THE NEXT STEP: THE INTEGRATION OF ENERGY LAW AND ENVIRONMENTAL LAW

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For many years, the law has largely ignored the obvious connection between energy production and consumption and nature. The laws that govern energy in this country—energy law—have very little to do with the laws that restrict what can be done with nature—environmental law. The primary focus of energy law is to ensure that energy is supplied without disruption at an affordable price. The primary focus of environmental laws is to be sure that the process of creating anything, including energy, does not create "too much" pollution, however we might define that phrase.

The question motivating this conference is what the future of energy law holds. I contend that, acknowledging the realities of how energy is created and the critical and pressing question of climate change, energy law must become more integrated with environmental law. Indeed, I will argue that we need to reimagine energy policy in a way that draws on much of the best thinking in both energy law and environmental law circles, but that creates an integrated energy and environmental law. My hope is that such a law will streamline the requirements for energy producers and make clear to the public what our collective energy choices mean for nature.

I approach this question in five parts. I begin with the most basic of issues: where energy comes from[1] and how energy is consumed.[2] I then explore the disconnect between energy and the environment by examining the environmental impacts of energy production and consumption.[3] I then turn to how energy law and environmental law operate: They are not only disconnected but function without a comprehensive vision for an American energy policy.[4] Finally, I offer a solution that relies on regulating inputs to the energy process, which would require the expertise of both those who know environmental limitations and those who understand energy markets, distribution, and technologies.[5]

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[1] *See infra* Part I.

[2] *See infra* Part II.

[3] *See infra* Part III.

[4] *See infra* Part IV.

[5] *See infra* Part V.

I. WHERE DOES ENERGY COME FROM?

In the United States, the predominant sources of energy are oil, coal, and natural gas.[6] Oil remains the largest source of energy because it continues to be the main fuel for motor vehicles.[7] Coal, on the other hand, is burned primarily to provide electricity; it produces roughly half of the electricity consumed in the United States.[8] Natural gas, which has increased in use over the past decades, has a variety of uses including powering various home appliances such as furnaces and water heaters, and in "peaker" power plants, which are more easily dispatchable than "baseload" plants that run all the time and thus are used to generate electricity during "peak" or high-demand hours.[9]

Oil, coal, and natural gas are the result of heat and pressure changes on the decay of animals and plants hundreds of millions of years ago.[10] All three resources are found somewhere in the earth—sometimes deep in the ground, sometimes under the ocean, and sometimes in mountain tops—and must be extracted from these places in order to be usable. In other words, we must drill and dig for these resources. Moreover, these resources are nonrenewable. Once we burn oil, natural gas, and coal, they are gone.[11]

Although these three resources account for the vast majority of the nation's energy supply—83 percent in 2009—there are at least two other sources of energy that should be mentioned. The first is nuclear energy, which still has many critics[12]

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[6] *See* U.S. ENERGY INFO. ADMIN., *Energy Explained*, http://tonto.eia.doe.gov/energy explained/index.cfm?%20page=nonrenewable_home (last visited June 3, 2011).

[7] U.S. ENERGY INFO. ADMIN., *Oil: Crude and Petroleum Products Explained: Use of Oil*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=oil_use (last updated May 25, 2011).

[8] U.S. ENERGY INFO. ADMIN., *Coal Explained: Use of Coal*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=coal_use (last updated Oct. 8, 2010).

[9] U.S. ENERGY INFO. ADMIN., *Natural Gas Explained: Uses of Natural Gas*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=natural_gas_use (last updated May 26, 2011); ILL. ENVTL. PROT. AGENCY, *Peaker Power Plant Fact Sheet*, http://www.epa.state.il.us/air/fact-sheets/peaker-power-plant.html (last visited June 3, 2011).

[10] U.S. ENERGY INFO. ADMIN., *Oil: Crude and Petroleum Products Explained*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=oil_home (last updated Feb. 19, 2010); U.S. ENERGY INFO. ADMIN., *Natural Gas Explained*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=natural_gas_home (last visited June 3, 2011); U.S. ENERGY INFO. ADMIN., *Coal Explained*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=coal_home (last visited June 3, 2011).

[11] *See* U.S. ENERGY INFO. ADMIN., *What Is Energy Explained*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=about_home (last visited June 3, 2011) [hereinafter EIA, *What Is Energy Explained*].

[12] In fact, in the wake of the disaster, Germany has decided to phase out nuclear energy by 2022. Judy Dempsey & Jack Ewing, *In Reversal, Germany Announces Plans to Close All Nuclear Plants by 2022*, N.Y. TIMES, May 31, 2011, at A4. Switzerland has

particularly after the recent crisis in Japan.[13] There are also various renewable sources of energy such as wind, solar, and hydropower.[14]

Nuclear power accounts for approximately 9 percent of the energy supply and 20 percent of the electricity production in the United States.[15] Nuclear power requires the splitting apart of atoms in order to generate energy.[16] Most nuclear plants use one type of uranium, U-235, as the substance from which atoms are split when generating power.[17] U-235 is "relatively rare" but can be found in rocks all over the world.[18] This means that U-235 must be mined like coal. Unlike coal, however, uranium must then go through an extensive technological- and chemical-intensive processing regimen before it can be used in nuclear power plants.[19]

Renewable energy sources such as wind, hydropower, solar energy, biomass from plants, and geothermal energy make up approximately 8 percent of energy consumption in the United States.[20] The advantage of these power sources is that they do not deplete resources to generate energy. Wind, for example, is generated using wind turbines, the blades of which are moved when the wind blows generating electricity.[21] Likewise, geothermal energy draws on heat from the core of the Earth to warm water which can then be used to heat buildings or to create electricity.[22]

The key observation at this juncture is that every source of energy is based on a natural resource. We must dig or pump some resources from within the Earth and then combust them in some way. Or we make use of some resource such as the sun's rays, the wind, the heat of the earth, or the flow of rivers. Energy, then, is not

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banned the building of new nuclear plants and will phase out its existing facilities by 2034. James Kanter, *In Reassessment, Swiss Drop Plans to Build 3 Reactors*, N.Y. TIMES, May 25, 2011, at B4.

[13] *See, e.g.,* Michael Grunwald, *The Real Cost of Nuclear Power*, TIME, Mar. 28, 2011, *available at* http://www.time.com/time/nation/article/0,8599,2059453,00.html (arguing that, contrary to claims that the disaster in Japan would change the debate in the U.S., "the endlessly hyped U.S. nuclear revival was stumbling").

[14] *See* EIA, *What Is Energy Explained*, *supra* note 11.

[15] *See id.*

[16] *See* U.S. ENERGY INFO. ADMIN., *Nuclear Explained*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=nuclear_home (last visited June 3, 2011).

[17] *See id.*

[18] *Id.*

[19] U.S. NUCLEAR REGULATORY COMMISSION, *Stages of the Nuclear Fuel Cycle*, http://www.nrc.gov/materials/fuel-cycle-fac/stages-fuel-cycle.html (last updated Apr. 19, 2011).

[20] *See* EIA, *What Is Energy Explained*, *supra* note 11.

[21] *See* U.S. ENERGY INFO. ADMIN., *Wind Explained: Electricity Generation from Wind*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=wind_electricity_generation (last visited Aug. 23, 2010).

[22] *See* U.S. ENERGY INFO. ADMIN., *Geothermal Explained: Use of Geothermal Energy*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=geothermal_use (last visited Aug. 23, 2010).

the product of magic. Instead, every time we create energy, the central ingredient is some part of nature. More importantly, because the vast majority of our energy is derived from sources that can and will be depleted, we are not simply using nature—we are consuming nature.

Given nature's limits, one might expect that we would think carefully about the mix of the energy source use. Indeed, one can imagine that the law could provide a regulatory framework to do exactly that. Unfortunately, no such comprehensive regulation exists.

II. ENERGY CONSUMPTION

As we consider the raw ingredients that power our country, we might also consider the consumptive patterns of that energy. Energy in the United States can be divided among four basic uses: (1) commercial, such as in offices, malls, hospitals, and hotels, which together comprise 19 percent of the nation's energy use; (2) industrial, such as in manufacturing, construction, and agriculture, which together account for 30 percent of our energy use; (3) residential, such as in homes and apartments, which is 22 percent of energy use; and (4) transportation, such as in cars, trucks, rail, and airplanes, which together consume 29 percent of energy in the nation.[23]

There is a huge disparity between developed and developing countries in terms of energy use: "While the developed countries, with 20% of the world population, consume energy at an annual rate of more than 150 million Btu per capita, the developing countries, with 80% of the world population, consume energy at a rate of less than 40 million Btu per capita."[24] The United States is one of the world's largest energy consumers. In 2005, the average inhabitant of the United States consumed 340 million Btu per year.[25] By contrast, the average German consumed a relatively meager 176 Btu per year.[26] As Professors Randolph and Masters have summarized, "The United States, with less than 5% of the world's population, accounted for 20 to 22% or about 4 or 5 times its share of the world's energy consumption, economic output, and carbon dioxide emissions in 2005."[27]

There are, however, some promising signs in the United States. Energy consumption has remained relatively steady, including some recent small declines in consumption,[28] even as the gross domestic product has increased.[29] Most chalk

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[23] *See* U.S. ENERGY INFO. ADMIN., *Use of Energy in the United States*, http://tonto.eia.doe.gov/energyexplained/index.cfm?page=us_energy_use (last visited June 3, 2011).

[24] JOHN RANDOLPH & GILBERT M. MASTERS, ENERGY FOR SUSTAINABILITY: TECHNOLOGY, PLANNING, POLICY 8 (2008).

[25] *Id.*

[26] *See id.* at 9.

[27] *Id.*

[28] *See* U.S. ENERGY INFO. ADMIN., *U.S. Energy Facts Explained*, http://www.eia.gov/energyexplained/index.cfm?page=us_energy_home (last updated Sept. 1, 2010).

[29] *See* RANDOLPH & MASTERS, *supra* note 24, at 12.

this decrease up to increased energy efficiency, "the use of technology that requires less energy to perform the same function," rather than energy conservation or what we typically describe as no longer doing something that consumes energy.[30] This means that "[w]e are getting far more economic output from our energy, and we are not increasing our average use of energy per person despite driving more, occupying bigger houses, and using more energy gadgets, such as cell phones and computers."[31]

While these numbers provide an outline of the American energy consumption, there are a few other principles in energy policy that more fully illustrate the picture. First, Americans expect energy to be provided without interruption. California's rolling blackouts of 2001 were a vivid reminder of the major upset caused by even temporary energy losses,[32] an upset that led to, among other things, the recall of California's governor.[33] Thus, a core principle of American energy policy is "to assure abundant energy supplies."[34] Likewise, in order to provide stable rather than intermittent energy, the United States' electrical system is designed using both baseload power, which gives a consistent amount of power continuously, and peaking power supplies, which supplements the baseload during periods of higher demand.[35] In both cases, operators control the energy created at any particular time, balancing what they supply with what the system demands (its so-called "load"). In the case of peaking power, the source, often called a peaking plant or a peaker, must be able to respond quickly to heightened demand.[36] The point is thus clear. Demand drives the American electrical system, not supply. Supply is not seen as a limit, because the starting expectation is that Americans are *entitled* to receive as much electricity as they need.

[30] *See* U.S. ENERGY INFO. ADMIN., *Use of Energy in the United States Explained: Energy Efficiency and Conservation*, http://www.eia.gov/energyexplained/index.cfm?page=about_energy_efficiency (last visited June 6, 2011).

[31] *See* RANDOLPH & MASTERS, *supra* note 24, at 12.

[32] *See* Steven Ferrey, *Soft Paths, Hard Choices: Environmental Lessons in the Aftermath of California's Electric Deregulation Debacle*, 23 VA. ENVTL. L.J. 251, 253–54 (2004).

[33] Steven Ferrey, *Restructuring a Green Grid: Legal Challenges to Accommodate New Renewable Energy Infrastructure,* 39 ENVTL. L. 977, 986–87 (2009) [hereinafter Ferry, *Restructuring*]. Although shorter in duration, the 2003 power outage that affected large parts of the Midwest and Northeast United States as well as Canadian province of Ontario caused a similar upset. *See* U.S.-CANADA POWER SYSTEM OUTAGE TASK FORCE, FINAL REPORT ON THE AUGUST 14, 2003 BLACKOUT IN THE UNITED STATES AND CANADA: CAUSES AND RECOMMENDATIONS (2004), *available at* https://reports.energy.gov/.

[34] JOSEPH P. TOMAIN & RICHARD D. CUDAHY, ENERGY LAW IN A NUTSHELL 73 (2004).

[35] *See* Ferry, *Restructuring*, *supra* note 33, at 987.

[36] *See* RANDOLPH & MASTERS, *supra* note 24, at 366; Warren C. Kotzmann, *Flipping the Switch on Alternative Energy?,* 29 J. LAND, RESOURCES, & ENVTL. L. 19, 20–21 (2009).

Add to this one more technological fact: large-scale energy storage is quite limited.[37] Pump storage, which involves pumping water from one reservoir to another several hundred meters above it and then later releasing that water back to the lower reservoir, has been used in some circumstances. This kind of storage, however, requires a great deal of space, an environment in which water will not evaporate quickly, and natural elevation changes that make the placement of such reservoirs possible.[38] More importantly, we have yet to devise large-scale battery storage.[39] As a result, energy that is created must be able to be distributed quickly to the locations where it is needed, or it is lost.

The intolerance for variability, plus the inability to store energy, has resulted in an energy policy that "favors large-scale, high-technology, capital-intensive, integrated, and centralized energy producers which rely on fossil fuels."[40] Wind and solar sources are simply too unpredictable to fit this model because it is unclear how much, if any, power will be produced at a given hour due to the intermittent nature of both the wind and the sun.[41] Thus, unlike baseload power, renewables generally do not run all the time. Likewise, unlike peakers, electric utility dispatchers cannot call on solar- or wind-powered facilities whenever they need more power. This leaves renewables unlike either of the major kind of power sources on which electric providers typically rely.[42]

There is one final principle to American energy policy that is critical to understanding American consumption of energy: We expect energy to be provided at a reasonable price, which most prefer to be a relatively cheap price.[43] For example, retail electricity rates are set by state public utility commissions that are instructed by statute to keep rates low.[44] The result is that energy producers are put at odds with regulators, particularly environmental regulators, who are viewed as increasing their costs by demanding control of emissions and discharges.

It is also true that if the energy provider can convince consumers to use more energy, it will sell more power and thus make money. There have been some programs enacted to counter this, such as programs that encourage conservation and those that attempt to separate a producer's profits from power consumption—so-called "demand decoupling."[45] Energy producers, however, still have strong incentives to encourage energy consumption.

From these points, a picture of the American energy consumption culture emerges. Americans tend to use more energy per person than even those in other developed countries. Although we are becoming more efficient, this improvement

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[37] VACLAV SMIL, ENERGY 171 (2006).
[38] *See id.* at 171–72.
[39] *See id.* at 172.
[40] TOMAIN & CUDAHY, *supra* note 34, at 73.
[41] Ferrey, *Restructuring, supra* note 33, at 987.
[42] *See id.* at 997–1000.
[43] *See* TOMAIN & CUDAHY, *supra* note 34, at 73.
[44] Lincoln L. Davies, *Power Forward: The Argument for a National RPS*, 42 CONN. L. REV. 1339, 1354 (2010).
[45] *See id.* at 1356.

has only resulted in modest decreases in overall energy consumption because we continue to invent and use more devices that require energy. Moreover, because energy prices have remained relatively low, there is not much to encourage Americans to change their patterns of consumption. Americans also expect energy to be provided whenever and wherever they need it. Because of the lack of large-scale energy storage options, this has meant a dependence on centralized, fossil fuel sources that can provide energy on a constant basis and distribute power quickly.

What is notable about the American approach to energy consumption is the lack of any sense of what is required to provide low-priced energy on demand. There is no realization when one flips on a light switch, turns on a computer, or starts up a car of the tradeoffs we have made by invoking the American energy system. Our nation's energy policymakers, by the same token, only peripherally take into account the natural limits of fossil fuels or the externalities that they create. Instead, we assume that our environmental laws will inspire clever environmental engineering that will solve the problems created by our energy consumption; there is no need to radically rethink energy consumption. The question, then, is whether this fragmented approach is viable in the long term?

III. THE ENVIRONMENTAL IMPACTS OF ENERGY PRODUCTION

Nonrenewable sources of energy—coal, oil, and natural gas—create a long list of environmental impacts.[46] These are primarily the result of the emission of harmful pollutants into the air from burning these fuels, but there are land and water impacts as well.

Of greatest concern at the moment is that burning coal, oil, and natural gas produces significant greenhouse gas emissions. Coal and oil produce enormous carbon dioxide emissions. Indeed, according to a recent Government Accountability Office report, coal-fired power plants and oil used in transportation are each responsible for approximately one-third of the United States' carbon dioxide emissions.[47] The extraction of natural gas, which has fewer carbon dioxide emissions per unit of energy produced, also leads to fugitive methane emissions which are multiple times more potent in terms of climate change impact than carbon dioxide.[48]

In addition to their impact on climate change, the burning of these fuels produces nitrogen oxides, sulfur dioxide, and particulate matter which harm people

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[46] *See, e.g.*, Amy J. Wildermuth, *Is Environmental Law a Barrier to Emerging Alternative Energy Sources*, 46 IDAHO L. REV. 509, 524–28 (2010) [hereinafter Wildermuth, *Is Environmental Law*].

[47] U.S. GOVERNMENT ACCOUNTABILITY OFFICE, CLIMATE CHANGE: FEDERAL ACTIONS WILL GREATLY AFFECT THE VIABILITY OF CARBON CAPTURE AND STORAGE AS A KEY MITIGATION OPTION 8 (2008), *available at* http://www.gao.gov/new.items/d081080.pdf.

[48] U.S. ENERGY INFO. ADMIN., *Natural Gas and the Environment*, http://www.eia.gov/energyexplained/index.cfm?page=natural_gas_environment (last visited June 6, 2011).

and the environment.[49] For example, nitrogen oxide and sulfur dioxide emissions react with gases in the atmosphere to form acidic compounds which eventually results in acid rain.[50] Particulate matter is associated with several respiratory and cardiovascular illnesses, plant growth problems, and smog and other visibility problems.[51]

In addition to these results from burning coal, oil, and natural gas, there are impacts from the extraction of these resources from the earth. The environmental impacts of coal mining, particularly mountaintop mining, has been the subject of numerous lawsuits[52] and has been a focus of recent efforts of the Environmental Protection Agency because of its impacts on water quality.[53] The negative impacts that mountaintop, and surface mines generally, have on streams has even made its way into popular media; indeed, it was recently featured as a storyline in the popular television show *Justified.*[54]

The potential environmental harms of oil extraction were on stark display last summer when BP's Deepwater Horizon oil rig exploded, killing eleven people, and releasing over four million gallons of oil into the Gulf of Mexico.[55] The full devastation of the spill still remains unknown and will not be known for many years to come, but there can be no question that "[w]hatever the final tally of

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[49] *See* U.S. ENERGY INFO. ADMIN., *Oil and the Environment*, http://www.eia.gov/energyexplained/index.cfm?page=oil_environment (last visited June 6, 2011); U.S. ENERGY INFO. ADMIN., *Natural Gas and the Environment*, http://www.eia.gov/energyexplained/index.cfm?page=natural_gas_environment (last visited June 6, 2011); U.S. ENERGY INFO. ADMIN., *Coal and the Environment*, http://www.eia.gov/energyexplained/index.cfm?page=coal_environment (last visited June 6, 2011); *see also* Arnold Reitze, *Controlling Greenhouse Gases From Highway Vehicles*, 31 UTAH ENVTL. L. REV. 309 (2011); Wildermuth, *Is Environmental Law*, *supra* note 46, at 525.

[50] U.S. E.P.A., *What Is Acid Rain?*, http://www.epa.gov/acidrain/what/ (last visited June 3, 2011).

[51] ROBERT L. GLICKSMAN ET AL., ENVIRONMENTAL PROTECTION: LAW AND POLICY 394 (5th ed. 2007).

[52] *See, e.g.,* Ohio Valley Envtl. Coal v. Aracomoa Coal Co., 556 F.3d 177, 190–91 (4th Cir. 2009) (a challenge to the issuance of permits to fill streams as part of mountaintop mining); *cf.* Marfork Coal Co., Inc. v. Smith, 2011 WL 1044496, at *1 (S.D.W.Va. 2011) (suit brought to stop groups protesting mountaintop mining from entering mine property).

[53] *See, e.g.*, Memorandum for U.S. Army Corps of Engineers Headquarters, Directorate of Civil Works, Districts and Divisions, and U.S. Environmental Protection Agency Regional Offices, *Assessment of Stream Ecosystem Structure and Function under Clean Water Act Section 404 Associated with Review of Permits for Appalachian Surface Coal Mining* (July 30, 2010), *available at* http://water.epa.gov/lawsregs/guidance/wetlands/upload/Stream_Guidance_final_073010.pdf.

[54] David Roberts, *FX's* Justified *Features Mountaintop-Removal Mining Controversy*, GRIST (Apr. 8, 2011), http://www.grist.org/coal/2011-04-08-fxs-justified-features-mountaintop-removal-mining-controversy.

[55] *See* NATIONAL COMMISSION ON THE BP DEEPWATER HORIZON OIL SPILL AND OFFSHORE DRILLING, DEEP WATER: THE GULF OIL DISASTER AND THE FUTURE OF OFFSHORE DRILLING vi (2011), *available at* http://www.oilspillcommission.gov/final-report.

shorelines oiled, fishing days lost, and waterfowl killed, the *Deepwater Horizon* oil spill touched virtually every aspect of life on the Gulf of Mexico coast— and far beyond."[56] In other words, drilling for substances like natural gas and oil, particularly offshore, can have devastating environmental consequences.

Even when there is no disaster, the extraction of both natural gas and oil yields several harmful byproducts. First, there is "produced water," which typically contains harmful substances such as metals, hydrocarbons, and other organic materials, and therefore must be treated before being discharged into bodies of water.[57] Second, there is increasing concern over the air emissions resulting from drilling operations.[58] In fact, the EPA has been ordered to review its standards for, among other things, emissions from drilling extraction facilities.[59] It plans to propose new rules early in the summer of 2011.[60]

Finally, in between being extracted and being burned as fuel, oil must be refined, a process that also has several environmental impacts.[61] Indeed, most oil refineries produce air, water, and solid waste that must be disposed of under various environmental statutes.[62]

Compared to fossil fuels, nuclear power has a clear climate change advantage, in that it has very few emissions and thus is viewed by some as a cleaner energy source.[63] Unfortunately, the recent disaster in Japan has vividly illustrated many of the possible environmental impacts of nuclear energy when radioactive materials enter the environment.[64] This is particularly troubling because there remains no

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[56] *Id.* at 197 (italics in original).

[57] *See* Wildermuth, *Is Environmental Law*, *supra* note 46, at 526–27.

[58] *See id.* at 527; Eric Waeckerlin, *Fracking Sparks Renewed Interest in Air Standards for Oil and Gas Industry*, FRACKING INSIDER (Apr. 26, 2011), http://www.frackinginsider.com/regulatory/fracking-sparks-renewed-interest-in-air-standards-for-oil-and-gas-industry/ (explaining that "[c]oncern over air emissions from oil and gas facilities has persisted for a long time, most recently in the wake of EPA's 2008 ozone National Ambient Air Quality Standard and the Agency's current proposal to strengthen the ozone NAAQS even further.").

[59] U.S. E.P.A., *Oil and Natural Gas Air Pollution Standards,* http://www.epa.gov/airquality/oilandgas/index.html (last updated May 3, 2011).

[60] *Id.*

[61] *See* FRED BOSSELMAN ET AL., ENERGY, ECONOMICS, AND THE ENVIRONMENT 287–88 (2d ed. 2006).

[62] *See* Wildermuth, *Is Environmental Law*, *supra* note 46, at 527.

[63] BOSSELMAN ET AL., *supra* note 61, at 1009; U.S. ENERGY INFO. ADMIN., *Nuclear Power and the Environment*, http://www.eia.gov/energyexplained/index.cfm?page=nuclear_environment (last visited June 6, 2011).

[64] *See Nuclear Energy—Crisis in Japan*, N.Y. TIMES (updated May 24, 2011), *available at* http://topics.nytimes.com/top/news/business/energy-environment/atomic-energy/index.html ("On April 12, Japan raised its assessment of the accident at the crippled Fukushima Daiichi nuclear power plant from 5 to 7, the worst rating on an international scale, putting the disaster on par with the 1986 Chernobyl explosion, in an acknowledgement that the human and environmental consequences of the nuclear crisis could be dire and long-lasting.").

good, or at least politically palatable, solution for disposing of radioactive waste from nuclear power plants.[65] In the United States, the ping-pong-like politics surrounding the proposal to permanently store high-level nuclear fuel in Yucca Mountain, north of Las Vegas, Nevada, make this clear. The most recent iteration of this battle is a Congressional investigation of the Obama administration's decision to shutter the Yucca facility.[66]

Even renewable resources, which are widely considered the greenest of energy sources, are not without environmental impacts. To begin, solar, wind, and hydropower all require more land area than coal-fired or gas-fired power plants. This has led at least one environmental group to warn against the risk of "energy sprawl."[67]

Hydropower requires the construction of a dam as well as setting aside area for a reservoir behind the dam.[68] These reservoirs "may cover important natural areas, agricultural land, and archeological sites, and cause the relocation of people," but the impacts of a dam can be more far-reaching.[69] A dam disrupts fish migration, particularly those that go upstream to spawn.[70] In addition, "[a] reservoir and operation of the dam can also change the natural water temperatures, chemistry, flow characteristics, and silt loads, all of which can lead to significant changes in the ecology (living organisms and the environment) and physical characteristics (rocks and land forms) of the river upstream and downstream."[71]

Wind power also consumes land. The landscape occupied by turbines, however, tends to be less disrupted due to the fact that wind turbines are placed farther apart and are more permeable for migration than a dam or a series of solar panels.[72] The bigger environmental issue for wind turbines is their impact on flying

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[65] BOSSELMAN ET AL., *supra* note 61, at 1145.

[66] Press Release, House Energy & Commerce Committee, Committee Examines Yucca Mountain Shutdown, EPA's Overreach and Billions of Dollars in Obamacare Bailouts, Apr. 1, 2011, *available at* http://republicans.energycommerce.house.gov/News/PRArticle.aspx?NewsID=8432; *see also* GOVERNMENT ACCOUNTABILITY OFFICE, GAO-11-220, COMMERCIAL NUCLEAR WASTE: EFFECTS OF A TERMINATION OF THE YUCCA MOUNTAIN REPOSITORY PROGRAM AND LESSONS LEARNED (2011), *available at* http://www.gao.gov/new.items/d11229.pdf.

[67] Robert I. McDonald et al., *Energy Sprawl or Energy Efficiency: Climate Policy Impacts on Natural Habitat for the United States of America* (2009), http://www.plosone.org/article/info:doi/10.1371/journal.pone.0006802; *see also* Kate Galbraith, *Study Warns of 'Energy Sprawl,'* N.Y. TIMES, Aug. 26, 2009, *available at* http://green.blogs.nytimes.com/2009/08/26/study-warns-of-energy/sprawl/.

[68] U.S. ENERGY INFO. ADMIN., *Hydropower and the Environment*, http://www.eia.gov/energyexplained/index.cfm?page=hydropower_environment (last visited June 6, 2011) [hereinafter EIA, *Hydropower and the Envirionment*].

[69] *Id.*

[70] *Id.*; TOMAIN & CUDAHY, *supra* note 34, at 348.

[71] EIA, *Hydropower and the Environment*, *supra* note 68.

[72] U.S. ENERGY INFO. ADMIN., *Wind Energy and the Environment*, http://www.eia.gov/energyexplained/index.cfm?page=wind_environment (last visited June 6, 2011) [hereinafter EIA, *Wind Energy and the Environment*].

species, particularly endangered bats and birds.[73] In addition, although not a true environmental impact, it should also be noted that there are many who find wind turbines less than aesthetically pleasing.[74] The most obvious example of opposition to wind development on these grounds is the longstanding debate over the offshore Cape Wind project near Cape Cod, Massachusetts.[75]

Likewise, large-scale solar power installations, which are basically large expanses of mirrors,[76] pose environmental concerns. First, birds and insects can be harmed or killed by flying into concentrated beams of sunlight.[77] Second, solar panels can cause harmful habitat alteration particularly when the installation is not properly designed which would harm the surrounding ecosystem.[78] Third, all solar panels require some water, a commodity that is often hard to find in the deserts that make the most sense for solar installations.[79] Finally, perhaps of most concern is that solar panels contain toxic chemicals and thus must be handled carefully, both while in use and when disposed of in order to minimize the release of those chemicals into the environment.[80]

In short, all energy generation has environmental consequences. Some energy generation options—such as coal-fired power plants and cars and trucks powered by oil—are more harmful, especially in terms of climate change. But alternative energies are not without their own environmental impacts.

The question thus becomes how we can craft an energy strategy that takes into account both our energy needs and the environmental consequences of each energy source. Given that all energy begins as a natural resource of some kind and then, when converted for purposes of energy production, creates byproducts that impact nature, it would make sense to attempt to balance energy production's environmental impacts with questions of the energy's cost and availability. To accomplish this, one might suggest a comprehensive law that could provide the incentives necessary to accomplish energy and environmental goals.

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[73] *See* Animal Welfare Institute v. Beech Ridge Energy LLC, 675 F. Supp. 2d 540 (D. Md. 2009) (challenge brought to wind development project under the Endangered Species Act because of the potential of harm to, including killing of, Indiana bats, an endangered species); Wildermuth, *Is Environmental Law*, *supra* note 46, at 534.

[74] EIA, *Wind Energy and the Environment*, *supra* note 72; Melanie McCammon, *Environmental Perspectives on Siting Wind Farms: Is Greater Federal Control Warranted?*, 17 N.Y.U. ENVTL. L.J. 1243, 1267 (2009).

[75] *See Cape Wind Threats: View*, SAVE OUR SOUND: ALLIANCE TO PROTECT NANTUCKET SOUND, http://org2.democracyinaction.org/o/6891/content_item/threats-view (last visited June 6, 2011) (providing projections of what wind turbines would do to various views of Cape Cod).

[76] Wildermuth, *Is Environmental Law*, *supra* note 46, at 533.

[77] U.S. ENERGY INFO. ADMIN., *Solar Energy and the Environment*, http://www.eia.gov/energyexplained/index.cfm?page=solar_environment (last visited June 6, 2011) [hereinafter EIA, *Solar Energy and the Environment*].

[78] *See id.*

[79] *See id*; Wildermuth, *Is Environmental Law*, *supra* note 46, at 532.

[80] *See* EIA, *Solar Energy and the Environment*, *supra* note 77; Wildermuth, *Is Environmental Law*, *supra* note 46, at 532–33.

Unfortunately, however, the law did not develop in this way. Instead, energy law and environmental law grew as two separate fields with separate goals and separate regulatory mechanisms. Even more unfortunate, little has changed—even after problems like climate change and acid rain have made it increasingly clear just how interrelated energy and environmental issues are.

IV. RECOGNIZING THE DIVIDE BETWEEN ENERGY LAW AND ENVIRONMENTAL LAW

There can be no doubt that energy law and environmental law today have little to do with each other. A brief sketch of these two areas sheds some light on how the divide developed, as well as the potential obstacles to integrating them today. Before beginning, however, I must note that, because I am not attempting to comprehensively detail each of these fields, the following discussion by necessity relies to some extent on generalities. There are, of course, exceptions, typically small ones in which many themes are developed here. Nevertheless, for the sake of efficiency, I paint with a broad brush.

"[E]nergy law has been, and is, primarily economic in nature."[81] Energy law developed from roots in oil and gas law and public utility law.[82] These laws focused on two main goals: (1) maximizing a resource's economic benefit and (2) restricting monopoly power to ensure competitive pricing.[83] Although energy law began as largely local and state law, it has become more federal in nature.[84] Moreover, energy law increasingly has focused on particular sources rather than adopt a more comprehensive approach.[85] Finally, in recent decades, energy law has moved toward more market competition: "Rather than trying to mimic the market, regulators attempt to ensure that the market is workable, and then let it function."[86]

The result is that the vast majority of energy law has evolved to a model in which the federal government, and sometimes states, oversee markets, which are supposed to yield the most competitive prices.[87] The result is, not surprisingly, a lack of central planning. As Professor Lincoln Davies has explained, "if . . . regulation relies on markets, price dictates the outcome, and the shape of our energy profile emerges accordingly."[88] The result is that "there is no single agency to turn to for a master blueprint of where our national architecture is headed."[89]

Environmental law, like energy law, is also fragmented. Rather than a comprehensive statute that regulates impacts on the environment as a whole,

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[81] Lincoln L. Davies, *Alternative Energy and the Energy-Environment Disconnect*, 46 IDAHO L. REV. 473, 480 (2010) [hereinafter Davies, *Alternative Energy*].

[82] TOMAIN & CUDAHY, *supra* note 34, at 1.

[83] Davies, *Alternative Energy*, *supra* note 81, at 480.

[84] *Id.*

[85] *See id.*

[86] *Id.* at 481; *see id.* at 482.

[87] *See id.* at 483.

[88] *Id.*

[89] *Id.* at 484.

different statutes govern different media, such as the Clean Water Act for water pollution and the Clean Air Act for air pollution.[90] Moreover, these statutes predominantly regulate at the end of a process—at the end of the discharge or emissions pipe—rather than at the beginning. These laws typically do not consider the inputs to a process or the process as a whole.[91]

Dividing environmental impacts into discrete pieces and parts in this way creates a danger that we will simply move a pollutant from one media to another: "[E]nd-of-the-pipe controls sometimes achieve pollution reduction in one medium, in part, by transferring the pollution problem to another medium."[92] More importantly, it means that the law does not require a more comprehensive evaluation that might "consider the deeper roots that led to the generation of waste in the first instance."[93] In other words, rarely in environmental law can we find "the impulse to think about an entire industrial process or, for that matter, consumption generally." [94] As a result, "[t]here is, at bottom, no acknowledgment of any natural limits."[95]

In short, environmental law and energy law do very different work. They have different aims—"for energy law, economic development; for environmental law, conservation of resources and protection of public health."[96] Energy law ensures that there are abundant supplies at a reasonable price,[97] which under today's federal laws means a competitive market price. Environmental law attempts to protect people and ecosystems from the most immediate and severe harms; it reduces the risk of other harms and threats to public health and the environment, often while balancing the cost of that reduction against the benefits.[98]

Despite these different goals, environmental law and energy law have some similarities. They are both fragmented, with each focusing respectively on discrete parts of the environmental and energy picture.[99] They are also both reactive in their approach. Environmental laws often "appear to be performing triage; they are the equivalent of an emergency response to environmental problems, an ER or Urgent Care."[100] Likewise, energy law is often playing catch-up with the latest crisis be it Enron or climate change.[101] Finally, energy and environmental laws focus on the

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[90] Wildermuth, *Is Environmental Law*, *supra* note 46, at 522; Amy J. Wildermuth, *The Legacy of Exxon Valdez: How Do We Stop the Crisis?*, 7 U. ST. THOMAS L.J. 130, 148–49 (2009) [hereinafter Wildermuth, *The Legacy*].

[91] *Id.*

[92] David M. Driesen & Amy Sinden, *The Missing Instrument: Dirty Input Limits*, 33 HARV. ENVTL. L. REV. 65, 69 (2009).

[93] Wildermuth, *Is Environmental Law*, *supra* note 46, at 522.

[94] Wildermuth, *The Legacy*, *supra* note 90, at 150.

[95] *Id.*

[96] Davies, *Alternative Energy*, *supra* note 81, at 491.

[97] TOMAIN & CUDAHY, *supra* note 34, at 383.

[98] *See* DAVID M. DRIESEN & ROBERT W. ADLER, ENVIRONMENTAL LAW: A CONCEPTUAL AND PRAGMATIC APPROACH 239–41 (2007).

[99] Davies, *Alternative Energy*, *supra* note 81, at 493–94.

[100] Wildermuth, *The Legacy*, *supra* note 90, at 149.

[101] Davies, *Alternative Energy*, *supra* note 81, at 493.

short-term. Although there was hope that environmental law would make society more sustainable, environmental law frequently discounts future generations. “[W]hat is not immediately in peril often is ignored.”[102] Energy law, however, has never had longer-term aspirations: “For energy law, the short-term is the nature of the enterprise, not a failure of aspirations.”[103]

These similarities, unfortunately, only make the case worse for any attempt to think about these areas working together. Because they are “reactive, fragmented, and short-term,”[104] the statutes, policies, and regulations that make up energy law and environmental law function outside any frame of long-term comprehensive goals or a vision for their respective domains. As a result, we end up with lots of pieces but no overall picture.

This is not to say that environmental law and energy law are always at odds. Instead, environmental law simply regulates the various steps in the energy production process, particularly when there is an emission, discharge, or disposal of waste at the end of the process.[105] A coal-fired plant must get a Clean Air Act permit for its air emissions;[106] a mountaintop coal mine must get a permit under the Clean Water Act in order to discharge waste into streams.[107] This, in turn, increases costs for energy production, which is, of course, factored into the market pricing overseen by energy law. But energy law does not treat the costs of environmental pollution control any differently than it would treat the increased costs of labor.

In sum, despite the inescapable fact that all energy production is based on natural resources, and thus, imposes numerous environmental impacts, there is no special relationship—or even much of a relationship at all—between energy law and environmental law. The end result is no central plan for energy development, production, consumption, and regulation. But is this a problem?

Professor Davies has argued that there are four problems with this “divorce.”[108] First, drawing on the example of cheap electricity from nuclear plants, he contends that the conflicting aims of environmental law and energy law makes each of them less effective.[109] Second, he points to the inefficiency of disconnecting environmental law and energy law, such as when it comes to competing systems in energy law and environmental law for dealing with climate change.[110] Third, he argues that synergies—that is, added benefits from combining energy law and environmental law—are lost. Finally, Professor Davies complains about the incompleteness, that is, the gaps that remain when the two fields remain

[102] *Id.* at 494.
[103] *Id.*
[104] *Id*. at 493.
[105] *See* Wildermuth, *Is Environmental Law*, *supra* note 46, at 524.
[106] *See* Envtl. Def. v. Duke Energy Corp., 549 U.S. 561, 582 (2007).
[107] *See* Kentuckians for the Commonwealth, Inc. v. Rivenburgh, 317 F.3d 425, 431 (4th Cir. 2003).
[108] Davies, *Alternative Energy, supra* note 81, at 500.
[109] *Id.* at 500–01.
[110] *Id.* at 501.

separate. This might be seen most keenly, for instance, in the lack of consideration of energy efficiency in our nation's electricity supply.[111]

While these are all persuasive arguments against allowing the disconnect between energy law and environmental law to continue, the best argument for integrating environmental law and energy law emerges when we consider the strategies for combating climate change.[112] As the Supreme Court has recognized, "[t]he harms associated with climate change are serious and well recognized."[113] They include "loss of sea ice, accelerated sea level rise and longer, more intense heat waves," as well as "more frequent wildfires, longer periods of drought in some regions and an increase in the number, duration and intensity of tropical storms."[114]

One of the primary causes of climate change is energy. In 2008, "[e]nergy-related carbon dioxide emissions represented 81% of total U.S. human-caused greenhouse gas emissions."[115] In other words, if we are going to do anything about climate change, we must start with energy. Eighty-one percent is not a small number. We cannot make the necessary large reductions with tiny tinkering, the kind of thing that might be accomplished by adding modest restrictions on air emissions under the Clean Air Act.[116] Instead, if we are truly interested in combating climate change, we need a new approach to the entire scheme of energy production and consumption, one that will balance energy needs and costs with environmental impacts.

V. A NEW WAY?

There are, of course, several approaches that we might consider to integrate energy and environmental law. We could think of a scheme that looks holistically at every step in energy generation of a particular energy source—the life cycle of energy generation from coal, oil, gas, solar, wind, and hyrdo—and evaluates the

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[111] *Id.* at 501–02.

[112] *See* Wildermuth, *Is Environmental Law*, *supra* note 46, at 543; *cf.* Davies, *Alternative Energy*, *supra* note 81, at 502–04.

[113] Massachusetts v. E.P.A., 549 U.S. 497, 521 (2007).

[114] NAT'L AERONAUTICS AND SPACE ADMIN., *The Current and Future Consequences of Global Change*, http://climate.nasa.gov/effects/ (last visited June 6, 2011).

[115] U.S. ENERGY INFO. ADMIN., *Energy and the Environment Explained: Where Greenhouse Gases Come From*, http://www.eia.gov/energyexplained/index.cfm?page=environment_where_ghg_come_from (last updated May 25, 2011).

[116] *Cf.* News Release, E.P.A., EPA to Set Modest Pace for Greenhouse Gas Standards / Agency stresses flexibility and public input in developing cost-effective and protective GHG standards for largest emitters (Dec. 23, 2010), *available at* http://yosemite.epa.gov/opa/admpress.nsf/6424ac1caa800aab85257359003f5337/d2f038e9daed78de8525780200568bec!OpenDocument (announcing EPA's latest attempt, after two years of efforts, to regulate greenhouse gas emissions under the Clean Air Act, which now will only involve regulating fossil fuel power plants and petroleum refineries).

environmental impact of each whole process. This would quickly, however, become an overwhelming task. It would be even harder to administer efficiently.[117]

Another possibility, frequently suggested by the popular media and marketers, is that we each individually take action to become more energy-conscious and energy-efficient. We are encouraged to, by voluntary actions, "go green" in order to combat our collective bad behavior that has caused climate change and other environmental problems.

The problem with this approach, however, is that it is far too little and far too late. As Michael Tidwell has argued, green gestures "lure us into believing that broad change is happening when the data shows that it isn't."[118] Tidwell contends instead that most people are not willing to make significant voluntary changes: "[M]ost people want carbon reductions to be mandated by laws that will allow us to share both the responsibilities and the benefits of change."[119]

Whether most people want a climate change law remains to be seen.[120] It is clear, though, that voluntary action suffers from a lack of comprehensiveness, which is what we lack in the laws that exist today. Moreover, any voluntary individual action must occur within the broader system of energy production as it now functions. Without laws that encourage utilities to do otherwise, it is unlikely that they would change the status quo because, at the end of the day, they will do what is most cost-effective.[121] Individuals can install solar panels or wind turbines—so long as their local zoning code allows it and they can afford it—but it is difficult for individuals to demand that the energy their public utility company delivers to them comes exclusively from wind or solar sources.

Even when renewable options are offered to consumers through initiatives such as Rocky Mountain Power's Blue Sky Program—which invites customers to pay an additional but modest $1.95 for a 100-kilowatthour block that will go towards developing renewable energy (approximately ten such blocks equates to an average home's electricity use)[122]—the rates of participation are quite low. For the vast majority of communities in Utah, Blue Sky participation is in the single-digits, with the most in the 3 percent range; the numbers are even lower in

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[117] *See* Wildermuth, *Is Environmental Law*, *supra* note 46, at 538–39.

[118] Michael Tidwell, *To Really Save the Planet, Stop Going Green*, WASH. POST, Dec. 6, 2009, http://www.washingtonpost.com/wp-dyn/content/article/2009/12/04/AR2009120402605.html.

[119] *Id.*

[120] *See* Ryan Lizza, *As the World Burns: How the Senate and the White House Missed Their Best Chance to Deal with Climate Change*, THE NEW YORKER (Oct. 11, 2011), http://www.newyorker.com/reporting/2010/10/11/101011fa_fact_lizza (describing the failure of the bipartisan climate change legislation).

[121] *Cf.* Wildermuth, *The Legacy*, *supra* note 90, at 144–45 (describing the power of corporations and the incentives to degrade the environment in order to keep costs low).

[122] ROCKY MOUNTAIN POWER, *Blue Sky Program Overview*, http://www.rockymountainpower.net/env/bsre/po.html (last visited June 6, 2011).

Wyoming, largely falling in the 1–2 percent range.[123] In other words, perhaps because Americans are accustomed to paying lower prices, there seems to be little gained even if voluntary actions are offered more widely, because these actions tend to be modest at best.

The best answer that has been offered to date is that of Professors Driesen and Sinden, which proposes to focus on the inputs, rather than the outputs, of our modern energy economy.[124] In particular, they focus on "dirty input limits," which are responsible for two great environmental successes—stopping ozone depletion and removing lead from gas.[125] They suggest that input limits would work particularly well with the nonrenewable energy sources—oil, coal, and natural gas:[126]

> One could choose to use [dirty input limits or DILs] to limit some fossil fuels and not others; one could also use a suite of DILs to address all fossil fuels. Alternatively, one might focus on carbon as an input. Since coal, oil, and gas consist mostly of carbon, a limit on carbon would function as a limit on gasoline, coal, and oil. Designing a DIL this way would add flexibility and might merit policy makers' consideration.[127]

Professors Driesen and Sinden argue that dirty limits would lead to fewer dirty outputs throughout the energy production, generation, and consumption process. [128] It would be easier to administer and monitor, and it would encourage conservation as well as innovation, including greater efficiency.[129] Ultimately, they contend, it would inspire the kind of change that should come of the integration of energy law and environmental law because this approach "helps us to reframe the question so that we ask not just about air pollution or water pollution, but about whether we should consider fossil fuel use itself as the problem to solve."[130]

An even more aggressive approach for integrating energy law and environmental law might be to combine dirty input limits with other legal tools. As I have suggested elsewhere, given the "history of entrenched entities who complain that the limits imposed on them are too difficult to meet and often are able to delay

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[123] ROCKY MOUNTAIN POWER, *Participation Rate by Community*, http://www.rockymountainpower.net/env/bsre/bscc/prbc.html (last visited June 6, 2011).

[124] *See* Driesen & Sinden, *supra* note 92, at 70; *see also* Robert N. Stavins, *A Meaningful U.S. Cap-and-Trade System to Address Climate Change*, 32 HARV. ENVTL. L. REV. 293, 309–10 (2008) (suggesting the implementation of an upstream point of regulation).

[125] *See* Driesen & Sinden, *supra* note 92, at 83–88.

[126] *See id.* at 104–07.

[127] *Id.* at 105 (footnotes omitted).

[128] *See id.* at 71–73.

[129] *See id.* at 88–96.

[130] *Id.* at 115.

those limits,"[131] the best system would be one that imposed both dirty input limits and clean input requirements.[132] These would be similar to the renewable portfolio standard requirements found in energy law that "mandate[] electric utilities to produce or acquire a certain percentage of their energy from renewable resources."[133] It would both limit the use of fossil fuels and affirmatively require the use of alternative energy sources.[134] As I argued before, "the benefit of this approach is that it would avoid overestimating conservation and efficiency measures' effectiveness. Moreover, this approach would clearly signal that alternative energies must be developed, which should provide more assurance to investors in alternative energy."[135]

To fully integrate energy law and environmental law, though, this statute would need to draw on the expertise of those who have overseen and know the energy markets, as well as those who know the environmental limits, in order to set the correct input levels. In particular, there would need to be four basic considerations: (1) how to translate environmental goals into input limits; (2) knowledge of the current and future mix of available energy sources, including conservation and efficiency measures; (3) a method for ensuring reliable energy, which by definition encompasses energy transport, distribution, and delivery; and (4) cost structures for energy that maintain reasonable prices but also encourage behaviors that are consistent with the goals of the new statute.

The translation of environmental goals, particularly those for climate change, into energy realities will require an understanding of the many possible strategies for meeting the desired emission reductions.[136] Several years ago, Professor Sokolow and his colleagues, using the concept of "stabilization wedges," explained that improvements cannot be limited to a single strategy such as increased efficiency or going all renewable, but rather will require a mix of strategies.[137] Today the stabilization wedges game requires those who play it to confront difficult energy choices at a very large scale.[138]

Environmental experts tasked with assisting the determination of the appropriate dirty input limits and clean input requirements will need to be able to equate each of the available options into climate impacts. That is, they will need to translate coal, oil, and natural gas inputs as well as any renewable strategy that

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[131] *See, e.g.*, International Harvester Co. v. Ruckelshaus, 478 F.2d 615 (D.C. Cir. 1973) (car manufacturers brought suit to delay EPA's 1975 emission standards).

[132] *Wildermuth*, *Is Environmental Law*, *supra* note 46, at 541.

[133] Davies, *Alternative Energy*, *supra* note 81, at 496; *see* BOSSELMAN ET AL., *supra* note 61, at 792–93.

[134] *Cf.* Davies, *Alternative Energy*, *supra* note 81, at 496.

[135] Wildermuth, *Is Environmental Law*, *supra* note 46, at 541.

[136] *See* Robert Socolow et al., *Solving the Climate Problem: Technologies Available to Curb CO_2 Emissions*, 46 ENVIRONMENT 8 (2004), *available at* http://www.princeton.edu/mae/people/faculty/socolow/ENVIRONMENTDec2004issue.pdf.

[137] *See id.* at 18–19.

[138] *See* PRINCETON UNIVERSITY CARBON MITIGATION INITIATIVE, *Stabilization Wedges Game*, http://cmi.princeton.edu/wedges/game.php (last updated Feb. 17, 2011).

might have climate impacts into greenhouse gas emissions. Only then can they make informed recommendations about the correct mix of strategies.

Once we understand what each strategy's potential contribution is to climate change, the next step is to begin thinking about what is possible. Energy experts know the current mix of available energy strategies as well as what to expect from innovation. They also understand the potential of efficiency and conservation measures. Based on this, we can begin to construct an input scheme that takes into account these considerations on a timeline. We might begin with a scheme that requires a 20 percent reduction in dirty input limits (with a corresponding increase in clean inputs) in the next ten years and, over time, steps up to the point where it requires a 70 percent reduction in dirty input limits in the next fifty years. In other words, we need a strategy that is realistic but that will allow us, over time, to effectively combat climate change.

As we think about the mix of energy sources, we will undoubtedly have to consider the question of energy distribution and reliability. It is unlikely that much will change about the American culture of energy consumption, particularly in terms of wanting an instant and constant source of energy. Accordingly, as we move toward renewable sources that are intermittent and distributed widely, we will need to add to the centralized grid system—smaller systems of local distribution that allow the power from wind farms and solar farms to reach nearby customers.[139] Moreover, because we do have smaller battery storage capabilities, we may be able, on these smaller scales, to store energy to make renewable energy more reliable. Add to this a "smarter" overlay for the grid as a whole which will further assist in harnessing the energy resource of efficiency, and we will be on our way to an energy system no longer moored in our unsustainable past.

Of course, we will also need energy experts to fully understand the prices that must be charged when the new input scheme are implemented. Although it is clear that prices will increase under a statute of this sort, it is worth noting that we pay more for gas for our cars and trucks with lots of grumbling but relatively few changes in behavior.[140] Though we do not want to acknowledge it, energy demand is largely price inelastic. Nevertheless, it would be worth experimenting with pricing innovations that might yield better energy consumption behavior. For example, unlike our historical practice, prices could increase as one uses more as a way to encourage conservation. Some energy sectors have trended this way, but today, the vast majority continues to charge flat rates.

Ultimately, setting the appropriate dirty input limits and clean input requirements will involve an understanding of the climate change impacts of a

[139] *See* Sara C. Bronin, *Curbing Energy Sprawl with Microgrids*, 43 CONNTEMPLATIONS 547, 559 (2010).

[140] *Cf.* Dennis Jacobe, *In U.S., High Gas Prices May Make Many Get Fuel-Efficient Cars*, GALLUP, May 23, 2011, http://www.gallup.com/poll/147746/high-gas-prices-may-fuel-efficient-cars.aspx (noting that Americans might change some behaviors when gas prices increase but that "[s]even in 10 Americans would not move and about the same number of workers would not change jobs or quit working, no matter how high prices rise.").

wide variety of energy strategies. It will also require knowledge of the variability, transmission, and storage capacity for any energy technology—new or old—in order to ensure a reliable energy source. And it will require appropriate pricing for consumers that would still meet the goal of providing energy at a reasonable cost, in a market with newly defined boundaries. In other words, if we are to devise a new approach that will combat climate change, we will need to combine the expertise and lessons of both energy and environmental law and policy.

VI. CONCLUSION

The integration of energy law and environmental law faces many barriers. In the current political context, few observers have any illusion that Congress will adopt climate change legislation soon, let alone a comprehensive statute that reimagines the entire energy landscape. I concur with that view. It is clear, however, that energy has great impacts on the environment and thus should be more closely intertwined with environmental law. Energy law, with its economic focus, ironically leaves the environment largely to the side, viewed as one more cost of doing business. Until we move toward a more integrated legal approach, one that is able to combine and harmonize the goals of each area of the law, both our energy landscape and our natural landscape will continue to suffer.