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Complex Value Choices at the Environment-Energy Interface

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SYMPOSIUM ESSAY

COMPLEX VALUE CHOICES AT THE ENVIRONMENT-ENERGY INTERFACE

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During the 2001–02 academic year, I lived in China, teaching U.S. civil rights law and helping to start a labor law clinic. My first day of teaching the fall civil rights course was the day of the September 11 attacks, and that event and reactions to it played a dominant role in my experience of that year. However, it was also a particularly interesting year to be in China from an environmental-energy perspective because the Three Gorges Dam was in the process of being built and brought online.[1] At that point, the area was partially flooded and it was one of the last years that one could take a standard boat ride through the area. I took a Chinese cruise ship to look at the site—quite an experience that included an almost non-stop speaker directing my daily activities—and also visited the Three Gorges Dam tourist center and a resettled village. I had a number of quiet conversations with people in that village about how the project was affecting their lives.

The Three Gorges Dam provides a particularly dramatic example of the complex value choices at the environment-energy interface that are the focus of this essay. In the panel discussion from which this essay emerges, we were asked to assess anthropocentric, biocentric, and ecocentric values at the environment-health interface. However, in the context of the dam, the value conflicts are not found so much in the comparative valuation of humans, species, and ecosystems, but rather in the difficult choices among energy sources that have significant benefits and externalities.

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1. For a description of the Three Gorges Dam, see sources cited *infra* notes 2–5.

On the one hand, the Three Gorges Dam embodies everything that environmentalists have criticized dams for over the years. The dam has had major ecological and environmental impacts (e.g., erosion, sedimentation, landslides, wildlife impacts, pollution), displaced approximately 1.4 million people, and flooded significant cultural and archeological sites.[2]

On the other hand, its production of electricity is replacing significant amounts of coal use and its accompanying greenhouse gas emissions. The Chinese government estimates that the dam's electricity reduces the country's carbon dioxide emissions by 100 million tons by avoiding 50 million tons of coal consumption per year.[3] While there have been some recent analyses indicating that dams may produce more greenhouse gases than previously estimated due to methane from decomposing organic matter in the pools of water that they create, the dam is certainly preventing some of the serious environmental and health consequences that would have come with the additional coal mining and burning.[4]

This dilemma of environment-energy decisions that have major positives and negatives from either a health or ecosystem perspective poses an important ethical challenge that this essay explores. Namely, in many cases, one can value humans, species, and ecosystems, and still not be able to resolve the best way forward. The essay focuses in particular on a core problem at the environment-energy interface, of which the Three Gorges Dam is just one example: people demand cheap and reliable energy, which pushes us towards new technology or the massive expansion of existing technology, both of which carry risks and possibilities for a cleaner future.

The essay considers this dilemma in the U.S. context with respect to a wide range of emerging technologies at the energy-environment interface, each of which poses its own unique challenges. At times, such as with respect to deepwater drilling and hydraulic fracturing, the key issue is the most appropriate way to constrain risk. In other situations, including ones Environmental Protection Agency (EPA) Administrator Gina McCarthy discussed in her opening keynote, the technology has the potential to limit risk but is still quite experimental and expensive. For example, the proposed EPA rule to regulate carbon pollution from power plants includes

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2. The Chinese government has acknowledged these concerns. *See* Michael Wines, *China Admits Problems with Three Gorges Dam*, N.Y. TIMES, May 19, 2011, *available at* http://www.nytimes.com/2011/05/20/world/asia/20gorges.html?_r=0 /20gorges.html?_r=1&. For further discussion of the relocation issues, see Brooke Wilmsen et al., *Development for Whom? Rural to Urban Resettlement at Three Gorges Dam, China*, 35 ASIAN STUDIES REV. 21, 22 (2011).

3. *See Three Gorges Project Helps Cut Emissions*, GOV.CN (Dec. 21, 2007), http://english.gov.cn/2007-12/21/content_854708.htm.

4. *See* Huai Chen et al., *Methane Emissions from the Surface of the Three Gorges Reservoir*, 116 J. GEOPHYSICAL RES. (2011), *available at* http://onlinelibrary.wiley.com/doi/10.1029/2011JD016244/abstract.

partial carbon sequestration and storage. This decision represents a compromise between the most emissions-limiting option and technological and economic reality.[5]

The essay uses examples from the energy transition context to explore questions of uncertainty, federalism, inclusion, and equity.[6] Managing technological development and expansion is made more difficult by the messiness of the applicable law and key stakeholders. A diverse set of public and private actors at multiple levels of government interact with energy technology, and the authority to regulate it is often divided in somewhat overlapping ways among different local, state, and federal agencies. Moreover, in the U.S. context, environmental and energy laws are mostly regulated separately, under varying statutes and agencies, with inconsistent federalism arrangements.[7]

The essay analyzes the ways in which complicated value choices interface with hard governance challenges. Part I provides a context for its analysis by discussing the way in which the demand for cheap, reliable energy interacts with the development and expansion of risky technology. Part II then considers how scientific, technological, and legal uncertainty interact with efforts to create an effective regulatory approach. The essay concludes in Part III by proposing principles for addressing these complex value choices more effectively.

I. Energy Demand and Emerging Technology

This Part frames the value conundrum of this essay by looking at the broader context in which energy transition takes place. Although per capita energy use has declined in recent years[8]—due to both the recession and increased energy efficiency—total U.S. demand for energy has continued to rise steadily over time as population has grown. The following diagram from the U.S. Energy Information Administration illustrates the more than

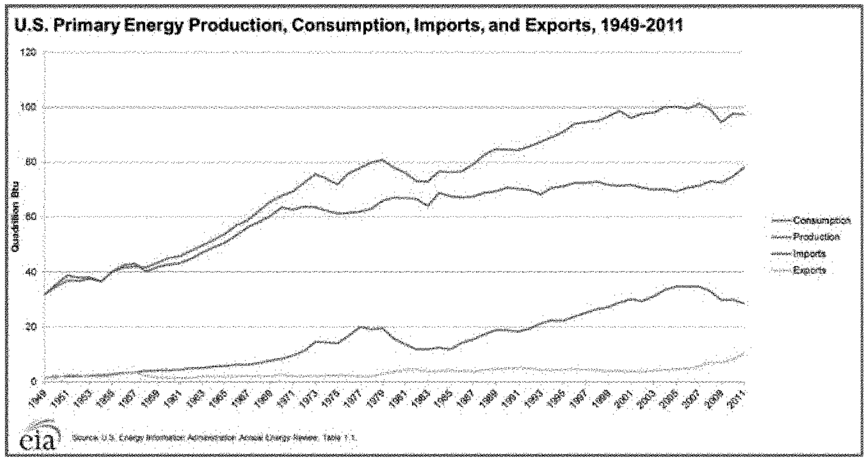
5. *See* Gina McCarthy, *Keynote Remarks at the University of Michigan Environmental Law and Public Health Conference*, 3 MICH. J. ENVTL. & ADMIN. L. 243 (2014).

6. I first focused on these four governance challenges in the context of the British Petroleum Deepwater Horizon oil spill and draw from that analysis here. Hari M. Osofsky, *Multidimensional Governance and the BP Deepwater Horizon Oil Spill*, 63 FLA. L. REV. 1077, 1077 (2011).

7. *See* Hari M. Osofsky & Hannah J. Wiseman, *Dynamic Energy Federalism*, 72 MD. L. REV. 773 (2013), and Hari M. Osofsky & Hannah J. Wiseman, *Hybrid Energy Governance*, 2014 U. ILL. L. REV. 1 (describing these federalism and governance challenges and exploring the possibilities for hybrid regional governance approaches to help address them).

8. U.S. ENERGY INFO. ADMIN., ANNUAL ENERGY REVIEW 2011, at 12 (2012).

doubling of energy production and consumption in the United States since the middle of the twentieth century.[9]



From top right to bottom right, the lines represent Consumption, Production, Imports, and Exports

This demand has been paired with technological developments like deepwater drilling, horizontal drilling, and hydraulic fracturing that have allowed access to previously inaccessible domestic oil and gas resources. The Energy Information Administration's 2014 Energy Outlook predicts that crude oil production will hit its historic 1970 high in 2016 before declining, while natural gas will continue to steadily rise.[10]

Although renewable energy use has grown over recent years, it still represents a small fraction of overall energy sources. The core fossil fuels—oil, natural gas, and coal—provide 82 percent of energy for consumption in this country, with nuclear power making up another 8 percent. In addition, despite all the attention given to wind and solar energy, and their increasing financial viability, dams like the one highlighted in the introduction still make up more than one-third of the limited U.S. renewable energy production.[11]

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9. *See Energy Perspectives 1949–2011*, U.S. ENERGY INFO. ADMIN. (Sept. 27, 2012), http://www.eia.gov/totalenergy/data/annual/perspectives.cfm (showing U.S. production, consumption, imports, and exports of energy since 1949).

10. *Increased Tight Oil Production, Vehicle Efficiency Reduce Petroleum and Liquid Imports*, U.S. ENERGY INFO. ADMIN. (Dec. 16, 2013), http://www.eia.gov/todayinenergy/detail.cfm?id=14211. *See also* INTL. ENERGY AGENCY, WORLD ENERGY OUTLOOK 2012, at 49, 75–76 (2012) (explaining that the rapid expansion of U.S. shale gas and oil production, which may allow the United States to become a net exporter); U.S. ENVTL. PROT. AGENCY, PROPOSED AMENDMENTS TO AIR REGULATIONS FOR THE OIL AND NATURAL GAS INDUSTRY: FACT SHEET, *available at* http://www.epa.gov/airquality/oilandgas/pdfs/20110728factsheet.pdf (describing the massive expansion of fracturing techniques).

11. According to the U.S. Energy Information Administration, as of 2011, the core sources of energy were: petroleum (36%), natural gas (26%), coal (20%), renewable energy (9%), and nuclear (8%). The 9% of renewable energy was comprised of: hydroelectric power

Our heavy reliance on fossil fuels and desire for energy independence has created ongoing pressure to continue to expand the use of these new technologies to access domestic oil and natural gas. Given this reality and the unlikelihood of a ban on these new practices, an important question is how key stakeholders can limit their risks to ecosystems and health. The rest of this essay explores the ethical and regulatory challenges for such efforts.

II. LEGAL IMPLICATIONS OF SCIENTIFIC, TECHNOLOGICAL, AND LEGAL UNCERTAINTY

This Part considers the ways in which scientific, technological, and legal uncertainty creates both regulatory and ethical challenges. These challenges come not only from the uncertainty itself, but also from the broader governance and justice context in which these issues arise. Often multiple governmental entities at more than one level of government have partial regulatory authority. This simultaneous overlap and fragmentation of authority can exacerbate justice concerns—stemming from the underlying unequal distribution of environmental and energy benefits and risks—as each agency's justice mandate may at times be lost in complex public and private arrangements.[12] This Part begins by examining the uncertainty that arises in these contexts, and then considers these broader governance and justice questions.

When scientific and technological understanding evolves rapidly, uncertainty exists. Some uncertainty simply cannot be eliminated. For example, in the context of climate change, although a very high level of consensus exists that anthropogenic emissions are causing a wide variety of impacts, mapping the detailed pathways of causation—especially at smaller spatial and temporal scales—can be vexing. However, these details often become relevant in legal contexts; it would assist regulators to know exactly which impacts result from which emissions, or whether the increased risk of severe weather events triggered a particular weather event. Instead, climate change regulation must proceed along precautionary lines, mitigating to try to limit impacts and taking adaptation measures to address the greatest risks of impacts. Even if one moves beyond the politicized debates over climate science in the United States to ask how to manage the risks most appropriately, areas of reasonable disagreement over strategies exist.[13]

(35%), wood (22%), biofuels (21%), wind (13%), waste (5%), geothermal (2%), and solar/PV (2%). *Energy Perspectives 1949-2011*, *supra* note 9.

12. I have explored this confluence in depth in the context of the BP Deepwater Horizon oil spill. *See* Osofsky, *supra* note 6.

13. *See* COMM. ON STRATEGIC ADVICE ON THE U.S. CLIMATE CHANGE SCI. PROGRAM, NAT'L RESEARCH COUNCIL, EVALUATING PROGRESS OF THE U.S. CLIMATE

In the context of the hot-button issues of deepwater drilling and hydraulic fracturing, the emergence and expansion of technology creates the uncertainties around risks from the technology itself that regulators must manage. Deepwater drilling operates miles below the surface where temperature and pressure issues create many unknowns, and ultra-deepwater drilling has developed rapidly over the past decade.[14] At each stage of the choices that led to the massive BP Deepwater Horizon spill, corporate decisionmakers with limited governmental oversight balanced risk against the desire to have the project move forward. When problems arose—a formation that did not allow them to drill as deeply as planned, issues around casing choices, tests suggesting cement instability, procedures that revealed the beginnings of a blowout—key corporate decisionmakers at BP and its subcontractors decided to rework computer models or dismiss findings in order to keep the project moving forward.[15] Although many regulatory reforms took place in the aftermath of the spill to try to ensure that better oversight would occur in the future, the fast pace of technological change in this area paired with the multiplicity of relevant agencies and limited agency funding makes effective prescriptive regulation difficult.[16]

Moreover, once the spill took place, hard questions arose about how to stop it and how to limit the effects of the oil. Incorrect assessments about the quantity and rate of oil flowing from the site and limited government ability to access the site or second-guess BP's estimates helped contribute to failures to contain the spill. The key corporate and governmental actors

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CHANGE SCIENCE PROGRAM: METHODS AND PRELIMINARY RESULTS 5 (2007), *available at* http://books.nap.edu/openbook.php?isbn=0309108268 ("Information at regional and local scales is most relevant for state and local resource managers and policy makers, as well as for the general population, but progress on these smaller spatial scales has been inadequate. Improving understanding of regional-scale climate processes and their impacts in North America, for example, would require improved integrated modeling, regional-scale observations, and the development of scenarios of climate change and impacts."); Patrick J. Bartlein, Professor, Dep't of Geography, Univ. of Or., Remarks at Seminar on Reading the Fourth IPCC Assessment Report 2007 (Oct. 17, 2007) (author's notes, on file with author). I have explored these issues in depth in Hari M. Osofsky, *Is Climate Change "International"? Litigation's Diagonal Regulatory Role*, 49 VA. J. INT'L L. 585 (2009).

14. For a description of the expansion of deepwater drilling, see CURRY L. HAGERTY & JONATHAN L. RAMSEUR, CONG. RESEARCH SERV., REPORT NO. R41262, DEEPWATER HORIZON OIL SPILL: SELECTED ISSUES FOR CONGRESS 26 (July 30, 2010), *available at* www.fas.org/sgp/crs/misc/R41262.pdf. *See also Production, Proved Reserves and Drilling in Ultra-Deepwater Gulf of Mexico*, U.S. ENERGY INFO. ADMIN., at fig.2 (May 26, 2010), http://www.eia.gov/oog/info/twip/twiparch/100526/twipprint.html.

15. For a discussion of the systematic failures that caused the spill, see NAT'L COMM. ON THE BP DEEPWATER HORIZON OIL SPILL & OFFSHORE DRILLING, DEEP WATER: THE GULF OIL DISASTER AND THE FUTURE OF OFFSHORE DRILLING (2011) [hereinafter NAT'L COMM. REPORT], *available at* http://www.gpo.gov/fdsys/pkg/GPO-OILCOMMISSION/pdf/GPO-OILCOMMISSION.pdf.

16. *Id.* at 72–76, 174–75.

desperately wanted to stop the oil flow, but struggled for critical weeks with a lack of technological ability to do so.[17] The difficulties did not stop with the spill itself. Currents, storms, and the less-than-pristine onshore and offshore conditions made it hard to predict the oil's path and determine its impacts with precision. Because dispersants had never been used in such large quantities or in such deep water, major disagreements took place over the appropriate way to deploy them. Furthermore, as the long-term aftermath of the 1989 Exxon Valdez spill has revealed, many of the harms from the oil and dispersants to ecosystems and humans will only become clearer over decades.[18]

Hydraulic fracturing does not take place at such extreme depths and has existed for some time, but its rapid expansion due to developments in horizontal drilling technology creates difficult questions around risk. As with deepwater drilling, the pace of development makes it hard for regulators to keep up. An activity like hydraulic fracturing, where the risks are manageable at small scales, may create much more significant impacts at larger scales. Moreover, because hydraulic fracturing, unlike deepwater drilling, often takes place on private land and under state and local regulation, responses to the uncertainty differ based on reactions in those places. These varying state and local approaches have led to a patchwork approach to regulating hydraulic fracturing. Not only do states take approaches that diverge at times from one another, but localities within states that allow hydraulic fracturing have attempted to ban it. This regulatory variation paired with the massive increase in drilling over a short period of time—with many relevant state laws developed when there was much less activity to regulate—creates uncertainties which make consistent and appropriate risk management difficult.[19]

Even when the technological developments are ones intended to address risks or harms, uncertainty creates governance concerns; regulators

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17. *Id.* at 129–71; *Decision-Making Within the Unified Command* 12 (Nat'l Comm. on the BP Deepwater Horizon Oil Spill & Offshore Drilling, Staff Working Paper No. 2, 2010), *available at* http://www.washingtonpost.com/wp-srv/politics/documents/WorkingPaperUnifiedCommandForRelease.pdf.

18. NAT'L COMM. REPORT, *supra* note 15, at 140–213. *Accord* Christopher M. Reddy et al., *Composition and Fate of Gas and Oil Released to the Water Column During the Deepwater Horizon Oil Spill*, PROC. NAT'L ACAD. SCI. (EARLY EDITION), July 18, 2011, *available at* http://www.pnas.org/content/early/2011/07/15/1101242108.full.pdf+html?with-ds=yes; Stanley D. Rice, *Persistence, Toxicity, and Long-Term Environmental Impact of the* Exxon Valdez *Oil Spill*, 7 U. ST. THOMAS L.J. 55, 59–67 (2009); Press Release, Nat'l Sci. Found., Chemical Make-up of Gulf of Mexico Plume Determined (July 18, 2011), *available at* http://www.nsf.gov/news/news_summ.jsp?cntn_id=120962&WT.mc_id=USNSF_51&WT.mc_ev=click.

19. For a more in-depth discussion of these issues, see Osofsky & Wiseman, *Hybrid Energy Governance*, *supra* note 7; Hannah J. Wiseman, *Remedying Regulatory Diseconomies of Scale*, 94 B.U. L. REV. 237 (2014).

often struggle with determining when it is appropriate to require an emerging technology. For example, as noted in the introduction, the EPA has had to decide whether carbon capture and sequestration (CCS) technology is well enough developed in an affordable form to require coal-fired power plants to use it. Its choice to include partial CCS—which reflects the confluence of the current state of technology with economic realities—is tech-technology forcing, but will not control emissions as well as more complete CCS might have. With either form, the newness of the technology means that questions remain about how effective it will be in the long term and what risks it carries.[20]

For some technologies, hard choices exist about whether the risk of using it is worse than the risk of not using it. Debates over attempting geoengineering to reverse climate change or its impacts represent a prime example of such a dilemma.[21] As it becomes increasingly apparent that we will not mitigate adequately to prevent significant impacts from climate change, scientists and the public have begun to take more seriously not only the need for adaptation, but also whether the problem could be solved technologically. However, major uncertainties exist about whether the leading strategies to reverse climate change will work, with some scientists claiming that they can only be truly tested through full implementation.[22] Some techniques also raise major intergenerational justice questions. For instance, solar radiation management, the leading technique of which involves injecting particles into the atmosphere, only treats the warming of the atmosphere and not the concentrations of greenhouse gases. If the practice were started without accompanying mitigation, even more rapid climate change would occur if it were stopped, tying future generations to this choice.[23]

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20. For a discussion of these issues as well as property rights concerns, see Alexandra B. Klass & Elizabeth J. Wilson, *Climate Change, Carbon Sequestration, and Property Rights*, 2010 U. ILL. L. REV. 363; Alexandra B. Klass & Elizabeth J. Wilson, *Carbon Capture and Sequestration: Identifying and Managing Risks*, 8 ISSUES IN LEGAL SCHOLARSHIP, no. 3, art. 1, 2009.

21. For example, the Co-Chairs of Working Groups I, II, and III of the Intergovernmental Panel on Climate Change (IPCC) indicated in their proposal for an IPCC expert meeting that "geoengineering itself may constitute 'dangerous anthropogenic interference with the climate system' " under Article 2 of the United Nations Framework Convention on Climate Change. Intergovernmental Panel on Climate Change [IPCC], *The IPCC Fifth Assessment Report (AR5): Proposal for an IPCC Expert Meeting on Geoengineering*, at 1, IPCC Doc. IPCC-XXXII/Doc.5, (Oct. 11–14, 2010). *See also* Hari M. Osofsky, *Technology Transfer and Climate Change*, *in* SUSTAINABLE TECHNOLOGY TRANSFER: A GUIDE TO GLOBAL AID & TRADE DEVELOPMENT 177 (2011).

22. Alan Robock et al., *A Test for Geoengineering?*, 327 SCIENCE 530 (2010).

23. William C.G. Burns, *Climate Geoengineering: Solar Radiation Management and its Implications for Intergenerational Equity*, 4 STAN. J.L. SCI. & POL'Y 37, 47–48 (2011), *available*

Finally, as noted at the start of this Part, while the challenges of rapidly evolving technology are difficult, their interconnection with governance concerns make them even harder. Strategies for responding to scientific and technological uncertainty and change will interact with simultaneous overlap and fragmentation in the regulatory system, the tension between inclusion of key stakeholders and efficient decisionmaking, and the unequal distribution of environmental and energy benefits and harms.

Moreover, there is no "one size fits all" way to address these concerns. Different formulations of uncertainties and of governance and justice problems take place across many issues that bridge the energy-environment divide. Even with respect to any one of these issues, the particular concerns at a specific point in time will vary based on geography and circumstances. For instance, deepwater drilling regulation is largely federalized and so an important governance challenge involves bringing together multiple federal agencies with other key stakeholders, like state and local governments, corporations, and community groups. In the aftermath of the BP Deepwater Horizon oil spill, significant justice concerns arose in numerous specific contexts, such as the disproportionate disposal of waste near low-income communities of color.[24] Hydraulic fracturing, on the other hand, struggles with the piecemeal quality of state-by-state regulation and of local bans on the practice within states that allow it. Particular communities also often have safety and justice concerns related to the way in which drilling is operationalized in that place within its geographical and geological contours.[25]

However, even with the need to consider nuanced specifics, this essay argues that there are some principles for navigating these value dilemmas that can help with the many different issues arising in energy transition. The next Part explores these principles and their possibilities.

III. NAVIGATING VALUES IN MULTIPLE DIMENSIONS

This Part concludes the essay by proposing principles for crafting innovative institutional structures that can help key stakeholders navigate these hard governance and value problems better at the intersection of energy, environment, and health. In so doing, it draws from my prior work on the BP Deepwater Horizon oil spill and my collaborative work on energy feder-

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at http://www.stanford.edu/group/sjlsp/cgi-bin/orange_web/users_images/pdfs/61_Burns%20 Final.pdf.

24. *See generally* Osofsky, *supra* note 6 (describing the aftermath of the Deepwater Horizon oil spill).

25. Osofsky & Wiseman, *Hybrid Energy Governance*, *supra* note 7.

alism and governance with Hannah Wiseman.[26] These principles do not eliminate the underlying complexity of the problems, but they provide pathways for managing it better.

First, hybrid structures may help to bring together the various overlapping formal and informal regulatory vehicles and numerous public and private stakeholders. By hybrid structures, I mean those that combine multiple institutions or actors, often across levels of governance and the public/private divide. For example, in the context of oil spills, the Regional Citizens Advisory Councils (RCACs) created in Alaska following the Exxon Valdez spill allow many governmental and nongovernmental stakeholders to provide input into spill prevention.[27] These types of structures exist in many contexts relevant to the environment-energy intersection, and Hannah Wiseman and I have argued that they seem to make some difference in allowing for progress in energy transition.[28]

Hybridity is a potentially effective strategy for addressing the challenges described in Part II because it helps bridge fragmented authority and bring key actors to the table. In so doing, such structures can help make sure that private scientific and technical knowledge infuses public decisionmaking processes and includes voices from disproportionately impacted communities. While combining public and private actors must be done carefully to prevent regulatory capture—in which private interested parties inappropriately influence public decisions—it can help to bridge some of the divides discussed in the prior parts.[29]

Second, such structures need to allow key actors at each level of governance and across levels to interact meaningfully and effectively. As described above, in the context of the BP Deepwater Horizon oil spill and so many of the other issues at the energy-environment interface, important regulatory authority is divided among local, state, national, and international levels. In addition, at each of these levels, many different entities often have partial authority. This fragmentation not only creates problems of incomplete, overlapping ability to regulate, but can exacerbate justice prob-

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26. Osofsky, *supra* note 6; Osofsky & Wiseman, *Dynamic Energy Federalism*, *supra* note 7; Osofsky & Wiseman, *Hybrid Energy Governance*, *supra* note 7.

27. For an in-depth description of these Regional Citizens Advisory Councils, see George J. Busenberg, Regional Citizens' Advisory Councils and Collaborative Environmental Management in the Marine Oil Trade of Alaska (Sept. 1, 2005) (unpublished manuscript), *available at* http://www.allacademic.com/meta/p41678_index.html (analyzing the two advisory councils' contributions); *What We Do*, COOK INLET REGIONAL CITIZENS ADVISORY COUNCIL, http://www.circac.org/what-we-do/ (last visited Mar. 21, 2014); *About Us*, PRINCE WILLIAM SOUND REGIONAL CITIZENS' ADVISORY COUNCIL, http://www.pwsrcac.org/about/ (last visited Mar. 21, 2014).

28. Osofsky & Wiseman, *Hybrid Energy Governance*, *supra* note 7.

29. *See id.*

lems. Even if individual agencies work hard to comport with environmental justice mandates, multi-agency groupings may do so less effectively.[30]

Hybrid structures that bridge these levels of authority may help to accomplish these goals. By bringing together relevant entities at each level with key nongovernmental and corporate stakeholders, they can help to ensure that regulatory authority gets coordinated or, at the very least, can provide a space in which conflict might be addressed. Hannah Wiseman's and my work on energy transition suggests that the regional level often serves as a helpful space for creating these bridges between smaller and larger governmental entities.[31]

Finally, these hybrid multiscalar structures need to be systematically aware of and responsive to change. Scientific understanding and technology is moving quickly with respect to sources of energy and other aspects of the energy system. As the BP Deepwater Horizon oil spill and the debates over how to regulate hydraulic fracturing indicate, our prescriptive regulatory structures often struggle to evolve quickly enough. Moreover, throughout the regulatory system, key people may face challenges regarding whether they have or how they should obtain adequate expertise to make assessments. For example, in the context of climate change, judges have grappled with whether they can assess the science.[32]

Hybrid structures can assist with this responsiveness through their inclusion of diverse stakeholders across levels. For example, Professor George Busenberg's study of RCACs concludes that "the councils have operated as institutional learning arrangements (by promoting the application of new ideas and information to policy decisions in this system)" and collaborating with other key institutions.[33] In our broader work on energy transition, Hannah Wiseman and I have found a pattern across these kinds of institutions in their innovative and often constructive efforts to respond to evolving needs.

In the final analysis, the confluence of energy and environment is rife with hard choices, particularly if we are realistic about energy demand and the entrenchment of fossil fuels. The rapid development of both hydraulic fracturing and deepwater drilling will likely continue. The EPA faces ongoing challenges in its efforts to require power plants to reduce greenhouse gas emissions, including its proposal to require coal-fired power plants to

30. Osofsky, *supra* note 6 at 1110–15; Hari M. Osofsky, Kate Baxter-Kauf, Bradley Hammer, Ann Mailander, Brett Mares, Amy Pikovsky, Andrew Whitney & Laura Wilson, *Environmental Justice and the BP Deepwater Horizon Oil Spill*, 20 N.Y.U. ENVTL. L.J. 99, 106 (2012).

31. *See* Osofsky & Wiseman, *Hybrid Energy Governance*, *supra* note 7.

32. For example, in *American Electric Power Co. v. Connecticut*, the Supreme Court explains that "[f]ederal judges lack the scientific, economic, and technological resources an agency can utilize in coping with issues of this order." 131 S. Ct. 2527, 2539–40 (2011).

33. Busenberg, *supra* note 27, at 18–19.

use partial CCS. Experts continue to debate the repercussions of the Three Gorges Dam and hydropower more broadly, as new technology increasingly allows the pairing of hydropower with hydrokinetic projects. For example, in 2009, the first federally licensed hydrokinetic project, using flow from the output channel from a dam, began operating commercially in my state of Minnesota.[34]

However, a principled approach to the governance and value challenges at the confluence of environment and energy is critical as our system continues to transition. Institutions that model hybridity, multiscalar inclusion, and regulatory responsiveness can help to overcome governance challenges and frame value dilemmas appropriately. More development and assessment of such institutions is needed for the hard choices ahead.

34. *See* U.S. Dep't of Energy, *First U.S. Hydrokinetic Project Begins Commercial Operations*, EERE NEWS, Aug. 26, 2009, http://apps1.eere.energy.gov/news/news_detail.cfm/news_id=14859.