind Energy: An Untapped Resource, http://www.awea.org/pubs/factsheets/Wind_Energy_An_Untapped_Resource.pdf (last visited May 28, 2010).

16. *See* GOSNOLD ET AL., *supra* note 8.

17. N.D. CENT. CODE § 38-19-01 (2007).

States appears to have temperatures approaching 150°C, and far less approaching 300°C, with virtually none of these higher temperatures in the eastern United States.[18] This 150°C to 300°C range matters because it was traditionally viewed as the viable temperature range for geothermal energy.[19]

If we look deeper, however, to 10 kilometers, the picture looks quite different. At 10 kilometers, almost all of the United States has temperatures of at least 150°C and nearly one-third of the country has temperatures exceeding 200°C, including about half of North Dakota.[20] A significant part of western North Dakota has temperatures around 250°C at this depth.[21] If accessed properly, some researchers believe this indicates the potential for EGS to serve the entire United States' primary energy needs.[22]

Traditional non-EGS geothermal energy systems come in two basic forms: closed-loop and open-loop systems.[23] In a traditional closed-loop system, the system accesses energy by using water or, more likely, another fluid that runs down into the earth, between 100 and 400 feet deep, where the earth has a stable temperature.[24] In the winter, the fluid goes down, absorbs the heat from the within the earth, and brings it up, providing heat to the structure.[25] In the summer, we reverse it, and the fluid takes the heat from the warm summer air in the structure back down into the earth. The fluid then returns to the structure cooled because of the static temperature down below.[26]

Similarly, an open-loop system can be used if there is an available aquifer in the area.[27] In such a system, the water from the aquifer is used in place of the fluid in the closed-loop system, but the idea is the same.[28] The water just flows back into the water resource either through a tile field, through a second well, some irrigation, or another similar option.[29] Variations on these systems include horizontal-loop systems that build out, in-

18. *See* S. PETTY & G. PORRO, UPDATED U.S. GEOTHERMAL SUPPLY CHARACTERIZATION 11 (2007), *available at* http://www.nrel.gov/docs/fy07osti/41073.pdf.

19. *See id.* at 8.

20. *See id.* at 11.

21. *See id.*

22. MASS. INST. OF TECH., *supra* note 4, at § 3.1, 3.

23. *See* Lorraine A. Manz, *Geothermal Energy: Another Alternative*, DEP'T MINERAL RES. NEWSLETTER, 2007, at 1-2, *available at* http://www.nd.gov/ndgs/newsletter/nl0107/geothermal.pdf.

24. *See id.* at 2.

25. *See id.*

26. *See id.*

27. *See id.* at 1-2.

28. *See id.*

29. *See id.*

stead of down, and lake and pond systems that build under a lake or pond, which also have stable and static temperatures that can be used to regulate temperatures.[30] These types of systems can be used on a smaller scale, at the residential level, or on a larger commercial scale.[31]

The real opportunity, though, to bring significant change to our current energy fuels mix through geothermal energy can be found in EGS. Two recently funded public and private University of North Dakota endeavors are designed to demonstrate this potential.[32] The projects are designed both to show that EGS is an economically viable source of sustainable energy and to determine the company or companies that provide the most economical system.[33] More specifically, these two-year projects will evaluate the power capacity efficiency and economics of five commercially available equipment manufacturers.[34]

The projects are funded equally, with about $1.7 million for each of the two projects—for a total $3.5 million from DOE—and the other half of the money coming from the private partners.[35] The first project joins Berrendo Geothermal, Encore Acquisition, and the North Dakota Geological Service, and the other project is with Continental Resources and the North Dakota Geological Service.[36]

Both University of North Dakota EGS projects will be sited on working oil fields. One of the geothermal Organic Rankin Cycle (ORC) system projects will be installed in an oil field in western North Dakota, "where geothermal fluids occur in sedimentary formations at depths of 10,000 feet."[37] The project will generate electricity using the heat from geothermally heated water pulled up through a well drilled specifically for the purpose of accessing that water.[38] The other EGS project will be attached to a working oil well and will generate electricity using waste fluids that come up along with the oil.[39]

The projects are possible because of new technology as part of an ORC engine that can now generate electricity using temperatures as low as 90°C, which provides "cost-competitive power production."[40] In addition, by

30. *See id.*
31. *See id.*
32. Press Release, *supra* note 9.
33. *See id.*
34. *See id.*
35. *See* U.S. Dep't of Energy, *supra* note 5; U.S. Dep't of Energy, *supra* note 6.
36. Press Release, *supra* note 9.
37. *See* U.S. Dep't of Energy, *supra* note 6.
38. *See id.*
39. *See* U.S. Dep't of Energy, *supra* note 5.
40. *See* GOSNOLD ET AL., *supra* note 8.

using the ORC engines on sites with currently operating oil wells, the "use of existing infrastructure eliminates drilling and well completion costs."[41]

The system works, conceptually, much like the traditional geothermal systems in that it uses the warm, geologically speaking, fluids that come up with the oil to generate electricity. The real value in this system is that electricity is needed to operate any oil well.[42] In fact, wells need a good deal of electricity to operate. In North Dakota, it is almost certain that the needed electricity comes from coal-fired plants,[43] meaning that significant pollutants are being emitted by the energy used to seek fuel that, when consumed, will emit significant pollutants. Quite simply, we're burning coal to get oil that we can then burn.

By adding EGS systems to working oil wells, one part of that process can be skipped, meaning North Dakota's oil would be as clean, and green, as possible. Once the project is running, the oil wells can create the electricity needed for drilling. In fact, these projects even have the potential to generate more electricity than the well would need, providing opportunities to sell power back into the grid.[44]

Although North Dakota is in a position to gain substantially from EGS projects, the potential of EGS projects extends far beyond the state. A recent Massachusetts Institute of Technology (MIT) study found that the potential power from U.S. EGS projects could provide 5.9 gigawatts, and even up to 21.9 gigawatts, of power.[45] This means EGS offers a tremendous opportunity to generate electricity from something we are already doing: drilling for oil. And for the foreseeable future, we are going to continue drilling for oil to reduce, how ever modestly, our imports from unfriendly sources.

The potential benefits from EGS also extend beyond oil drilling. Some studies indicate that the geothermal energy available in U.S. oil and gas basins could potentially provide the country's entire need for electricity.[46] In some cases, this could be accomplished using temperatures as low, in

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41. *Id.*

42. Electricity has been used to power oil wells since at least 1902, when electricity began to displace steam as the power source of choice. CHARLES AUSTIN WHITESHOT, THE OIL WELL DRILLER 869-70 (1905).

43. ENERGY INFO. ADMIN., STATE ENERGY PROFILES: NORTH DAKOTA (2010), http://www.eia.doe.gov/state/state_energy_profiles.cfm?sid=ND ("Nearly all of the electricity generated in North Dakota is produced by coal-fired power plants.").

44. *See* GOSNOLD ET AL., *supra* note 8.

45. *Id.*

46. *See* MASS. INST. OF TECH., *supra* note 4, at § 3.1, 3-3.

some cases, as 50°C.[47] The twelve possible basins around the country provide different opportunities from the Gulf Coast and throughout the rest of the country.[48] Recognizing that about fifty percent of man-made carbon dioxide comes from coal, these technologies provide a potential emissions offset; that is, another option to reduce the amount of electricity generated by coal.[49]

These technologies present an opportunity to address some of the concerns related to greenhouse gas emissions, as well as other pollutants that come along with burning coal.[50] It is also an opportunity to address safety concerns related to mining for coal. In the long term, if EGS were to provide all that seems possible, electricity would be cheap, sustainable, and available in quantities that might even spur a more dramatic shift in fuel sources in the transportation area.

Most of the time in energy production, the Rolling Stones rule applies: "You can't always get what you want."[51] Usually, there is some major impediment to reaping the value of the energy source. Wind is a primary example.

North Dakota is first among the states with the most potential to generate electricity from wind projects.[52] However, the existing transmission infrastructure needed to move that electricity to load centers—that is, population centers—is wholly inadequate.[53] In most wind projects, access to adequate transmission lines is the biggest obstacle.[54] This results in significant problems for many wind projects. Project developers, as well as regulators, are reluctant to site wind farms without access to transmission lines. Transmission developers, on the other hand, are reluctant to build in places without a demonstrated need for capacity. And so the circle begins.

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47. *Id.* § 1.2, 1-9 ("Although beyond the scope of this assessment, it is important to point out that even at temperatures below 50°C, geothermal energy can have a significant impact.").

48. *See* GOSNOLD ET AL., *supra* note 8.

49. *See id.*

50. *See* Alan Nogee et al., The Projected Impacts of a National Renewable Portfolio Standard, Elec. J., May 2007, at 33, 44 ("[T]he burning of coal, oil, and natural gas for power currently accounts for more than 26 percent of smog-producing nitrogen oxide emissions, one-third of toxic mercury emissions, and 64 percent of acid rain-causing SO2 emissions.").

51. *See* ROLLING STONES, *You Can't Always Get What You Want*, *on* LET IT BLEED (London Records 1969).

52. Am. Wind Energy Ass'n., Wind Energy Potential, http://www.awea.org/faq/wwt_potential.html (last visited May 30, 2010) (citing PAC. NW. LAB., AN ASSESSMENT OF THE AVAILABLE WINDY LAND AREA AND WIND ENERGY POTENTIAL IN THE CONTIGUOUS UNITED STATES (1991)).

53. *Id.*

54. Am. Wind Energy Ass'n., Renewable Energy Transmission Highways, http://www.awea.org/legislative/#RETH (last visited May 30, 2010) (stating that transmission access is "perhaps the biggest obstacle to the long-term growth of wind power and other renewables").

Similarly, as a country, we want energy independence and freedom from foreign oil. However, even using the most aggressive views of our available reserves, the United States is not going to drill its way to freedom from foreign oil. The country will drill to try and lessen the need for foreign source oil, and that drilling is going on right now. Try as we might, we will be importing oil for the foreseeable future.

In addition, although there is little consensus on what we should do or how to do it, most people would like environmentally friendly energy sources. For many, this means combating climate change. And for most, regardless of their views of how aggressive we should be in that area, cleaner and economical energy resources would be welcomed. Environmental protection, beyond climate change, has a broad acceptance. To the extent a new energy source is safe and offers relatively low cost, it is likely to draw significant support.

EGS is one of the few sustainable energy sources that offers almost all of what we seem to want. Often, low-cost energy sources become a problem when we talk about renewable energy, at least in the near term. Although prices have dropped significantly over the past several years—for wind and solar energy, for example[55]—renewable sources are still often considered to be more expensive than traditional resources,[56] although that is subject to debate.[57] Regardless, this "gap" may close if the United States puts a price on carbon,[58] but it is unlikely this will change significantly in the near term with or without a carbon price.

With EGS, cost is not necessarily a problem,[59] which is what the University of North Dakota projects are designed to demonstrate. At least

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55. David J. Lazerwitz et al., *Renewable Energy Development on the Federal Public Lands: Catching Up with the New Land Rush*, 55 ROCKY MTN. MIN. L. INST. PROCEEDINGS § 13.02(1)(a), at 13-1 (2009) ("The price gap between conventional fuels and renewable energy has narrowed substantially in recent years, leading to increased interest in solar and wind power projects.").

56. *See* U.S. ENERGY INFO. ADMIN., 2016 LEVELIZED COST OF NEW GENERATION RESOURCES FROM THE ANNUAL ENERGY OUTLOOK 2010 33 (2010), *available at* http://www.eia.doe.gov/oiaf/aeo/pdf/2016levelized_costs_aeo2010.pdf.

57. *See, e.g.*, Richard L. Ottinger & Rebecca Williams, *Renewable Energy Sources for Development*, 32 ENVTL. LAW 331, 339 (2002) ("Governments and agencies frequently fail to assess costs and benefits correctly when comparing renewable to traditional energy options—particularly given the heavy subsidization of traditional energy resources—and fail to value resources on a life-cycle basis, accounting for externality costs to society.").

58. *See, e.g.*, American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong., Title III, Subtitle A—Reducing Global Warming Pollution, § 311 (2009); *see generally* Melissa Powers, *Integrating the Clean Air Act With Cap-and-Trade*, 37 RUTGERS L. REC. 150, 152-55 (2010) (describing the potential implications of H.R. 2454).

59. Christopher Mims, *Can Geothermal Power Compete with Coal on Price?*, SCI. AM., Mar. 2, 2009, http://www.scientificamerican.com/article.cfm?id=can-geothermal-power-compete-

initially, the geothermal energy will be pursued on project sites that already exist, already have demand, and already have part of the project infrastructure: the well. There are currently 102 operating oil fields in North Dakota as part of the Williston Basin,[60] and EGS on the current oil fields in the thirty-one oil and gas states could eventually produce all of the power needed by the oil fields, plus another 6.8% of the current electricity consumption.[61] That is, there would be a net benefit, or a net excess, that could be sold back to the grid if this project actually works and goes online.

In time, developing EGS could create additional and sustainable energy opportunities even where an oil well has been, or would have been, shut down for oil production purposes. The new ORC technology may create opportunities to access and run the projects on old oil wells, or new wells specifically created only for electricity generation, which would make these projects more like a typical geothermal project. That is, the only purpose would be electricity generation. Beyond this, developing large-scale binary power plants using geothermal resources could eventually replace coal power plants.[62] This should have tremendous appeal given the amount of problems related to coal consumption.

III. IMPEDIMENTS TO NORTH DAKOTA RENEWABLE ENERGY PROJECTS

When we think about the impediments to a number of these renewable energy projects, we need to realize they are not singular, not just expensive, and not just hard to site. There are, of course, the physical infrastructure issues related to transmission and access to renewable generation resources.[63] There are also technological issues related to the price at which new technologies are available. This is true for wind and solar projects, as discussed earlier, and it is true for projects such as carbon sequestration designed to make coal projects clean, or at least cleaner.

One of the problems with new energy technologies is reaching economic, not just scientific, viability. Just because scientists can conceive of something, such as algae-based ethanol[64] or carbon sequestration,[65] does

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with-coal-on-price ("Two recent reports, among others, suggest that geothermal may actually be cheaper than every other source [for generating electricity], including coal.").

60. *See* U.S. Dep't of Energy, *supra* note 5.

61. *See* GOSNOLD ET AL., *supra* note 8.

62. *Id.*

63. *See As Utilities Race to Meet RPS with New Wind Projects, Key Grid Expansion Sets Slower Pace*, ELEC. UTIL. WEEK, June 11, 2007, at 1.

64. *See* Joel K. Bourne, Jr., *Green Dreams*, NAT'L GEOGRAPHIC, Oct. 2007, at 41, 57.

65. *See* Elisabeth Rosenthal, *Our Fix-It Faith and the Oil Spill*, N.Y. TIMES, May 30, 2010, at WK1 (reporting the views of William Jackson, deputy director general of the International

not mean it can happen. If it is not economically viable, it is not viable, and we need to make it economical before it has any real impact. There are many things we can accomplish in theory or in a lab, but that does not mean we have a solution. Unfortunately, being able to accomplish something on a commercial scale is very different than being able to prove something works conceptually.

In addition, there are legal impediments to bringing renewable energy online, including but not limited to these geothermal projects. For example, with regard to transmission siting, the lack of federal, and sometimes state, authority can make it extremely difficult, if not impossible, to build needed transmission infrastructure.[66] This can prove especially problematic when the benefits of a new transmission line inure largely to citizens of other states, but must run through a state that would derive minimal benefits. In North Dakota, for example, the Public Service Commission (PSC) would be limited in its ability to approve such a transmission line legally, as well as politically, because the North Dakota Energy Conversion and Transmission Facility Siting Act requires that the PSC "ensure that the location, construction, and operation of energy conversion facilities and transmission facilities will produce minimal adverse effects on the environment and upon the welfare of the citizens of th[e] state" when considering siting proposals for transmission lines.[67]

Additional impediments to the potential viability of renewable energy projects in North Dakota, including the proposed geothermal projects, involve the state's implementation of the Public Utility Regulatory Policies Act of 1978.[68] This act requires certain utilities to buy, at avoided cost, renewable energy from certain independent generators.[69] However, these rules do not apply to electric cooperatives in the state. The North Dakota PSC does not regulate rural electric cooperatives,[70] which means the PSC

Union for Conservation of Nature, who "not[ed] that carbon capture and storage—which involves pumping CO2 emissions underground rather than releasing them to the air—may be 'there' as a science, but the costs prevent it from being a practical answer").

66. *See* Jim Rossi, *The Trojan Horse of Electric Power Transmission Line Siting Authority*, 39 ENVTL. L. 1015, 1018-21 (2009).

67. *See* N.D. CENT. CODE § 49-22-02 (2007).

68. Pub. L. No. 95-617, § 2, 92 Stat. 3117, 3119 (codified as amended in scattered sections of 7, 15, 16, and 30 U.S.C.).

69. 16 U.S.C. § 824a-3(a) (2006).

70. N.D. Pub. Serv. Comm'n, Jurisdiction: Electricity, http://pc6.psc.state.nd.us/jurisdiction/electricity.html (last visted May 30, 2010) ("The Commission does not have jurisdiction to regulate rates, terms and conditions for rural electric cooperatives (REC's) or municipal providers.").

does not regulate the rates of about fifty percent of the state.[71] Thus, these cooperatives can have requirements contracts and essentially avoid purchasing some of the renewable energy projects, if the cooperatives so choose.

Finally, North Dakota lacks the legislative incentives needed to help encourage renewable energy projects on a large scale. North Dakota is one of about twenty states without a mandatory renewable portfolio standard, which would mandate that covered utilities in the state procure a certain portion of their sales of electricity from renewable resources, as defined by statute.[72] North Dakota has a renewable portfolio goal, but it is an objective—an aspirational goal—without any enforcement mechanism.[73] Quite simply, there are no teeth. If the state is serious about creating renewable energy opportunities, these kinds of mandates are essential to this process. Of course, even with a mandate in the state, if it would not apply to the electric cooperatives, as is likely to happen, almost forty percent of the electricity sold in the state would remain exempt.

IV. CONCLUSION

North Dakota is already a leader in energy production, and the state has benefited handsomely from its energy resources. North Dakota's oil is one of the primary reasons the state has a budget surplus while nearly every other state is either struggling to break even or facing budget deficits.[74] As we pursue oil and gas exploration in the state, we need to be focusing on opportunities not only for maximizing our current resources, but also on positioning the state to maintain its position as a long-term energy leader in the country.

By providing incentives for, and reducing impediments to, bringing renewable resources online, the state can provide significant opportunities for a robust and solid energy future in the state and around the country. Generating geothermal energy from co-produced fluids as a by-product of oil production is an ideal addition to North Dakota's renewable energy industry and a great reason to begin pursuing more aggressive renewable

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71. N.D. Ass'n of Rural Elec. Coop., Cooperative Facts, http://www.ndarec.com/electric NetworkFacts.htm (last visted May 30, 2010) (stating that North Dakota rural electric distribution cooperatives sell almost fifty percent of all retail electricity in the state).

72. *See* DSIRE: Database of State Incentives for Renewables & Efficiency, Renewables Portfolio Standards, http://www.dsireusa.org/documents/summarymaps/RPS_Map.ppt (last visited May 30, 2010) (stating that twenty-nine states and the District of Columbia have an RPS, and six more states have renewable energy goals, as of May 2010).

73. N.D. CENT. CODE § 49-02-28 (2007).

74. *See* Amy Merrick, *In North Dakota, the Good Times Are Still Rolling*, WALL ST. J., June 5, 2009, at A4.

energy policies in the state. These geothermal projects are pragmatic and practical. They support the state's current pursuit of its most lucrative energy industry, oil, while promoting new clean energy technologies. In essence, these projects are a win-win. They have the potential to make our current energy mix a little cleaner and a little safer, while providing a process that could make our future energy mix much cleaner and much safer, in every sense of the word—and that makes good sense for North Dakota: economically, environmentally, and ethically.