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Hannah J. Wiseman
Florida State University College of Law

URBAN ENERGY

Essay

*Hannah J. Wiseman**

ABSTRACT

Growing domestic energy development—the extraction of fuels and construction of electricity generation facilities—poses new challenges to a country accustomed to importing much of its energy. As has always been the case, fuel in the form of oil, gas, sunlight, wind, water, or other energy sources must be extracted wherever it happens to be found. Compounding this challenge is the fact that some of our most abundant remaining energy sources exist in low concentrations and are widely distributed.

As we tap these sources in ever more numerous locations, energy development bumps up against certain human population centers. The City of Fort Worth, Texas, now hosts nearly 2000 hydraulically fractured natural gas wells, and San Diego has more than 4500 solar projects. With the rise of the Smart Grid, every American consumer could become a small source of electricity, sending electricity back into the grid from a plug-in hybrid electric vehicle, a solar panel or small wind turbine, a fuel cell, or battery storage. As energy development becomes an integral part of certain population centers, the law will have to adjust, responding to property-based, land use and environmental disputes; nuisance claims; enhanced demands on local infrastructure; and equity concerns related to unevenly distributed effects.

This Essay explores these growing themes in energy law, investigating how certain populated areas have begun to embrace their role as energy centers by addressing potential conflicts ex ante—in some cases creating clearer zoning and permitting systems, and

* Assistant Professor, Florida State University College of Law. J.D., Yale Law School; A.B., Dartmouth College. Many thanks to Professors Alexandra Klass and Samuel Wiseman for their helpful comments on this Essay. Thanks, too, to the editors of the *Fordham Urban Law Journal* for including me in the Fortieth Anniversary Symposium and for their editing assistance.

using a combination of public and common law to balance the tradeoff between land-based energy demands and other needs. The Essay also briefly proposes broader lessons for improving energy law based on the piecemeal approaches so far. Municipalities must address energy development in their comprehensive plans and zoning ordinances, and states must provide certain uniform standards for energy development but not preempt all local control or common law actions. Finally, all levels of government must carefully examine the unevenly distributed impacts of energy and ensure that those who bear the brunt of energy-related development have a meaningful say in the bargaining process that balances producers' and others' costs and benefits of energy development.

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INTRODUCTION

The extraction of fuel resources and generation of electricity in the United States have gone through several cycles. The use of primary energy resources to produce heat or run a steam engine was originally quite local: individuals burned coal or wood to heat their homes and used candles and later oil and gas lamps for light.[1] When electricity began to replace gas lamps, thousands of small, local power plants supplied this secondary energy source—with more than forty plants in Chicago alone in the early twenty-first century.[2] With the invention

1. For a description of this history, see Garrick Pursley & Hannah Wiseman, *Local Energy*, 60 EMORY L.J. 877, 884 (2011).

2. Robert L. Bradley, Jr., *The Origins and Development of Electric Power Regulation*, *in* THE END OF A NATURAL MONOPOLY 42 n.4 (Peter Z. Grossman &

of alternating current, however, which allowed electricity to be more efficiently transported over long distances,[3] electricity became a highly centralized endeavor, with large power plants generating electricity and transporting it hundreds or even thousands of miles for eventual delivery to customers.[4] Conventional fuel extraction, too, occurred in productive, discrete, conventional reservoirs,[5] and a growing network of interstate pipelines allowed long-distance transport of fossil fuels from large oil and gas fields.

The twenty-first century has seen several important changes in fuel extraction, electricity generation, and energy transportation, bringing some of these activities closer to human populations. These changes make modern energy somewhat "urban," loosely defined here as energy infrastructure that appears near residences, schools, and other non-industrial buildings. This is not to say that energy generating units or gas wells are now consistently packed within cities, and more so than in the past; rather, I observe that a non-negligible amount of modern energy infrastructure, whether temporary or permanent, is close to people, whether in cities, towns, townships, boroughs, or rural agricultural areas.[6]

In the past decade or so, energy companies have begun to unlock vast quantities of oil and gas from unconventional formations, including shales and tight sandstones thousands of feet below the earth.[7] By definition, unconventional fuel resources do not naturally flow toward common points underground without enhanced fuel

Daniel H. Cole eds., 2003); *see also* Pursley & Wiseman, *supra* note 2, at 886 (describing early, small power plants).

3. Bradley, *supra* note 2, at 44; Pursley & Wiseman, *supra* note 1, at 886.

4. *See* Pursley & Wiseman, *supra* note 1 , at 886.

5. Conventional resources are, of course, not open "pools" of oil or gas underground, but unconventional resources are often differentiated from conventional ones as being more diffuse. *See* Jennifer L. Miskimins, et al., *The Technical Aspects of Hydraulic Fracturing*, ROCKY MTN. MIN. L. FOUND., Nov. 17, 2011, at 1-9 (defining unconventional resources as those distributed over a broader area than conventional ones).

6. This Essay does not make an empirical claim that more people are now closer to energy infrastructure than in the past but rather observes that certain modern energy infrastructure is close to humans, and this can cause conflicts. Furthermore, although this Essay focuses on solar and wind, which are some of the fastest-growing renewable resources in the United States, there are of course many other types of renewable energy resources.

7. *See* INTL. ENERGY AGENCY, WORLD ENERGY OUTLOOK 49, 75–76 (2012) (on file with author) (describing the "renaissance" in U.S. production of gas and oil from shales and the likelihood that we will become a net exporter of gas and will be largely self-sufficient in our energy supply by 2035).

recovery techniques (techniques required in addition to drilling).[8] This means that energy companies must drill thousands of wells throughout an unconventional formation;[9] where human populations happen to be located on top of the formation, these wells will inevitably bump up against other surface uses.[10] In the City of Fort Worth, which lies over a productive area of the Barnett Shale in Texas, there are approximately 1832 producing gas wells, with 123 additional permitted wells.[11] Arlington, Texas also hosts many wells.[12] And well numbers in Texas and elsewhere will likely continue to expand: from North Dakota to Colorado and Pennsylvania, companies are drilling and hydraulically fracturing thousands of new wells.[13] As a result, the United States is on track to be one of the world's largest oil producers and a major exporter of natural gas,

8. *See* Miskimins et al., *supra* note 5, at 1-5 (explaining that "[u]nconventional resources exist in petroleum accumulations that are pervasive throughout a large area and that are not significantly affected by hydrodynamic influences," that they have "low flow capacities," and that fracturing is "required for unconventional reservoirs").

9. Many wells are now horizontal; this means that less surface disturbance is required to extract the same amount of gas, as the wellbore extends laterally underground, sometimes for miles. Still, operators drill thousands of vertical wellbores from the surface and then extend lateral bores out from the verticals. *Cf.* U.S. DEP'T OF ENERGY, OFFICE OF FOSSIL ENERGY, DOE-FE-0385, ENVTL. BENEFITS OF ADVANCED OIL AND GAS EXPLORATION AND PROD. TECH. 34, 36 (1999) (describing the benefits of horizontal drilling); R.R. COMM'N. OF TEX., NEWARK, EAST (BARNETT SHALE) FIELD DISCOVERY DATE 10-15-1981 (2012), *available at* http://www.rrc.state.tx.us/data/fielddata/barnettshale.pdf (showing 16,530 gas wells entered on RRC (Railroad Commission of Texas) records as of January 2012).

10. *See* Bruce R. Kramer, *Local Land Use Regulation of Extractive Industries*, 14 UCLA J. ENVTL. L. & POL'Y 41, 41 (1996) ("Population trends show an increase in ["rur-urban"] development, bringing people into contact with existing mineral development."); *cf.* Jeffrey R. Fiske & Anne E. Lane, *Urbanization of the Oil Patch: What Happens When They Pave Paradise and Put Up a Parking Lot*, 49 ROCKY MTN. MIN. L. INST. 15-1, 15-2 (2003) (describing growing conflicts); Jan G. Laitos & Elizabeth H. Getches, *Multi-layered, and Sequential, State and Local Resource Barriers to Extractive Resource Development*, 23 VA. ENVTL. L.J. 1, 8 n.16 (2004) ("Population growth and the migration of city dwellers to more distant locales contributes significantly to the tensions between surface development and existing oil and gas operations.").

11. *Applications and Permits*, CITY FORT WORTH (May 27, 2013), http://fortworthtexas.gov/gaswells/default.aspx?id=50608.

12. *See Guiding Arlington's Development*, CITY ARLINGTON, http://www.arlingtontx.gov/planning/gas_drilling.html (follow "Search by Operator" "Search Carrizo" (and other operators) to see well listings) (last visited Sept. 4, 2013) (showing that Chesapeake—one gas company—has thirty wells in the city).

13. *See, e.g.*, Hannah Wiseman, *Risk and Response in Fracturing Policy*, 84 U. COLO. L. REV. 101, 107–09 (2013) (describing growing well numbers and providing sources).

something few would have predicted only a few years earlier.[14] Activities associated with this boom might also be increasingly irksome to certain residents: mining sand for the "proppant" used to prop open fractures in shales after hydraulic fracturing can create dust, noise, and other nuisances in addition to substantial environmental effects.[15]

Unconventional oil and gas production is not the only change that has pushed modern energy development closer to human populations in some regions. As energy companies increasingly tap renewable energy resources like sunlight and wind, they must similarly take advantage of low-density, widely distributed resources. Just as unconventional fuels are characterized by their widespread, low-flow nature and require thousands of wells to be developed, renewable fuels are "flow-limited" and must be captured by numerous solar panels or wind turbines.[16] And like unconventional fuels, renewable resources exist in economical quantities only in certain regions[17]—some of which host large human populations.

In a growing trend away from centralized production of renewable resources from large utility-scale plants—which require transmission lines for long-distance electricity transport[18]—residents and business owners in a number of states are building distributed renewables like solar panels on roofs and wind turbines in backyards. Governor Jerry Brown of California wants 12,000 megawatts of electricity to come from "localized" renewable sources—"small energy systems located close to where energy is consumed"—by 2020.[19] Indeed, San Diego

14. *See supra* note 7.

15. *See, e.g.*, WIS. DEP'T OF NATURAL RES., SILICA SAND MINING IN WIS. 3, 12–20, 30 (2012), *available at* http://dnr.wi.gov/topic/Mines/documents/SilicaSandMiningFinal.pdf (noting that "the demand for frac sand has increased exponentially in the past two or three years" and that there are "approximately 20 new mining operations being proposed," and describing the air quality-based and nuisance-type impacts of the blasting, crushing, grinding, and other activities associated with sand mining).

16. *Glossary*, U.S. ENERGY INFO. ADMIN., http://www.eia.gov/tools/glossary/index.cfm?id=R (last visited Sept. 4. 2013).

17. *See* NAT'L RENEWABLE ENERGY LAB., PHOTOVOLTAIC SOLAR RESOURCE OF THE U.S., (2012), *available at* http://www.nrel.gov/gis/images/eere_pv/national_photovoltaic_2012-01.jpg; NAT'L RENEWABLE ENERGY LAB., U.S.—ANNUAL AVERAGE WIND SPEED AT 30 M (2012), *available at* http://www.nrel.gov/gis/images/30m_US_Wind.jpg.

18. *See* Alexandra Klass & Elizabeth Wilson, *Interstate Transmission Challenges for Renewable Energy: A Federalism Mismatch,* 65 VAND. L. REV. 1801 (2012) (describing the challenges of siting transmission to these renewable resources).

19. Jerry Brown, *Clean Energy Jobs Plan*, GOVERNOR'S OFFICE PLANNING & RESEARCH, http://gov.ca.gov/docs/Clean_Energy_Plan.pdf (last visited Oct. 14, 2013).

already has 4500 solar projects, producing "more solar power than the entire nation of Mexico."[20]

The trend toward localized (distributed) renewable energy, like the drilling of thousands of new oil and gas wells, places some energy infrastructure directly within cities, or close to certain residential areas, and can cause conflicts.[21] Distributed electricity production will likely continue to expand along with the growth of the Smart Grid, which is a general term used to describe the computerization of both electricity transmission and distribution wires[22] and certain appliances attached to the grid.[23] The Smart Grid allows consumers to better control both their electricity use and their sale of electricity back to the grid, including from batteries,[24] fuel cells, and renewable infrastructure.[25] With an advanced grid and improved renewable and electric vehicle technology, each home and business could become a small generating plant, thus shifting some electricity production functions toward population centers.[26] Indeed, certain buildings within cities—often schools, nursing homes, and hospitals—already

20. BENJAMIN DAVIS ET AL., CALIFORNIA'S SOLAR CITIES 2012: LEADERS IN THE RACE TOWARD A CLEAN ENERGY FUTURE 4–5 (2012), *available at* http://www.environmentcalifornia.org/sites/environment/files/reports/California%27s%20Solar%20Cities%202012%20-%20Final.pdf.

21. *See infra* notes 29–31, 142, and 163 and accompanying text.

22. The wires are typically described as one unitary "grid," despite not being connected at the national level.

23. U.S. DEP'T OF ENERGY, THE SMART GRID: AN INTRODUCTION 11–13, *available at* http://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/DOE_SG_Book_Single_Pages%281%29.pdf (describing the Smart Grid as including, for example, Advanced Metering Infrastructure, which allows consumers to "use electricity more efficiently" and to program appliances to match price signals; includes "phasor measurement units," which "sample voltage and current many times a second"; better "ease[s] congestion and bottlenecks" on the grid; and allows more connection of distributed generation because of the "two-way flow of electricity and information" enabled by the updated grid).

24. *See, e.g.*, Bryan Lamble, *Of Nesting Dolls and Trojan Horses: A Survey of Legal and Policy Issues Attendant to Vehicle-to-Grid Battery Electric Vehicles*, 86 CHI.-KENT L. REV. 193, 194 (2011) (describing vehicle-to-grid (V2G) technologies that would involve a vehicle with "enough electricity in its battery to allow the larger grid to take electricity back from it").

25. *See* U.S. DEP'T OF ENERGY, *supra* note 23, at 9.

26. *See, e.g.*, Joel B. Eisen, *Can Urban Solar Become a "Disruptive" Technology? The Case for Solar Utilities*, 24 NOTRE DAME J.L. ETHICS & PUB. POL'Y 53, 77–79 (2010) (describing federal incentives for distributed solar, wind, fuel cells, and geothermal heat pumps).

produce their own electricity and/or heat through combined heat and power projects.[27]

The cycling of certain energy resources back to the local level and the move toward unconventional fossil fuels and renewable energy raises a variety of legal issues. Individuals, citizens' groups, and governments have sometimes objected to energy infrastructure development that conflicts with other land uses: neither wind turbines nor gas rigs running around the clock mix well with residential development,[28] and even seemingly innocuous solar panels can cause disputes.[29] A number of individuals have argued that energy development creates backyard nuisances, from alleged contamination of water and soil as a result of drilling and hydraulic fracturing (involving both nuisance and negligence-based claims)[30] to aesthetic disruptions caused by solar panels.[31]

27. *See, e.g.*, *Combined Heat and Power Units Located in New York*, IFC INT'L, http://www.eea-inc.com/chpdata/States/NY.html (last visited Sept. 4, 2013) (showing hundreds of CHP units in the state).

28. *See, e.g.*, Huntley & Huntley, Inc. v. Borough Council of Borough of Oakmont, 694 A.2d 855, 858 (Pa. 2009) (noting objections to a proposed gas well, which included allegations that the well "would have adverse safety, noise, and traffic effects on the community"); Robinson Twp. v. Commonwealth of Pa., 52 A.3d 463, 484 & n.21 (Pa. Commw. Ct. 2012) (observing that what the court described as the "slop" (analogizing to nuisance cases involving pigs)—"noise, light, trucks, [and] traffic" associated with gas development—"literally affects the use of the landowner's parlor"), *appeal quashed*, 73 A.3d 520 (Pa. 2013) (mem.); *see also* COLL. OF AGRIC. SCIS., PENN. STATE UNIV., MARCELLUS SHALE: WHAT LOCAL COURT OFFICIALS NEED TO KNOW 11, 18 (2009), *available at* http://pubs.cas.psu.edu/freepubs/pdfs/ua454.pdf (noting "heightened noise" and aesthetic impacts, as well as heavy truck traffic).

29. *See, e.g.*, Tesoro Del Valle Master Homeowners Ass'n v. Griffin, 133 Cal. Rptr. 3d 167, 172 (Cal. Ct. App. 2011) (noting objections to a proposed solar panel installation because it was "at the entry to the neighborhood," and "adjacent homes had a direct line of sight").

30. *See, e.g.*, Complaint, Berish v. Sw. Energy Prod., 763 F. Supp. 2d 702 (M.D. Pa. 2011) (No. 201-1882CP) (on file with author) (making similar nuisance and negligence allegations based on contamination); Amended Complaint, Fiorentino v. Cabot Oil & Gas Corp., 750 F. Supp. 2d 506 (M.D. Pa. 2010) (No. 3:09-cv-02284-TIV) (on file with author) (alleging unreasonable interference with use of property as a result of the release of hazardous substances). For a compendium of cases, many of which involve nuisance (but none of which plaintiffs appear to have won), see SMITA WALAVALKAR, CTR. FOR CLIMATE CHANGE LAW, COLUMBIA LAW SCH., DIGEST OF HYDRAULIC FRACTURING CASES (2013), *available at* http://www.law.columbia.edu/null/download?&exclusive=filemgr.download&file_id=622373.

31. *See, e.g.*, Sara C. Bronin, *The Quiet Revolution Revised: Sustainable Design, Land Use Regulation, and the States*, 40 ENVTL. L. REP. NEWS & ANALYSIS 10733, 10735 (2010) (observing that "aesthetic review boards and historic preservation boards, which typically govern structures visible from a public way, regularly reject" the installation of photovoltaic solar panels).

In some cases, the co-location of energy infrastructure and humans has also had direct physical impacts on the infrastructure on which many people rely, including roads, and wires that deliver electricity. In certain cities, utilities' old grids, which are designed primarily to deliver electricity to customers, cannot easily accept more electricity flowing back to the grid from rooftop solar panels[32]—particularly when many residents within one area all attempt to produce their own home-grown electricity. Other communities have experienced road damage and traffic conflicts[33] as thousands of trucks carry materials to and from oil and gas drilling and fracturing sites.

And finally, at a broader level, the expansion of human-energy interactions raises major equity issues: while surface owners and energy consumers have benefited from increased energy production, others have tried to ban this development to prevent environmental degradation and quality-of-life impacts.[34] This leads to important fairness-based questions about how the costs and benefits of more localized energy production should be distributed.

This Essay explores and categorizes the primary conflicts that arise from human-energy interactions. Part I describes land use and environmental conflicts caused by oil and gas wells, centralized renewable energy development, and distributed solar panels and wind turbines, and it analyzes the nuisance doctrines, statutory limits, and environmental regulations that have emerged in response. Part II identifies more direct, physical impacts on communities as

32. *Cf.* Robert Passey et al., *The Potential Impacts of Grid-Connected Distributed Generation and How to Address Them: A Review of Technical and Non-technical Factors*, 39 ENERGY POLICY 6280, 6282 (2011) (noting that "[w]ith significant levels of DG (distributed generation), localised overvoltage can occur," meaning that the voltage flowing backward from a neighborhood into a distribution line can be "greater than the voltage on the normal supply side of the line . . ."). In some cases, the grid simply cannot accept the quantity of electricity flowing backward. *See id.*

33. *See* COLL. OF AGRIC. SCIS., PENN. STATE UNIV., MARCELLUS EDUCATION FACT SHEET: IMPACTS OF MARCELLUS SHALE DEVELOPMENT ON MUNICIPAL GOVERNMENTS IN SUSQUEHANNA AND WASHINGTON COUNTIES 2010, at 2 (2011), *available at* http://www.marcellus.psu.edu/resources/PDFs/jacobson_fiscal.pdf ("Gas development creates significant increases in truck and other traffic, and wear and tear on roads is often very visible.").

34. For a summary of some of the many bans on hydraulic fracturing, see Joseph de Avila, *'Fracking' Goes Local*, WALL ST. J., Aug. 29, 2012, http://online.wsj.com/article/SB10000872396390444327204577617793552508470.html. For a description of attempts to ban large-scale wind development, see Nicholas R. Hoffman, Comment, *A Don Quixote Tale of Modern Renewable Energy: Counties and Municipalities Fight to Ban Commercial Wind Power Across the United States*, 79 UMKC L. REV. 717 (2011).

concentrated energy development strains existing electrical and traffic grids, and it describes innovative legal efforts to improve or expand infrastructure. Having considered these narrower concerns, Part III moves to a broader level, describing how energy development has redistributed the impacts of energy and caused certain communities to bear the brunt of modern energy booms. It then explores how local, regional, state, and federal governments have responded to this shift—allowing or forbidding local control, and in some cases attempting to redistribute mitigation funds to burdened communities. In each of these Parts, after introducing the existing law, the Essay briefly suggests how the law should improve to enable energy development while mitigating the inevitable conflict between humans and energy infrastructure.

So far, responses to human-energy conflicts have been piecemeal.[35] This is inevitable to some extent, as we cannot perfectly predict how energy technologies will continue to change or impact humans. But to the extent that we know of or can predict impacts, a more cohesive legal regime must emerge. Municipalities must address energy development in their comprehensive plans and zoning ordinances, and states must provide certain uniform standards for energy development but not preempt all local-control or common-law actions. Finally, to address equity issues, states should give communities a meaningful voice at the bargaining table to ensure that the full societal costs and benefits of energy development are accounted for. In some cases, redistributive instruments will be needed, such as using severance tax proceeds and other money from energy development to make long-term infrastructural investments in the communities most affected by development.

35. *See, e.g.*, Jill Grealey, *State and Federal Frameworks for Distributed Solar and Wind Projects*, 63 PLAN. & ENVTL. L. 9, 9 (2011) (noting that some municipalities "obstruct introduction of renewable energy equipment," while others wish to "foster" renewables but "lack the funding and expertise to update zoning ordinances that incidentally hinder installations"); Felix Mormann, *Enhancing the Investor Appeal of Renewable Energy*, 42 ENVTL. L. 681, 710 (2012) ("Many American communities fail to include renewable energy technologies in their spatial planning."); Troy A. Rule, *Renewable Energy and the Neighbors*, 2010 UTAH L. REV. 1223, 1238–42 (noting that "local zoning and subdivision covenants" are sometimes silent with respect to small wind turbines, others have "restrictions" that "often discourage installation of the devices," and that "homeowner associations and local governments have adopted provisions that prohibit or severely restrict installation" of solar photovoltaic panels); *infra* notes 93–105 (describing municipal approaches to oil and gas and renewable energy).

I. PROPERTY, LAND-USE, AND ENVIRONMENTAL CONFLICTS

Some of the most common and predictable impacts of energy development in close proximity to humans are conflicts over surface uses of land.[36] Land use planners, courts, and scholars have long recognized that land is a unique resource because it is finite in quantity and cannot be moved.[37] We must work with what we have, and as humans demand new uses of the same land, conflicts inevitably arise. As introduced above, unconventional fuel sources and renewable resources tend to be widely distributed, and must be extracted at thousands of different locations in order to convert low-density resources into abundant supplies; energy companies must use the already-constrained land surface to extract them.[38]

Further compounding this problem is the fact that many modern energy resources take the form of a relatively immobile fuel. Unconventional oil and gas tend to be stubbornly trapped within a formation—they do not move around much.[39] And although sunlight and wind do flow more, they are only abundant at certain known locations; resource maps show consistently windy areas throughout the midwestern United States[40] and high levels of solar radiation concentrated in the Southwest.[41] Energy companies must use the

36. *See, e.g.*, *infra* notes 54–60, 64–90 and accompanying text (describing conflicts among surface owners, mineral owners, and renewable developers, and various instruments used to address the conflicts).

37. *See, e.g.*, Eduardo M. Peñalver, *Land Virtues*, 94 CORNELL L. REV. 821, 885 (2009) (arguing that "we would be wise to err on the side of caution and comprehensiveness in our decision making about land" because land is finite and has "memory," and certain actions can permanently mar it); *cf.* City of Eastlake v. Forest City Enters., 426 U.S. 668, 681 (1986) (reversing a state court decision finding a zoning referendum procedure unconstitutional and observing that "[a]s land continues to become more scarce, and as land use planning constantly becomes more sophisticated, the needs and the opportunities for unforeseen uses of specific parcels of real estate continually increase").

38. *See supra* note 9 and accompanying text (describing low-density unconventional gas and oil resources, which are distributed widely and require many wells to be economically extracted), 11–12 (describing numerous wells in Arlington and Fort Worth, Texas), and 17 (citing to maps that show the limited locations of high-quality sunlight and wind resources).

39. *See* Miskimins et al., *supra* note 5, at 1-5, 1-9 (describing unconventional fuels as flow-limited).

40. *United States Annual Average Wind Power*, NAT'L RENEWABLE ENERGY LAB., http://rredc.nrel.gov/wind/pubs/atlas/maps/chap2/2-01m.html (last visited Sept. 4, 2013).

41. BILLY J. ROBERTS, NAT'L RENEWABLE ENERGY LAB., U.S. DEP'T OF ENERGY, CONCENTRATING SOLAR RESOURCES OF THE UNITED STATES (2012) *available at* http://www.nrel.gov/gis/images/eere_csp/national_concentrating_solar_2012-01.jpg.

surfaces that happen to be below abundant sun or wind to economically extract these resources, and humans in these areas compete for other uses of the surface; the population of the sunny Southwest is booming as retirees and other groups move to dry, warm climates.[42] Shales and tight sandstones, too, are in some areas located directly below large population centers.[43] And in a perfect storm of land use conflicts, sunlight, wind, oil and gas, and people all are concentrated in certain regions: in these scenarios, different types of energy companies and residents, businesses, and industrial owners all compete for the same land.[44] This Part discusses three distinct conflicts that emerge as a result of these competing surface uses, including disputes among owners of mineral, land, and "air" (sun or wind) rights; the coexistence of incompatible surface uses; and environmental impacts, which may remain within the area of energy development or drift far beyond these activities.

A. Property Rights Conflicts

Disputes over property rights are a common product of competing interests in land and energy resources, particularly when energy development is located near concentrated human populations. Individuals who own mineral rights and the rights to wind or sunlight flowing over property—rights called "air estates" here—need to use the surface in certain ways to access these rights, and inevitable disputes emerge. Certain laws already have solved some of these types of energy-based conflicts in property, although challenges remain.

42. *See Climate Impacts in the Southwest*, EPA, http://www.epa.gov/climatechange/impacts-adaptation/southwest.html (last visited Oct. 14, 2013) ("The population growth in each state in this region exceeded the national average growth rate between 2000 and 2010.").

43. *See, e.g., supra* notes 11–12 and accompanying text.

44. *See, e.g.,* Ernest E. Smith & Becky H. Diffen, *Winds of Change: The Creation of Wind Law*, 5 TEX. J. OIL, GAS, & ENERGY L. 165, 181–84 (2009-2010) (describing a Texas 2008 case involving a dispute between an electricity producer and driller, Tex. Genco, LP v. Valence Operating Co., 255 S.W.3d 210, 213 (Tex. App. 2008), and generally describing the potential for conflicts between "the wind farm and oil and gas companies" and "the wind farm and the surface owner or his other surface lessees"); K.K. DuVivier & Roderick E. Wetsel, *Jousting at Windmills: When Wind Power Development Collides with Oil, Gas, and Mineral Development* 9-3 (Univ. of Denver Sturm Coll. of Law, Working Paper No. 09-21, 2009) (noting that the "potential for clashes have [sic] erupted across the country as wind resources seem to have an uncanny knack for overlapping existing mineral-rich areas"); *infra* notes 65–69 (describing the Osage Nation's opposition to a proposed wind farm that would purportedly interfere with petroleum development).

States have long struggled to address conflicts between mineral owners and surface owners, and the historic solution has been to treat the mineral estate as dominant over the surface estate.[45] Under this property doctrine, mineral owners may use the surface to extract the minerals below it, even over the surface owner's objection.[46] This doctrine preempts certain potentially actionable conflicts simply by causing one interest to consistently win out over another. The law softens the blow to surface owners by allowing only "reasonable" use by the mineral owner and requiring that the owner accommodate existing surface uses to some extent.[47] In some states, public law in the form of surface damages acts provides further remedies to surface owners. Oklahoma, for example, requires oil or gas developers to negotiate with landowners about damage payments prior to drilling.[48] If after good faith negotiations the parties cannot agree, a third party or a jury must determine the amount to be paid.[49] Operators—those developing oil or gas—also must post a surety bond with the state to cover anticipated surface damages that the operator "cannot otherwise pay."[50]

With the growth of unconventional energy and renewables, more conflicts have emerged that are not solved by simple mineral dominance or even the doctrines that temper it. In some cases, renewable energy and oil and gas developers compete for the same land: the wind energy company wants to use the surface to access

45. *See* Laitos & Getches, *supra* note 10, at 6 (observing that "[i]n most states, common law views the mineral estate as the 'dominant estate' and the surface estate as the 'servient estate'"); Ernest E. Smith, *The Growing Demand for Oil and Gas and the Potential Impact Upon Rural Land,* 4 TEX. J. OIL GAS & ENERGY L. 1, 10 (2008-2009) (noting that "[i]t is well established . . . that the mineral estate is the dominant estate").

46. Laitos & Getches, *supra* note 10, at 5-8 (describing the doctrines); Smith, *supra* note 45, at 15–16, 19–20 (describing the dominant estate and associated doctrines and explaining that many uses of the surface for oil and gas are considered reasonable).

47. *See* Hannah Wiseman, *Beyond* Coastal Oil v. Garza*: Nuisance and Trespass in Hydraulic Fracturing Litigation*, 5 THE ADVOCATE 8, 12 nn.40–41 (2011), *available at* http://www.litigationsection.com/downloads/Advocate_Vol57_Winter2011.pdf (listing sources that describe the surface-mineral owner relationship and the accommodation doctrine); *see also supra* notes 45–46.

48. OKL. STAT. ANN. tit. 52, § 318.5 (West 2012) (part of the Surface Damage Act of 1982); Smith, *supra* note 45, at 12 ("In Oklahoma and other states with surface damage legislation," operators must "pay the landowner for the value of all land that it uses and for any additional damage that the company does to the surface").

49. OKL. STAT. ANN. tit. 52, § 318.5.

50. *Id.* § 318.4.

resources above the surface, and the oil or gas operator needs surface area in order to extract the minerals below.[51]

Several papers have expertly explored how the law is transitioning from a simple common law doctrine of mineral dominance—sometimes tempered by accommodation—toward a regime that accommodates more interests. K.K. DuVivier and Roderick Wetsel describe a variety of express agreements (sometimes called mutual use agreements) used by wind, oil, and gas developers to avoid future conflicts.[52] The agreements differ depending on who first begins using the surface (oil and gas or renewable developers), and whether the mineral-surface estate is unitary. When one individual owns the surface and minerals, the energy developer can more easily bargain for use of the surface to access oil, gas, or wind.[53] If the wind company begins using the surface before the oil and gas operator arrives, and contracts with a grantor who owns both the surface and minerals, developers "negotiate clauses in their leases that greatly restrict oil, gas, and mining activities on the surface."[54] Where an oil or gas operator arrives first, on the other hand, or an entity other than the surface owner owns the minerals, wind developers must negotiate with the oil and gas operator. The developer typically notifies the oil or gas operator of anticipated activities and attempts to draft a contract in which the operator promises to avoid interfering with wind development activities.[55] When the oil and gas operator refuses to execute the agreement due to its dominance over surface rights, the person who granted the wind rights—particularly if she owns the surface and minerals—might act as referee.[56]

In Texas, Ernest Smith and Becky Diffen note similar accommodation agreements and an even more innovative (and

51. *See, e.g.*, Osage Nation v. Wind Capital Grp., No. 11-CV-643-GKF-PJC, 2011 WL 6371384, at *2–3 (N.D. Okla. Dec. 20, 2011) (describing how the Osage Nation, which had leased its mineral interests to and oil and gas operator, believed that a wind farm would interfere with its right to use the surface for oil and gas development), *appeal dismissed*, No. 12-5007 (10th Cir. Feb. 23, 2012).

52. DuVivier & Wetsel, *supra* note 44, at 9-22 to -24.

53. *See* Smith & Diffen, *supra* note 44, at 182 (noting that when the landowner "still owns the mineral rights" and there is not an existing mineral lease on the property, the landowner can draft an agreement that can give wind rights equal status or superior status to minerals and can require accommodation of various surface uses).

54. DuVivier & Wetsel, *supra* note 44, at 9-22.

55. *Id.* at 9-23.

56. *Id.* at 9-24 ("Concurrent wind and mineral development is more likely when the grantor can act as referee between these separate interests.").

potentially dangerous) approach taken by wind developers.[57] Some developers are acquiring rights only to the air above property and then using the surface to build towers and turbines that capture the wind within the air estate—just as oil and gas operators use the surface, which they often do not own, to extract minerals beneath the property.[58] Neither the state legislature nor the courts have yet recognized this new type of severed estate, though, so this approach is somewhat risky.[59] Even when the wind developer obtains a memorandum or other instrument from the surface owner indicating recognition of the severed air estate, future surface owners who acquire title through inheritance or sale might deny the existence of the separate estate.[60] Smith and Diffen believe that Texas courts are likely to recognize the air estate due to its similarity to the severed mineral estate, however—and that they are likely to extend oil and gas and/or water law and wildlife doctrines to this new estate.[61] But the issue remains unsettled.

Other states have not been so sanguine about the creation of an additional severed air estate that might be dominant over surface uses—indeed, most states that have addressed the issue have banned severance with the exception of limited-term leases of wind rights.[62] As Alexandra Klass notes, there may be good reason for this: although severance can encourage development of a resource and could be a model for renewables, it also has drawbacks.[63] One drawback could be the creation of too many unresolved conflicts among multiple developers trying to use the surface. Anticipating clashes between oil and gas and renewable energy developers, Oklahoma has gone so far as to provide that "the lessee of a wind or solar energy agreement or the wind energy developer shall not

57. Smith & Diffen, *supra* note 44, at 176.

58. *Id.* (noting that deeds in parts of Texas "purport to convey or reserve rights in wind apart from other incidents of land ownership"); Troy A. Rule, *Property Rights and Modern Energy*, 20 GEO. MASON L. REV. 803, 812 (2013) (noting and analyzing these types of agreements).

59. Smith & Diffen, *supra* note 44, at 177.

60. *Id.* at 176–77.

61. *Id.* at 176–80, 217.

62. *See, e.g.*, N.D. CENT. CODE ANN. § 17-04-04 (West 2007); S.D. CODIFIED LAWS § 43-13-19 (1996); Troy A. Rule, *Wind Rights Under Property Law*, 26 PROB. & PROP. 56, 59 (2012) (listing Colorado, Wyoming, Nebraska, and Montana as prohibiting severance).

63. Alexandra B. Klass, *Property Rights on the New Frontier: Climate Change, Natural Resource Development, and Renewable Energy*, 38 ECOLOGY L.Q. 63, 93 (2011).

unreasonably interfere with the mineral owner's right to make reasonable use of the surface estate,"[64] although it is not clear what additional rights this creates for mineral owners, if any.

Mineral-renewable energy conflicts over surface use have not merely been hypothetical. The Osage Nation in Oklahoma unsuccessfully argued in federal district court that proposed wind development, which requires substantial surface use, would interfere with the production of its oil—which also required surface access.[65] The court conceded that wind energy development uses significant portions of the surface—each "permanent turbine site" would be "70 feet by 70 feet" and would require transmission lines, an access road, and even larger sites during the turbine construction phase.[66] Although not noted in the case, wind farms also require extensive underground wires to carry electricity from each turbine to a central substation.[67] But in addressing the tribe's request for a permanent injunction against wind development, the court found insufficient evidence that the wind farm would "unreasonably interfere with plaintiff's right to make reasonable use of the surface estate,"[68] noting that the oil operator could make "modest adjustments" to planned well locations without materially affecting oil recovery.[69]

Conflicts over rights to surface use will be even more prominent in populous areas, in which oil and gas, renewable energy, businesses, and residential structures can, potentially, all compete for the same space. Certain recent alternatives to direct surface competition, however, show promise in solving property-based disputes. First, some cities are allowing the construction of renewable energy infrastructure on brownfields sites that might not otherwise be put to productive use.[70] Second, distributed renewable energy—small-scale

64. OKLA. STAT. ANN. tit. 52 § 803 (West 2013).

65. Osage Nation v. Wind Capital Grp., No. 11-CV-643-GKF-PJC, 2011 WL 6371384 at *2 (N.D. Okla. Dec. 20, 2011), *appeal dismissed*, No.12-5007 (10th Cir. Feb. 23, 2012).

66. *Id.* at *4.

67. DuVivier & Wetsel, *supra* note 44, at 9-9.

68. *Osage Nation*, 2011 WL 6371384 at *6.

69. *Id.* at *4.

70. Hannah Wiseman et al., *Formulating a Law of Sustainable Energy: The Renewables Component,* 28 PACE ENVTL. L. REV. 827, 852–53 (2011) (citing TODD D. DAVIS & SCOTT A. SHERMAN, BROWNFIELDS: A COMPREHENSIVE GUIDE TO REDEVELOPING CONTAMINATED PROPERTY 41–52, 77–79 (2010) (describing "Steel Wind," a project on a Brownfield site); *cf.* Uma Outka, *The Renewable Energy Footprint*, 30 STAN. ENVTL. L.J. 241, 281–82, 301 (2010) (citations omitted) (noting

equipment in the form of rooftop solar panels or turbines—can in many cases be effectively integrated into city landscapes and may require no new surface uses.[71]

In the remaining situations where new energy infrastructure must be placed close to human populations and use greenspace, surface owner-developer conflicts will arise. It is likely unwise to grant wind or solar developers fully dominant rights to the air estate against the surface owner's wishes. But it also might be unfair, and in some cases inefficient, to require that wind and solar developers acquire both the surface and the air estate. A reasonable compromise might allow limited severance of air rights (for a fifty-year period), for example,[72] and surface damage provisions for the surface owner. Just as some states give mineral developers the right to use the surface but require negotiation with and the payment of damages to surface owners, renewable energy developers should perhaps have a similar right that grants more limited access to the surface but guarantees damages for excessive surface damage.

In addition to conflicts over the surface, oil and gas drilling and renewable development at higher densities will generate disagreement over the use of the mineral or air estate itself—developers will compete for the same minerals, sunlight, or wind. In oil and gas, these conflicts have largely been addressed by the rule of capture—which allows anyone who has legally drilled a well to extract as much oil or gas as possible, even if draining others' wells—and public law doctrines that modify the wasteful impacts of this rule.[73]

several federal studies of brownfields' potential to host renewable energy installation).

71. *See, e.g.*, Sara C. Bronin, *Building-Related Renewable Energy and the Case of 360 State Street*, 65 VAND. L. REV. 1875, 1930 n.242 (2012) (describing "a rooftop installation of the largest solar array in Manhattan" on Roosevelt Island); Melissa Powers, *Small Is (Still) Beautiful: Designing U.S. Energy Policies to Increase Localized Renewable Energy Generation*, 30 WIS. INT'L L.J. 595, 623–24 (2012) (noting that "distributed generation sources can operate in a number of different landscapes and thus place less pressure on specific areas or ecosystems" and describing how solar panels and turbines on rooftops often generate little opposition).

72. *See, e.g.*, S.D. CODIFIED LAWS § 43-13-19 (2013) ("No interest in any resource located on a tract of land and associated with the production or potential production of energy from wind power on the tract of land may be severed from the surface estate . . . except that such rights may be leased for a period not to exceed fifty years."). For alternative proposals, see Rule, *supra* note 58, at 833–35 (suggesting that clarifying property rights will not be adequate and proposing that energy rights receive liability rule protection).

73. *See, e.g.*, Coastal Oil & Gas Corp. v. Garza Energy Trust, 268 S.W.3d 1 (Tex. 2008) (holding that an individual may not obtain damages for an alleged trespass into

Much law remains to be created, however, for renewables. This is particularly true for urban solar energy, as Sara Bronin has observed in two articles.[74] Alexandra Klass[75] and Troy Rule[76] have similarly noted the wake effects, shading challenges, and other air space conflicts for both solar and wind energy production. Despite encouraging the development of solar energy,[77] some states have not adequately addressed concerns about buildings, trees, and other structures in densely-populated areas that block access to sunlight.[78] Similarly, dense siting of wind turbines can cause wake effects that block downwind access to wind, and only a limited number of laws have addressed this problem.[79] Clearer "air" easements or air access zoning regimes are needed so that renewable energy developers can contract with neighbors for open windows of air through which adequate sunlight or wind will flow.

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a mineral estate by fractures because the rule of capture allows other drilling and fracturing companies to drain the individual's gas, provided they have drilled legal wells).

74. *See* Sara C. Bronin, *Solar Rights,* 89 B.U. L. REV. 1217, 1222–23 (2009) (arguing that although the American legal system has not recognized the solar right, there are many reasons why it should); Sara C. Bronin, *Modern Lights*, 80 U. COLO. L. REV. 881, 905–06 (2009) (describing a variety of regimes that attempt to mediate disputes over shading and other solar issues).

75. *See* Alexandra B. Klass, *Property Rights on the New Frontier: Climate Change, Natural Resource Development, and Renewable Energy*, 38 ECOLOGY L.Q. 63, 95–103 (2011).

76. Rule, *supra* note 58; Troy Rule, *Airspace in a Green Economy*, 59 UCLA L. REV. 270 (2011); Troy Rule, *Shadows on the Cathedral: Solar Access in a Different Light,* 2010 U. ILL. L. REV. 851 (noting the challenges and proposing solutions); Troy Rule, *A Downwind View of the Cathedral: Using Rule Four to Allocate Wind Rights*, 46 SAN DIEGO L. REV. 207 (2009).

77. *See, e.g.*, U.S. DEP'T OF ENERGY, DATABASE OF STATE INCENTIVES FOR RENEWABLE ENERGY, RENEWABLE PORTFOLIO STANDARD POLICIES WITH SOLAR/DISTRIBUTED GENERATION PROVISIONS (2013), *available at* http://www.dsireusa.org/documents/summarymaps/Solar_DG_RPS_map.pdf (showing sixteen states that require a certain percentage of electricity to come from distributed solar generation).

78. A good number of states have at least begun to address the issue. *See Solar Access Laws*, DATABASE ST. INCENTIVES RENEWABLES & EFFICIENCY, http://www.dsireusa.org/solar/solarpolicyguide/?id=19 (last visited Oct. 14, 2013) (showing that forty states have solar access laws).

79. *See, e.g.*, Memorandum from Henri R. Bisson, Acting Dir., Bureau of Land Mgmt., Dep't of the Interior, to All Field Officials (Dec. 19, 2008), http://www.blm.gov/wo/st/en/info/regulations/Instruction_Memos_and_Bulletins/national_instruction/2009/IM_2009-043.html (expired Sept. 30, 2010) ("In the absence of any specific local zoning and management issues, no turbine will be positioned closer than 5 rotor-diameters from the center of the wind turbine to the right-of-way boundary in the dominant upwind or downwind direction to avoid potential wind turbulence interference issues with adjacent wind energy facilities.").

Even where there are clearly defined property rights to reduce conflicts over energy resources and surface uses in populous areas, urban energy development can create incompatible land uses, with neighbors arguing that renewable equipment is unsightly or noisy.[80] This raises questions about how energy and other land uses can effectively coexist, as discussed in the following section.

B. Incompatible or Conflicting Uses: Zoning and Nuisance

An oil and gas drilling operation is, although temporary, an intense, noisy industrial operation that causes pollution like air emissions and accidental spills.[81] Sand mining for the proppant used in fracturing has similar impacts.[82] Renewable energy, too, requires prominent physical infrastructure in the form of towers, turbines, and solar collectors, as well as distribution and transmission wires; it also requires loud equipment and disturbs surface area during the construction process and, to a much more limited degree, during maintenance operations.[83]

As early as 1935, courts began addressing the inevitable human-energy use-based conflicts that arise when largely incompatible uses coexist. In South Houston, "it became apparent to city and city officers that . . . [an individual] was taking oil and gas leases from many owners of lots in the city" with the intent of producing oil and gas.[84] City officers accordingly sought to protect residents and passers-by "from the dangers and hazards of the escape of gas, fire, explosions, cratering, and other similar dangers incident to oil fields and the production of oil and gas" by passing an ordinance.[85] The state oil and gas commission implemented additional spacing orders to augment those in the city ordinance, ensuring that oil and gas wells were not located too close to each other.[86] The commission's spacing orders prevented the plaintiff from drilling a well on a tract near the

80. *See* Timothy Riley, Note, *Wrangling with Urban Wildcatters: Defending Texas Municipal Oil and Gas Development Ordinances Against Regulatory Takings Challenges*, 32 VT. L. REV. 349, 354 (2007) ("The converging forces of increased drilling activity and urban expansion are raising land use conflicts previously unknown to North Central Texas.").

81. *See, e.g.*, Wiseman, *supra* note 13, at 130–32, 137–41, 159–62 (describing spills and air emissions).

82. *See supra* note 15 and accompanying text.

83. *See supra* text accompanying note 66; *infra* note 143.

84. Tysco Oil Co. v. R.R. Comm'n of Tex., 12 F. Supp. 195, 196 (S.D. Tex. 1935).

85. *Id.*

86. *Id.* at 199.

city center, which was also near a business center, a railroad, and a busy highway;[87] the court affirmed the power of the commission to so limit development, finding that the orders were not unreasonable in light of the commission's powers.[88]

More recently, urban residents have complained about similar impacts of drilling and fracturing within city limits—in part because, as Professor David Spence notes, neighborhood character impacts are "perhaps the most significant consequences of fracking."[89] These impacts have been evident in places like Fort Worth, where in June 2012, one resident who had moved to a property near a well pad expressed the following concerns at a city meeting:

> I have a private well for my drinking water on the very back of my property back there almost 15 feet to the back property line closest to the well it self [sic] and I do not want that contaminated. I am also disabled[;] I suffer from migraine headaches, sleep apnea, and ringing of the ears.[90]

Local renewable energy installations also can conflict with business, residential, or even industrial uses. Installation of mid-sized solar panel arrays or wind turbines can create a temporary yet noisy construction site.[91] Once the equipment is installed, continuous operation of the equipment can be unsightly and, in the case of wind, potentially cause health impacts from "shadow flicker" (moving shadows caused by spinning blades, which plaintiffs argue cause headaches or even seizures), icicles thrown from blades, and irritations from noise and blinking lights.[92]

Cities have begun to control the local impacts of both oil and gas and renewable energy development through zoning ordinances—some of which are surprisingly comprehensive in scope. Fort Worth[93] and Arlington,[94] Texas, for example, require fencing of oil and gas

87. *Id.* at 197, 200.

88. *Id.* at 201.

89. David B. Spence, *Federalism, Regulatory Lags, and the Political Economy of Energy Production*, 161 U. PA. L. REV. 431, 480 (2012).

90. CITY OF FORT WORTH, GAS DRILLING REVIEW COMMITTEE MEETING NOTES 10 (2012), *available at* http://fortworthtexas.gov/uploadedFiles/Gas_Wells/GDRC/12_June_GDRC.pdf.

91. *See supra* text accompanying note 66; *infra* note 143.

92. *Cf. infra* note 136.

93. *See* Fort Worth, Tex., Ordinance 18449-02-2009 (Feb. 3, 2009), *available at* http://fortworthtexas.gov/uploadedFiles/Gas_Wells/090120_gas_drilling_final.pdf.

94. Arlington, Tex., Ordinance 11-068 (Dec. 6, 2011), *available at* http://www.arlingtontx.gov/planning/pdf/Gas_Wells/Gas_Drilling_and_Production_Ordinance.pdf.

sites,[95] place limits on the time during which noisy drilling and completion (fracturing) or truck deliveries[96] may occur, and limit permitted decibel levels around sites.[97] Farmington, New Mexico similarly requires fencing around sites and a landscaping plan for wells within 300 feet of residences, and it prohibits noise above certain decibel levels, among other provisions.[98] These ordinances also include certain environmental protections, as discussed in Part I.C below.

For renewable energy, many zoning codes do not mention renewables of any size, thus failing to place developers on notice as to whether a rooftop solar panel, mid-size wind turbine or solar panel, or even a larger generation unit would be permitted, and also failing to describe how residents will be protected from potential nuisances.[99] This is beginning to change, as scholars like Patricia Salkin[100] and John Nolon[101] have observed. Cities are beginning to clarify the zones in which certain renewable energy equipment is allowed, and to place certain limits on the development to control its impacts, establishing setbacks of equipment from buildings and other structures,[102] height limits,[103] and maximum permitted decibel levels (for wind turbines),[104]

95. *See Id.* art. vii, § 7.01(C) (requiring landscaping and perimeter fencing).

96. *Id.* art. vii, § 7.01(E).

97. *Id.* art. vii, § 7.01(F)(5)–(7).

98. FARMINGTON, N.M., CODE, ch. 19, art. 3, § 19-3-10 (2011), http://library.municode.com/index.aspx?clientId=10760.

99. *See supra* note 36.

100. *See* Patricia Salkin, *The Key to Unlocking the Power of Small Scale Renewable Energy: Local Land Use Regulation*, 27 J. LAND USE & ENVTL. L. 339, 354–62 (2012).

101. John R. Nolon & Jessica A. Bacher, *Wind Power: An Exploration of Regulations and Litigation,* N.Y. L.J., Feb. 20, 2008.

102. *See, e.g.*, Salkin, *supra* note 100, at 357 (describing setbacks).

103. *See, e.g.*, San Diego, Cal., Zoning Ordinance pt. 6, § 6952(a) (2010) (including on-site solar as an accessory use in most zones and allowing solar to extend five feet "above the highest point of the roof."); COUNTY OF SAN DIEGO, PLANNING & DEVELOPMENT SERVICES, AMENDMENT TO THE ZONING ORDINANCE RELATED TO SOLAR ENERGY SYSTEMS—CUSTOMER FAQS 1 (2012), *available at* http://www.sdcounty.ca.gov/pds/zoning/formfields/PDS-315.pdf (indicating approval on Sept. 15, 2010); *see also* Salkin, *supra* note 100, at 357–58 (describing height limits and codes that "permit solar panels and wind energy systems to exceed the maximum height regulations for their zoning districts"); Hannah J. Wiseman & Sara C. Bronin, *Community-Scale Renewable Energy*, 4 SAN DIEGO J. CLIMATE & ENERGY L. 165, 188 (2012–2013) (discussing the ordinance).

104. *See, e.g.*, Rindge, N.H., Small Wind Energy System Ordinance § (D)(1)(c) (Mar. 12, 2013), *available at* http://town.rindge.nh.us/Small%20Wind%20Energy%20FINAL%20approved%20by%20voters%20March%2012,%202013.pdf ("The small wind energy system shall not exceed 50 decibels using the A scale (dBA), as

for example. Many municipalities, however, still have not even specified whether renewable equipment is allowed as a permitted use, a conditional use (one that is acceptable in certain districts but requires case-by-case approval), an accessory use[105] (in certain jurisdictions, a use automatically allowed to accompany certain development), or by special license. Without this needed notice, the pace of urban renewable development may be stifled, or, where it occurs, could emerge in a haphazard manner that creates further conflict with residents. If cities grant exceptions to zoning codes for certain renewable developers rather than establish a uniform policy, for example, this could ultimately harm both developers—who may be arbitrarily treated in the decision-making process—and nearby residents, who may suffer from inadequate and inconsistent consideration of renewable energy impacts.

In some cases, local governments attempt to limit conflicts over energy land use simply by banning energy development, including oil and gas development and renewable energy.[106] This is not a new practice: the industrial activity associated with oil and gas drilling and other mineral extraction has long irked those living near that activity, and prohibition of these activities—sometimes deemed "NIMBYist"[107]—has long sparked legal conflict.[108] Bruce Kramer has explored a number of early municipal bans on the mining of clay and other minerals within municipal limits.[109] Courts reversed some bans, citing the substantive due process requirement of nonarbitrary regulation and the need to impose a less burdensome alternative in order to protect public safety.[110] Others allowed them, describing

measured at the site property line, except during short-term events such as severe wind storms and utility outages.").

105. *But see* Salkin, *supra* note 100, at 360 (describing municipalities in which "renewable energy devices may be regulated as accessory uses").

106. *See supra* note 34.

107. *See, e.g.*, Kramer, *supra* note 10, at 41, 51 (noting that "most early cases relating to the imposition of the land use regulatory powers on mining operations focused on sand and gravel extraction" and "[m]ineral extraction activities have been NIMBY's for many years as reflected by the number of cases showing local government efforts to terminate such uses through ordinances"). NIMBY refers to "not in my back yard."

108. *See id.* at 51.

109. Kramer, *supra* note 10, at 46–63.

110. *Id.* at 46–47 (citing *Ex parte* Kelso, 82 P. 241 (Cal. 1905)).

mining as a nuisance or nuisance-like activity that requires no compensation when banned to protect public welfare.[111]

With the rise of renewable energy and unconventional oil and gas drilling, recent local prohibitions have gained attention,[112] and courts and state legislatures have continued to take somewhat conflicting approaches to them.[113] The core question is whether a state has expressly preempted the field of local energy development, has regulated in a way that might cause local energy-based ordinances to conflict with state law, or has regulated energy to the extent that it occupies the field, thus impliedly preempting certain municipal control.[114] This preemption analysis is in part affected by the independent jurisdictional (home rule) authority granted to municipalities by states.[115] The more independent authority the municipality possesses, the less likely its regulation of energy activity may be found to be preempted, although outright conflicts with state law still will not stand, however, and the extent to which home rule authority will protect a municipality's energy-related regulatory choices varies significantly among states.[116] The law that has emerged in the area of state preemption of local energy bans is therefore, unsurprisingly, far from clear.

Kansas allows municipalities to ban wind development,[117] while states like Wisconsin have created uniform statewide siting requirements that preempt more restrictive municipal regulation—

111. *Id.* at 48–51 (citing West Bros. Brick Co. v. City of Alexandria, 192 S.E. 881 (Va. 1937); *Ex parte* Hadachek, 132 P. 584 (Cal. 1913), *aff'd*, Hadachek v. Sebsatian, 239 U.S. 394 (1915)).

112. *See generally* John R. Nolon & Victoria Polidoro, *Hydrofracking: Disturbances Both Geological and Political: Who Decides?*, 44 URB. L. 507 (2012) (describing bans of oil and gas development and/or hydraulic fracturing in municipalities in several states); Nolon & Bacher, *supra* note 101 (describing moratoria against wind development); *infra* notes 117–25 and accompanying text (describing bans and moratoria and court cases addressing them).

113. *See infra* notes 118–26 and accompanying text.

114. *See* Nolon & Polidoro, *supra* note 112, at 518.

115. *See id.* ("Like many other states, New York is a 'home-rule' state; and, therefore, local governments have constitutionally-derived power to enact local laws relating to their property . . . so long as such laws are not inconsistent with the constitution or a general law of the state.").

116. *Cf. id.* at 518 (noting that "[w]hen faced with a potential conflict between state and local zoning laws, courts will attempt to harmonize local and state legislative enactments," and that "home rule" municipalities "have constitutionally-derived power to enact local laws relating to their property, affairs, or government, so long as such laws are not inconsistent with the constitution or a general law of the state").

117. *See generally* Zimmerman v. Bd. of Cnty. Comm'rs, 218 P.3d 400 (Kan. 2009).

even for small-scale wind energy that tends to be built near human populations.[118] New Mexico and Texas[119] allow municipalities to regulate oil and gas development somewhat extensively (although perhaps prohibiting all-out bans),[120] while Pennsylvania attempted relatively broad preemption of municipal regulation of oil and gas through an act currently under review with the state supreme court.[121] A New York statute preempts local regulation of oil and gas development in a more general manner[122] than Pennsylvania's Act 13, but the state's trial court has so far determined that bans implemented as part of municipal land use authority are acceptable.[123] An earlier case in New York, however, suggests that there might be limits to these bans or other efforts to impede local development: a town may not impose bonding and permit fees only on oil and gas wells, for example.[124] In West Virginia, a court found that state regulation of oil and gas development, although not expressly preempting local regulation, created a "comprehensive regulatory scheme" for oil and gas regulation, thus not leaving room for a local ban.[125]

118. WIS. ADMIN. CODE PSC § 128.03 (2011).

119. *See, e.g.,* E. Allen Taylor, Jr., *Municipal Regulatory Authority vis-à-vis Mineral Development in Texas*, ROCKY MTN. MIN. L. FOUND., Nov. 4–5, 2004 (noting that "municipalities in Texas have authority to exert regulatory control over mineral development from both a general health and safety approach as well as a zoning/land use and approach" and that home rule municipalities may adopt regulations more stringent than state law unless specifically preempted).

120. *See generally* Maguire Oil Co. v. City of Houston, 69 S.W.3d 350 (Tex. App. 2002); Trail Enters. v. City of Houston, 957 S.W.2d 625 (Tex. App. 1997). I am grateful to Professor Bruce Kramer for alerting me to these cases.

121. Oil and Gas Act of Feb. 14, 2012, Pub. L. 87 (codified at 58 PA. CONS. STAT. §§ 2301–2318 (2012), http://www.legis.state.pa.us/WU01/LI/LI/US/HTM/2012/0/0013..HTM, *invalidated by* Robinson Twp. v. Commonwealth of Pa., 52 A.3d 463 (Pa. Commw. Ct. 2012), *appeal quashed*, 73 A.3d 520 (Pa. 2013) (mem.).

122. NY ENVTL. CONSERV. LAW § 23-0303 (McKinney 2007) ("The provisions of this article shall supersede all local laws or ordinances relating to the regulation of the oil, gas and solution mining industries; but shall not supersede local government jurisdiction over local roads or the rights of local governments under the real property tax law.").

123. *See* Anschutz Exploration Corp. v. Town of Dryden, 35 Misc. 3d 450, 471–72 (N.Y. Sup. Ct. 2012); *see also* Cooperstown Holstein Corp. v. Town of Middlefield, 35 Misc. 3d 767, 780 (N.Y. Sup. Ct. 2012). For a more extensive discussion of New York preemption in the oil and gas area, see Nolon & Polidoro, *supra* note 112, at 518.

124. *See* Envirogas, Inc. v. Town of Kiantone, 112 Misc. 2d 432, 434–35 (N.Y. Sup. Ct. 1982).

125. Ne. Natural Energy v. City of Morgantown, No. 11-c-411, 2011 WL 3584376, at *5–9 (W. Va. Cir. Ct. Aug. 12, 2011).

Bruce Kramer has noted that even where municipalities do not ban energy development, they may find ways to make it practically impossible through comprehensive environmental requirements, permitting, the listing of energy development as a conditional use (and associated denial of permits), allowance of energy development as an accessory use in only limited zones, or other zoning schemes.[126] Local regulations—when combined with an array of state and federal constraints on certain energy development—can create an even higher barrier according to Jan Laitos and Elizabeth Getches: "The typical mineral resources developer is micro-managed horizontally throughout the lifecycle of the resource operation. This regulation is increasingly more local, creating new and more rigorous requirements for the developer to meet."[127]

In some cases, energy developers can attempt to overturn bans—or even lesser restrictions—by raising takings claims, substantive due process claims, and other challenges.[128] These arguments will likely become more common as municipalities work to limit the impacts of human-energy interactions. As Patrick McGinley has noted, however, successful challenges will in some cases be difficult: regulations that cause less than a one hundred percent diminution in the value of property—whether a mineral or wind/solar estate, the surface, or all of these combined—will fall under the permissive *Penn Central* balancing test, which requires a showing of relatively severe economic impact that seriously interferes with investment-backed expectations for a taking to be found.[129]

The overall trends in the state-local balance over energy impacts involve states preempting or partially preempting[130] local authority

126. Kramer, *supra* note 10, at 46–63.

127. Laitos & Getches, *supra* note 10, at 40.

128. *See, e.g.*, Patrick C. McGinley, *Regulatory Takings in the Shale Gas Patch*, 19 PENN ST. ENVTL. L. REV. 193, 201–03 (2011).

129. *Id.* at 228. Defining the segment of property that diminished in value can be difficult, though. Landowners generally may not artificially segment property in order to claim that 100 percent of the value of that segment was diminished, but the law, particularly in the severed mineral or air context, remains murky. *See, e.g.*, Palazzolo v. Rhode Island, 533 U.S. 606, 631 (2001) ("Some of our cases indicate that the extent of deprivation effected by a regulatory action is measured against the value of the parcel as a whole; but we have at times expressed discomfort with the logic of this rule.") (citations omitted).

130. *See, e.g.*, MINN. STAT. ANN. § 216F.08 (West 2010) (providing for state siting authority over wind installations larger than twenty-five megawatts, but requiring the state to apply a county's requirements unless there is good cause to deviate from it); *In re* AWA Goodhue Wind, LLC, No. A11-2229, 2012 WL 2369004 at *2 (Minn. Ct. App. June 25, 2012) (allowing the state to ignore a county's setback requirement for

over large renewable energy installations and leaving municipalities to regulate smaller infrastructure that tends to be in neighborhoods. On the oil and gas side, states similarly issue the permits needed to drill and fracture for oil and gas and sometimes preempt local regulation, although to varying degrees they allow municipal control over the location of the drilling activities and their impacts.[131] Local bans on both renewables and oil and gas, although permitted in some states, may not ultimately survive, although the law remains largely in flux.

Beyond preemption battles over energy regulation, courts have had an additional independent role in sorting out energy-human conflicts —often through nuisance suits. In states where the legislature has taken matters into its own hands by regulating energy development through a state-centric siting and licensing process, parties have argued that this state regime preempts municipal control *and* displaces common law approaches to energy conflicts.[132] Courts addressing this issue so far seem to be skeptical of displacement arguments. In Texas, a state court made clear that the permitting of an oil and gas wastewater injection well by a state agency does not preclude a nuisance suit for damages from contamination.[133] And in West Virginia, the approval of a wind farm by the state's energy licensing agency similarly did not block a nuisance suit.[134]

It will not always be easy, however, to establish that an oil or gas well or renewable energy installation actually causes a nuisance. One Texas court noted that to challenge the impacts of wind turbines,

a wind turbine and finding "good cause" because the setback was unnecessary to protect human health and could "severely hinder the implementation of state renewable energy policies"); *see also* Wiseman et al., *supra* note 70, at 881–86 (describing "preemption" and "partial preemption" states).

131. *See* Hannah Wiseman & Francis Gradijan, Regulation of Shale Gas Development, Including Hydraulic Fracturing 15–17 (Jan. 20, 2012) (unpublished manuscript), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1953547 (exploring the state-local balance and describing the centrality of the states in regulating oil and gas wells); *see also Types of Wells*, FORT WORTH, http://fortworthtexas.gov/gaswells/default.aspx?id=58084 (last visited Oct. 14, 2013) (showing the types of city permits required for proposed wells within city limits).

132. *See infra* notes 134–35.

133. *See* FPL Farming Ltd. v. Envt'l Processing Sys., 351 S.W.3d 306, 312 (Tex. 2011) (wastewater injection well). *But see* R.R. Comm'n. of Tex. v. Manziel, 361 S.W.2d 560, 567–69 (Tex. 1962) (holding that a trespass is not "committed when secondary recovery waters from an authorized secondary recovery project cross lease lines").

134. *See* Burch v. Nedpower Mount Storm, LLC, 647 S.E.2d 879, 895 (W. Va. 2007).

individuals will likely have to argue more than aesthetic impacts.[135] Other alleged impacts like shadow flicker and ice throw could potentially be more successful. The few courts that have addressed these types of issues so far, though, have found the claims to be too "conjectural."[136]

For oil and gas wells, many of the recent nuisance suits have settled or are ongoing, making the state of the law somewhat murky. The court cases addressing initial motions in ongoing suits shed some light on the likely future direction of oil and gas nuisance suits. Federal courts in Pennsylvania have made clear that it is not yet settled in that state whether hydraulic fracturing is an abnormally dangerous activity[137]—a finding that could potentially impose strict liability on operators for damages. One court also found that plaintiffs "sufficiently stated a plausible common-law claim for medical monitoring" in a case alleging contamination from fracturing.[138]

Several improvements will be necessary to create a more comprehensive, predictable, and effective system for governing land use conflicts involving energy. First, states should consider allowing municipalities to ban energy development entirely only with a showing that local industry, like tourism or agriculture, or a unique cultural or environmental resource, will be negatively impacted by the development. Certain forms of energy development are of course more disruptive than others, however, and municipalities will need a strong voice with respect to choosing the location and type of development that they must endure—if any. Development is more efficient in certain areas due to the location of energy resources and their proximity to transportation infrastructure like wires or pipelines, so consistently requiring all communities to bear a share of energy development would be unwise.

135. *See* Rankin v. FPL Energy, LLC, 266 S.W.3d 506, 512–13 (Tex. App. 2008).

136. *See e.g.*, Fairwindct, Inc. v. Conn. Siting Council, No. CV116011389s, 2012 WL 5201354, at *10 (Conn. Super. Ct. Oct. 1, 2012) ("The shadow flicker and ice throw issues are speculative and minor."); *In re* AWA Goodhue Wind, LLC, No. A11-2229, 2012 WL 2369004, at *2–4 (Minn. Ct. App. June 25, 2012) (challenging a state license rather than arguing nuisance, pointing to "modeling studies performed by an engineering consulting firm demonstrating that the anticipated turbine noise and shadow flicker would be minimal," and concluding that "substantial evidence" showed that the wind development would not have adverse health impacts).

137. *See e.g.*, Fiorentino v. Cabot Oil & Gas Corp., 750 F. Supp. 2d. 506, 511–12 (M.D. Pa. 2010); *cf.* Berish v. Sw. Energy Prod., 763 F. Supp. 2d. 702, 706 (M.D. Pa. 2011) (waiting for further development of the record to determine whether strict liability applies).

138. *Fiorentino*, 750 F. Supp. 2d at 513.

Furthermore, although states should address local bans with at least a moderate degree of skepticism, requiring nearly all zones within a community to allow energy development paints with too broad of a brush. Considering developers' ability to vary the location of surface infrastructure due to horizontal drilling techniques in oil and gas, this requirement might needlessly impose burdens on certain portions of communities that could host more valuable land uses than energy development.

States also should implement centralized requirements for controlling certain predictable nuisances and environmental harms, such as construction and operation standards that ensure the safety of oil and gas and renewable energy operations. States are likely better equipped than local governments to write effective standards, and there are economies of scale in writing and enforcing one uniform regulation. States must leave basic zoning control to local governments, however, to address nuisances that vary depending on the location of energy development. Municipalities need ways to govern the localized impacts of energy development, including noise, aesthetic disruptions, and other effects, and they have long regulated these types of impacts resulting from other forms of development. Wresting simple zoning authority over energy from municipalities could create years of litigation and unproductive battles over the extent of the preemption, and it would be unfair to those who live closest to energy development.

If local governments retain the power to determine the zones in which energy development is most appropriate, they should update both their comprehensive plans and zoning codes to make clear where this development will be allowed or encouraged and the conditions that will be imposed to prevent potential nuisances. Where local governments are unsure of the impacts, they can use a conditional use permitting system, in which they list oil and gas extraction or renewable energy as a use that might be permitted but for which case-by-case review will be required. Conditional use approvals can be onerous for developers, however, and should likely be avoided where municipalities do not anticipate major use conflicts.

With respect to the courts, nuisance law and other doctrines serve as important backstop authority when a local zoning ordinance or state regime fails to address certain negative or unanticipated impacts of development. The courts that have so far addressed the question of whether public law displaces the common law in energy-related

disputes are likely correct to have left some room for additional review.[139] To the extent that local governments and state officials already comprehensively address impacts in issuing permits and licenses for wells and renewable energy installations, though, the courts may simply serve as a tool for NIMBYists who will use any tactic available to delay a needed product.

Because in some cases the common law will be used simply as a delay tactic, the better solution seems to be limiting the types of claims against energy facilities that remain available—not displacing those claims entirely. If, for example, a state has a centralized siting process for wind facilities—one in which a state agency hears complaints about potential noise and other nuisances, comprehensively considers safety and environmental impacts, and allows citizen appeals before granting a final permit[140]—the state should perhaps preempt nuisance claims relating to safety and environmental impact, unless the plaintiff can show that the siting process failed to address a core element of the claim.

C. Environmental Impacts

Energy development near human populations does not only introduce industrial uses to areas that may not be accustomed to them and cause nuisances. It also can have substantial environmental impacts—some of which directly affect human populations nearby. Oil and gas drilling in areas of Colorado that already have excess air pollution, for example, exacerbated air quality problems, leading the state to pass new regulations on air emissions from oil and gas operations.[141] And in Midland, Texas, an underground disposal well for oil and gas wastes (apparently from conventional, not fractured wells) leaked into the city's drinking water aquifer, polluting billions of gallons of water.[142] Renewable energy development also has

139. *See supra* notes 133–34.

140. *See, e.g.*, Wiseman et al., *supra* note 70, at 882–883 (describing regimes somewhat similar to this hypothetical in Minnesota and Wisconsin).

141. *See generally* COLO. DEP'T OF PUB. HEALTH & ENV'T, OIL AND GAS EXPLORATION & PROD. REGULATION NO. 7 REQUIREMENTS: AN OVERVIEW OF AIR QUALITY REGULATIONS (2011) (noting oil and gas air emissions limits in nonattainment areas that exceed national standards for air quality and statewide).

142. *See* City of Midland's Motion for Estimation of Claims for Purpose of Allowance, Voting, and Determining Plan Feasibility, and Request for Determination that Remediation Claim is Entitled to Administrative Expense Priority at 2, *In re* Heritage Consolidated LLC, No. 10-36484-hdh-11, 2011 WL 7719608 (Bankr. N.D. Tex. Nov. 15, 2010) (No. 256) (on file with author).

important environmental impacts, disrupting landscapes—even at the urban level—and harming certain wildlife.[143] Further, renewable equipment that has been abandoned can pose a safety hazard.[144]

A range of federal, state, regional, and local regulations apply to these practices.[145] Federal laws prohibit oil and gas companies from dumping wastes into water without a permit, and they require construction of disposal wells into which many wastes are injected in a manner that avoids contamination of underground water.[146] State laws address the proper casing of oil and gas wells, attempting to ensure that they will not pollute underground sources of water, and typically require that wastes be handled in lined pits or tanks in order to avoid surface contamination.[147] Some municipal laws add further protections. For renewable energy, the laws are less clear—particularly for small- to mid-sized equipment.[148] Local or state building codes, however, typically require minimum standards for the attachment of solar panels to roofs, or guywires for wind turbines in backyards.[149] Indeed, these standards can sometimes be too onerous; requirements for individualized certification of equipment safety by engineers have sometimes slowed development.[150]

143. *See, e.g.*, SCOTTISH NAT'L HERITAGE, GUIDANCE: ASSESSING THE IMPACT OF SMALL-SCALE WIND ENERGY PROPOSALS ON THE NATIONAL HERITAGE 5 (2012), *available at* http://www.snh.gov.uk/docs/A669283.pdf (noting runoff, dust, and noise during construction and operation and potential impacts on wildlife).

144. *Cf.* James M. McElfish, Jr. & Sara Gersen, *Local Standards for Wind Power Siting: A Look at Model Ordinances*, 41 ENVTL. L. REP. NEWS & ANALYSIS 10825, 10838 (2011) ("Some model ordinances include requirements regarding maintenance and repair, primarily to ensure safety and reduce the likelihood of abandonment and disuse.").

145. *See* Wiseman et al., *supra* note 70 (in the utility-scale context, exploring the regulations); Wiseman & Gradijan, *supra* note 131 (comparing regulations at all stages of well development in sixteen states); Wiseman, *supra* note 13 (describing the regulations and violations of them); *see also* Jeffrey Thaler, *Fiddling as the World Floods and Burns: How Climate Change Urgently Requires a Paradigm Shift in the Permitting of Renewable Energy Projects*, 42 ENVTL. L. 1101 (2012) (comprehensively describing environmental regulation in the utility-scale context).

146. *See* Wiseman & Gradijan, *supra* note 131, at 18, 112–13.

147. *Id.* at 123–24.

148. *See supra* note 35.

149. *See, e.g.*, CAL. GOVERNOR'S OFFICE OF PLANNING AND RESEARCH, CALIFORNIA SOLAR PERMITTING GUIDEBOOK 7 (2012), *available at* http://opr.ca.gov/docs/California_Solar_Permitting_Guidebook.pdf (explaining that California's state building codes apply to solar PV installations).

150. *See, e.g.*, Hannah Wiseman, *Expanding Regional Renewable Governance*, 35 HARV. ENVTL. L. REV. 477, 503 (2011) (describing how the four towns underlying New York's largest wind farm initially "insisted on reviewing safety through a typical

Despite this multijurisdictional layering of laws and regulations for oil and gas development and renewable energy, it can create gaps: the appearance of over-regulation could cause us to miss the holes that remain. Indeed, because so much of the responsibility for ensuring the safety of oil and gas and renewable development rests at the state level, and state laws are far from uniform, certain impacts are almost certainly inadequately addressed.

Governments have made some progress in filling these gaps. In the oil and gas context, some states have updated underground injection control requirements for oil and gas disposal wells, as well as minimum standards for the casing (lining) of wells, the maintenance of waste pits, and spill prevention practices.[151] Regional river basin commissions in the Northeast have required that operators withdrawing water for fracturing ensure a minimum stream flow to protect aquatic life, and have proposed more ambitious regulations to protect water quality.[152] Municipalities, too, play an increasingly important role. Farmington, New Mexico has specific requirements for placing steel casing in wells to prevent groundwater contamination.[153] At least two Texas cities also prohibit the pollution of water sources, and require environmental liability insurance of $5 million per incident.[154] For renewable energy, states like Wisconsin have established minimum siting and safety standards, and several states and local governments require renewable energy developers—at least those constructing large equipment—to post a bond.[155] This

building inspection under New York's Uniform Fire and Building Code," but later reached an agreement for a less onerous review procedure).

151. *See generally* Wiseman & Gradijan, *supra* note 131.

152. *See e.g.*, DEL. RIVER BASIN COMM'N NATURAL GAS DEVELOPMENT REGULATIONS: ARTICLE 7 OF PART III—BASIN REGULATIONS, (2011), *available at http://www.nj.gov/drbc/library/documents/naturalgas-REVISEDdraftregs110811.pdf*; SUSQUEHANNA RIVER BASIN COMM'N, ACCOMMODATING A NEW STRAW IN THE WATER: EXTRACTING NATURAL GAS FROM THE MARCELLUS SHALE IN THE SUSQUEHANNA RIVER BASIN 2 (2009).

153. FARMINGTON, N.M., CODE ch. 19-3-4 (2011), http://library.municode.com/index.aspx?clientId=10760.

154. Arlington, Tex., Ordinance 11-068 art. vi, § 6.01(C)(4)(a) (Dec. 6, 2011), *available at* http://www.arlingtontx.gov/planning/pdf/Gas_Wells/Gas_Drilling_and_Production_Ordinance.pdf.; Fort Worth, Tex., Ordinance 18449-02-2009 §15-41(d)(3) (Feb. 3, 2009), *available at* http://fortworthtexas.gov/uploadedFiles/Gas_Wells/090120_gas_drilling_final.pdf.; Arlington, Tx., Ordinance, *supra* note 94, art. vi, § 6.01(C)(4)(a).

155. *See* Brent Stahl et al., *Wind Energy Laws and Incentives: A Survey of Selected State Rules*, 49 WASHBURN L.J. 99, 107, 135 (2009) (citing S.D. Admin. R. § 20:10:22:33.01 (2009)) (describing Illinois county ordinances that require bonds and how the South Dakota Public Utility Commission is permitted to require bonds for

bond covers the cost of decommissioning if the developer fails to properly mothball an old or abandoned renewable facility.

Despite progress in filling in potential gaps, state and local governments must continue to compare environmental regulations and update them where they find substantial differences that are not justified by geographic variation. In some cases, we also may need to consider centralizing certain regulations. Particularly where the impacts of energy development cross borders or have large impacts—such as the movement of air pollution from oil and gas development and the pollution of groundwater caused by leaking oil and gas surface waste pits—certain jurisdictional authority must move to a regional or federal level.[156]

II. PHYSICAL CONSTRAINTS ON URBAN ENERGY DEVELOPMENT

The combination of energy development and human populations does not only exacerbate land use and environmental conflicts; it can also strain physical infrastructure. This is true for both renewable energy and oil and gas. In the renewable energy context, one of the most popular forms of "urban energy" is the rooftop solar panel.[157] And because trends often catch on when neighbors emulate each other, certain communities often see rapid installation of these panels.[158] In some cases, the electricity distribution infrastructure

the decommissioning of certain renewable facilities); *see also* MD. LOCAL GOV'T CODE § 13-706(d)(1)(ii) (West, Westlaw thorugh 2013 Regular Sess. of the Gen. Assembly) (showing a Garrett County requirement that applicants for industrial wind energy facilities "post a bond equal to 100% of the [decommissioning] cost estimate"); OKLA. STAT. ANN. tit. 17, § 160.15(A) (West Supp. 2012) (requiring "evidence of financial security to cover the anticipated costs of decommissioning the wind energy facility" after fifteen years of operation).

156. *See* Michael Burger, *Fracking and Federalism Choice*, 161 U. PA. L. REV. ONLINE 150 (2013) (proposing possible justifications for federal regulation of fracturing under the Safe Drinking Water Act, certain wastes under the Resource Conservation and Recovery Act, and information disclosure under the Emergency Planning and Community Right-to-Know Act, and exploring theoretical reasons for federal intervention in some areas); Wiseman, *supra* note 13 (not proposing full federal regulation of oil and gas development, but describing certain areas in which federal control could be potentially beneficial and has begun to emerge). *But see* Spence, *supra* note 89 (arguing primarily for local control but suggesting that where impacts cross state boundaries, federal control is needed).

157. *See, e.g.*, *Program Totals by Administrator*, GO SOLAR CAL., http://www.californiasolarstatistics.ca.gov/reports/agency_stats/ (last visited Oct. 14, 2013) (showing a total of more than 425 megawatts of installed residential solar equipment in California).

158. *See* Pursley & Wiseman, *supra* note 1, at 902 (describing how when air conditioners were first installed in neighborhoods, neighbors talking to each other

within a neighborhood cannot handle the excess electricity generated by these panels, which flows back through the grid when the homes are generating more power than they use.[159] The growth of the Smart Grid will only exacerbate this challenge.

The Smart Grid is a broad term generally used to describe the computerization of the grid[160]—the array of transmission and distribution wires that carry electricity. With the use of computers to measure and sometimes change individual energy use, as well as to forecast energy needs farther in advance and to better balance the electricity flowing through the grid, a variety of energy innovations will be available.[161] Certain smart meters in homes allow a computer to turn air conditioners or heaters up or down or appliances on and off depending on the total demand for electricity and its instantaneous price.[162] Similar equipment also can enable electricity consumers to become generators—sending electricity back to the grid from plug-in hybrid electric vehicles, which they plug in at night.[163] Indeed, enterprising individuals could even serve as back-up "generators," offering battery power to the grid during times of high energy demand.[164]

All of this will be difficult without certain technical and legal innovations. Utility operators complain that as they struggle to accommodate all of the new power flowing back to the grid from

and seeing other air conditioners quickly installed their own, and suggesting that the same can occur for solar). *But see* Eisen, *supra* note 26, at 68 (arguing it is unlikely that "thousands or even millions of consumers would demand the solar panels they saw going up on their neighbors' roofs").

159. *See supra* note 32.

160. *See supra* text accompanying note 24.

161. *See* U.S. DEP'T. OF ENERGY, THE SMART GRID: AN INTRODUCTION, http://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/DOE_SG_Book_Single_Pages%281%29.pdf.

162. *See* PUBLIC UTIL. COMM'N OF TEX., SMART METERS OR ADVANCED METERING SYSTEM (AMS) (2011), *available at* http://www.puc.texas.gov/consumer/facts/factsheets/elecfacts/smartm.pdf.

163. U.S. DEP'T. OF ENERGY, ENHANCING THE SMART GRID: INTEGRATING CLEAN DISTRIBUTED AND RENEWABLE GENERATION (2009), *available at* http://energy.gov/sites/prod/files/oeprod/DocumentsandMedia/RDSI_fact_sheet-090209.pdf (describing the energy projects of the U.S. Department of Energy's Renewable and Distributed Systems Integration Program).

164. *See* ELIAS LEAKE QUINN, SMART METERING AND PRIVACY: EXISTING LAW AND COMPETING POLICIES—A REPORT FOR THE COLORADO PUBLIC UTILITIES COMMISSION 7 (2009), *available at* http://www.dora.state.co.us/puc/DocketsDecisions/DocketFilings/09I-593EG/09I-593EG_Spring2009Report-SmartGridPrivacy.pdf (noting potential future "battery-to-grid sales").

rooftop solar panels,[165] they must spend additional money to balance total electricity flow within the grid.[166] Their rate structures, however, do not consistently allow them to charge individual consumers (and rooftop solar panel owners) for these utility services.[167] Nor do all utilities currently have means to pay individuals for providing services like back-up batteries, or solar panels with special inverters[168] and other equipment that helps to moderate the flow of electricity back to the grid and make the utility's job easier.[169] Although many states have "net metering" schemes, through which owners of renewable equipment can send some electricity back to the grid and offset their electricity costs,[170] these are not always sufficiently nuanced to allow utilities to pay individuals for specific services, such as back-up batteries or inverters. Furthermore, the number of consumers wanting to install renewables and take advantage of net metering

165. *See, e.g.*, Eisen, *supra* note 26, at 64 (arguing that solar could become a new breakthrough ("disruptive") technology but faces barriers, noting that "[u]tilities often view renewables as too intermittent to ensure that the lights never go out").

166. The presentation of Tom Brill, Dir. of Strategic Analysis, San Diego Gas & Electric, at the Fourth Annual Climate & Energy Law Symposium at the University of San Diego School of Law, Nov. 9, 2012, first introduced me to these challenges.

167. *But see* Trevor D. Stiles, *Regulatory Barriers to Clean Energy*, 41 U. TOL. L. REV. 923, 934 (2010) (explaining that under Wisconsin net metering tariff rules, customers that want to install distributed generation over a certain kilowatt level must "pay for the cost of rebuilding any utility facilities required to accommodate" the new generation).

168. *See* Robert Passey et al., *The Potential Impacts of Grid-Connected Distributed Generation and How to Address Them: A Review of Technical and Non-technical Factors*, 39 ENERGY POL'Y 6280, 6281 (2011) (noting the problem of the voltage fluctuation—a "change or swing in voltage"—that can be problematic at certain levels and how if voltage in the grid becomes too low, distributed generation, through the use of inverters, should be able to provide "reactive power" to "boost network voltage").

169. *Cf.* Matthew Hutton & Thomas Hutton, *Legal and Regulatory Impediments to Vehicle-to-Grid Aggregation*, 36 WM. & MARY ENVTL. L. & POL'Y REV. 337, 359 (2012) (in the electric vehicle context, noting the need for "anti-islanding" capabilities that would shut down distributed generation, such as cars, in order to prevent distributed generation from continuing to send electricity to the grid during an outage). *But see* Lamble, *supra* note 25, at 212 (citing DEL. CODE. ANN. tit. 26, § 1014(g) (West Supp. 2010)) (noting that Delaware revised its net metering statute to recognize a new type of generation-grid-enabled vehicles).

170. *See Net Metering*, DATABASE ST. INCENTIVES RENEWABLES & EFFICIENCY, http://www.dsireusa.org/solar/solarpolicyguide/?id=17 (last visited Oct. 14, 2013) ("More than 40 U.S. states plus the District of Columbia and four U.S. territories have established net-metering policies, and many have subsequently expanded their policies to accommodate expanding solar markets.").

schemes often causes these consumers to quickly bump up against the ceiling on allowed quantities of net metered electricity.[171]

Even more complicated problems arise for distributed renewables incorporated into multi-unit buildings, as Sara Bronin has noted in a case study.[172] When a project developer wishes to install "building-related renewable energy," or BRRE,[173] on an apartment, condominium complex, or other shared building, she needs to be able to "submeter" this energy in order to recoup costs—that is, to sell the energy to different residents based on their actual demand.[174] Many states have not enabled submetering, however, thus adding another barrier to distributed renewables.[175] Sara Bronin and I have also explored similar physical barriers to mid-sized "community-scale renewables"—those owned collectively by residents and businesses in a neighborhood. These, too, run up against net metering caps, the inability to submeter to customers served by the renewables, and a lack of uniform interconnection standards, among other problems.[176]

Just as the rise in distributed renewable generation in cities has taxed certain grids and challenged existing legal systems, large numbers of oil and gas wells drilled in some regions tax existing physical infrastructure and challenge legal systems—particularly where the development occurs near human population centers. Williston, North Dakota has experienced major population growth in the past decades as a result of fracturing for oil in shales, and in 2013 the city estimated that it would require $625 million in additional infrastructural investment to address this growth.[177] Since 2010, the city has added twelve "new hotel properties,"[178] and 1816 new housing units were built in 2012, as compared to 688 in 2010.[179] Calls for fire service expanded from 1079 in 2006 to 2500 in 2012.[180]

171. Trevor D. Stiles, *Regulatory Barriers to Clean Energy*, 41 U. TOL. L. REV. 923, 939 (2010) (noting caps "on the size of the individual facilities or on the total enrollment").

172. Bronin, *supra* note 74, n.242.

173. *Id.* at 1881.

174. *Id.* at 1900–01.

175. *Id.* at 1902.

176. Wiseman & Bronin, *supra* note 103, at 184-85, 190-91.

177. WILLISTON ECON. DEV., WILLISTON IMPACT STATEMENT 5 (2012), *available at* http://www.willistonnd.com/usrimages/Williston_Impact_Statement.pdf.

178. *Id.* at 13.

179. *Id.* at 11.

180. *Id.* at 7.

Hydraulic fracturing of oil and gas wells does not only affect city infrastructure due to rapid influxes of workers; it also requires additional truck traffic—in some cases, 1000 more trips than would have been necessary for a conventional well.[181] This influx can damage roads and cause major traffic delays.[182] Many municipalities have responded by entering into road use agreements with oil and gas operators, in which operators agree to widen roads where needed, repair any damage, and waive liability of the municipality for problems that occur on the roads.[183] Although these can address road damage, traffic congestion, in particular, remains a concern in a number of communities.[184]

Energy development affects physical infrastructure no matter where it is located, but when development occurs close to human populations it can exacerbate existing infrastructural challenges. One individual proposing to send solar-generated electricity back to the grid poses few challenges; an entire neighborhood of solar enthusiasts, on the other hand, could cause substantial grid interruptions in the absence of grid upgrades. And trucks that travel to and from fracturing sites will cause more problems in areas that already experience traffic congestion.

III. EQUITY CONCERNS

Energy development inevitably collides with human populations and causes challenges in the form of property rights, land use, and infrastructural conflicts—particularly because we cannot control the location of sunlight, wind, oil, or gas. This simple physical fact, and the choices that governments make in allowing energy development

181. NAT'L. PARK SERV., POTENTIAL DEVELOPMENT OF THE NATURAL GAS RESOURCE IN THE MARCELLUS SHALE: NEW YORK, PENNSYLVANIA, WEST VIRGINIA, AND OHIO 9 (2008), *available at* http://www.nps.gov/frhi/parkmgmt/upload/GRD-M-Shale_12-11-2008_high_res.pdf (estimating 100 to 1,000 truckloads required for "fracture stimulation fluid and materials").

182. Robert H. Freilich & Neil M. Popowitz, *Oil and Gas Fracking: State and Federal Regulation Does Not Preempt Needed Local Government Regulation*, 44 URB. LAW. 533, 534 (2012) (noting the impacts on roads).

183. *See* Cheryl L. Coon, *Environmental Law in the Barnett Shale*, *in* 64TH ANNUAL INSTITUTE ON OIL AND GAS LAW 255, 271–72 (2008) (describing a "Road Damage Redemption Agreement" required in Denton, Texas).

184. *But see* C.J. Randall, *Hammer Down: A Municipal Guide to Protecting Local Roads in New York State*, *in* THE ECONOMIC CONSEQUENCES OF MARCELLUS SHALE GAS EXTRACTION: KEY ISSUES 9 (Susan Christopherson ed., 2011), *available at* http://www.greenchoices.cornell.edu/downloads/development/marcellus/Marcellus_CaCaR.pdf (noting that municipalities may "link capacity of the road to permitting" of routes and truck traffic for the purpose of public safety).

and controlling its impacts, strongly affect those who live and work near energy resources. Certain communities have experienced disproportionately high impacts in the form of pollution, road damage, noise, and the interruption of landscapes and culture.[185] As with other industrial activities, this raises important questions about environmental justice and who should bear these impacts.[186]

The distribution of energy impacts could be further exacerbated as certain communities bar energy development of all types yet continue to import energy for their own use. In New York, where the state has taken a very precautionary approach to hydraulic fracturing, a number of towns have banned it; towns have also placed moratoria on wind energy development[187] or prohibited backyard wind development in certain densely-populated zoning districts, where this type of development may be "needed most."[188]

Is it fair for cities, towns, townships, boroughs or counties, to benefit from energy consumption yet suffer none of the externalities of production? In some areas, energy production is simply less efficient than in other areas, particularly in communities where land has other highly valued uses (including subjective benefits associated with community character and culture). Communities that choose to extract energy resources and export them certainly reap broad economic benefits. But if the proceeds of this development are not used to mitigate or respond to the externalities of this development,

185. *See, e.g.*, Susan Christopherson & Ned Rightor, *The Boom-Bust Cycle of Shale Gas Extraction Economies*, *in* THE ECONOMIC CONSEQUENCES OF MARCELLUS SHALE GAS EXTRACTION: KEY ISSUES 4 (Susan Christopherson ed., 2011) (describing "regional long-term industrialization of life and landscape" and road impacts); Nolon & Polidoro, *supra* note 112, at 516 (describing some of the impacts).

186. *See, e.g.*, Luke W. Cole, *Empowerment as the Key to Environmental Protection: The Need for Environmental Poverty Law*, 19 ECOLOGY L.Q. 619, 628 (1992) (describing "factors that have diminished certain communities' ability to resist undesirable land uses and pollution"). The environmental justice story in oil and gas development is of course different from typical large industrial plants that cause pollution; here, wealthy land and mineral owners or poor farmers may sell mineral rights, causing neighbors to face disproportionate impacts; boom and bust cycles also can contribute to long-term poverty.

187. *See, e.g.*, Ecogen, LLC v. Town of Italy, 438 F. Supp. 2d 149 (W.D.N.Y. 2006) (affirming the validity of a town moratorium, which was extended several times); Nolon & Bacher, *supra* note 101, at 4–5 (describing the case).

188. JOHN FORBUSH & PAMELA KO, SITING BACKYARD WIND POWER FACILITIES UNDER THE ZONING LAWS OF NEW YORK STATE 14–15 (2011), *available at* http://www.albanylaw.edu/media/user/esb/Siting_Backyard_Wind_Systems_080311.pdf (describing the allowance of backyard wind turbines as an accessory use only in agricultural and industrial districts).

these extraction-based communities might receive the short end of the stick.

Communities that import energy resources and prohibit energy production should, at minimum, pay for their share of the harms of production—energy must be accurately priced to reflect harms not directly paid for by producers. Bargaining that ensures that all social costs and benefits are accounted for should achieve this. Transaction costs, however, prevent certain groups from effectively bargaining. As a result of this challenge, and the need to allocate money to the communities most impacted by energy development, taxes on energy development that re-inject money into long-term community improvements are also very important. Systems like Pennsylvania's show some promise. Through its 2012 Act 13 (currently under court review), the commonwealth allows municipalities to impose an unconventional well fee on hydraulically fractured wells; the money from the fee goes to the state, and the state then reinvests the money in communities—paying for environmental clean-up and needed infrastructural projects like bridge repair.[189] These investments in projects with long-term value can both address the negative externalities suffered by extraction-based towns and moderate boom and bust cycles that occur when energy companies rush into a town and then leave, leaving behind abandoned housing and other infrastructure. Similar redistributive systems could be implemented for renewable energy—paying towns that have the most solar or wind development for decommissioning costs, trees that provide visual and sound barriers, and other projects that mitigate negative impacts.

Even fees and severance taxes that are collected and carefully allocated to the communities most affected still might not adequately address the inequities of energy development. Perhaps it is simply not enough for certain communities to benefit from energy use while paying others to endure the negative impacts of production. Perhaps we must better equalize the direct impacts by prohibiting city-wide bans on all energy development while recognizing that certain areas are historically, environmentally, or culturally significant and merit protection from the impacts of development. If we do require communities to accept a certain level of energy development, then

189. *See, e.g.*, Act of Feb. 14, 2012, Pa. P.L. 87, No. 13, (codified at 58 PA. CONS. STAT. (2012)) (allowing counties or municipalities to impose an unconventional well fee on spud (just-drilled) wells, the proceeds of which are collected by the state and redistributed for repairing bridges, cleaning up environmental contamination, and investing in other long-term improvements).

procedural mechanisms—in addition to structures for the redistribution of funds—will be essential.

In the wind energy context, Sean Nolon has explored important procedural solutions that would give communities more say in the location and impacts of development while ensuring that the development still occurs.[190] He suggests that the federal government should provide local governments with "substantive and procedural" assistance in the form of information about best wind technologies and "best practices for mitigating adverse environmental impacts," as well as supporting the convening of citizen committees or negotiated rulemaking at the local level.[191] Nolon also proposes that states write model ordinances for municipalities and "establish a public-private entity to provide process and technical support to local siting commissions," among other support measures.[192] Finally, he emphasizes that citizens must be empowered to effectively negotiate in the siting process and have some say in the mitigation measures and conditions placed on wind development, as well as ongoing monitoring of wind facilities.[193]

A combination of impact fees that fund long-term investments in affected communities, better procedural mechanisms for deciding who bears how much development, and the decommissioning and bonding requirements explored in Part II should help to make energy development more equitable, although much progress remains to be made.

CONCLUSION

Energy development has long occurred near human populations. The recent rise in particular types of domestic energy, however, including distributed resources in the form of unconventional gas and oil, sun, and wind, has raised new challenges. Governments struggle to encourage more localized energy extraction while controlling its impacts, which often fall disproportionately on those close to the development. Slowly, a framework of "urban" energy law is developing: some state legislatures are centralizing control over the siting and operation of both renewables and oil and gas development; others are allowing more local control. Local governments are

190. *See generally* Sean F. Nolon, *Negotiating the Wind: A Framework to Engage Citizens in Siting Wind Turbines*, 12 CARDOZO J. CONFLICT RESOL. 327 (2011).

191. *Id.* at 366.

192. *Id.* at 367.

193. *Id.* at 368–69.

revising and writing new zoning laws to address impacts; courts are hearing nuisance and other complaints; and municipalities, states, and other government entities at the regional and federal level are changing certain regulations to address potential environmental, nuisance, and health-based impacts.

Despite some local efforts to constrain energy development in the midst of these regulatory changes, extraction of oil and gas and renewable resources will continue to bump up against human populations. We need energy for nearly everything that we do, and renewables (and to some extent, natural gas[194]) offer cleaner options than the fuels we have traditionally relied upon. But these cleaner options have substantial impacts: construction of both oil and gas wells and renewable equipment is noisy, emits unpleasant air pollution, and can cause soil erosion and water pollution. In somewhat rarer circumstances, oil and gas development has also caused larger contamination events, such as leaking underground waste disposal wells. The thousands of new shale gas and oil wells drilled and fractured in recent years also have generated cumulative and interactive effects from spills at well sites and other accidents.[195]

In light of these impacts, we must pull together and improve the array of laws that are developing at the local, state, regional, and federal levels, and continue to investigate the most effective means of allowing adequate energy development while balancing the harms. Property rights involving the use of the surface to access resources below or above it must be clarified, particularly in the renewable energy context; while giving wind and solar developers a dominant estate in the form of air rights may not be wise, we need, at minimum, mechanisms that allow developers to access the surface. These might best be implemented through long-term leases and a statute similar to

194. *See* ENERGY INFO. ADMIN., U.S. DEP'T OF ENERGY, NATURAL GAS 1998: ISSUES AND TRENDS 49, (1999), *available at* http://www.eia.gov/pub/oil_gas/natural_gas/analysis_publications/natural_gas_1998_issues_trends/pdf/it98.pdf (noting that burning natural gas emits lower quantities of greenhouse gasses than burning fossil fuels, but also noting that natural gas operations release methane, another harmful greenhouse gas); Wiseman, *supra* note 150, at 492–93 (describing the environmental advantages of renewables over fossil fuels, including "near-zero" lifecycle emissions (citing Ralph E.H. Sims et al., *Carbon Emission and Mitigation Cost Comparisons Between Fossil Fuel, Nuclear and Renewable Energy Sources for Electricity Generation*, 31 ENERGY POL. 1315, 1317 (2003)).

195. *See* Hannah Wiseman, *Remedying Regulatory Diseconomies of Scale*, B.U. L. REV. (forthcoming 2014), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2257047 (describing collective, individual-risk and interactive risks of gas development).

an oil and gas surface damages act, in which a wind or solar developer is allowed to use the surface to access air resources but must negotiate with the surface owner about the extent of the use and damages to be paid. States must also provide some uniform energy development standards, such as those addressing safety and environmental impacts, but they should not preempt all local control over energy or displace all common law actions. Municipalities, in turn, must address energy development within their comprehensive plans and zoning codes, clarifying the zones in which energy development is permitted and the conditions that will be imposed to prevent nuisances and other externalities.

Finally, to better address equity issues associated with development, states should implement severance taxes or other fees for energy development and reinvest this money in the communities most impacted by energy development. Careful economic analysis of the best scheme will of course be required in order to prevent under-investment in energy while also ensuring that the full costs of energy development are accounted for. Reinvestment in communities using the proceeds from fees or taxes should mitigate the impacts of energy development, such as environmental damage, and provide long-term infrastructural support. States also must implement procedural mechanisms that educate citizens about energy development and allow them to raise legitimate concerns before permits for development are granted. And to ensure that all populations affected by energy development are protected, states must fill in certain gaps in environmental regulation—looking to how other states have addressed these impacts and modeling regulations on leader states. Where impacts are particularly acute or spill beyond state boundaries, federal or regional regulation will be necessary.

These efforts are all more easily proposed than carried out, but they are not impossible to implement. In Colorado, the governor instigated a task force on local-state cooperation in regulating oil and gas development,[196] although the process later broke down, and many states require municipal participation in state-centric siting processes for large renewable energy installations.[197] To the extent that states

196. COLO. DEP'T OF NAT'L RES., TASK FORCE ON COOPERATIVE STRATEGIES REGARDING STATE AND LOCAL REGULATION OF OIL AND GAS DEVELOPMENT: PROTOCOLS RECOMMENDATIONS (2012), *available at* http://www.dnr.state.co.us/taskforce/Pages/home.aspx (follow "recommendations" hyperlink in article text).

197. *See, e.g.*, WASH. ADMIN. CODE § 463-28-070 (2012) (providing that if the state's Energy Facility Site Evaluation Council accepts a request to preempt local law in the siting process, it must "include conditions in the draft certification agreement

centralize permitting of smaller facilities, they can do the same. Furthermore, states and nonprofit organizations are beginning to write model codes for zoning regulation[198] of small-scale distributed energy and are providing other needed informational resources to local governments.

Just as there is no silver bullet in energy development, there is no perfect formula for energy regulation—particularly when energy encounters large human populations. But there is great progress to be made, and we must move forward: as energy development rushes ahead, so, too, must the law.

which consider state or local governmental or community interests affected by the construction or operation of the energy facility"); WYO. STAT. ANN. § 35-12-113 (West 2012) (requiring a finding that the "facility will not substantially impair the health, safety or welfare of the inhabitants" and requiring notice to local governments if an alternate location from that initially proposed is approved).

198. *See, e.g.*, Conway, N.H., Small Wind Energy Systems Ordinance (Apr. 14, 2009), *available at* http://www.planning.org/pas/infopackets/subscribers/pdf/EIP32part6.pdf; SOLAR AMERICA BOARD FOR SOLAR STANDARDS, http://www.solarabcs.org/index.html (last visited Oct. 14, 2013).