THE RENEWABLE ENERGY POLICY PUZZLE: PUTTING THE PIECES TOGETHER

SYMPOSIUM INTRODUCTION

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U.S. energy policy continues to place an increasing emphasis on renewable energy as a means to enhance national security, protect the environment, and promote rural economic development.[1] Despite conflicting ideas about the most efficient and effective method of achieving these goals,[2] there is no doubt that the goals themselves are worthwhile. As the U.S. economy is heavily dependent on petroleum imported from foreign nations,[3] a shift toward domestically-produced renewable energy will have a profound impact on U.S. energy security. Additionally, as scientific consensus continues to converge on the notion that combustion of fossil fuels drives global climate change,[4] it is becoming apparent that increased sourcing of renewable energy will produce important environmental benefits.[5] Finally, rural economies in the United States will bene-

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1. *See, e.g.*, Energy Independence and Security Act of 2007, Pub. L. No. 110-140, 121 Stat. 1492 (enacting the federal Renewable Fuel Standard (RFS2), funding research and development for solar and wind technologies, and funding incentives to establish "green jobs").

2. For an example of conflict regarding the environmental benefits of biofuels, compare Alexander E. Farrell et al., *Ethanol Can Contribute to Energy and Environmental Goals*, 311 SCIENCE 506 (2006) (analyzing current ethanol production processes and concluding that replacing gasoline with ethanol as a transportation fuel could provide environmental benefits), with Timothy Searchinger et al., *Use of U.S. Croplands for Biofuels Increases Greenhouse Gases Through Emissions from Land-Use Change*, 319 SCIENCE 1238 (2008) (arguing that over a thirty-year period, the use of corn-based ethanol could double greenhouse gas emissions).

3. Peter Ogden et al., *A New Strategy to Spur Energy Innovation*, ISSUES SCI. & TECH., Winter 2008, at 35, 35.

4. *See, e.g.*, Barbara J. Finlayson-Pitts, *Atmospheric Chemistry*, 107 PROC. NAT'L ACAD. SCI. U.S. AM. 6566, 6566 (2010) ("[O]ver the last several decades, the interweaving of climate and air pollution and their relationship to fossil fuel usage and combustion has become widely accepted.").

5. *See, e.g.*, A.K. Akella et al., *Social, Economical and Environmental Impacts of Renewable Energy Systems*, 34 RENEWABLE ENERGY 390, 391 (2009) (noting that the environmental benefits of utilizing renewable energy sources include "(i) reduced air pollution, (ii) lower greenhouse gas emissions, (iii) lower impacts on watersheds, (iv) reduced transportation of energy resource and (v) main-

fit from increased sourcing of agricultural-based energy because facilities generating renewable energy will not only rely on biomass feedstocks, but will also be sited in rural areas where they will generate new, high-technology employment opportunities.[6]

Within the ever-expanding realm of alternative energy options, liquid biofuels justifiably hold a prominent position, as current transportation fuel infrastructure in the United States can only accommodate liquid fuels.[7] Not only is the vast fleet of automobiles, trucks, ships, and airplanes designed to combust liquid fuels,[8] but the vast network of pipelines, fueling stations, and fuel pumps can only distribute and dispense liquid fuels.[9] Even if a viable alternative to liquid transportation fuels were developed today, the amount of capital investment and time needed to effectuate a shift to this new technology would be great.[10] It is, therefore, abundantly clear that our heavy reliance on liquid transportation fuels will continue in the short- to mid-term. As such, liquid biofuels derived from renewable feedstocks currently are the most attractive renewable energy option within the immense transportation sector. This proposition is bolstered by recent trends toward the production of current infrastructure-compatible "drop-in" biofuels[11] that have quelled some of the concerns that a shift to widespread implementation of traditional liquid biofuels (e.g., ethanol) would also require large capital investment in infrastructure.[12]

taining natural resources for the long term"); David Tilman et al., *Beneficial Biofuels—The Food, Energy, and Environment Trilemma*, 325 SCIENCE 270, 270 (2009) (noting that important environmental benefits such as reduction in greenhouse gas emissions will result if "biofuels are done right"); *Environmental Benefits of Renewable Energy*, UNION OF CONCERNED SCIENTISTS, http://www.ucsusa.org/clean_energy/technology_and_impacts/impacts/environmental-benefits-of.html (last updated Oct. 28, 2002).

6. *See generally* Joe L. Parcell & Patrick Westhoff, *Economic Effects of Biofuel Production on States and Rural Communities*, 38 J. AGRIC. & APPLIED ECON. 377 (2006) (analyzing and discussing the economic effects of biofuel production on rural economies).

7. Rakesh Agrawal et al., *Sustainable Fuel for the Transportation Sector*, 104 PROC. NAT'L ACAD. SCI. U.S. AM. 4828, 4828 (2007).

8. *See id.*

9. *See id.*

10. *See id.* (noting how the current liquid transportation fuel infrastructure hampers the viability of batteries and hydrogen as petroleum-replacing technologies).

11. *See, e.g.*, *Renewable Petroleum Technology*, LS9, INC., http://www.ls9.com/technology/ (last visited Feb. 2, 2011) (describing "an elegant 1-step fermentation process that uses patent-pending DesignerMicrobes™ to efficiently convert renewable feedstocks to a portfolio of 'drop in compatible' UltraClean™ fuels"). In the public sector, the U.S. Department of Energy has recently announced that it will begin issuing grants to fund "the development of advanced biofuels that will be able to replace gasoline or diesel without requiring special upgrades or changes to the vehicle or fueling infrastructure." Press Release, U.S. Dep't of Energy, Secretary Chu Announces up to $30 Million for Research to Advance the Next Generation of Biofuels (Dec. 14, 2010), *available at* http://www.energy.gov/news/9884.htm.

12. *See* U.S. DEP'T OF AGRIC., A USDA REGIONAL ROADMAP TO MEETING THE BIOFUELS GOALS OF THE RENEWABLE FUELS STANDARD BY 2022, at 17 (2010), http://www.usda.gov/documents/USDA_Biofuels_Report_6232010.pdf (noting that, if ethanol is used to meet the RFS2's mandate of thirty-six billion gallons of renewable fuel by 2022, $12.066 billion would need to be invested in railroad infrastructure to distribute ethanol); Bryan Walsh, *Top 20 Green Tech Ideas: Custom Biofuels*, TIME (Dec. 6, 2010), http://www.time.com/time/specials/packages/article/0,28804,2030137_2030135_

Additionally, policymakers are considering a shift in the traditional paradigm from "biofuels" as merely liquid transportation fuels.[13] For instance, if a crop or forest residue is harvested from the land, compacted into a pellet, and fed into an industrial boiler to generate either heat or power, is this pellet not itself a biofuel? Based on the current U.S. Department of Agriculture (USDA) interpretation of its Biomass Crop Assistance Program (BCAP) final rule, the answer is likely yes.[14] If this trend continues, the spectrum of uses for biomass will grow. Policymakers, however, must continue to refine the "sustainability" and "renewability" parameters that make up the definition of "biofuel."

As the myriad greenhouse gas (GHG) regulations and other renewable energy incentives developing at the federal and state levels demonstrate, law and regulation are at the forefront of defining and ushering in a societal shift toward the implementation of renewable energy alternatives. The nascent bioenergy sector continues to struggle in light of the financial crisis, and it is therefore perhaps premature to assume that industry sectors will *sua sponte* make efforts to enhance national security, protect the environment, and promote rural economic development in the absence of legal mandates and incentives. As a result, if these important national policy objectives are to be achieved, laws and regulations must be fashioned to incentivize the desired shift to renewable energy options while ensuring that such policies balance environmental, social, and economic sustainability.

While the renewable energy-related efforts of policymakers must no doubt continue to increase and evolve, some important first steps have been made. In the area of liquid transportation biofuel implementation, the federal Renewable Fuel Standard (RFS2) continues to refine regulations implementing the legal mandate that thirty-six billion gallons of renewable fuel enter the U.S. fuel supply by 2022.[15] In order to address the classic "chicken and egg" problem associated with biofuel production and biomass feedstock production, programs such as BCAP and USDA and Department of Energy (DOE) loan guarantees will directly incentiv-

2021658,00.html (commenting that the "trillion-dollar infrastructure already in place around petroleum" creates "a hidden obstacle to wider adoption" of traditional biofuels such as corn ethanol and biodiesel).

13. *See* Biomass Crop Assistance Program, 75 Fed. Reg. 66,202, 66,216 (Oct. 27, 2010) (to be codified at 7 C.F.R. pt. 1450) ("[P]ellets and briquettes would be considered to be advanced biofuels under the 2008 Farm Bill definition if comprised of eligible materials under BCAP . . . ."). *But see* BRENT D. YACOBUCCI & RANDY SCHNEPF, CONG. RESEARCH SERV., RL 33928, ETHANOL AND BIOFUELS: AGRICULTURE, INFRASTRUCTURE, AND MARKET CONSTRAINTS RELATED TO EXPANDED PRODUCTION 2 (2007), http://collinpeterson.house.gov/PDF/ethanol.pdf ("[T]he term [biofuel] generally refers to liquid transportation fuels.").

14. Biomass Crop Assistance Program, 75 Fed. Reg. at 66,216.

15. Regulation of Fuels and Fuel Additives: Changes to Renewable Fuel Standard Program, 75 Fed. Reg. 14,670, 14,674 (Mar. 26, 2010). The statutory thirty-six billion gallon mandate for renewable fuels is to be comprised of sixteen billion gallons of "[c]ellulosic biofuel," twenty-one billion gallons of "[a]dvanced biofuel," and a yet-undetermined volume, but no less than one billion gallons, of "[b]iomass-based diesel." *Id.*

ize both biomass production and biorefinery construction.[16] Additionally, many states have also begun to enact laws and promulgate regulations in an effort to incentivize the implementation of renewable energy options.[17] As has been the norm with environmentally progressive state legislation, California is taking the lead in blazing its own trail to reduce GHG emissions, including the California Renewable Portfolio Standard, cap-and-trade program, and a Low Carbon Fuel Standard.[18]

The plethora of interesting and quickly evolving issues related to renewable energy demands agile and thoughtful scholarship. This Symposium represents a significant step toward establishing renewable energy law and policy as an area of its own, one that encompasses broad, cross-disciplinary efforts not only in environmental and energy law, but in economics, agriculture, and ecology as well. The Symposium papers published in this issue, which were first presented at the Second Annual EBI Biofuels Law and Regulation Conference,[19] strive to spur further discourse within this nascent area of legal scholarship, which is essential to sound policies and the science on which they are based.

The Symposium issue is organized as follows. First, two law professors, Neil D. Hamilton and Jim Rossi, bring us two papers that address recent legal and political disappointments in the area of renewable energy.[20] Professor Hamilton's piece takes a detailed look at the global cli-

16. Biomass Crop Assistance Program, 75 Fed. Reg. at 66,234–43; Press Release, U.S. Dep't of Agric., Agriculture Secretary Vilsack Outlines Progress on Effort to Advance Renewable Energy Production in America: Expansion of Biofuels Reaches All Regions of the Country (Jan. 20, 2011), *available at* http://www.usda.gov/wps/portal/usda/usdahome?contentidonly=true&contentid=2011/01/0020.xml; Press Release, U.S. Dep't of Energy, Department of Energy Offers First Conditional Commitment for a Loan Guarantee for Advanced Biofuels Plant (Jan. 21, 2011), *available at* http://lpo.energy.gov/?p=2052.

17. *See generally* Jay P. Kesan & Atsushi Ohyama, *Understanding U.S. Ethanol Consumption and Its Implications for Policy: A Study of the Impact of State-Level Incentives*, 2011 U. ILL. L. REV. 435 (providing an overview of state-level transportation fuel incentives); *see also* DSIRE: DATABASE OF STATE INCENTIVES FOR RENEWABLES & EFFICIENCY, http://www.dsireusa.org/ (last visited Feb. 2, 2011) (providing a comprehensive list of renewable energy policies).

18. S. 1078, 2001–2002 Reg. Sess. (Cal. 2002), *available at* http://www.energy.ca.gov/portfolio/documents/SB1078.PDF (establishing the California Renewable Portfolio Standard); Notice of Public Hearing to Consider the Adoption of a Proposed California Cap on Greenhouse Gas Emissions and Market-Based Compliance Mechanisms Regulation, Including Compliance Offset Protocols, 44-Z Cal. Regulatory Notice Reg. 1832 (Oct. 29, 2010), http://www.oal.ca.gov/res/docs/pdf/notice/44z-2010.pdf; Cal. Exec. Order No. S-01-07 (Jan. 18, 2007), http://www.arb.ca.gov/fuels/lcfs/eos0107.pdf (ordering "[t]hat a Low Carbon Fuel Standard ('LCFS') for transportation fuels be established for California"); *see also* CAL. HEALTH & SAFETY CODE §§ 38500–38599 (West 2010) (providing the statutory authority for California's LCFS).

19. SECOND ANNUAL EBI BIOFUELS LAW AND REGULATION CONFERENCE, http://www.biofuelslawconference.org/index.html (last visited Feb. 2, 2011) (providing a complete itinerary of the conference and streaming videos of the conference presentations). The conference was co-sponsored by the University of Illinois Energy Biosciences Institute's (EBI) Biofuels Law and Regulation Program and the Program in Intellectual Property & Technology Law at the University of Illinois College of Law. *Id.*

20. *See* Neil D. Hamilton, *Farming an Uncertain Climate Future: What COP 15 Means for Agriculture*, 2011 U. ILL. L. REV. 341; Jim Rossi, *The Shaky Political Economy Foundation of a National Renewable Electricity Requirement*, 2011 U. ILL. L. REV. 361.

mate change talks that took place in Copenhagen in 2010.[21] He concludes that the talks resulted in a missed opportunity for U.S. agriculture and compares this disappointing outcome to the legislative debates in the United States that continue to abound over the implementation of a cap-and-trade regulatory regime for carbon emissions.[22] Professor Rossi's piece considers the efficacy of implementing a national renewable portfolio standard (RPS) and ultimately concludes that a national RPS, in the form currently proposed, would most likely not be adopted by Congress, nor would it serve its intended goals.[23]

Next, we consider the issue of GHG emission calculations with a paper by law professor Daniel A. Farber and another paper coauthored by David Zilberman, Gal Hochman, and Deepak Rajagopal.[24] While both papers discuss the multitude of problems associated with including indirect land use change (ILUC) in GHG emission calculations, Professor Farber's piece takes a law and regulation–centered look at the U.S. Environmental Protection Agency's (EPA) treatment of corn ethanol and concludes that, although EPA has acted in good faith regarding ILUC, it should nonetheless develop better methods of dealing with the uncertainty associated with ILUC.[25] In contrast, the paper that is lead-authored by Professor Zilberman takes an economics-based approach to the same issue and argues that policymakers should not mandate the inclusion of ILUC values in the life cycle analyses for GHG emissions that are often relied upon by biofuel-related laws and regulations.[26]

The paper coauthored by Atsushi Ohyama and myself, as well as the piece coauthored by Professor James M. Van Nostrand and Anne Marie Hirschberger, stems from the conference's panel on the role of the states in biofuel policy.[27] The paper that I coauthored takes a law and economics-based approach to state-level biofuel incentives and provides a detailed empirical analysis of the effect of these state-level incentives on ethanol consumption patterns.[28] We show that there is a recent shift toward a national market for biofuels and argue that policy-making coordination between state and federal lawmakers must be strengthened.[29] Looking at a single state-specific example of biofuel policy, the paper by Professor Van Nostrand and Ms. Hirschberger provides a de-

21. Hamilton, *supra* note 20.
22. *Id.* at 356–59.
23. Rossi, *supra* note 20.
24. Daniel A. Farber, *Indirect Land Use Change, Uncertainty, and Biofuels Policy*, 2011 U. ILL. L. REV. 381; David Zilberman et al., *On the Inclusion of Indirect Land Use in Biofuel Regulations*, 2011 U. ILL. L. REV. 413.
25. Farber, *supra* note 24.
26. Zilberman et al., *supra* note 24.
27. *See* Kesan & Ohyama, *supra* note 17; James M. Van Nostrand & Anne Marie Hirschberger, *New York's Roadmap for Reducing Greenhouse Gases in the Transportation Sector*, 2011 U. ILL. L. REV. 475.
28. Kesan & Ohyama, *supra* note 17.
29. *Id.*

tailed analysis and discussion of the recently issued *Renewable Fuels Roadmap and Sustainable Biomass Feedstock Supply for New York*.[30]

Next, we consider the role of biomass in reducing GHGs and otherwise enhancing environmental conservation with a paper authored by Jody M. Endres and a paper coauthored by Professor Madhu Khanna, Xiaoguang Chen, Haixiao Huang, and Hayri Önal.[31] Ms. Endres's piece examines how existing conservation programs such as those administered by USDA can be used, at least initially, as a gauge of energy biomass' level of "sustainability," and posits that ongoing efforts to define "renewable" energy likely will change the environmental paradigm within all agricultural landscapes.[32] The paper by Professor Khanna et al., provides a detailed economic analysis of the various effects of federal biofuel incentive schemes such as RFS2, BCAP, and the volumetric biofuel tax credits.[33]

In an effort to provide a science-based foundation for scholarly discourse on biofuel law and regulation, the paper coauthored by Kristina J. Anderson-Teixeira, Professor Peter K. Snyder, and Professor Evan H. DeLucia provides an ecological science perspective on the way biofuel GHG life cycle analyses account for land use changes.[34] Specifically, the paper highlights how land use change impacts our climate through both "biogeochemical" and "biophysical" forcings.[35] The paper ultimately concludes that the climate impact of land use change is not accurately quantified by current GHG life cycle analyses for biofuels because biophysical forcings are not included in these assessments.[36]

Finally, the paper by Professor A. Bryan Endres and the paper by Professors Elizabeth Burleson and Winslow Burleson focus on innovation and the regulatory challenges associated with renewable energy.[37] Focusing on geologic carbon sequestration, Professor Endres's piece takes a law and economics approach to analyzing and discussing the various property rights regimes that govern legal interests in geologic pore spaces.[38] The paper coauthored by Professors Burleson and Burleson discusses the problems associated with global climate change, analyzes the current state of environmentally sound technologies, and argues for

30. Van Nostrand & Hirschberger, *supra* note 27.
31. Jody M. Endres, *Agriculture at a Crossroads: Energy Biomass Standards and a New Sustainability Paradigm?*, 2011 U. ILL. L. REV. 503; Madhu Khanna et al., *Land Use and Greenhouse Gas Mitigation Effects of Biofuel Policies*, 2011 U. ILL. L. REV. 549.
32. Endres, *supra* note 31.
33. Khanna et al., *supra* note 31.
34. Kristina J. Anderson-Teixeira et al., *Do Biofuels Life Cycle Analyses Accurately Quantify the Climate Impacts of Biofuels-Related Land Use Change?*, 2011 U. ILL. L. REV. 589.
35. *Id.*
36. *Id.* at 620–21.
37. A. Bryan Endres, *Geologic Carbon Sequestration: Balancing Efficiency Concerns and Public Interest in Property Rights Allocations*, 2011 U. ILL. L. REV. 623; Elizabeth Burleson & Winslow Burleson, *Innovation Cooperation: Energy Biosciences and Law*, 2011 U. ILL. L. REV. 651.
38. Endres, *supra* note 37.

increased cooperation amongst various stakeholders in order to foster the further development of sustainable practices.[39]

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39. Burleson & Burleson, *supra* note 37.