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BIG TALK AND LITTLE ACTION ON RENEWABLE ENERGY

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ABSTRACT

The United States has been in pursuit of a conflicting objective—pursuing an "all of the above" energy policy while trying to reduce emissions that drive climate change. As the United States pursues climate mitigation objectives, renewable energy must be built out in every region of the country. This article explores the tension between renewable energy development and its visible conflicts with land and wildlife conservation and environmental protection goals. While it is certain that climate change will bring devastating harms to the planet, the adoption of an aggressive renewable energy build-out will also have environmental impacts. Managing these impacts is an important component of a sustainable energy strategy.

I. INTRODUCTION

In 2015 the Kratovil Conference at The John Marshall Law School convened a group of scholars and practitioners to discuss hydraulic fracturing, climate change, renewable energy and their relation to real estate issues. As discussed more fully in this paper, I contend that continued discussion of natural gas, and "fracking"[1]

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1. *See* D. Barcelo, J. P. Bennett, *Human Health and Environmental Risks of Unconventional Shale Gas Hydrofracking*, 544 SCIENCE OF THE TOTAL ENVIRONMENT, 1139–40 (2016) (explaining hydrofracking and gathering

in particular as a bridge to a decarbonized future, is misguided because it unduly prolongs the transition from fossil fuels. The metaphoric bridge has the potential to be a long highway, which we invest in despite the reality that it does not take us to our desired destination. And while a measure of short-term sacrifice is experienced as new renewable energy projects bring associated environmental impacts, the tradeoffs for cleaner air, water, soil, and climate mitigation will not materialize if the United States continues significant reliance on fossil fuels.

The U.S. has made minimal progress expanding use of renewable energy despite vocal national and state leadership supporting it. Transition to a clean, renewable energy system must occur much more quickly than has occurred thus far to reach climate mitigation targets. Renewable energy sources, such as solar, wind, hydropower, and geothermal, do not emit greenhouse gases (GHGs), which are responsible for climate change. The most recent international agreement (the Paris Agreement) to mitigate climate emissions emerged from the 2015 Paris Climate Conference, the twenty-first Conference of the Parties (COP 21) to the United Nations Framework on Climate Change. Over 190 nations, including the U.S., have committed to individually reducing GHG emissions through nationally determined contributions with the goal of limiting global warming to under 2 degrees Celsius above preindustrial levels and targeting of 1.5 degrees Celsius above preindustrial levels.[2] Internationally, the power sector represents two-thirds of the world's GHG emissions.[3] The energy sector represents over one-third of the GHG emissions in the U.S., creating a need for continued buildup of renewables in all regions to meet climate mitigation goals. The transition therefore could have significant influence on land use, both public and private.

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articles on health and environmental impacts in a virtual special issue).

The term "fracking" refers to hydraulic fracturing. Hydraulic fracturing is used to extract unconventional oil and gas deposits. A mixture of fracking fluid, generally water, chemicals and sand, is injected at a high pressure deep underground to fracture rocks such as shale and tight sand to release oil and gas deposits. *Id.*

2. Parties to the United Nations Framework Convention on Climate Change met November 30–December 11, and the talks culminated in an agreement on various actions to mitigate and adapt to climate change. Adoption of the Paris Agreement: Proposal by President, FCCC/CP/2015/L.9, http://unfccc.int/resource/docs/2015/cop21/eng/l09.pdf. Although previous discussion identified a target of limiting warming to 2 degrees Celsius, research has demonstrated catastrophic impacts at that level, necessitating the lower target.

3. *See* International Energy Organization, Energy and Climate Change, World Energy Outlook Special Report, Executive Summary 1 (2015) (noting that energy will be the core of COP 21 discussions because energy production and use constitute two-thirds of the world's GHG emissions).

This paper highlights two related challenges in the transition to expanding renewable energy as a source of electricity. One is the myth that renewables are not up to meet existing and growing energy demands. Another is that renewables have a benefit for climate change mitigation, but have a host of other environmental impacts when they are actually built on public and private lands that have created resistance to their expansion and conflicts with bedrock environmental laws.

II. BIG TALK, LITTLE ACTION ON RENEWABLE ENERGY DEVELOPMENT FOR CLIMATE MITIGATION

The past decade has been a mixed bag for renewable energy development, and, even more broadly, for environmental issues. In the U.S. the federal government has failed to adopt a comprehensive climate strategy. Instead piecemeal policies, including federal tax credits, incentives, research funding, and administrative policies, have provided some support for increasing renewable energy development. State leadership and adoption of renewable portfolio standards (RPSs) have been powerful drivers of change. This section first discusses some of the important actions taken by the presidential administration of Barack Obama to address climate change mitigation and support expansion of renewable energy. Next, I examine some of the conflicting policies of the administration including pursuit of an "all of the above" energy strategy.[4] This approach has complicated the daunting task of switching to renewables. Third, this section highlights trends in international and national renewable energy production and use.

A. Congressional Resistance, Administrative Innovation

Although Congress has not addressed climate change with comprehensive legislation, actions at the federal level have made progress in reducing GHG emissions from the transportation, building and electricity sectors. President Barack Obama has highlighted his administration's commitment to tackling climate change, and he has linked the mission to environmental justice.[5]

4. Executive Office of the President, The All-of-the-Above Energy Strategy as a Path to Sustainable Economic Growth 4 (May 2014). The President's "all of the above" strategy embraced natural gas as a transitional fuel, while also supporting renewable energy, nuclear energy and zero-carbon technology advancements. More broadly, its three main components are "to support economic growth and job creation, to enhance energy security, and to deploy low-carbon technologies and lay the foundation for a clean energy future." *Id*. at 5.

5. *See, e.g.*, U.S. Envtl. Prot. Agency, Plan EJ 2014 (Sept. 2011). One tenet

His administration has accomplished much in the face of resistance by prominent members of Congress who deny the existence of climate change, and opponents who have challenged his policies in the courts.[6]

First, the administration was successful in improving automobile mileage standards impacting emissions from the transportation sector.[7] The administration boasts that its fuel efficiency standards for cars and trucks are the first meaningful update in three decades.[8] The U.S. has lagged behind other countries in adopting aggressive fuel mileage standards.[9] Automobiles in U.S. will reach an impressive 54.5 miles per gallon average by 2025.[10] Efforts to reach this milestone required technological innovation and changes in production.[11]

Second, energy conservation goals are also an important component of future climate mitigation efforts. Energy efficiency advocates note that the largest new source of energy is energy efficiency. The International Energy Agency (IEA) strongly promotes energy efficiency, calling it a "hidden fuel" that is literally in plain sight.[12] Leading by example, President Obama signed an

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of the administration's environmental justice agenda has been to address climate change and recognize its multiplier effect on members of communities that are already facing an undue burden of environmental degradation. *Id*.

6. *See* Alan Neuhauser, *Obama's Climate Authority Came Straight From Congress,* U.S. NEWS & WORLD REP. (Apr. 10, 2015), www.usnews.com/news/articles/2015/04/10/obama-not-sidestepping-congress-on-climate-action-experts-say (discussing debates among legal scholars on the president's use of existing statutory authorities to address climate change and Clean Air Act litigation).

7. 75 Fed. Reg. 25324-01, Light-Duty Vehicle Greenhouse Gas Emission Standards and Corporate Average Fuel Economy Standards; Final Rule (May 7, 2010); 77 Fed. Reg. 62624-01, 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, Final Rule (Oct. 15, 2012).

8. The Obama Administration Record in Focus, Obama Administration Record on All-Of-The-Above Energy Strategy (2012), www.whitehouse.gov/sites/default/files/docs/clean_energy_ record_0.pdf.

9. *See* Brad Plummer, *Even With Strict New Rules, U.S. Still Lags on Fuel Economy*, WASH. POST (Sept. 12, 2012), www.washingtonpost.com/news/wonk/wp/2012/09/12/even-with-stricter-new-rules-u-s-still-lags-in-fuel-economy/ (noting superior fuel economy standards in Japan and the European Union).

10. 77 Fed. Reg. 62624-01, 2017 and Later Model Year Light-Duty Vehicle Greenhouse Gas Emissions and Corporate Average Fuel Economy Standards, Final Rule (Oct. 15, 2012).

11. *See* Mark Fischetti, *Can U.S. Cars Meet the New 54 mpg CAFÉ Standards? Yes They Can,* SCI. AM. (Nov. 16, 2011), http://blogs.scientificamerican.com/observations/can-cars-meet-the-new-54-mpg-cafe-standards-yes-they-can/ (noting that much of the technology necessary has been sitting on shelves for years).

12. *See Visualising the "Hidden" Fuel of Energy Efficiency*, JOURNAL OF THE INTERNATIONAL ENERGY AGENCY, Issue 4 (Spring 2013). *See also* Jyotsna Ravishankar, *Largest Source of Energy Not Coal, Not Oil, Not Renewable, Not Natural Gas, Not Nuclear . . .* , CLEANTECHNICA (Apr. 1, 2014), http://cleantechnica.com/2014/04/01/energy-efficiency-largest-source-energy/ (quoting IEA director, Mira van der Hoeven, from her presentation at the World Energy

executive order that relies on a combination of efficiency and improved environmental performance to potentially reduce GHG from the federal government by 40% between 2015 and 2025.[13] The order directs federal agencies to reduce energy use in buildings by 2.5% per year between 2015 and 2025.[14] The new federal sustainability plan requires federal agencies to cut their GHG emissions by 40% from 2008 levels by 2025.[15] The administration adopted a goal to increase the share of the electricity the federal government uses from renewable energy sources to 30% by directly calling on renewables.[16]

Third, an indirect benefit to climate change involves the rules the Environmental Protection Agency (EPA) adopted on mercury and toxic pollution from power plants (MATS) pursuant to its authority under the Clean Air Act (CAA).[17] The United States Supreme Court in *Michigan v. EPA* found that EPA should have considered costs when deciding that it was "appropriate and necessary" to regulate hazardous air pollutants from power plants.[18] The EPA has stated it will reissue the MATS rule complete with the required cost analysis by April 2016.[19] Despite the court's ruling, EPA notes that the industry has acted in anticipation of the new rule.[20] The rule impacts the use of coal as a fuel to power electric generation units given the levels of mercury and other hazardous air pollutants emitted by coal, and the cost of reducing that pollution puts additional pressure to move away from reliance on coal.

Fourth, the Clean Power Plan is the administration's most significant effort to address climate change through the CAA.[21] The plan directly addresses carbon dioxide emissions from electric generation units.[22] The structure of the plan empowers states to decide how to meet the new standards by establishing emission performance rates for two categories of fossil-fuel-fired electric generating units (EGUs) that reflect the "best system of emission

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Congress in Korea).

13. Exec. Order No. 13696 (Mar. 19, 2015).

14. *Id.*

15. *Id.*

16. *Id.*

17. 42 U.S.C. § 7412(n)(1)(A) (2012). The CAA empowers the EPA to regulate hazardous air pollution from power plants if it finds regulation "appropriate and necessary." *Id.*

18. Michigan v. Envtl. Prot. Agency, 135 S. Ct. 2699, 2711 (2015).

19. Respondent's Opposition to the Mot. of Tri-State Generation and Transmission Association Inc. for Suspension of Its Compliance Obligation, White Stallion Energy Center, LLC v. Envtl. Prot. Agency (D.C. Cir. Aug. 10, 2015) (No. 12-1100).

20. *Id.*

21. 80 Fed. Reg. 64662-01, Carbon Pollution Emission Guidelines for Existing Stationary Sources: Electric Utility Generating Units (Oct. 23, 2015).

22. 40 C.F.R. pt. 60.

reduction . . . adequately demonstrated," and also establishing state-specific rate-based and mass-based goals.[23] States with affected EGUs must create a plan to reduce carbon emissions impacted by the rule.[24] The EPA under the Obama administration should be credited with the initial important step of recognizing carbon emissions as harmful pursuant to the CAA. Previously, the EPA under the administration of President George W. Bush expressed doubt of its authority to regulate carbon emissions under the CAA, requiring litigation to resolve the issue.[25] Although litigation over the legality of the Clean Power Plan will take some time to resolve, it is undoubtedly a sign of a strong commitment by the current administration to addressing climate change.

Finally, despite its failure to pass climate change legislation, Congress did authorize funding of new technologies and tax relief related to production of wind and solar energy in the American Recovery and Reinvestment Act of 2009.[26] According to the White House, the administration had invested $80 billion in a clean energy economy, taking into consideration ARRA appropriations across all agencies, federal loans and tax incentives.[27] Recently Congress passed an extension of the production and investment tax credits for wind and solar projects.[28] The Consolidated Appropriations Act of 2016 extends the phase-out of credits for qualifying wind and solar projects.[29] This is predicted to help incentivize expansion of renewable energy production. The uncertainty related to the tax credit has been criticized for its impact in tempering growth and investment by the private sector.[30]

B. Administrative Leadership Takes a Winding Path

Despite the significant gains to be made from the administrative actions taken by the Obama administration, these accomplishments have to be put into context. The continued commitment to using "all of the above" as a means to achieve American energy independence is at odds with a movement from

23. *Id.*

24. *Id.*

25. *See* Massachusetts v. EPA, 127 S. Ct. 1438, 1450 (2007) (noting that EPA gave as one reason for denying rulemaking petition its view that the CAA does not authorize EPA to issue mandatory regulations on climate change).

26. 123 Stat. 115, §§ 1101–04 (renewable energy incentives) and § 1111 (increased limitation on new clean renewable energy bonds by $1.6 billion).

27. White House Memorandum, Progress Report: The Transformation to a Clean Energy Economy (Dec. 15, 2009), www.whitehouse.gov/sites/default/files/administration-official/vice_president_memo_on_clean_energy_economy.pdf (last visited Jan. 6, 2016).

28. Consolidated Appropriations Act of 2016, §§ 301–04 (signed Dec. 18, 2015).

29. *Id.*

30. REN21 Global Status Report at 28 (2015).

fossil fuel dependence to a clean, renewable energy powered U.S. At the same time as investments were made in conservation, renewable energy, and constraining coal as a fuel source, the administration continued U.S. reliance on fossil fuels. The contradiction has caught the attention of many advocates, urging the president to switch to a "best of the above" energy policy.[31]

The administration boasts that domestic oil and gas production has increased each year since President Obama took office.[32] The U.S. has long been in pursuit of energy independence, and the associated economic and national security benefits such independence could provide. During the increase in gas prices in 2008, advocates of domestic onshore and offshore oil and gas development promoted the "all of the above" approach to energy and the tagline that emerged was later embraced by the president.[33] The advances in horizontal drilling has made the process of hydraulic fracturing for oil and natural gas cost-feasible.[34] The U.S. has plentiful onshore supply of these reserves.[35] Hydraulic fracturing and the use of natural gas produces GHGs that contribute to climate

31. Laura Gardner, CQ ROLL CALL, Zichal, *Ritter urge Obama to shift to 'best of the above' energy policy*, Jan. 21, 2014 (2015 Congressional Quarterly Inc.). Allies of the president encouraged more focus on nonfossil fuel energy sources from the perspective of a carbon constrained future. *Id*. Lauren Gardner, CQ ROLL CALL, Obama presses forward with "sustainable" natural gas development, Jan. 29, 2014 (2015 Congressional Quarterly Inc.). *See* Center for the New Energy Economy, Colorado State University. *Powering Forward: Presidential and Executive Agency Action to Drive Clean Energy in America* 5 (2013). The Center's section on financing renewable energy recommended that the federal government develop methods to capture the full cost of energy choices including pollution and heath care, and to use those methods to help prioritize choices toward "best of the above" instead of "all of the above." *Id*.

32. *See* The Obama Administration Record in Focus, *supra* note 8.

33. Gardner, *supra* note 31.

34. U.S. EPA. Assessment of the Potential Impacts of Hydraulic Fracturing for Oil and Gas on Drinking Water Resources (External Review Draft). U.S. EPA, Washington, DC, EPA/600/R-15/047, 2015. The process of hydraulic fracturing typically involves the injection of a proprietary mix of fluids into the pore space underground to fracture rocks and release trapped pockets of natural gas or oil. Because the fluid used often contains chemicals that may be toxic to human health and the environment, concerns about the fluids reaching water sources used for drinking water are particularly acute. There have been few reported instances of contamination. EPA issued a report in 2015 of its assessment of potential impacts to quality and quantity of drinking water from hydraulic fracturing. Although still in draft stages, EPA concluded there had not been widespread contamination of water resources and noted few instances where contamination of drinking wells had occurred through the potential mechanisms of contamination identified in its report. *Id*.

35. Jude Clement, *The Amazing Rise in U.S. Proven Natural Gas Reserves and Use*, FORBES (June 2, 2015), www.forbes.com/sites/judeclemente/2015/06/02/the-amazing-rise-in-u-s-proven-natural-gas-reserves-and-use/#2e9f4931a417; U.S. Energy Information Administration, *U.S. Crude Oil and Natural Gas Proved Reserves*, 2014 (Nov. 2015) (noting record increase in proven reserve second consecutive year).

change and other environmental impacts. However, the switch away from coal to natural gas fired plants has reduced pollution and played a significant role in recent U.S. GHG emission reductions.[36] Natural gas has nearly half the GHG profile compared to traditional coal-fired generating facilities, although estimates vary depending on calculations from production to combustion. Therefore, it is a complex picture of pros and cons. Adoption of MATS and other regulatory actions focused on coal mining have led some to question whether the administration has declared a "war on coal," and it does appear the administration was keen to reduce pollution and GHG from coal use.[37] Yet the increased dependence on natural gas, while advancing a serious measure of mitigation, does not get us to the carbon reductions necessary to reach warming targets. Moreover, the associated air, soil, and water impacts of hydraulic fracturing have been the subject of legislative and regulatory actions as the practice booms in multiple parts of the U.S. In particular, EPA has begun to focus on methane emissions, also a powerful GHG, from oil and gas operations.[38] In sum, there is considerable debate over whether there is such a thing as sustainable natural gas development.[39]

The Union of Concerned Scientists has commented on this trajectory, raising the alarm of over-reliance on natural gas as a mitigation measure.[40] Relating directly to the bridge metaphor, the union recognized a potential role for natural gas in the near and

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36. Douglas Fischer, *Switch to Natural Gas Slashes Power Plant Pollution*, SCI. AM. (Jan. 9, 2014), www.scientificamerican.com/article/switch-to-natural-gas-slashes-power-plant-pollution/.

37. *See* Patrick Charles McGinley, Climate Change and the War on Coal: Exploring the Dark Side, 13 VERMONT J. ENVTL. L. 255 ,314 (2011) (explaining how the phrase "war on coal" was created as a public relations campaign by industry critical of enforcement of health, safety and environmental regulation related to coal mining). Professor McGinley urges an objective and informed consideration of future energy options including the negative impacts of coal. *Id*.

38. *See e.g.* The Center for the New Energy Economy, Colorado State University, Powering Forward: Presidential and Executive Agency Action to Drive Clean Energy in America 7 (2013) (recommending "zero tolerance for methane leaks" and cooperation between the federal government with states to develop a methane reduction strategy for the entire natural value gas chain). Methane regulation was a specific recommendation from advocates for more sustainable natural gas production. *Id*.

39. *See* John C. Dernbach, *Asking the Right Questions About the Future of Shale Gas*, 49 J. MARSHALL L. REV. 377 (2015). Lauren Gardner, CQ ROLL CALL, *Obama presses forward with "sustainable" natural gas development*, Jan. 29, 2014 (2015 Congressional Quarterly Inc.). For a counter-point arguing for the role of shale gas to provide domestic energy security and reduce environmental impacts *see* Monika Ehrman, *The Next Great Compromise: A Comprehensive Response to Opposition Against Shale Gas Development Using Hydraulic Fracturing in the United States*, 46 TEX. TECH. L. REV. 423 (2014).

40. Union of Concerned Scientists, *The Climate Risks of an Overreliance on Natural Gas for Electricity*, UCSUS (2013), www.ucsusa.org/climate-risks-overreliance-natural-gas-electricity-2013#.VsROOXI3NMs.

intermediate future, but the danger of replacing coal with natural gas results in an electric power sector that still generates too much GHG to stay below dangerous warming levels. Scholars have also noted the potential for the role of natural gas in this time of transition to ratchet down emissions quickly and in the future to smooth out variable sources such as wind and solar.[41] At the same time, many call for increased scrutiny of hydraulic fracturing practices to ensure they are appropriately regulated particularly for their impact on water supply and quality.[42]

Consistent with increased domestic fossil fuel production, a related controversial policy of the administration has been to encourage offshore drilling in the Arctic and in the Atlantic. Any offshore drilling would continue reliance on fossil fuels, but Arctic exploration and production endangers a particularly sensitive environment. Shell Oil announced it would end exploration drilling in the Arctic Chuckchi and Beaufort seas.[43] The Bureau of Safety and Environmental Enforcement denied Shell's request for a lease suspension.[44] The administration also proposed opening up controversial areas along the Atlantic coast.[45] Although offshore drilling has always been a regional conflict, with some states favorable to development and others in opposition,[46] the additional context within the climate change debate and melting Arctic is poignant. Climate change has opened up the potential for expanded Arctic oil and gas exploration. The optics are particularly bad, as the evidence of dramatic warming impacts are already harming the Arctic region and its inhabitants. Nonetheless, particularly for Alaskans, the criticism of regulatory complexity and uncertainty is a hindrance to companies exploring the region understood to contain rich deposits of fossil fuels.[47]

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41. *See* Ehrman, *supra* note 39, at 455 (noting the capacity of shale gas to serve as an immediate replacement for coal).

42. *See id*. at 435–52 (examining opposition to shale development based on impacts to water resources).

43. Pam Radke Russell, *Shell Appeals Decision to end Arctic Leases*, CQ ROLL CALL (Dec. 16, 2015).

44. *Id*.

45. *See* Bureau of Ocean Energy Management, 2017–2022 OCS Oil and Gas Leasing Draft Proposed Program (Jan. 2015) at S-9 (including option for a lease sale in Mid-Atlantic and South Atlantic planning areas in 2021, noting for survey activities and that the governors of Virginia, North Carolina, and South Carolina requested that these areas be included to better understand oil and gas potential).

46. *Id*. at S-10. Notably, the new Draft Proposed Program continues the approach to exclude the Pacific Region based on the opposition to oil and gas development by leaders particularly expressed in the West Coast Governors' Agreement on Ocean Health. *Id*.

47. Daniel Bloom, Alaskans: Regulations forced Shell's withdrawal, CQ ROLL CALL (Sept. 28, 2015) 2015 WL 5672287.

Finally, another controversial project during this time has been the Keystone XL pipeline. TransCanada Keystone Pipeline LP applied for a presidential permit from the State Department in 2008.[48] This proposed pipeline would have the capacity to bring crude oil from Canada south to Oklahoma and southeastern Texas for processing.[49] Opponents argued that the pipeline would contribute to climate change by facilitating processing of fossil fuels, and that Canadian oil sands, which would be transported, had a comparably higher GHG profile than other crudes.[50] After a lengthy State Department review, the administration of President Obama rejected the pipeline. President Obama early on contended that if the project had a climate change impact he would reject the project. Opponents argued ideologically for the Canadian oil to remain in the ground. Of the various fossil fuel reserves in the world, some will need to remain intact to avoid the worst impacts of climate change. It is difficult for the U.S. to have an impact on Canada's decision to develop its reserves of oil, a global commodity, based on this pipeline. The environmental impact statement concluded that "the proposed project is not likely to impact the amount of crude oil produced from the oil sands."[51]

Thus, the path toward a clean, renewable energy future has been somewhat winding in the past decade. Although the U.S. has made notable advancements to reduce fossil fuel consumption, the nation's policies have not taken our foot, or our investments, off the gas. The rhetoric has been strongly in support of moving to a clean energy future, but the actions have been contradictory.

C. Renewable Energy Trends

Internationally, countries have of late invested significantly in renewable energy development. The National Renewable Energy Laboratory (NREL), a laboratory of the U.S. Department of Energy, estimates that investment in clean energy reached $40.8 billion in 2014.[52] Yet renewable energy sources still represent a small fraction of the energy consumed throughout the world compared to traditional sources. The next section will discuss some trends in overall energy consumption and electricity generation.

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48. United States Department of State, Bureau of Oceans and International Environmental and Scientific Affairs, Keystone XL Project, Final Environmental Impact Statement Executive Summary, ES-1 (Aug. 26, 2011).

49. *Id*.

50. *Climate Impacts of the Keystone XL Tar Sands Pipeline*, NATURAL RESOURCES DEFENSE COUNCIL 2 (Oct. 2013), www.nrdc.org/energy/keystone-pipeline/files/tar-sands-climate-impacts-IB.pdf.

51. *Id*. at ES-15. The EIS also concluded that oil sands crude is on average higher in GHG intensity than crude it would replace in the U.S. *Id.*

52. 2014 Renewable Energy Data Book, U.S. Department of Energy, Energy Efficiency & Renewable Energy 108 (Nov. 2015).

1. Energy Consumption

In 2014 the U.S. Energy Information Administration (EIA) estimated that about 11% of world marketed energy consumption is from renewable energy sources including biofuels, biomass, geothermal, hydropower, solar, and wind.[53] EIA projected that figure would only reach 15% by 2040.[54] For 2014, renewable energy sources accounted for approximately 10% of U.S. energy consumption.[55]

2. Electricity Generation

EIA estimates that about 21% of world electricity generation was from renewable energy in 2011, with a projection for nearly 25% in 2040."[56] According to the NREL 2013 data book "[r]enewable sources accounted for 23% of all electricity generation worldwide (5,095 TWh) in 2013." Gains in renewable electricity generation in the U.S. and China, which are among the largest consumers of energy, demonstrate an interest but insufficient commitment to transition. According to the NREL 2013 data book, China led in cumulative total renewable electricity installed capacity, as well as cumulative wind and hydropower. Germany led in the world for cumulative solar photovoltaic. The U.S. led in geothermal and biomass installed capacity.

Annually renewables provide about 13% of U.S. electricity generation. Bright spots in the U.S. include California, which had the most installed renewable electricity capacity with approximately 28 GW in 2014.[57] California has added more solar energy capacity than any other state.[58] Washington State had the highest per capita capacity, and is second in the nation at nearly 25 GW.[59] Third is Texas, at approximately 16 GW installed renewable electricity capacity.[60] Texas surpasses all other states in installed wind capacity, adding 1.8 GW in 2014, with a cumulative of 14 GW installed wind capacity.[61]

Actions in the European Union have been more aggressive. The EU Commission has set a goal for 20% renewables by 2020. The EU also has some examples of aggressive goal setting such as Denmark,

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53. U.S. EIA frequently asked questions (last updated Dec. 2014.).

54. *Id.*

55. U.S. EIA, Monthly Energy Review, Table 1.3 and 10.1 (Mar. 2015), preliminary data.

56. U.S. EIA frequently asked questions, *supra* note 53.

57. 2014 Renewable Energy Data Book, U.S. Department of Energy, Energy Efficiency & Renewable Energy 30 (Nov. 2015).

58. *Id.*

59. *Id.*

60. *Id.*

61. *Id.*

which has targeted 100% renewables in energy and transportation sector by 2050, as well as aggressive target setting by Sweden, UK, Scotland, and Germany. The overall aggressive goal-setting by the EU Commission helps to illustrate what might be possible if the U.S. were to take a similar approach.

A new record in Germany made headlines when 78% of electricity was provided by renewable energy sources on one day.[62] The country's progress had previously made news when Bloomberg reported that 27% of German electricity demand was met by renewable sources such as solar and wind, supported by favorable weather.[63] Germany has set a goal to achieve 80% renewables by 2050.[64] It is an industrialized nation with a strong manufacturing and industrial sector, and these records provide strong evidence that modern electricity systems can manage the transition.[65]

While these trends are not as promising as one might hope, it is important to recognize that this progress has occurred without aggressive policy drivers we may yet employ such as a national RPS or the elimination of subsidies for fossil fuels. Existing incentives, state policies and local actions coupled with improvements in technology have made renewable energy projects cost competitive and allowed penetration of the marketplace. The relatively small increase has to be ramped up significantly to decarbonize U.S. energy production and electricity consumption.

III. TWO RELATED CHALLENGES FOR RENEWABLES

Expanding the use of renewable energy in the U.S. faces a number of obstacles—not all of which are technology or infrastructure related. A broader discussion of the various challenges of renewable energy deployment, of which there are many, is beyond the scope of this article. There is a rich body of scholarship evaluating marketplace barriers to expanded renewable deployment, [66] non-marketplace land-use challenges, the need for a "smart grid" to integrate variable power sources,

62. Emily J. Gertz, *Germany Breaks Renewable Energy Record,* ECOWATCH, (July 30, 2015), http://ecowatch.com/2015/07/30/germany-breaks-renewable-energy-record/.

63. Stephan Nicola, *Renewables Meet Record 27 Percent of German Electricity Demand*, BLOOMBERG (May 9, 2014), www.bloomberg.com/news/articles/2014-05-09/renewables-meet-record-27-percent-of-german-electricity-demand.

64. *Id*.

65. *See* Kiley Kroh, *Germany Sets New Record, Generating 74 Percent Of Power Needs From Renewable Energy* THINK PROGRESS (May 13, 2014), http://thinkprogress.org/climate/2014/05/13/3436923/germany-energy-records/ (quoting renewable energy consultant Bernard Chabot).

66. *See* Felix Mormann, *Requirements for a Renewables Revolution*, 38 ECOLOGY L. Q. 903, 919–25 (2011) (considering fossil fuel subsidies, lack of market differentiation, and grid connection barriers).

necessary transmission infrastructure upgrades,[67] and the political challenges to implementing actions that might speed transition to renewables over traditional energy sources such as a national renewable energy portfolio or a carbon tax.[68] This paper focuses more narrowly on two related aspects of the transition challenge that must be addressed to ensure a sustainable pathway to a renewable energy future.

A. Filling the Void Left by Fossil Fuels in Electricity Generation

Survey data illustrate that the public supports the expanded use of renewable energy, especially wind and solar power.[69] However, policymakers and prominent outlets have promoted skepticism that renewable energy sources will be able to supply electricity if the U.S. curtails use of fossil fuels.[70] Although some critics have emphasized the relatively higher cost for a system supported primarily by renewable energy sources (an argument that is quickly being disproven), others simply contend that the intensity of energy demands cannot be met without continued

67. Joel B. Eisen, Distributed Energy Resources, *"Virtual Power Plants," and the Smart Grid*, 7 ENVT'L & ENERGY L. & POL'Y J. 191 (2012) (discussing use of more distributed sources of energy and how this will impact infrastructure needs).

68. *See* Lincoln L. Davies, *Power Forward: The Argument for a National RPS*, 42 CONN. L. REV. 1339 (2010) (contending that the debate over a national RPS has lost its way and using empirical assessment of state RPS policies to support myriad rationales for a national standard). It is hard to refute the role of politics in thwarting potentially beneficial policies based on the evidence that the complexity of the state patchwork approach creates regulatory uncertainty, geographic barriers to trade, and overall inadequate progress on achieving intended goals and obvious potential for spurring development of renewable energy technology and deployment. Prof. Davies argues that national RPS may "better deliver the environmental, security and economic benefits that RPSs potentially offer." *Id*. at 1375. *See also* David B. Spence, *The Political Barriers to a National RPS*, 42 CONN. L. REV. 1451 (2010) (arguing that benefits primarily accruing to future generations and disparity in cost impacts have a serious impact on the implementation and political acceptability of a national RPS).

69. *See* Stanford University, Global Warning and Clean Energy National Poll, www.rff.org/files/sharepoint/Documents/Stanford-RFF-USAT-2013-TOPLINE.pdf (2013); *see also* NREL Consumer Attitudes About Renewable Energy: Trends and Regional Differences 6, 9 (Apr. 2011) (concluding that majority of consumers, 80%, care about renewable energy with a plurality citing environmental benefit over traditional sources as the primary benefit).

70. *See* Keith Johnson, *Six Myths About Renewable Energy*, WALL ST. J. (Sept. 22, 2013), www.wsj.com/articles/SB10001424127887324432404579052900100464562 (examining arguments that renewables supply an insignificant of U.S. energy demand, cannot replace fossil fuels, are too expensive, are doomed by variability, are inconsistent with natural gas development, and will provide millions of jobs).

reliance on the intensity-rich fossil fuels we have long depended on.[71] This creates an image problem for renewables, and hampers efforts at rapid transition.

The evidence supporting the feasibility of decarbonization has been available for over a decade. The widely-cited study by Princeton researcher Stephen Pacala, and Robert Socolow, *Stabilization Wedges*, emphasized how to reach a less-than doubling of pre-industrial carbon dioxide trajectory with existing technology in 2004.[72] Although not dictating a particular mix of energy resources, *Stabilization Wedges* identifies replacements including solar, wind and nuclear power. More recently, Armory Lovins and The Rocky Mountain Institute published a comprehensive blueprint, *Reinventing Fire,* which provides examples of a possible future with existing technology looking to distributed energy and sustainability more broadly.[73]

The U.S. government itself has produced evidence of the logistical viability of a decarbonized energy sector. The National Renewable Energy Laboratory (NREL), a laboratory of the U.S. Department of Energy, prepared an analysis of existing technologies and conditions in the U.S. for a future powered by renewables culminating in the *Renewable Electricity Futures Study*.[74] This study took into account geographic, temporal and electric system operational aspects to analyze potential renewable energy futures for the contiguous U.S. With these in mind, the study illustrated pathways with existing technologies to achieve 80% renewable energy in the U.S. by 2050.[75] Under most of the scenarios, approximately 50% would be derived from wind and solar power.[76] But another finding of the study is the existence of multiple options for a mix of energy supply as the clean energy transformation unfolds. The executive summary emphasizes that

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71. *See* Ehrman, *supra* note 39, at 435–52 (promoting shale gas as an immediate climate mitigation measure and noting the lack of available alternatives). Professor Ehrman, in response to the argument that fracking impacts the development of renewables states that ". . . at this time, there is no renewable energy infrastructure or technology sufficient to replace fossil fuel energy sources." *Id*. at 460.

72. *See* Stephen Pacala & Robert Socolow, *Stabilization Wedges: Solving the Climate Problem for the Next 50 years with Current Technologies*, 305 SCI. 968 (Aug. 13, 2004).

73. Amory B. Lovins and Rocky Mountain Institute, REINVENTING FIRE: BOLD BUSINESS SOLUTIONS FOR THE NEW ENERGY ERA (2011).

74. Renewable Electricity Futures Study (Entire Report). National Renewable Energy Laboratory. (2012). Renewable Electricity Futures Study. Hand, M. M.; Baldwin, S.; DeMeo, E.; Reilly, J. M.; Mai, T.; Arent, D.; Porro, G.; Meshek, M.; Sandor, D. eds. 4 vols., NREL/TP-6A20-52409. Golden, CO: National Renewable Energy Laboratory.

75. Renewable Electricity Futures Study: Executive Summary, National Renewable Energy Laboratory, Mai, T.; Sandor, D.; Wiser, R.; Schneider, T. NREL/TP-6A20-52409-ES. at 2 (2012).

76. *Id*.

"[t]he renewable energy resource base of the United States is both abundant and diverse. As a result, a central finding of the analysis is that there are many possible ways to achieve high renewable penetration levels."[77]

Most recently, research collaborators from Stanford University and University of California- Berkeley illustrated how a 100% renewable energy future could be achieved in the U.S. in 40 years.[78] The study authors modeled how, on a state-by-state basis, renewable resources with solar, wind, geothermal, hydroelectric and hydrokinetic energy sources could support a fully electrified U.S. (that is, including all sectors including electricity, transportation, heating and cooling, and industry).[79] The roadmaps created by the researchers did not include nuclear power, coal, natural gas, or biofuels.[80] Although also relying on energy efficiency measures, the scenarios are based on meeting predicted future demand with existing technology, and dispute arguments regarding the technological feasibility of a transition to a renewable energy economy.[81]

The findings of these various research groups do not detract for the high potential and necessity for technological innovation. There is still a significant need for research, development, and deployment to boost the capacity of alternative sources of energy to replace existing dependence on fossil fuels. Moreover, the public sector and private industry has committed to exploring technology improvements.

As previously mentioned, Congress has supported the development of renewable energy by providing subsidies and research funding in recent years during passage of the American Reinvestment and Recovery Act, as well as the recent Consolidated Appropriations Act of 2016. Government assistance such as this can help achieve breakthrough technology. For example, the U.S. through the Department of Energy funded marine renewable energy centers to develop new technologies in the Northwest (through University of Washington, Oregon State University, and University of Alaska Fairbanks collaboration), in Hawaii, and in the Southeast (Florida Atlantic University). These research centers focus on marine energy sources in that region, for example wave and tidal power in the Northwest and Hawaii, initially ocean currents and ocean thermal energy conversion in the Southeast, and ocean

77. *Id*. at 18.

78. Mark Z. Jacobson et al., *100% Clean and Renewable Wind, Water, and Sunlight (WWS) all-sector energy roadmaps for the 50 United States*, 8 ENERGY ENVIRON. SCI. 2093 (2015).

79. *Id*. at 2094.

80. *Id*.

81. *See id*. (noting that such roadmaps may be used to help reduce social and political barriers).

thermal energy conversion in Hawaii as well. These sources of energy are not currently commercially deployed but there is a great promise for the future and they could be the most benign form of energy generation we have discovered. A related development in connection with the Paris Climate Conference is public-private partnership focused on technological innovation to reduce the cost of renewable energy. Embracing the potential for a zero-carbon-emission and 100%-renewable-energy future, billion-dollar-investor Bill Gates spearheaded the Breakthrough Energy Coalition to support research into renewable technologies.[82]

To close out the consideration for replacing fossil fuels with renewable sources, it is useful to look at conservative projections for the rise in renewable energy deployment in the U.S. The most recent forecast of the EIA is quite favorable for the growth of renewable energy in the U.S. through 2040. The EIA Annual Energy Outlook 2015 predicts the potential for renewables to supply between 22%–51% of *new* electricity generation capacity in the next twenty-five years.[83] The EIA outlook assumes wind and solar energy will lead the growth.[84] The EIA outlook notes that "[s]tate and national policy requirements play an important role in the continuing growth of renewable generation."[85] However, given the rapidly shifting landscape, it is possible that new forms of energy generation will become commercially available, deployed in various regions of the U.S. and globally.

B. Filling the Void Sustainably

While there are myriad benefits of renewable energy sources over traditional fossil fuels, the urgency of transitioning to renewable energy comes from the climate change mitigation benefits of replacing fossil fuel use. Renewable energy development is less harmful than continued fossil fuel dependence by avoiding emissions of greenhouse gases and other co-pollutants. But such projects still have serious environmental impacts that require a thoughtful approach to new energy capacity installation. In the U.S., we have begun to question the transition's impacts on avian species, offshore vistas and desert landscapes in particular.

Renewable energy projects must conform to federal environmental laws designed to limit impacts on the environment, such as the National Environmental Policy Act (NEPA),[86] the

82. Jackie Wattles, *Bill Gates Launches Multi-Billion Dollar Clean Energy Fund*, CNN MONEY (Nov. 30, 2015). http://money.cnn.com/2015/11/29/news/economy/bill-gates-breakthrough-energy-coalition/.

83. U.S. EIA, Annual Energy Outlook 2015, DOE/EIA-0383(2015), 26 (Apr. 2015).

84. *Id.* at 25.

85. *Id.*

86. 42 U.S.C. § 4321 (2012).

Endangered Species Act,[87] Marine Mammal Protection Act,[88] and environmental provisions of the Federal Power Act among other environmentally protective statutes and regulations. Although renewable energy still provides a small measure of the overall supply of energy in the U.S., getting to above 10% has required installation of capacity over the objections of local communities and often environmental groups citing impacts to important natural and historic resources, aesthetic values and wildlife. One powerful example is the controversy over a programmatic long-term permit to take bald eagles, developed by the Federal Fish and Wildlife Service, to facilitate wind energy development.[89] Bird strikes are one of the main objections to wind development, and the national treasure of bald eagles brings the trade-offs into sharp relief.[90] Without a policy framework that integrates land-use, environmental, climate and energy concerns, the conflicts between environmental values and energy transition remain acute and tools for reconciliation sparse.[91] While it has been possible to demonstrate the capacity for renewables to fill the role currently played by reliance on fossil fuels, making the transition both swiftly and sustainably presents a separate challenge.

NREL's futures report highlighted that the U.S. has a diversity of renewable resources, but in order to reach a high level of generation capacity significant and sustained, build-out in all regions of the U.S. is necessary. The recent research paper providing a roadmap for 100% renewable energy from wind, water, and solar estimates about .42% of U.S. land area would be necessary for the transition, mostly for PV solar.[92] Large renewable energy development projects take up significant space, and (particularly when sited on undeveloped lands) destroy habitat, have impacts to wildlife, and impair aesthetics. Attention has now turned to fostering dialogue on how the renewable energy build-out can be

87. 16 U.S.C. §§ 1531–43 (2012).

88. 16 U.S.C. §§ 1361–407 (2012).

89. Eagle Permits; Changes in the Regulations Governing Eagle Permitting, 77 Fed. Reg. 22,267 (Apr. 13, 2012) (to be codified at 50 C.F.R. pts. 13, 22).

90. Dan Frosch, *A Struggle to Balance Wind Energy With Wildlife*, N.Y. TIMES, (Dec. 16, 2015), www.nytimes.com/2013/12/17/science/earth/a-struggle-to-balance-wind-energy-with-wildlife.html?_r=1.

91. *See* Victor B. Flatt and Heather Payne, *Not One Without the Other: The Challenge of Integrating U.S. Environment, Energy, Climate, and Economic Policy*, 44 ENVTL. L. 1079, 1104–05 (2014) (noting significant political divides when environmental protection and energy production goals conflict).

92. Jacobson, *supra* note 78, at 2097. This did not take into account decreases from current energy generation such as mining, transportation, and refining of fossil fuels or growing and transportation of biofuels. *Id*.

done in a way that minimizes sprawl,[93] and conforms to the values inherent in bedrock environmental laws.[94]

One means to deploy swiftly and sustainably has been for federal agencies to undertake broad project planning efforts. Planning efforts can assess the most sensitive areas to avoid, collect data on likely impacts, and promote the means for reducing and avoiding harms in particular locations. Landscape scale planning for large solar and wind energy projects on public lands has been a significant step forward.[95] Other examples include onshore federal lands planning for solar balanced with conservation in the desert[96], and offshore wind in state and federal waters.[97] In short, identifying places where development has less of an impact on cherished natural resources helps avoid the greatest harm from development, although it is no guarantee against community resistance or obstruction.[98]

Further, the admonition to reconsider the role of distributed energy, small scale roof-top solar and small wind systems both speak to the need for a redundant and diversified energy generation base, and the capacity to reduce the energy footprint harming wildlife and aesthetics.[99] In short, distributed energy could assist with sustainable transition by reducing the energy footprint. Battles are now brewing between traditional utilities and individual solar-systems tied into the grid. Utilities promoted policies that limit payments for excess generation over usage, and

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93. *See* Uma Outka, *The Renewable Energy Footprint*, 30 STAN. ENVTL. L. J. 241, 244 (2011) (noting interest in integrating land-use and energy law toward sustainability ends). Professor Outka observes that "[s]iting is the clearest point of intersection between energy and land use law—the context in which we can readily see energy policy made tangible on the land . . . ." *Id*.

94. Rachael E. Salcido, *Rationing Environmental Law in a Time of Climate Change*, 46 LOYOLA U. CHI. L. J. 617 (2015).

95. *See* U.S. Dep't of the Interior, Bureau of Land Mgmt., Record of Decision: The Implementation of a Wind Energy Development Program and Associated Land Use Plan Amendments 1-2 (2005).

96. U.S. Department of the Interior, Bureau of Land Management, Desert Renewable Energy Conservation Plan. The plan is a state-federal process involving California and federal officials in planning for over 22 million acres of California desert, www.blm.gov/ca/st/en/prog/energy/DRECP.html.

97. Press Release, U.S. Dep't of the Interior, *Salazar Launches "Smart from the Start" Initiative to Speed Offshore Wind Energy Development Off the Atlantic Coast* (Nov. 23, 2010); Commercial Leasing for Wind Power on the Outer Continental Shelf (OCS) Offshore Massachusetts – Request for Interest (RFI), 75 Fed. Reg. 82,055 (Dec. 29, 2010) (noting initiation of the program).

98. *See* John Copeland Nagle, *Green Harms of Green Projects*, 27 NOTRE DAME J. L. ETHICS & PUB. POL'Y 59, 103 (2013) (arguing that some locations should be off-limits regardless of the renewable energy capacity in that place). Professor John Copeland Nagle has noted that we have already identified special place such as National Parks and Wilderness Areas that, regardless of the benefits of renewable energy, should simply be off-limits to large-scale development. *Id*.

99. Eisen, *supra* note 67; Outka, *supra* note 93, at 241.

taxes to collect from all grid connections with the purported need to spread out the base of revenue generation for infrastructure maintenance and upgrades. A recent measure in California, where the deployment of solar has been significant, was defeated. In other places around the U.S. these measures threaten to reduce the incentive of individual homeowners to opt for solar systems. Net metering policies could have an impact on how swiftly we can incorporate distributed energy system benefits, and if it thwarts it, how sustainably we transition to renewables like solar.[100]

While federal agencies cannot go outside their statutory authorities, there have been some innovations to address the pace of development—not all welcome. For example, the Department of the Interior has tried to make federal projects less time consuming by designating renewable energy coordination offices, boosting the personnel available to process permits and ensuring adequate resources, and reducing inefficiencies through better coordination with other federal agencies.[101] Developers continue to lobby for other means of streamlining or fast-tracking permit applications. The Federal Energy Regulatory Commission (FERC), responsible for regulating energy produced from water, has tried to balance the swift and sustainable transition problem through legal experimentation.[102] Small-scale exemptions, such as for hydro-projects less than 5 MW in capacity, promote an expedited approach for projects where only minor environmental impacts are expected.[103] Alternatively, the creation of experimental permits for demonstrating the capacity of new technology such as hydrokinetic wave energy conversion devices promises developers less regulatory burden than the full-scale permit application process.[104] These approaches have all raised concern that serious environmental consequences are being overlooked or understudied and that the transparency that has come to be expected by the public is under-attack. Even with the most robust environmental impact assessment and public input processes, new information is often discovered only after a project is fully online.

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100. *See*, *e.g.*, Energy and Policy Institute, Attacks on Renewable Energy Standards and Net Metering Policies By Fossil Fuel Interests & Front Groups 2013–2014 (May 2014).

101. Order No. 3283, Enhancing Renewable Energy Development on the Public Lands (Jan. 16, 2009).

102. FERC's authority is found in the Federal Power Act, 16 U.S.C. §§ 791(a)-825 (2012). However, FERC is not responsible for regulating energy produced by various federal agencies.

103. Fed. Energy Regulatory Reg. Comm'n, Handbook for Hydroelectric Project Licensing and 5 Exemptions from Licensing 6-2 (2004) (explaining exemption for projects of 5 MW or less).

104. Fed. Energy Regulatory Comm'n, Licensing Hydrokinetic Pilot Projects (2008).

The controversial Ivanpah Concentrated Solar Project provides a powerful illustration of the development of new information post-project.[105] The five-mile project in the California Mojave desert killed far more birds that flew into the heat-generating area than was originally predicted.[106] This project in particular has raised questions about the viability of concentrated solar playing a more significant role in the renewable energy mix due to its potential environmental impacts. Thus, while it's a cautionary tale, it is also an example of how renewable deployment will have to learn from its mistakes. A recent media story related to installation of a photovoltaic solar farm illustrates that new concerns may arise even with well-known and understood technology. The proposal, rejected by a North Carolina town council petitioned to rezone land for solar development, raised fears among community members that the solar panels would be taking up "too much sun" and thus have an impact on photosynthesis in the surrounding area, stopping plants from growing and potentially causing cancer.[107] Whether this is an expression of concern for massive deployment of this technology or the manifestation of fear from threat to livelihood and history is unclear. This particular fear is likely to be dispelled, but the unknown impacts of a project can be a haunting prospect.

Moving swiftly and sustainably could also mean increasing environmental scrutiny post-project. More attention to the after-effects of renewable energy development, including improvement of mitigation commitments is another suggestion promoted for the benefit of species and land management.[108] Mitigation refers to the range of actions that can be taken to reduce the intensity of potential impacts or compensate for harm caused by a project. Whether required by federal laws such as the Endangered Species Act, Clean Water Act or part of an environmental impact assessment done for federal or state purposes, these mitigation measures provide a full picture of the project. Despite reliance on these measures for legal sufficiency, studies have shown that follow-through on these commitments is often lacking.

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105. *See* Amy Wilson Morris and Jessica Owley, *Mitigating the Impacts of the Renewable Energy Gold Rush*, 15 MINN. J. L. SCI. & TECH. 293 (2014) (using the Ivanpah project as a case study for enhanced mitigation in the face of evolving experience with desert solar projects).

106. Cassandra Sweet, *The $2.2 Billion Bird-Scorching Solar Project*, WALL ST. J. (Feb. 12, 2014). www.wsj.com/articles/SB10001424052702304703804579379230641329484.

107. Lee Moran, *Solar Farm Rejected Amid Fears It Will "Suck Up the Sun's Energy,"* HUFFINGTON POST (Dec. 18, 2015), www.huffingtonpost.com/entry/solar-farm-suck-up-the-sun_us_566e9aeee4b0e292150e5d66.

108. *See* Outka, *supra* note 93, at 304–06 (emphasizing both least-harm sites for new facilities and better mitigation measures); *see also* Amy Wilson Morris and Jessica Owley, *Mitigating the Impacts of the Renewable Energy Gold Rush*, 15 MINN. J. L. SCI. & TECH. 293, 372–86 (2014) (explaining off-site mitigation shortcomings and lack of sufficient scientific information and transparency).

What is certain is that no small measure of experimentation will be required to move *both swiftly and sustainably*. Although some question the validity of criticisms that permitting processes are overly expensive and onerous, the timelines speak for themselves. The most often vilified is NEPA environmental impact assessment process.[109] Multiple proposals to wholesale curtail or accelerate the process have been rejected, but there is a continuing agitation for change.[110] Moreover, its relatively clear now that the environmental impact assessment process (which was originally designed to encouraged deliberative, transparent, and rational decision-making) is being used by those who simply dislike a project sited in a particular spot by causing delay that will derail a project.[111] Enabling informed deliberation remains an important goal of this bedrock environmental law. Nonetheless, current misuse allows politically astute and wealthy landowners to manipulate the process, potentially exacerbating environmental justice concerns if new energy facilities primarily are concentrated in areas with less politically powerful individuals rather than on a rational consideration of harms and benefits to the environment.

IV. CONCLUSION

The U.S. has taken some action toward a clean, renewable energy transition. Much more is needed to change the trajectory and keep warming at or below 2 degrees Celsius, or at the targeted 1.5 degrees from the recent COP 21 in Paris. A necessary component of the transition is a mindset change that redirects continued talk about the natural gas bridge and investment today must pivot from the fossil fuel economy.

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109. 42 U.S.C. § 4321 (2012).

110. *See e.g.* Trevor Salter, *NEPA and Renewable Energy: Realizing the Most Environmental Benefit in the Quickest Time*, 34 ENVIRONS ENVT'L. L. & POL'Y J. 173 (2011) (arguing for qualified projects to enjoy faster timeline to completion). Note that in another context, such as the Healthy Forest Restoration Act, Congress has reduced the NEPA process to require the analysis of fewer alternatives in order to manage hazardous fuels projects in an accelerated time line. 16 U.S.C. § 6514(d)(1) (2012). This illustrates another legal innovation that may be considered with the passage of time and experience.

111. *See e.g.* John Copeland Nagle, *Green Harms of Green Projects*, 27 NOTRE DAME J. L. ETHICS & PUB. POL'Y 59, 98 (2013) (explaining how NEPA delay can end projects that are disliked regardless of whether the environmental impact assessment process would have eventually allowed the project to proceed). It is not always clear why a project is facing resistance from the community—the line between a "not in my backyard" approach to any development and rational objections over unwarranted and excessive environmental impacts is not an easy distinction to make. Nonetheless, regardless of whether the project is disliked due to its impacts, or disliked for other reasons, delay can thwart projects even if they ultimately would have been approved through environmental permitting processes. *Id.*

It is more difficult to promote the myth that renewables are incapable of being scaled up to a sizeable supply of the U.S. generation. Industrialized countries such as Germany have made great strides, and provide inspiration. The U.S. has myriad renewable resources it could tap into for electricity generation and government, academic and nongovernmental institutions have illustrated the variety of potential pathways to achieve a renewable future. Yet as we confront significant impacts to the environment with renewable energy development, difficult trade-offs are being made. They are calling into question whether these sacrifices are reasonable if they will not help wean us from fossil fuel dependence and harmful climate disruption.[112] Although we have examples that try to balance the values of environmental laws with an interest in expediting renewable energy transition, we still confront the challenge of sacrifices today for benefits tomorrow. All of the above must give way to best of the above for these compromises to be bearable.

The renewable energy picture will evolve as new technologies and improvements come on line. It will be a time of learning, building and innovating. We can and should make that change as swiftly and sustainably as possible.

112. *See* Outka, *supra* note 93, at 244 (contending that in the context of renewable energy sprawl we should "avoid needless compromise wherever we can").