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Legal Pathways for a Massive Increase in Utility-Scale Renewable Generation Capacity

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Summary

Decarbonizing the U.S. energy system will require a program of building onshore wind, offshore wind, utility-scale solar, and associated transmission that will exceed what has been done before in the United States by many times, every year out to 2050. These facilities, together with rooftop photovoltaics and other distributed generation, are required to replace most fossil fuel generation and to help furnish the added electricity that will be needed as many uses currently employing fossil fuels (especially passenger transportation and space and water heating) are electrified. This Article, excerpted from Michael B. Gerrard & John Dernbach, eds., *Legal Pathways to Deep Decarbonization in the United States* (ELI Press forthcoming 2018), discusses the four most important legal processes and obstacles involved in this enormous project: site acquisition and approval; the National Environmental Policy Act; state and local approvals; and species protection laws. It also presents recommendations for lowering the obstacles and briefly discusses several corollary actions that are needed.

I. Introduction

Achieving the Deep Decarbonization Pathways Project (DDPP) scenarios[1] to decarbonize the U.S. energy system will require a program of building onshore wind, offshore wind, utility-scale solar,[2] and associated transmission that is not only unprecedented—it will exceed what has been done before in the United States by many times, every year out to 2050.

This Article will discuss the four most important legal processes and obstacles involved in this enormous project: site acquisition and approval; the National Environmental Policy Act (NEPA); state and local approvals; and species protection laws. It will also present recommendations for lowering the obstacles, and it will briefly discuss several corollary actions that are also needed.

These problems are not unique to the United States. A 2016 study from the International Energy Agency found that large renewable projects in France, Norway, and the United Kingdom have also been plagued in varying degrees by delays from political/regulatory issues, site access, environmental approvals, and grid connection.[3]

Approval delays are costly in several ways. Construction costs may escalate. New technologies or requirements may compel a revision in designs, leading to further delays. Applicants may become so discouraged by the delays that they give up, or their financing may vanish, or local opposition to siting may grow. Lenders who require speedy returns may be deterred from engaging at all. During the years that a renewable facility is not yet operating, the energy needs it will fill may be provided by fossil fuel facilities that add to the cumulative load of greenhouse gases.

After quantifying the number of facilities needed, this Article discusses each of the four principal processes in turn. First, however, it is appropriate to introduce NEPA,[4] since it is so pervasive in what follows. NEPA requires fed-

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1. The Deep Decarbonization Pathways Project is a global consortium of researchers working on practical methods to deeply reduce greenhouse gas emissions in their own countries. *See* http://deepdecarbonization.org/.
2. Utility-scale facilities are typically stand-alone and are designed to provide power to the electric grid. They are in contrast to distributed facilities, which are often attached to buildings and are designed to help power those buildings and perhaps the immediate community, though they sometimes sell excess power to the grid.
3. International Energy Agency's Implementing Agreement for Renewable Energy Technology Deployment, Final Report: Documenting the Cost of Regulatory Delays (Re-Delays) (2016), *available at* http://iea-retd.org/wp-content/uploads/2016/03/RE-DELAYS-final-report.pdf.
4. 42 U.S.C. §§4321 et seq.

eral agencies to prepare an environmental impact statement (EIS) for any major federal action significantly affecting the quality of the human environment. Utility-scale projects on federal land, or offshore, almost invariably require an EIS. The NEPA process can go on for several years and cost millions of dollars, and it often leads to litigation that can take still more years.

As discussed below, recent legal and administrative reforms have shown promise in shortening NEPA time lines and reducing litigation for renewable energy projects, but the field remains challenging. Several related actions may be considered together in a "programmatic" EIS, sometimes (but not always) followed by narrower site-specific EIS or environmental assessments; this "tiering" process has the potential to reduce duplicated effort.[5]

It must also be noted that the Donald Trump Administration is moving to rescind a large number of environmental regulations and guidance documents, especially those adopted during the Barack Obama Administration. The Trump Administration is clearly very favorable toward fossil fuel development; its attitudes toward renewable energy development remain to be seen. Readers are cautioned to ensure that any federal regulations or orders referenced here are still in effect.

II. The Massive Number of Needed Facilities

The DDPP scenarios all call for the construction of a massive number of new central station renewable energy facilities, mostly wind and solar—many times higher than the amount of such construction ever previously achieved. These are required to replace most fossil fuel generation and to help furnish the added electricity that will be needed as many uses currently employing fossil fuels (especially passenger transportation and space and water heating) are electrified. (Some of this needed capacity could be met instead by small-scale distributed units, mostly rooftop solar photovoltaic (PV) and solar thermal.) All of this is in addition to aggressive programs of energy efficiency and, possibly, expanded use of nuclear energy and hydropower.

The amount of energy produced in the United States from wind and solar sources has been rapidly increasing, as shown in Table 1.

Table 1
U.S. Net Electricity Generation[6]
Thousands Megawatt (MW) Hours

Year	Wind	Solar PV Utility Scale	Solar Thermal Utility Scale	Solar PV Distributed
2006	26,589	15	493	N/A
2007	34,450	16	596	N/A
2008	55,363	76	788	N/A
2009	73,886	157	735	N/A
2010	94,652	423	789	N/A
2011	120,177	1,012	806	N/A
2012	140,822	3,451	876	N/A
2013	167,840	8,121	915	N/A
2014	181,655	15,250	2,441	11,233
2015	190,719	21,666	3,227	14,139
2016	226,485	33,367	3,388	19,467

In 2016, wind and solar amounted to 6.9% of U.S. electricity generation.[7] By 2050, this will need to go up to 50.25% under the DDPP Mixed Scenario and 78.0% under the DDPP High Renewables Scenario, as shown in Tables 2 and 3.[8]

Table 2
Percentage of U.S. Electricity Generation—
DDPP Mixed Scenario

Year	Onshore Wind	Offshore Wind	Solar PV
2016*	5.50	0	1.30
2020	8.41	0.03	0.62
2030	18.09	1.38	1.11
2040	27.04	4.44	3.27
2050	31.56	7.59	11.10

*Actuals[9]

Table 3
Percentage of U.S. Electricity Generation—
DDPP High Renewables Scenario

Year	Onshore Wind	Offshore Wind	Solar PV
2016*	5.50	0	1.30
2020	9.57	0.03	1.12
2030	26.14	4.28	4.64
2040	45.30	7.18	7.93
2050	51.57	10.89	15.54

*Actuals

5. 40 C.F.R. §1508.28. This was successfully done by the Bureau of Land Management (BLM) in the Dry Lake, Nevada, solar energy zone. Because of the programmatic EIS for the zone, three large projects were able to move forward in less than 10 months under tiered environmental assessments. Press Release, U.S. Department of the Interior, Interior Department Approves First Solar Energy Zone Projects (Apr. 26, 2016), *available at* https://www.doi.gov/pressreleases/interior-department-approves-first-solar-energy-zone-projects.

6. U.S. Energy Information Administration (EIA), Electric Power Monthly With Data for February 2017 tbls. 1.1 and 1.1.A (2007) [hereinafter Electric Power Monthly], *available at* https://www.eia.gov/electricity/monthly/pdf/epm.pdf.

7. *Id.*

8. Source: Personal Communication with Ben Haley, DDPP (Aug. 29, 2016).

9. Source of actuals: Electric Power Monthly, *supra* note 6, tbls. 1.1 and 1.1.A. Excluded is the very small amount of electricity generated by the Rhode Island offshore wind facility that opened on Dec. 12, 2016.

Tables 1, 2, and 3 show electricity *generation*—the electricity that is actually generated. The amount of new generating *capacity* added each year—the amount of electricity that could be generated if the units were running all the time—has fluctuated considerably for wind (not solar), due mostly to the expiration and renewal cycles for federal tax credits. This is shown in Table 4.

Table 4
U.S. Renewable Energy Nameplate Net Capacity Added (MW)[10]

Year	Onshore Wind	Solar PV*
2004	372	58
2005	2,396	79
2006	2,454	105
2007	5,237	160
2008	8,425	298
2009	9,919	382
2010	5,112	852
2011	6,649	1,925
2012	13,089	3,372
2013	1,102	4,761
2014	4,772	6,247
2015	8,113	7,260

* Grid connected only; reported in MW direct current (MWdc)

The amounts of new generation capacity added each year under the DDPP Mixed Scenario and DDPP High Renewables Scenario are presented in Tables 5 and 6.[11] As these tables show, the amount of new capacity that will need to be added each year must be many times higher than what has been achieved in prior years.

Table 5
Annual Capacity Additions (MW)—DDPP Mixed Scenario

Year	Onshore Wind	Offshore Wind	Solar PV
2014*	4,772	0	6,201**
2020	9,606	333	1,294
2025	16,448	1,689	3,996
2030	23,689	3,682	10,788
2035	26,551	7,921	12,149
2040	27,863	8,728	15,092
2045	18,137	17,485	20,524
2050	13,913	12,273	42,857

* Actuals
** Grid connected only

Table 6
Annual Capacity Additions (MW)—DDPP High Renewables Scenario

Year	Onshore Wind	Offshore Wind	Solar PV
2014*	4,772	0	6,201**
2020	10,462	304	1,311
2025	29,813	4,770	7,040
2030	39,625	14,323	19,074
2035	61,343	2,606	20,379
2040	66,584	0	24,751
2045	54,105	20,532	40,331
2050	51,305	13,578	66,502

* Actuals
** Grid connected only

Table 7 compares the electric generating capacity from wind and solar PV that actually existed in 2016 to what is projected for 2050 under the DDPP Mixed and High Renewables Scenarios; the Energy Information Administration's (EIA's) 2017 Annual Energy Outlook (AEO) reference case (which assumes that the statutes and regulations of 2016 remain in place, that known technologies will improve, and that economic and demographic trends continue); and the U.S. Department of Energy's (DOE's) *Wind Vision* report. The table starkly shows the order of magnitude-scale increases that will be needed over current capacity, and the large increases needed beyond DOE's projections for 2050.

Table 7
U.S. Electric Generating Capacity (MW)

Scenario	Onshore Wind	Offshore Wind	Solar PV
2016 actual	81,260	30[a]	19,380
2050: DDPP Mixed[b]	725,382	186,802	488,539
2050: DDPP High Renewables	1,373,372	313,208	800,267
2050: EIA AEO 2017 reference case[c]	156,300	30,000	148,000[d]
2050: DOE Wind Vision[e]	318,000	86,000	—

a. Deepwater Wind, *Block Island Wind Farm*, http://dwwind.com/project/block-island-wind-farm/ (last visited May 1, 2017).
b. The DDPP figures were derived from printouts depicting annual capacity additions under each scenario, provided by Ben Haley of Evolved Energy Research. The figures represent capacity additions for 2015 through 2050. The table assumes that all the capacity that existed prior to 2015 is retired by 2050, and it does not assume any other retirements.
c. EIA, *Annual Energy Outlook 2017—Table: Renewable Energy Generating Capacity and Generation* [hereinafter *Annual Energy Outlook 2017 Table*], http://www.eia.gov/outlooks/aeo/data/browser/#/?id=16-AEO2017&cases=ref2017&sourcekey=0 (last visited May 1, 2017).
d. This figure does not include off-grid PV.
e. DOE, WIND VISION: A NEW ERA FOR WIND POWER IN THE UNITED STATES xxxiii, fig. ES.1-3 (2015) (DOE/GO-102015-4557) [hereinafter DOE, WIND VISION].

10. U.S. DEPARTMENT OF ENERGY, NATIONAL RENEWABLE ENERGY LABORATORY, 2015 RENEWABLE ENERGY DATA BOOK 22 (2016), *available at* http://www.nrel.gov/docs/fy17osti/66591.pdf.
11. Source: Personal Communication with Ben Haley, DDPP (Aug. 26, 2016).

III. Site Acquisition and Approval

Large solar and wind projects require a considerable amount of land.[12] When land that is suitable for a large facility is privately owned and its owner is willing to sell or lease, few novel legal issues arise. This is a conventional real estate transaction, though for large projects, it may be necessary to acquire title or easements from multiple landowners, which can lead to difficult negotiations and sometimes holdout problems. However, three important kinds of sites invoke complicated legal processes that can engender years of delays: federal land, especially the vast tracts in the western deserts that could accommodate large solar arrays; offshore areas, which have enormous potential for wind farms; and contaminated or otherwise disturbed land. This section describes the legal issues for these kinds of sites, together with recommendations.

A. Federal Land

The federal government controls vast amounts of land. The process for designating some of this use for utility-scale wind and solar projects has been complex and lengthy.

Most pertinently here, the Bureau of Land Management (BLM), part of the U.S. Department of the Interior (DOI), controls approximately 248 million surface acres of federal land, nearly all of it located in 11 western states and Alaska. The U.S. Forest Service, part of the U.S. Department of Agriculture, controls 193 million surface acres of forests and grasslands, primarily in western states and Alaska, but also throughout the country.[13] BLM has identified 20.6 million acres of its land with wind potential, and 19 million with solar potential.[14] The Forest Service, while not adding up the acreage, has identified 99 National Forest Units with potential for wind, solar, or both.[15]

Efforts to site wind and solar facilities on federal lands emerged, at first slowly, in the 2000s. In May 2001, President George W. Bush issued an Executive Order directing federal agencies "to take appropriate actions, to the extent consistent with applicable law, to expedite projects that will increase the production, transmission or conservation of energy."[16] However, the order did not distinguish between fossil and renewable energy. In 2002, BLM issued an interim wind energy policy,[17] and in 2005, it issued a programmatic EIS on wind development, as further discussed below. In 2004 and 2007, BLM issued policies on solar development.[18] BLM has also taken other actions on geothermal energy.[19]

The Energy Policy Act of 2005 devoted one sentence to the subject:

> It is the sense of Congress that the Secretary of the Interior should, before the end of the 10-year period beginning on the date of enactment of this Act, seek to have approved non-hydro-power renewable energy projects located on the public lands with a generation capacity of at least 10,000 megawatts of electricity.[20]

However, the U.S. Congress did not confer any additional authority on BLM, or alter the approval procedures that BLM must use.

By the time Obama became president in January 2009, BLM had approved only 566 MW of wind generation and no solar energy projects on public lands.[21] However, in March 2009, his Secretary of the Interior, Ken Salazar, issued a Secretarial Order establishing renewable energy development as a priority for DOI. Secretary Salazar implemented a series of permitting reforms to improve and accelerate the review and permitting process for utility-scale projects on public lands.[22] The American Recovery and Reinvestment Act of 2009 (the stimulus legislation) played an important role by providing expanded tools to help renewable energy developers obtain financing for their projects.

As a result of these efforts, BLM achieved the Energy Policy Act of 2005's goal of authorizing more than 10,000 MW of renewable energy on public lands in 2012, three

12. *See* Paul Denholm et al., National Renewable Energy Laboratory, Land-Use Requirements of Modern Wind Power Plants in the United States (2009) (NREL/TP-6A2-45834); Sean Ong et al., National Renewable Energy Laboratory, Land-Use Requirements for Solar Power Plants in the United States (2013) (NREL/TP-6A20-56290); Vasilis Fthenakis & Hyung Chui Kim, *Land Use and Electricity Generation: A Life-Cycle Analysis*, 13 Renewable & Sustainable Energy Revs. 1465 (2009); Nathan F. Jones & Liba Pejchar, *Comparing the Ecological Impacts of Wind and Oil & Gas Development: A Landscape Scale Assessment*, 8 PLoS ONE 1 (2013).
13. U.S. Government Accountability Office (GAO), Renewable Energy: Agencies Have Taken Steps Aimed at Improving the Permitting Process for Development on Federal Lands 4 (2013) (GAO-13-189) [hereinafter GAO, Renewable Energy Report].
14. BLM, *Renewable Energy: New Energy for America*, https://www.blm.gov/programs/energy-and-minerals/renewable-energy (last visited May 11, 2017).
15. U.S. Forest Service & National Renewable Energy Laboratory, Assessing the Potential for Renewable Energy on National Forest System Lands (2005) (NREL/BK-710-36759).
16. Exec. Order No. 13212, 66 Fed. Reg. 28357 (May 22, 2001), Actions to Expedite Energy-Related Projects.
17. Instruction Memorandum No. 2003-020 from BLM, to All Field Officials, on Interim Wind Energy Development Policy (Oct. 16, 2002), *available at* http://windeis.anl.gov/documents/docs/IM2003-020,InterimWindEnergyDevelopmentPolicy.htm.
18. Instruction Memorandum No. 2005-006 from BLM, to All Field Officials, on Solar Energy Development Policy (Oct. 20, 2004), *available at* https://www.doi.gov/sites/doi.gov/files/archive/news/archive/04_News_Releases/solar.pdf; Instruction. Memorandum No. 2007-097 from BLM, to All Field Officials, on Solar Energy Development Policy (Apr. 4, 2007), *available at* https://www.blm.gov/policy/im-2007-097.
19. *See* BLM Geologist Sean Hagerty, Presentation at Geothermal Energy Leasing on BLM Managed Lands, Geothermal Resource Council 2014 Pre-Meeting Workshop (Sept. 24, 2014), https://geothermal.org/Annual_Meeting/PDFs/1%2009.55%20%20Leasing%20of%20Federal%20Lands.%20HAGERTY,%20BLM.pdf.
20. Energy Policy Act of 2005, Pub. L. No. 109-58, §211, 199 Stat. 594.
21. Jennifer A. Diouhy, *Obama Rule Could Take Wind Out of Renewable Power on Public Land*, Bloomberg Markets, Aug. 22, 2016, https://www.bloomberg.com/news/articles/2016-08-22/obama-rule-could-take-wind-out-of-renewable-power-on-public-land.
22. *See* David J. Hayes et al., Stanford Law School, A 21st Century Governance Challenge: Finding Effective Mechanisms to Address Climate Change Across the Federal Government 40-55 (2015), *available at* https://www-cdn.law.stanford.edu/wp-content/uploads/2015/04/SLS-Climate-Chg-Governance-Report.pdf.

years ahead of schedule.[23] As of December 2016, BLM had approved 30 solar projects, of which 11 were in operation and seven were under construction; and it had approved 11 wind projects, of which four were in operation.[24] A number of DOI's permitting reforms were then adopted by the Obama Administration and, importantly, codified in law under the FAST Act, discussed below.

The future is uncertain. President Obama's Climate Action Plan called for the permitting of at least 20,000 MW on public lands by 2020.[25] Hillary Clinton's presidential campaign posted a position paper pledging to "reform leasing and expand clean energy production on public lands and waters tenfold within a decade." During his campaign, Trump strongly favored new infrastructure construction, but appeared to be much more favorable to fossil fuels than renewables, and he expressed some antagonism to wind projects. On March 28, 2017, President Trump issued an Executive Order rescinding the Climate Action Plan.[26]

As of December 2016, approximately 5,000 MW of wind and solar capacity operate on public lands.[27] (There was one facility in the water—the Rhode Island project discussed below.) At that time, the total amount of wind capacity in the United States (on all kinds of land) was 81,260 MW; the total amount of solar PV was 19,380 MW.[28] How will we get to the 912,184 MW total wind that the DDPP reports indicated will be needed by 2050 in the Mixed Scenario, and the 1,686,580 MW total wind in the High Renewables Scenario (recognizing that much of this will be on private land)?

The needed increases in renewable generation may require—and would certainly be helped by—changes in the legal model for making public land available.

Special statutory leasing processes exist for oil and gas production, and for geothermal production. In 2005, Congress mandated special environmental review and leasing processes for oil shale and tar sands.[29] However, Congress has adopted no special rules for wind or solar siting on federal lands. Instead, wind and solar siting on BLM land is covered by the Federal Land Policy and Management Act (FLPMA),[30] first enacted in 1976. Specifically, under Title V of FLPMA, permits to lease BLM land for wind or solar purposes are treated as linear rights-of-way, based on the 19th century practices for building roads and railways.[31] These permits are temporary conveyances that may readily be modified or terminated, and offer less security than the leases held by oil, gas, and coal companies.

The Forest Service operates under the National Forest Management Act (NFMA),[32] which allows the Service to grant "special use authorizations" for uses other than road usage, grazing and livestock use, sale and disposal of timber and other forest products, and mineral usage.[33] Among the permitted authorizations are "permits, leases and easements . . . for rights-of-way for . . . systems and related facilities for generation, transmission and distribution of electric energy,"[34] which would authorize wind or solar generation facilities.

Both FLPMA and the NFMA require the agencies to develop land use plans for the areas they manage. All approved projects must be consistent with those plans, and if they are not, the plans must be revised. Revising the plans is an arduous process that requires compliance with NEPA, among other laws. Each solar project has typically required its own EIS under NEPA, while some wind projects merely require environmental assessments, which tends to save more than one year.[35]

BLM has gotten much faster at navigating this process. A 2013 study by the U.S. Government Accountability Office (GAO) found that solar and wind applications submitted in 2006 took an average of 3.9 years to process; applications submitted in 2009 took 1.5 years.[36]

As noted above, Secretary Salazar instituted new environmental review procedures in 2009 that accelerated the permitting of renewable energy projects on BLM lands. DOI retooled an ongoing solar energy programmatic EIS to institute additional permitting reforms through its so-called Western Solar Plan. More specifically, BLM developed a template in the programmatic EIS for "solar energy zones" that, because of lessened environmental conflicts and other attractive features (e.g., locations near transmission), should be preferred for solar development.[37] Applying the template, BLM identified 19 solar energy zones encompassing 285,000 acres in Arizona, California, Colorado, Nevada, New Mexico, and Utah, and anticipated that more solar energy zones would be created in

23. *Hearing on S.279, Public Land Renewable Energy Development Act of 2013, Before the Senate Energy & Natural Resources Committee* 1 (2004) (testimony of Neil Kornze, Director, BLM).
24. BLM, *Renewable Energy Data*, https://www.blm.gov/programs/energy-and-minerals/renewable-energy/data (last visited May 11, 2017).
25. Executive Office of the President, The President's Climate Action Plan 7 (2013), *available at* https://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf.
26. Exec. Order No. 13783, 82 Fed. Reg. 16093 (Mar. 31, 2017).
27. Calculated from the maximum capacity of all the facilities listed as operational, plus the 566 MW listed as having been approved prior to 2009, on this website as viewed in December 2016: http://www.blm.gov/wo/st/en/prog/energy/renewable_energy/Renewable_Energy_Projects_Approved_to_Date.html. This number may be high because it is not clear if all 566 MW of the capacity approved prior to 2009 was actually built, or whether all the approved units have been built to full capacity. (Author's Note: It has not been possible to update these figures because when the BLM website was checked on April 9, 2017, it was no longer available.)
28. *Annual Energy Outlook 2017 Table*, *supra* Table 7, note c. The solar PV figure does not include off-grid PV, which is not reported.
29. Oil Shale, Tar Sands, and Other Strategic Unconventional Fuels Act of 2005, Pub. L. No. 109-58, §1169, 119 Stat. 594, 728.
30. 43 U.S.C. §§1701-1785.
31. *Id.* §§1761 et seq. *See also* Adam Vann, Congressional Research Service, Energy Projects on Federal Lands: Leasing and Authorization (2012) (7-5700), *available at* https://fas.org/sgp/crs/misc/R40806.pdf.
32. 16 U.S.C. §§1600-1687.
33. 36 C.F.R. §251.50(a).
34. *Id.* §251.53(l)(4).
35. GAO, Renewable Energy Report, *supra* note 13, at 17-18.
36. *Id.* at 19.
37. David J. Hayes, *Thinking Big*, Envtl. F., Nov./Dec. 2013; BLM, Final Solar Energy Development Programmatic Environmental Impact Statement (2012), *available at* http://solareis.anl.gov/documents/fpeis/index.cfm.

the future.[38] It also amended 89 FLPMA land use plans to allow solar projects.[39]

Several environmental groups challenged the EIS on the grounds that there had been insufficient consideration of distributed generation and of building on disturbed lands, but the court upheld the EIS.[40] Because this EIS looked at the sorts of impacts a solar project could have in this region, individual solar projects in one of the solar energy zones did not require their own EIS, and they and associated transmission lines otherwise enjoyed expedited processing. (Outside of these zones, another 19 million acres are designated as "variance areas"; projects there must go through individual procedures.[41]) The first three projects to go through the new process, all in the Dry Lake solar energy zone in Nevada, got through the BLM process in less than 10 months. BLM also required funding for long-term desert tortoise monitoring, post-construction monitoring of impacts on bird and bats, and measures to reduce visual impacts.[42]

The process does not assure approval. In November 2014, BLM rejected an application to build a 200-MW solar facility in the Mojave Desert, finding that the project could disturb important natural and cultural resources.[43]

A somewhat similar process—which culminated with a BLM record of decision in September 2016 after eight years of work—was undertaken jointly by BLM, the U.S. Fish and Wildlife Service (FWS), and the state of California to develop the Desert Renewable Energy Conservation Plan. It designated multiple uses and protections for a 22.5-million area portion of the California desert. Of this, 388,000 acres were designated for renewable energy development—a far lower amount than the solar industry had sought.[44] Solar developers may now apply to build projects on this acreage.

BLM has made a bit less progress with wind than with solar. In June 2005, BLM completed a programmatic EIS for wind projects in the western states, and amended 52 FLPMA plans. It identified 20,634,000 acres as "potentially developable" for wind, but only 160,000 acres as "economically developable," based on access to and costs of transmission capacity, the intermittency of wind power, wind technology developments, and potential barriers to wind resource development. The EIS did not map those areas, and no wind energy zones have been designated.[45] BLM has, however, proposed some wind development areas in several resource management plans, which govern particular BLM units.[46]

In December 2016, BLM issued its final rule to create a competitive lease process for solar and wind energy on federal land.[47] It favors development in "designated leasing areas" with high solar or wind resource value and low land use conflicts. All the royalties go to the U.S. Treasury. Prior to final issuance of the rule, the Solar Industries Association had said it would add "time, uncertainty, complexity, and expense to a permitting process that is already substantially more difficult to pursue than permitting on private lands."[48] Tension also emerged between those who want to make sure the federal government gets a good financial return on these leases, and those who argue that the rule, while formalizing what had been informal procedures, will increase the costs of building wind and solar facilities on federal land. As this is written, controversy remains over whether the rule on a net basis will help or hinder renewables development.

As it is, rents for fossil fuel leases on BLM land (which are governed by the Mineral Leasing Act) are $2 per acre at most, in contrast to the rents set by BLM for solar, which are established according to a complex formula in the regulations and are much higher.[49] On top of the rental cost, royalties must be paid for fossil fuel production, but that is based on actual production; wind and solar operators must pay capacity fees regardless of actual production, though the capacity factor for each type of energy source is reflected in the rental rate.[50]

A bill to resolve some of these issues, the Public Lands Renewable Energy Development Act, has been introduced in every Congress since 2011. It has attracted broad

38. BLM, *Solar Energy Zones*, http://blmsolar.anl.gov/sez/ (last updated Jan. 10, 2014); *Breaking the Logjam at BLM: Examining Ways to More Efficiently Process Permits for Energy Production on Federal Lands: Hearing Before the Senate Committee on Energy and Natural Resources* 6 (2014) (testimony of Arthur Haubenstock, Solar Energy Industries Association); David J. Hayes & Nidhi Thakar, Center for American Progress, A 4-Point Plan for Responsibly Expanding Renewable Energy Production on America's Public Lands and Oceans (2015), *available at* http://www.ourenergypolicy.org/wp-content/uploads/2015/08/RenewableEnergy-report1.pdf.
39. GAO, Renewable Energy Report, *supra* note 13, at 23.
40. Western Lands Project v. Bureau of Land Mgmt., No. 13-cv-339, 44 ELR 20143 (S.D. Cal. June 25, 2014), *aff'd*, 668 F. App'x 802 (9th Cir. 2016).
41. Haubenstock testimony, *supra* note 38, at 6.
42. Scott Streater, *Interior OKs First Solar Projects Through Streamlined Reviews*, E&E News, June 1, 2015.
43. Carolyn Whetzel, *California Desert Solar Project Could Disturb Resources, BLM Says in Rejecting Application*, Daily Env't Rep. (BNA), Nov. 14, 2014, at A-5.
44. BLM, Desert Renewable Energy Conservation Plan Record of Decision (2016) (BLM/CA/PL-2016/03+1793+8321), *available at* http://www.drecp.org/finaldrecp/rod/DRECP_BLM_LUPA_ROD.pdf; Chris Mooney, *The Government Just Decided the Future of California's Desert, and Solar Companies Aren't Happy*, Wash. Post, Sept. 14, 2016. *See also* Nathaniel Logar, *When the Fast Track Hits the Off Ramp: Renewable Energy Permitting and Legal Resistance on Western Public Lands*, 27 Colo. Nat. Resources, Energy & Envtl. L. Rev. 361 (2017).
45. DOI, BLM, Final Programmatic Environmental Impact Statement on Wind Energy Development on BLM-Administered Lands in the Western United States, (2005); *see also* Domenic A. Cossi, *Getting Our Priorities Straight: Streamlining NEPA to Hasten Renewable Energy Development on Public Land*, 31 Pub. Land & Resources L. Rev. 149 (2010).
46. Nick Lawton, *Promoting Renewable Energy Development on Public Lands*, Green Energy Inst., Nov. 14, 2014, at 22.
47. 81 Fed. Reg. 92122 (Dec. 19, 2016).
48. Quoted in Memorandum from Andrew Vecera, Majority Committee Staff, to Subcommittee on Energy and Mineral Resources Members, on Legislative Hearing on H.R. 2663 (Rep. Paul Gosar, House Committee Report 3-4 (July 11, 2016)).
49. 43 C.F.R. §2806.52.
50. Lawton, *supra* note 46, at 24; Susan Kraemer, *BLM Charges Exorbitant Rent, Fees for Solar, Energy Storage Compared to Fossil Fuels*, Renewable Energy World, Nov. 24, 2015; Competitive Processes, Terms, and Conditions for Leasing Public Lands for Solar and Wind Energy Development and Technical Changes and Corrections, 79 Fed. Reg. 59023, 59033 (proposed Sept. 30, 2014); Competitive Processes, Terms, and Conditions for Leasing Public Lands for Solar and Wind Energy Development and Technical Changes and Corrections for 43 C.F.R. Parts 2800 and 2880, 81 Fed. Reg. 92122 (Dec. 19, 2016).

bipartisan support. In the fall of 2016, it was part of a comprehensive energy bill being advanced by Sen. Lisa Murkowski (R-Alaska), but the bill was not enacted before the end of the 114th Congress. The bill would apply to all BLM and national Forest Service lands that have not been excluded from solar or wind energy development by prior plans, and would require evaluation of other U.S. Department of Defense and Department of Agriculture lands for suitability for renewables. Programmatic EIS would be utilized to expedite project review. High-level interagency coordination would be required—something that all agree is important.

Rather than all the royalty revenue going to the Treasury, the bill would allocate 25% to the states, 25% to the counties, 35% to a Renewable Energy Resource Conservation Fund, and 15% to the Treasury for use in assisting in the processing of renewable energy permit applications.[51] This 35% allocation to a conservation fund to help restore and protect fish and wildlife habitat and related projects has earned the bill the support of the Wilderness Society, Trout Unlimited, the Natural Resources Defense Council, and other conservation and environmental groups. However, the wind and solar industries are still unhappy with the requirement for competitive bidding and the requirement for royalty payments.[52]

In another action taken in the final weeks of the Obama Administration, on December 22, 2016, BLM issued policy guidance on mitigation measures that could be employed in approving actions on public lands such as construction of renewable energy projects.[53] The policy guidance followed previous mitigation reforms intended to provide more certainty to developers, while also producing better environmental results, when identifying compensatory mitigation measures required as part of the permitting process.[54] However, shortly after President Trump took office, the new Secretary of the Interior, Ryan Zinke, issued an order that "directs a reexamination of the mitigation policies and practices across the Department of the Interior . . . in order to better balance conservation strategies and policies with the equally legitimate need of creating jobs for hard-working American families."[55]

Tribal lands also have tremendous potential for renewable energy. A 2013 study by DOE found that American Indian land comprises approximately 2% of U.S. land, but contains an estimated 5% of all renewable energy resources, including about 14 billion megawatt-hours (MWh) of total technical potential on tribal lands for electricity generation from utility-scale rural solar resources, about 1,100 MWh from wind, and about 7 million MWh from hydropower.[56] In 2015, the GAO found that energy development on Indian lands has been hindered by poor management by the Bureau of Indian Affairs, as well as by the complex regulatory framework, tribes' limited capital and infrastructure, and varied tribal capacity. This has led to missed development opportunities, lost revenue, and jeopardized viability of projects.[57]

Recommendations: The Western Solar Plan can serve as an exemplar for what can be accomplished without new legislation. By undertaking an environmental review over a large geographic area that included a detailed examination of species presence and habitat, it satisfied the requirements of both NEPA and the Endangered Species Act (ESA).[58] (The ESA is discussed in more detail below.) This way, the Western Solar Plan allowed individual projects within the study area to proceed quickly. BLM should identify more solar energy areas where this process could be utilized. The Desert Renewable Energy Conservation Plan is another example, though it took a long time to complete and designated only very limited areas for renewables. BLM has also launched more than a dozen "rapid ecoregional assessments" that examine ecological conditions and trends in large ecoregions.[59] As noted below, BLM's Planning 2.0 rule, designed to facilitate large-scale land use planning, was annulled by Congress and President Trump in 2017. This is a step backwards.

While BLM has made considerable progress in accommodating renewable projects on its land, the Forest Service has made much less progress and should take steps to catch up. The Forest Service has several policies in place promoting wind and solar projects,[60] and construction broke ground in September 2016 on the first utility-scale project actually to be built on its land, a 15-turbine wind project in the Green Mountain National Forest in Vermont.[61] (The Forest Service does a great deal with biomass, but that is beyond the scope of this Article.)

The Public Lands Renewable Energy Development Act has been under consideration in Congress since 2011. It would help encourage and expedite new renewable projects on public lands, and something like it should be enacted. In the deliberations over this bill, consideration should be given to relaxation of the fair market value requirement

51. Kornze testimony, *supra* note 23, at 4.
52. Haubenstock testimony, *supra* note 39, at 10-11; Jennifer A. Dlouhy, *Obama Rule Could Take Wind Out of Renewable Power on Public Land*, Bloomberg Markets, Aug. 22, 2016.
53. BLM, Manual §1794, Mitigation (2016); BLM, Mitigation Handbook H-1794-1 (2016).
54. David J. Hayes, *Addressing the Environmental Impacts of Large Infrastructure Projects: Making "Mitigation" Matter*, 44 ELR 10016 (Jan. 2014), *available at* http://www.eli.org/sites/default/files/docs/elr-na/44.elr_.10016.pdf.
55. Secretary of the Interior Order No. 3349, American Energy Independence (Mar. 29, 2017), *available at* https://www.doi.gov/sites/doi.gov/files/uploads/so_3349_-american_energy_independence.pdf.
56. DOE, Office of Indian Energy, Developing Clean Energy Projects on Tribal Lands: Data and Resources for Tribes 3 (2013), *available at* http://www.nrel.gov/docs/fy13osti/57748.pdf.
57. GAO, Report to the Chairman, Committee on Indian Affairs, U.S. Senate, Indian Energy Development: Poor Management by BIA Has Hindered Energy Development on Indian Lands (2015) (GAO-15-502) [hereinafter GAO, Indian Energy Development Report], *available at* http://www.gao.gov/assets/680/670701.pdf.
58. 16 U.S.C. §§1531-1544.
59. *Id.*; Hayes, *supra* note 54, at 10019.
60. *See* U.S. Forest Service, Special Uses-Energy, https://www.fs.fed.us/specialuses/special_energy.shtml.
61. "Avangrid, Governor Shumlin Break Ground on Deerfield Wind Farm," Vermont Bus. Mag., Sept. 19, 2016, http://www.vermontbiz.com/news/september/avangrid-governor-shumlin-break-ground-deerfield-wind-farm.

when leasing federal lands for renewables, since such relaxation would add to the economic incentive to build such facilities.[62] This might result in a loss of federal revenues (if enough projects that would have proceeded anyway are able to enjoy the lower rents), but it would advance the decarbonization objective.

DOI should carefully review and consider acting on the GAO recommendations for improving the process for approving renewable energy projects on tribal lands, including changes to the processes for mapping lands, verifying ownership, tracking reviews, providing guidance to tribes, and helping tribes eliminate capacity gaps.[63]

B. Offshore Wind

Difficult as it has been to site renewable projects on federal land, it has been even more difficult to do this offshore. However, the first offshore wind project has finally begun operation, and several more are in the pipeline.

The winds offshore tend to blow harder and more uniformly than the winds onshore. The potential energy produced from wind is directly proportional to the cube of the wind speed. As a result, in addition to being less intermittent than onshore wind, the somewhat higher wind speeds typical offshore can generate much more energy. Most large population centers in the United States are near coastlines, so offshore wind would not require nearly as much new transmission capacity as onshore wind.[64] The total technical potential for offshore wind in the United States—the amount of electricity that could be generated if turbines were placed everywhere physically possible—has been calculated as 4,200 gigawatts (GW),[65] which is about four times the current capacity of the U.S. grid.[66] The wind speeds are higher off the Pacific Coast than off the Atlantic and Gulf Coasts, but the water off the Atlantic and Gulf Coasts is much shallower, making the costs of offshore installations there lower.[67]

Denmark installed the world's first offshore wind project in 1991. Since then, 142 more have become operational worldwide, with a total capacity of 13.9 GW. Another 34 are under construction with a capacity of 7.7 GW, and 142 have been approved, with a capacity of 44.5 GW.[68] They are mostly in Europe, with some in China, Japan, and South Korea. The total number of operational offshore wind farms in the United States stood at zero until December 2016, when a very small facility (30 MW) started operations off Rhode Island. The best-known proposed project in the United States is Cape Wind in Massachusetts; this 468-MW project was first proposed in 2001 and is still struggling with approvals and financing. Its delays have cast a pall over offshore wind in the United States. (The Rhode Island and Cape Wind projects will be discussed in more detail below.)

Many companies have attempted to build offshore wind farms in the United States but have been discouraged or blocked by regulatory fragmentation and confusion, shifts in political support, high costs, and public opposition. However, recent actions by the federal government and some states, plus technological advances and falling costs (though still much higher than onshore wind), coupled with the 2015 extension of the production tax credit, portend a major expansion of offshore generation in the next few years, at least where the coastal states strongly and consistently support it.

An extraordinary expansion will be needed. As shown in Table 5, the DDPP Mixed Scenario contemplates the construction of the equivalent of four Cape Wind-sized facilities every year by 2025, eight every year by 2030, 17 every year by 2035, and 37 every year by 2045. The total of 17.5 GW that would need to be added in 2045 alone exceeds the 12.5 GW capacity of all the offshore wind turbines operating in the world today. Table 6 shows that the DDPP High Renewables Scenario involves 20.5 GW being added in 2045 alone.

The state governments play an important role with offshore facilities. The states control the underwater land out to three nautical miles from shore[69]; beyond that, the federal government has control out to 200 nautical miles from shore.[70] (However, for historical reasons, Florida and Texas control the seabed to about 10 nautical miles offshore in the Gulf of Mexico.[71]) Wind farms more than three miles offshore (as most of them would be)[72] still need transmission lines running through state waters; and wind farms less than three miles offshore are still subject to various federal laws (discussed below). Moreover, the Coastal Zone Management Act (CZMA)[73] provides for state review of certain activities occurring solely in federal waters. This means that every offshore wind farm needs both federal and state approvals—and, in almost every case, multiple approvals at each level of government.

Until 2005, the lead federal agency for offshore wind had been the U.S. Army Corps of Engineers (the Corps), acting under the Rivers and Harbors Act of 1899. The Energy Policy Act of 2005 shifted lead authority over all

62. There is considerable precedent for relaxing the fair market value requirement for certain favored uses on federal lands. *See* Pamela Baldwin, Fair Market Value for Wind and Solar Development on Public Land 11 (Taxpayers for Common Sense & Wilderness Society Dec. 2010), *available at* http://www.taxpayer.net/images/uploads/downloads/FMV_Report.pdf.
63. GAO, Indian Energy Development Report, *supra* note 57, at 36-38.
64. BOEM, *Offshore Wind Energy*, http://www.boem.gov/Offshore-Wind-Energy/ (last visited May 1, 2017).
65. Anthony Lopez et al., National Renewable Energy Laboratory, U.S. Renewable Energy Technical Potentials: A GIS-Based Analysis iv (2012).
66. EIA, *Electricity Generating Capacity*, https://www.eia.gov/electricity/capacity/ (last visited May 11, 2017).
67. *But see* International Renewable Energy Agency, Floating Foundations: A Game Changer for Offshore Wind Power (2016).
68. The Wind Power, *World Wind Farms Database*, http://www.thewindpower.net/store_continent_en.php?id_zone=1000 (last visited May 1, 2017).
69. Submerged Lands Act, 43 U.S.C. §1311(a)(1).
70. Outer Continental Shelf Act, 43 U.S.C. §1302.
71. Ben Deninger, *The Twenty-First Century Offshore Wind Boom: Why Texas Is Leading the Way*, 44 Tex. Envtl. L.J. 81, 91 (2014).
72. Timothy H. Powell, *Revisiting Federalism Concerns in the Offshore Wind Energy Industry in Light of Continued Local Opposition to the Cape Wind Project*, 92 B.U. L. Rev. 2023, 2029 (2012).
73. 16 U.S.C. §§1451-1466.

offshore energy projects (including wind, but not including the Great Lakes) to the Secretary of the Interior, acting through the Minerals Management Service, and authorized it to issue leases, easements, and rights-of-way for such projects. The Corps (as protector of navigation) retained permitting authority over offshore construction, and is still the lead federal agency for offshore wind energy in the Great Lakes. In October 2007, the Minerals Management Service issued a programmatic EIS for alternative energy development and production and alternative use of facilities on the Outer Continental Shelf.[74] In 2009, the Minerals Management Service and the Federal Energy Regulatory Commission (FERC) resolved a long-standing jurisdictional dispute and entered into a memorandum of understanding that clarified that the Service has exclusive jurisdiction over offshore wind energy. The Service then issued detailed regulations for this program, providing for competitive and noncompetitive leasing of offshore lands.[75] In 2010, in the wake of the *Deepwater Horizon* disaster, the Minerals Management Service was broken into three parts; one of them, the Bureau of Ocean Energy Management (BOEM), inherited the offshore wind leasing process.

In 2011, BOEM and DOE issued a "National Offshore Wind Strategy," which called for the deployment of 54 GW of offshore wind generating capacity by 2030.[76] (Under the DDPP Mixed Scenario, 20 GW of offshore wind would be added by 2030; under the DDPP High Renewables Scenario, the figure would be 64 GW.)

In April 2015, DOE issued its *Wind Vision* report, which examined how wind could supply 10% of the nation's electrical demand in 2020, 20% in 2030, and 35% in 2050. It studied a scenario with 22 GW of offshore wind capacity by 2030 and 86 GW by 2050.[77]

In September 2016, BOEM and DOE released a new version of the National Offshore Wind Strategy. Among the challenges it said would need to be overcome in order to achieve the *Wind Vision* goals are reducing costs and technology risks, and ensuring efficiency, consistency, and clarity in the regulatory process.

Progress has been made on both of those fronts. As the *Wind Vision* report documents, costs have declined significantly. In 2010, Secretary of the Interior Salazar launched a "Smart From the Start" program to speed wind deployment off the Atlantic Coast. BOEM hopes that Smart From the Start will reduce permitting time lines from the expected 7-10 years to half that or less.[78] Key elements of that program include:

- Streamlining the approval process for individual proposed projects and eliminating unnecessary regulatory requirements.
- Implementing a comprehensive, expedited leasing framework for offshore wind development by identifying so-called "wind energy areas" along the Atlantic Outer Continental Shelf that appear most suitable for offshore wind energy development because of fewer user conflicts and resource issues. Wind energy areas have been identified through an interagency process that gathered information regarding the environmental and geophysical attributes and other uses of these wind energy areas. That data were assembled in a publicly available format to help identify areas for development. Relevant federal departments with interests in the offshore areas were involved to reduce conflicts (e.g., Department of Defense military training; Coast Guard navigation; National Oceanic and Atmospheric Administration sensitive fishing grounds). State and tribal officials in each of the relevant states were consulted to obtain their input prior to the identification of wind energy areas.
- Moving aggressively on a separate but parallel track to process any applications to build offshore transmission lines, such as a potential regional "backbone" line that would serve multiple future offshore wind projects along the Atlantic outer continental shelf.[79]

BOEM has designated 11 wind energy areas, where offshore areas will be leased for wind development.[80] BOEM has awarded commercial leases for all of them. The leases could support a total of 14.6 GW of capacity.[81] BOEM is working to identify more areas. NEPA reviews are being tied to these designations, and arrangements are being made with other federal agencies and with the states in order to smooth the processes. The Smart From the Start program also involves a great deal of coordination on permitting; the National Offshore Wind Strategy declares:

> Several federal entities also have mandates to review and/or approve certain aspects of offshore wind projects, such as the Environmental Protection Agency, Fish and Wildlife Service, National Park Service, Department of Commerce's National Oceanic and Atmospheric Administration, National Marine Fisheries Service, Federal Aviation Administration, Department of Defense, U.S. Coast Guard, and the Federal Energy Regulatory Commission. Numerous state, local, and tribal government entities, as well as other stakeholders, must also be consulted in the permitting process. The mandates of these various enti-

74. BOEM, *Guide to the OCS Alternative Energy Final Programmatic Environmental Impact Statement (EIS)*, *at* http://www.boem.gov/Renewable-Energy-Program/Regulatory-Information/Guide-To-EIS.aspx (last visited May 11, 2017).
75. 30 C.F.R. pt. 585.
76. DOE, A National Offshore Wind Strategy: Creating an Offshore Wind Energy Industry in the United States iii (2011) (DOE/EE-0798).
77. DOE, Wind Vision, *supra* Table 7, note e, at xxxiii, fig. ES.1-3.
78. DOE, *supra* note 76, at 17.
79. DOE, *supra* note 76, at 13.
80. BOEM, *Mid-Atlantic Wind Energy Areas*, http://www.boem.gov/Mid-Atlantic-Wind-Energy-Areas/ (last visited May 11, 2017); BOEM, *North Atlantic Wind Energy Areas*, http://www.boem.gov/North-Atlantic-Wind-Energy-Areas/ (last visited May 11, 2017).
81. DOE & DOI, National Offshore Wind Strategy: Facilitating the Development of the Offshore Wind Industry in the United States (2016) (DOE/GO-102016-4866).

> ties include managing protected species, managing commercial and recreational fisheries, protecting marine and coastal habitats, and designation and protection of marine areas with special significance due to their conservation, recreational, ecological, historical, scientific, cultural, archeological, educational, or aesthetic qualities.[82]

The state role is strengthened by the CZMA. Under the Act, states prepare coastal zone management plans. Once a state plan has been approved by the Secretary of Commerce, all federal actions must be consistent with that plan, subject to very limited exceptions.[83]

The difficulties in working with all these federal and state agencies are highlighted by the tortuous path followed by the Cape Wind project. After being proposed in 2001, the project went through the NEPA process and obtained the permits it needed from the Corps, but it had to mostly start over when Congress shifted authority for offshore wind to DOI in 2005. DOI prepared a new EIS and approved the project in 2010. Other needed permits were issued in 2011. But the project was opposed by several prominent and wealthy owners of property in Cape Cod, including several members of the Kennedy family and one of the Koch brothers, and numerous lawsuits were filed.[84] Each new approval provided the opportunity for a new lawsuit. Among these were a suit by the Aquinnah Wampanoag Tribe of Gay Head in Martha's Vineyard, which claimed that the project would disrupt views that are necessary for their religious observances, and would violate their ancestral burial grounds[85]; and another seeking to overturn the Federal Aviation Administration's determination that the project would not be a hazard to flight.

The developers estimated they spent more than $70 million fighting the regulatory and legal battles. They seemed to have won them all, but in January 2015, the two utility companies that had signed power purchase agreements to buy most of the power output, discouraged by the lengthy delays, terminated the agreements.[86] In July 2016, the U.S. Court of Appeals for the District of Columbia Circuit rejected most of the challengers' latest claims, but found that BOEM had violated NEPA by using inadequate data about the seafloor and subsurface hazards, and must supplement the EIS. The court also found that FWS had erred in disregarding certain submissions before issuing an approval under the ESA.[87] Sixteen years after the project was first proposed, its fate remains very much in doubt.

This Massachusetts saga is in stark contrast to what has happened next door in Rhode Island.[88] By the mid-2000s, Rhode Island realized that it needed to expand its production of renewable energy, and that offshore might be a good place to do that. It conducted extensive studies of the offshore area, including marine ecology, climate, cultural and historical resources, fisheries, tourism, and recreation. The state's coastal regulator, the Coastal Resources Management Council, hired the University of Rhode Island to conduct the studies. They were utilized in undertaking a program of marine spatial planning—essentially, zoning the ocean to determine what sorts of activities should take place where and when. Interests that might otherwise be skeptical, including the fishing industry, were brought in early.

This led to the creation of the Rhode Island Ocean Special Area Management Plan (RI O-SAMP). Such plans are authorized by the CZMA, but had not previously been employed to plan for wind energy. They also tended to stop at the three-mile line; but the Coastal Resources Management Council, acting in the absence of a well-defined regulatory regime, went where the science took it, and its plan crossed into federal waters. The plan identified a site three miles southeast of Block Island as best suited for wind turbines. It did not hurt that Block Island is not connected to the mainland electric grid, and relies on diesel fuel to generate electricity; thus, the wind farm could lower Block Island's high electric bills, and the local government came to support the project (unlike what had happened in Cape Cod).

The U.S. Department of Commerce, eager to advance offshore wind, was receptive to this approach and accepted the RI O-SAMP into the state's coastal zone management plan. BOEM agreed to include the identified federal waters in the relevant wind energy area and lease them for offshore wind.

While all this was being done, the state issued a request for proposals to identify a qualified company to build a five-turbine 30-MW demonstration wind farm. The state selected Deepwater Wind, which was able to rely on the studies conducted by the state, and it agreed to reimburse the state for the $3.2 million cost of the studies. Since the studies had already been done, Deepwater Wind was able to obtain the needed federal and state permits within two years of applying.

Another element of this success was a power purchase agreement that would assure Deepwater Wind of a market for its electricity at a price that allowed it to obtain financing. With the strong support of the state's governor and legislature, National Grid entered into a power purchase agreement that some large ratepayers argued was above market prices. The state public utilities commission rejected the agreement based on its high cost, but

82. DOE, *supra* note 76, at 11 (abbreviations omitted).
83. 16 U.S.C. §1456. *See also* Jeffrey Thaler, *Fiddling as the World Floods and Burns: How Climate Change Urgently Requires a Paradigm Shift in the Permitting of Renewable Energy Projects*, 42 Envtl. L. 1101 (2012).
84. Katharine Q. Seelye, *Koch Brother Wages 12-Year Fight Over Wind Farm*, N.Y. Times, Oct. 22, 2013; Robert F. Kennedy Jr., *An Ill Wind Off Cape Cod*, N.Y. Times, Dec. 16, 2005.
85. Public Employees for Envtl. Responsibility v. Beaudreau, 25 F. Supp. 3d 67, 44 ELR 20058 (D.D.C. 2014).
86. Lawrence Susskind & Ryan Cook, *The Cost of Contentiousness: A Status Report on Offshore Wind in the Eastern United States*, 33 Va. Envtl. L.J. 204, 219-21 (2015); Powell, *supra* note 72, at 2025-27.
87. Public Employees for Envtl. Responsibility v. Hopper, No. 14-5301 (D.C. Cir. July 5, 2016).
88. This account of the events in Rhode Island is drawn from Michael Burger, *Consistency Conflicts and Federalism Choice: Marine Spatial Planning Beyond the States' Territorial Seas*, 41 ELR 10602 (July 2011); John M. Boehnert, *A New Blueprint for Coastal Zone Management*, 30 Nat. Resources & Env't 52 (2016); Susskind & Cook, *supra* note 86.

promptly afterwards, the legislature passed and the governor signed a law requiring the utility commission to consider environmental and other issues. In view of the project's environmental benefits, the commission then approved the agreement, and this approval was upheld by both the Rhode Island Supreme Court[89] and the U.S. District Court.[90] The facility began operation in December 2016. It is the first offshore wind farm in the United States, and, though it is small, it is being heralded as a model for federal-state cooperation in building projects of this sort.

New York may not be far behind Rhode Island. Gov. Andrew Cuomo has announced his strong support for a wind farm off Long Island, and in September 2016, the state released a "blueprint" for the New York State Offshore Wind Master Plan, declaring that New York has 39 GW of wind potential off its Atlantic Coast.[91] BOEM has identified a wind energy area off Long Island, and in December 2016, Statoil ASA, a subsidiary of a Norwegian energy company, won a BOEM auction to build a wind farm there of about 800 MW.[92] A coalition of fishing advocates, local towns, and municipalities sued BOEM, claiming that an EIS should have been prepared first. The U.S. District Court for the District of Columbia denied their motion for a preliminary injunction blocking the lease sale.[93]

Several of the states along the eastern seaboard have adopted statutory or regulatory programs to facilitate offshore wind, hoping the economic and political environments will become hospitable for such projects.[94] In August 2016, Massachusetts enacted a law requiring electric utilities to acquire a combined total of 1,600 MW of electricity from offshore wind; long-term contracts must be signed by 2027. However, this law was written to make Cape Wind ineligible to participate in this program.[95]

On the other hand, in May 2016, New Jersey Gov. Chris Christie vetoed a bill that would have advanced a proposed wind farm off Atlantic City,[96] amid charges from the Sierra Club that he is "holding offshore wind hostage to his national political ambitions."[97] A fellow Republican governor, Paul LePage of Maine, has been so cool to offshore wind that a Norwegian company that had been poised to build there withdrew.[98] For the Great Lakes, where BOEM has no jurisdiction, one commentator has written that without modifications to the coastal zone management process (which does apply):

> [S]tates may be reluctant to proceed, leaving them unprepared to face the headwinds that lie ahead. The snarled web of regulatory authorities, acts, and regulations must be sorted out now so that when the technological and infrastructural challenges are worked out, offshore deployment can take off in smooth, charted waters.[99]

Texas has a strong renewable portfolio standard, a tradition of permitting energy projects with relatively light environmental regulation, and control of the waters of the Gulf of Mexico beyond 10 nautical miles. It seemed poised to build offshore wind, but what may have been the most promising developer withdrew in 2013; Texas has by far the greatest amount of onshore wind power in the United States, and its cost is much lower than offshore facilities.[100]

Recommendations: BOEM should continue its designation of wind energy areas, and prepare programmatic EIS to expedite approval of projects in those areas. The most recent BOEM auction for offshore wind areas, held in December 2016 for a site off Long Island, New York, attracted six serious bidders and was won by a Norwegian-based company, Statoil.[101] This is one indication of considerable commercial interest in building such facilities.

In the first months of the Trump Administration, BOEM conducted an auction for offshore wind for water off Kitty Hawk, North Carolina; a Spanish-based company won. BOEM also announced it plans to stage another competitive lease auction in New England waters, triggered by unsolicited applications for the same area by Statoil and a German company.[102] These sorts of actions should continue.

Major federal facilities on the coastlines, such as large naval bases, should consider committing to purchasing power from offshore wind facilities. Power purchase agreements would considerably help project developers secure financing.

89. In re Review of Proposed Town of New Shoreham Project, 25 A.3d 482 (R.I. 2011).
90. Riggs v. Curran, No 15-342 (D.R.I. July 7, 2016).
91. New York State Energy Research and Development Authority, Blueprint for the New York State Offshore Wind Master Plan (2016).
92. Saqib Rahim & Daniel Cusick, *New York: How Statoil Edged Out the State on a Massive Bid*, Energywire, Dec. 19, 2016. *See also* Philip E. Karmel et al., *The Proposed Wind Farm Off the Shore of Long Island*, Envtl. L. N.Y., Sept. 2016.
93. Memorandum Opinion, Fisheries Survival Fund v. Jewell, No. 1:16-cv-02409, 47 ELR 20026 (D.D.C. issued Feb. 15, 2017), http://www.eenews.net/assets/2017/02/16/document_gw_01.pdf.
94. Katherine A. Roek, *Offshore Wind Energy in the United States: A Legal and Policy Patchwork*, 25 Nat. Resources & Env't 24 (2011).
95. Zahra Hirji, *Massachusetts' Ambitious Clean Energy Bill Jolts Offshore Wind Prospects*, Inside Climate News, Aug. 2, 2016; Bob Salsberg, *6 Things to Know About Massachusetts' New Energy Law*, Boston.com, Aug. 13, 2016.
96. Joyce Hannon, *Gov. Christie Vetoes Latest Offshore Wind Farms Bill*, Law360, May 2, 2016.
97. Jeff Tittel, *Christie Made NJ a Loser on Offshore Wind*, Daily J., Aug. 25, 2016; R. William Potter, *Opinion: Candidate Christie's Fateful About-Face on Wind Power*, NJ Spotlight, June 29, 2016.
98. *Maine Governor: Wind Power Is Too Expensive*, Seacoastonline.com, Apr. 4 2015; Susskind & Cook, *supra* note 86, at 226.
99. Sarah Schenck, *Maneuvering the Headwinds Facing Offshore Wind Development in the Great Lakes: Amending the Coastal Zone Management Act*, 98 Minn. L. Rev. 2479, 2510 (2013/2014). *See also* Ashlyn N. Mausolf, *Clearing the Regulatory Hurdles and Promoting Offshore Wind Development in Michigan*, 89 U. Det. Mercy L. Rev. 223 (2012).
100. Kent Harrington, *Texas Is Giving Away Wind Energy*, ChEnected, Nov. 30, 2015; Mark Del Franco, *Offshore Wind Developer Baryonyx Pulls Plug on GoWind Demonstration Project*, N. Am. Windpower, June 5, 2014; Anthony V. Bova, *What's the Holdup? How Bureaucratic Obstacles Are Undercutting the True Potential of American Wind Power*, 46 Suffolk U. L. Rev. 571, 593 (2013); Deninger *supra* note 71, at 91-94.
101. Diane Cardwell, *Off Long Island, Wind Power Tests the Waters*, N.Y. Times, Jan. 21, 2017.
102. Derrick Z. Jackson, *Made in America: Trump Embracing Offshore Wind?*, Daily Climate, Apr. 3, 2017, http://www.dailyclimate.org/tdc-newsroom/2017/april/made-in-america-trump-embracing-offshore-wind/.

Congress should instruct reviewing agencies that unavoidable visual and aesthetic impacts do not provide a basis for denying wind energy permits. There appears to be little evidence that offshore wind projects seriously impair property values, and even if they did, the decarbonization objective should take precedence.

Congress could include preference for offshore renewable energy projects in the CZMA consistency process.[103] This would make it more difficult for reluctant states to disapprove these projects should that issue arise.

States with offshore wind capacity should develop and implement processes to promptly review and act upon applications for offshore wind projects.

C. Disturbed Land

Contaminated sites, old mining areas, and closed landfills provide potential places to build solar or wind facilities. The land is typically inexpensive, and its owners are often happy to realize a little income—or even have someone else take it off their hands—if this use allows them to avoid the great expense of cleaning it up so that it can be suitable for residential use.

The U.S. Environmental Protection Agency (EPA) has established the RE-Powering America's Land Initiative to encourage and facilitate such actions. It reports that nearly 180 installations of renewable energy have been built on these sites, with a cumulative installed capacity of just over 1,124 MW.[104] As part of this program, EPA has developed an online mapping tool that has preliminarily screened more than 80,000 sites on more than 43 million acres for solar, wind, biomass, and geothermal potential.[105]

On December 5, 2013, President Obama issued a Presidential Memorandum, Presidential Leadership on Energy Management, that not only directed all federal agencies to obtain 10% of their yearly electricity from renewable resources by 2015 and 20% by 2020, but also directed that "[a]gencies shall consider opportunities to the extent economically feasible and technically practical, to install or contract for energy installed on current or formerly contaminated lands, landfills, and mine sites."[106]

One of the principal impediments stems from the fact that the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) makes anyone who assumes ownership or operation of a contaminated site potentially liable for its cleanup.[107] EPA insists that it will ordinarily not take enforcement action against renewables developers who build on contaminated land, and in July 2014, it issued its Liability Reference Guide for Siting Renewable Energy on Contaminated Properties. Several states have enacted laws encouraging the reuse of disturbed land for renewable projects.[108] However, many developers and their lenders remain skittish, in the absence of a more legally binding assurance of no liability, even though the actual risks are very modest.[109]

Several other developments are easing the way to finding sites for renewable energy facilities. The Federal Highway Administration is encouraging the use of highway rights-of-way for siting such facilities.[110] California has adopted a statute making it easier to use otherwise-restricted agricultural lands that have "severely adverse soil conditions" or "significantly reduced agricultural productivity" for renewable energy facilities.[111] Some farmers have found that it is more lucrative to lease certain land for renewable facilities than to grow crops there.[112]

In one particularly ambitious effort, in 2016, the Conservation Biology Institute and the University of California, Berkeley, School of Law published a study of land (most of it privately owned) in California's San Joaquin Valley where a collaborative process involving multiple stakeholders determined that solar PV could be sited with minimum conflicts with agriculture, species habitat, and other conservation concerns. Out of 9.5 million acres in the study area, 470,000 acres of land were identified, theoretically capable of providing 94,000 MW—greater than all combined in-state generation capacity.[113]

Recommendations: Congress could provide a liability exemption under CERCLA for the developers of renewable energy facilities on contaminated land, assuming they have followed specified standards and procedures.

States could adopt similar liability exemptions for renewable energy facilities under their own laws on contaminated land liability.

Other states could adopt laws similar to California's law encouraging renewables development on disturbed agricultural land.

States should conduct surveys to determine what disturbed lands (and other privately owned lands) would be suitable for renewable energy facilities.

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103. Thaler, *supra* note 83, at 1148.
104. U.S. EPA, *RE-Powering Accomplishment Highlights*, https://www.epa.gov/re-powering/re-powering-accomplishment-highlights (last updated Nov. 1, 2016).
105. U.S. EPA, *Developing Mapping and Screening Tools—RE-Powering Mapper*, https://www.epa.gov/re-powering/re-powering-accomplishment-highlights#highlight_1 (last updated Nov. 1, 2016).
106. Charles B. Howland, *Brightfields: Sustainable Opportunities for Renewable Energy Projects on Environmentally Impaired Lands*, 29 Nat. Resources & Env't 41 (2014).
107. 42 U.S.C. §§9601-9675, §9607 (CERCLA §107).
108. Amy Morris et al., *Green Siting for Green Energy*, 5 J. Energy & Envtl. L. 17 (2014).
109. Peter Trimarchi, *Structured Approach Can Help Solar Developers Fulfill Promise of Brownfields*, Daily Env't Rep. (BNA), Oct. 17, 2013, at B-1.
110. Federal Highway Administration, Renewable Energy Generation in the Highway Right-of-Way (2016) (FHWA-HEP-16-052), *available at* http://www.fhwa.dot.gov/environment/climate_change/mitigation/publications/row/renewablerow.pdf.
111. 2011 Cal. Stat. ch. 596; *see also* Amy Odens, *A New Crop for Agricultural Land: The Renewable Energy Mandate and Its Potential to Turn Farm Lands Into Energy Fields*, 44 McGeorge L. Rev. 1037 (2013).
112. Joe Ryan, *Harvesting Sunshine More Lucrative Than Crops at Some U.S. Farms*, Env't Rep. (BNA), Mar. 31, 2016, at A-9.
113. Dustin Pearce et al., University of California, Berkeley, Law School & Conservation Biology Institute, A Path Forward: Identifying the Least-Conflict Solar PV Development in California's San Joaquin Valley (2016), *available at* https://www.law.berkeley.edu/wp-content/uploads/2016/05/A-PATH-FORWARD-May-2016.pdf.

IV. NEPA

As noted above, large projects needing federal approvals, or federal onshore or offshore land, typically require an EIS under NEPA. Some states have their own impact assessment laws ("little NEPAs") that require EIS for state- or locally approved projects that are not undergoing EIS under NEPA. Many of the studies, hearings, and other processes involved in project approval are subsumed within the federal or state EIS processes, so while the EIS is being prepared, many other necessary tasks are being accomplished; delays should not be attributed entirely (or even mostly) to the EIS process.[114] But the NEPA and little NEPA processes can be extremely time-consuming and, as discussed below, several actions have been taken to speed up the processes, and more can be done.

An annual survey found that for federal EIS made available in 2014, there was an average of 1,709 days (4.7 years) between the issuance of the notice of intent to prepare an EIS and the issuance of the final EIS. Of the agencies most heavily involved in renewable energy projects, the average time for FERC was 1,201 days (with a range from 938 days to 2,985 days); for BLM, the average was 1,423 days (with a range from 839 days to 2,590 days).[115]

This does not span the full time between proposal and final construction approval; it takes at least months and sometimes years before a project reaches the point that an agency will issue a notice to prepare an EIS, and once the final EIS is complete, more months or years can pass until all permits are issued and construction may begin. Actual building also takes time, of course; one study found that for wind and solar projects, two to four years typically lapse between the start of construction and commercial operation.[116]

Project developers have long bemoaned delays caused by NEPA and the little NEPAs, and there have been many calls to reform and shorten the processes. The Council on Environmental Quality (CEQ) has performed numerous studies with this aim.[117] Improvements were made around the edges, but the most important change did not occur until December 2015.

As a lead-up to this, in 2010, DOI issued an order establishing a new interagency approach to facilitate permitting decisions for the siting and development of renewable energy projects on public lands.[118] This order proposed early collaboration inside and outside government, set schedules and monitored compliance with them, and added resources to the review process. All this helped reduce the time for processing solar and wind energy permits from an average of four years to one-and-a-half years.[119]

On August 31, 2011, President Obama issued a Presidential Memorandum calling on federal agencies to expedite the review of high-priority infrastructure projects. This led to the creation of the Federal Infrastructure Projects Permitting Dashboard, which tracked the permitting of approximately 50 selected major highway and transit projects. The dashboard was designed to provide greater transparency into agency decisionmaking by publicly announcing and tracking important NEPA milestones.

On March 22, 2012, the president took further action by signing Executive Order No. 13604, Improving Performance of Federal Permitting and Review of Infrastructure Projects. It established a steering committee comprising deputy secretaries or their equivalents from the 12 federal agencies most likely to be involved in infrastructure projects, charged with identifying best practices for infrastructure permitting and review. The steering committee issued its report in June 2012 and eventually developed the Implementation Plan for Modernizing Infrastructure Permitting. The White House developed the Federal Plan for Modernizing the Federal Permitting and Review Process for Better Projects, Improved Environmental and Community Outcomes, and Quicker Decisions, followed by an implementation plan that the steering committee issued in May 2014.

In 2015, Sens. Rob Portman (R-Ohio) and Claire McCaskill (D-Mo.) introduced the Federal Permitting Act, which adopted many of the recommendations that grew out of the process just described. That bill was folded almost entirely into the transportation appropriations bill as Title XLI, Federal Permitting Improvement. On December 4, 2015, President Obama signed this bill into law; it became the FAST Act.[120]

FAST borrows many of the key features of the president's initiative to expedite federal decisionmaking through improved efficiency, increased transparency, and application of best practices.[121] For example, it establishes the Federal Permitting Improvement Steering Council, the composition of which closely tracks the steering committee created by Executive Order No. 13604. The council is run by an executive director who is appointed by the president (without needing U.S. Senate confirmation). Moreover, the statute requires that federal agencies maintain an online

114. Linda Luther, Congressional Research Service, The Role of the Environmental Review Process in Federally Funded Highway Projects: Background and Issues for Congress 2-5 (2012); GAO, National Environmental Policy Act: Little Information Exists on NEPA Analyses 18-19 (2014) (GAO-14-369).

115. Piet deWitt & Carole deWitt, *Preparation Times for Environmental Impact Statements Made Available in 2014*, *in* Annual NEPA Report 2014, at 8 (Karen Johnson ed., National Association of Environmental Professionals 2015).

116. Steve Pociask & Joseph P. Fuhr Jr., U.S. Chamber of Commerce, Project No Project: Progress Denied: A Study on the Potential Economic Impact of Permitting Challenges Facing Proposed Energy Projects 9 (2011).

117. *E.g.*, CEQ, Modernizing NEPA Implementation (2003).

118. DOI, Secretarial Order No. 3285A1, Renewable Energy Development by the Department of the Interior (Feb. 22, 2010).

119. David J. Hayes, *Congress Just Enacted New Permitting Requirements for Energy Projects: Did You Miss It?*, Stan. L. Sch. Blog, Dec. 10, 2015, https://law.stanford.edu/2015/12/10/congress-just-enacted-new-permitting-requirements-for-energy-projects-did-you-miss-it/.

120. Pub. L. No. 114-94, 129 Stat. 1312.

121. This summary is drawn from Edward McTiernan et al., *Expediting Environmental Review and Permitting of Infrastructure Projects: The 2015 FAST Act and NEPA*, Real Est. Fin. J. 50 (Winter/Spring 2016).

permitting dashboard that presents project-specific permitting timetables, including projected dates for completion of environmental reviews and issuance of permits.

The permitting provisions apply to a broad swath of projects, not only those involving surface transportation. FAST applies to activities "involving construction of infrastructure for renewable or conventional energy production, electricity transmission," and many other kinds of infrastructure.[122] To qualify as a covered project, the initial anticipated total investment must be likely to exceed $200,000,000, and the project must trigger NEPA and be of a "size and complexity" such that "in the opinion of the Council . . . the project [is] likely to benefit from enhanced oversight and coordination . . . ."[123]

The council plays a key role in refining FAST's scheme for modernizing infrastructure permitting. The council is required to survey the key federal development agencies, develop an inventory of covered projects, and identify appropriate project categories. Based upon these categories, by December 2016, the council "shall develop recommended performance schedules, including intermediate and final completion dates, for environmental reviews and authorizations most commonly required for each category. . . ."[124] These schedules "shall reflect employment of the use of the most efficient applicable processes, including the alignment of Federal reviews of projects and reduction of permitting and project delivery time."[125] These schedules are not to exceed the average completion time for comparable projects. The statute creates a process for computing and then continuously updating these average completion times.

The new law further requires that

> [e]ach performance schedule shall specify that any decision by an agency on an environmental review or authorization must be issued not later than 180 days after the date on which all information needed to complete the review or authorization (including any hearing that an agency holds on the matter) is in the possession of the applicant.[126]

Furthermore, "[e]ach Federal agency shall conform to the completion dates set forth in the permitting timetable established . . ." by the council.[127] FAST stops short of allowing default approvals when agencies miss final deadlines. Nevertheless, it may give project sponsors a basis for seeking judicial relief for delayed permit decisions. Each covered project will have a lead agency, which will establish a plan for coordinating public and agency participation in any required federal environmental review, and set a permitting timetable, which may only be modified under limited circumstances. There are also constraints on how long the review date may be extended.

Other federal agencies are directed to cooperate with the lead agency in the processing of the application. Any disputes among agencies are to be resolved through a process established by the statute. The statute limits judicial review of project approvals by setting a two-year statute of limitations; allowing only parties that submitted comments during the environmental review process to sue, and then only about issues that had been raised in the comments; and in ruling on preliminary injunction motions, the court must consider the potential effects on public health, safety, the environment, and jobs. The statute also provides for coordination with state approvals, and for use of environmental review information developed at the state level so as to avoid unnecessary duplication.

On September 22, 2016, in one of its final public acts before President Obama left office, the council published an initial list of 34 covered projects.[128] As of April 10, 2017, 31 projects were posted on the council's permitting dashboard; seven of these were renewable energy projects (solar and hydropower).[129]

On January 24, 2017, just-inaugurated President Trump issued an Executive Order, Expediting Environmental Reviews and Approvals for High Priority Infrastructure.[130] It directs the CEQ to take the lead in coordinating federal efforts to expedite projects that are selected "after consideration of the project's importance to the general welfare, value to the Nation, environmental benefits, and such other factors as the Chairman [of CEQ] deems relevant." This language is certainly broad enough to encompass renewable energy projects. It is unclear why this Executive Order did not reference the FAST Act. However, the Executive Order signifies President Trump's commitment to expediting project approval. It is unclear whether renewable projects will benefit from this commitment, or whether the FAST Act will be utilized effectively. However, the FAST Act creates a statutory basis for expediting approvals.

Recommendations: Federal agencies should structure their reviews of new wind and solar capacity so that they can be completed as quickly as is reasonably possible. As noted at the beginning of this Article, in order to meet the DDPP targets, the amount of new wind and solar capacity that will need to be added each year must be an order of magnitude higher than what has been achieved in prior years. Even with an expedited NEPA process of the sort intended by FAST, reviewing and approving all these new facilities could swamp the ability of the regulatory agencies to handle such a volume. Two approaches are readily apparent.

The first is to increase staffing at the agencies. Given the difficulty in increasing government budgets, it has become increasingly common for agencies to allow or require appli-

122. Pub. L. No. 114-94, §41001(6)(A).
123. *Id.*
124. *Id.* §41002(c)(1)(C)(i).
125. *Id.* §41002(c)(1)(C)(ii)(I).
126. *Id.* §41002(c)(1)(C)(ii)(II)(cc).
127. *Id.* §41003(c)(2)(F)(i).
128. Permitting Dashboard, *FPISC Announces FAST-41 Covered Projects*, https://www.permits.performance.gov/about/news/executive-director-announces-fast-41-covered-projects (last updated Mar. 11, 2017).
129. Permitting Dashboard, *Projects*, https://www.permits.performance.gov/projects (last visited May 1, 2017).
130. Exec. Order No. 13766, 82 Fed. Reg. 8657 (Jan. 30, 2017).

cants to help pay for the costs of review, often through the use of higher permit application fees, enabling more staff or contractors to be hired to perform these tasks. (For example, DOI already arranges for applicants to pay for certain review work.) This of course leads to concerns over whether the reviews are completely independent. These problems are reduced if the funds go into general agency coffers rather than being used to hire personnel to look at specific projects.[131] These additional personnel resources could assist with the full range of permitting issues—not only those under NEPA. It will be important to ensure that the agencies retain control of the review work to minimize the chances of applicant capture. It is also important not to further reduce the staffing levels of the federal review agencies.

The second approach is to require fewer project-specific EIS by, for example, the more strategic use of programmatic EIS. As discussed above, BLM's Western Solar Plan, and BOEM's designation of wind energy areas, both successfully utilized programmatic EIS to consider impacts of similar projects over a broad geographic area.

Another way to reduce the number of EIS is to allow more projects to obtain approvals with a lower degree of environmental review. There are three levels of NEPA review: categorical exclusions (meaning that projects are of a type or size that have been previously determined not to have a significant environmental impact, and therefore not needing further environmental review); environmental assessments, which are shorter than EIS, leading to a finding of no significant impact (FONSI); and full EIS. Of all actions subject to NEPA, about 95% receive categorical exclusions; about 5% receive FONSIs; and fewer than 1% have EIS.[132]

A middle ground between a standard FONSI and a full EIS is a "mitigated FONSI"—a finding that no EIS is required if certain specified actions are taken to mitigate the project's impacts. Courts have accepted mitigated FONSIs as compliant with NEPA.[133] CEQ or project-approving agencies such as BLM or BOEM could amend their NEPA regulations to provide that a mitigated FONSI is the preferred method for reviewing certain kinds of renewable projects if specified types of mitigation measures are undertaken and if the particular site does not pose special problems.[134]

Along similar lines, several cities (most prominently Chicago and San Francisco) offer projects that meet certain environmental standards expedited review, reduced permit fees, and other benefits.[135] Likewise, agencies could grant review preference to renewable projects that met specified conditions.

The federal government should vigorously implement the new FAST provisions to achieve the expedited review of renewable energy projects. One element would be the imposition of time limits on reviews under NEPA, the ESA, and the Outer Continental Shelf Lands Act for renewable projects.[136]

Federal agencies with permitting or review roles should be required—perhaps through an amendment to CEQ's NEPA regulations—to address their issues on the front-end of the process, before projects are set in stone and before the scoping of an EIS. Too often, this now happens much later in the process.[137]

The CEQ NEPA regulations should require agencies to consider the positive as well as the negative environmental impacts of proposed actions when making decisions after environmental review; this is not always done now. The positive impacts of renewable energy projects can include reduced fossil fuel use.

V. State and Local Approvals

Many central station renewable projects require federal approvals, but all require state approvals and some also need local approvals. Some states and localities have been very hospitable to such projects; others have been less so. This section discusses the obstacles that some states and localities have posed to utility-scale projects, and how those obstacles might be addressed.

With respect to wind, as noted above, the leader by far is Texas. As of December 2016, it had 20,321 MW of installed wind capacity, nearly triple the second state, Iowa, with 6,917 MW, and the third, Oklahoma, which had 6,645 MW. The rest of the top 10 were California, with 5,662 MW; Kansas, 4,451 MW; Illinois, 4,026 MW; Minnesota, 3,526 MW; Oregon, 3,163 MW; Washington, 3,075 MW; and Colorado, 3,026 MW.[138]

As for solar, California is on top by a wide margin. As of December 2016, it had 18,296 MW of installed utility-scale solar capacity. Next were North Carolina, with 3,016 MW; Arizona, 2,982 MW; Nevada, 2,191 MW; New Jersey, 1,991 MW; Utah, 1,489 MW; Massachusetts, 1,487

131. *See* Jessica Owley, *The Increasing Privatization of Environmental Permitting*, 46 Akron L. Rev. 1091 (2013); Miriam Seifter, *Rent-a-Regulator: Design and Innovation in Privatized Governmental Decisionmaking*, 33 Ecology L.Q. 1091 (2006); Pat Ware, *Hazardous Waste: Several States With Privatized Programs Getting Speedier Cleanups at Lower Cost*, Daily Env't Rep. (BNA), Aug. 9, 2012, at B-1; Karen Young, *Air Pollution: New Georgia Program Will Allow Companies to Pay Fees to Accelerate Air Permit Process*, Daily Env't Rep. (BNA), June 27, 2013, at A-4.

132. GAO, *supra* note 114, at 7. For an innovative legislative approach to providing NEPA categorical exclusions to actions that meet certain conditions, see Jamilee E. Holmstead, Looking a Gift Horse in the Mouth: 2014 Farm Bill Insect and Disease Restoration Provisions—True Gift or False Hope? (2015) (M.S. thesis, Utah State University), http://digitalcommons.usu.edu/cgi/viewcontent.cgi?article=5523&context=etd.

133. City of Auburn v. United States, 154 F.3d 1025, 1033, 29 ELR 20096 (9th Cir. 1998).

134. *See* Trevor Salter, *NEPA and Renewable Energy: Realizing the Most Environmental Benefit in the Quickest Time*, 34 Environs Envtl. L. & Pol'y J. 173 (2011).

135. U.S. Green Building Council, *Green Building Incentive Strategies* (2010), http://www.slocounty.ca.gov/Assets/PL/Green+Building/Green+Building+Incentive+Strategies.pdf; City of Chicago, *Green Permits*, http://www.cityofchicago.org/city/en/depts/bldgs/provdrs/green_permit.html (last visited May 1, 2017).

136. Thaler, *supra* note 83, at 1143-46.

137. David J. Hayes, *Leaning on NEPA to Improve the Federal Permitting Process*, 45 ELR 10018 (Jan. 2015), *available at* http://www.eli.org/sites/default/files/docs/elrjan.pdf.

138. American Wind Energy Association, *Wind Energy Facts at a Glance*, http://www.awea.org/wind-energy-facts-at-a-glance (last visited May 1, 2017).

MW; Georgia, 1,432 MW; Texas, 1,215 MW; and New York, 927 MW.[139]

If Texas were a country, it would have the sixth largest wind-generating capacity in the world.[140] The boom in wind energy in Texas was certainly not driven by concern about climate change; oil and gas continues to be a dominant industry.[141] Rather, it stems from a combination of favorable economics, good planning, aggressive entrepreneurs, and the excellent wind resource enjoyed by much of the state. The deregulation of the state's power sector in 1999 under then-Gov. George W. Bush and a Republican legislature weakened the utilities monopoly and introduced competition. The same year, Texas adopted a renewable portfolio standard requiring 2,000 MW of new renewable energy capacity to be installed statewide by 2009. In 2005, the Texas Legislature raised the goal to 5,880 MW by 2015 and included a target of 10,000 MW by 2025. The state reached the 10,000 MW target in 2010, 15 years ahead of schedule.[142]

The federal production tax credit provided developers with an excellent incentive to build wind. Landowners were happy to receive income for the use of their land for turbines and transmission lines, and counties and school boards were pleased by the tax revenues. Everyone liked the lower electricity rates and the added jobs. Essential to all of this was an action by the legislature in 2005 creating competitive renewable energy zones (CREZs)—a $6.9 billion undertaking, completed to 2014, to build transmission lines that take the wind-generated power to market. It covers approximately 3,600 miles of right-of-way and is designed to serve approximately 18,500 MW of power.

CREZs are run by the Electric Reliability Council of Texas, the state's grid operator. The availability of these lines led to competition to build many wind farms. Since Texas is largely isolated electrically from the rest of the country, its grid is not subject to regulation by FERC. Without federal involvement (other than the subsidies), the Texas grid is not subject to NEPA, and Texas has no little NEPA law, so EIS are not needed. Offshore wind energy and solar energy are also poised to expand rapidly in Texas, and additional transmission may have to be built to handle this abundance of renewable energy.

Moving to solar, if California were a country, it would have the sixth largest generating capacity.[143] It has nearly one-half of the total installed capacity for solar in the United States,[144] and the amount of it has been growing rapidly. California receives a great deal of sunlight (insolation), and like everywhere, the costs of PV cells have been falling steeply. Unlike Texas, however, California is the state that has most fervently supported (and acted upon) the fight against climate change, and the growth of solar has been driven more by policy than by intrinsic economics. Californians tolerate relatively high electric rates.

California's renewable portfolio standard has been an important driver of the growth of solar; established in 2002, it rose from 20% (to be achieved by 2010) in 2006 to 33% (by 2020) in 2009 to 50% (by 2030) in October 2015.[145] The growth of rooftop solar has been spurred by net metering laws and the Million Solar Roofs Initiative.[146] More than 75,000 workers were employed in the solar industry in the state by the end of 2015.[147] As of September 2016, California had 7,350 MW in major solar projects in operation and another 27,948 MW in construction or under development.[148]

However, things have not gone as smoothly for central station solar plants in California. Solar PV farms require permits from local governments, typically county planning commissions, whereas solar thermal plants must be approved by the California Energy Commission, which has jurisdiction over power plants that generate 50 MW or more of electricity and also use heat to produce electricity. All these projects must go through California's little NEPA law, the California Environmental Quality Act (CEQA),[149] and there is controversy over the extent to which CEQA has inhibited the growth of solar in California.[150] In 2008, Gov. Arnold Schwarzenegger signed Executive Order No. S-14-08, designed to expedite the

139. Solar Energy Industries Association, *Top 10 Solar States*, http://www.seia.org/research-resources/top-10-solar-states (last visited May 1, 2017).

140. It would be behind China, the United States, Germany, India, and Spain, and ahead of the United Kingdom, Canada, France, Italy, and Brazil. Global Wind Energy Council, Global Wind Statistics 2015 (2016), *available at* http://www.gwec.net/wp-content/uploads/vip/GWEC-PRstats-2015_LR.pdf.

141. This account is drawn from Warren Lasher, *The Competitive Renewable Energy Zones Process*, ERCOT, Aug. 11, 2014; Roger Real Drouin, *How Conservative Texas Took the Lead in U.S. Wind Power*, Yale Env't 360, Apr. 9, 2015; The Texas Renewable Energy Industry, Texas Wide Open for Business (2014); Bill Spindle & Rebecca Smith, *Which State Is a Big Renewable Energy Pioneer? Texas*, Wall St. J., Aug. 29, 2016; James Osborne, *As Wind Boom Continues CREZ Capacity in Question*, Dallas Morning News, Feb. 13, 2015; Mark Del Franco, *Nearly Completed CREZ Lines Unlock Wind Congestion*, N. Am. Windpower (undated). *See also* Kate Galbraith & Asher Price, The Great Texas Wind Rush: How George Bush, Ann Richards, and a Bunch of Tinkerers Helped the Oil and Gas State Win the Race to Wind Power (2013).

142. Spindle & Smith, *supra* note 141.

143. International Energy Agency, Trends 2015 in Photovoltaic Applications 30, tbl. 3 (2015).

144. In the first quarter of 2016, there was 27.5 GWdc in solar operating capacity in the United States (PV only). GTM Research & Solar Industries Association, U.S. Solar Market Insight 2016 Q2 Executive Summary 5.

145. California Energy Commission, *Renewables Portfolio Standard (RPS)*, http://www.energy.ca.gov/portfolio/ (last visited May 1, 2017).

146. Lindsey Hallock & Michelle Kinman, *California's Solar Success Story: How the Million Solar Roofs Initiative Transformed the State's Solar Energy Landscape*, Env't Cal., Apr. 2015.

147. Ivan Penn, *California Solar Industry Job Growth Reaches Record Levels*, L.A. Times, Feb. 10, 2016.

148. Solar Energy Industries Association, Major Solar Projects in the United States Operating, Under Construction, or Under Development 2 (updated Sept. 14, 2016).

149. Cal. Pub. Res. Code §§21000 et seq.

150. Sean Hecht, *Anti-CEQA Lobbyists Turn to Empirical Analysis, but Are Their Conclusions Sound?*, Legal Plant, Sept. 28, 2015, http://legalplanet.org/2015/09/28/anti-ceqa-lobbyists-turn-to-empirical-analysis-but-are-their-conclusions-sound/; David Huard, *What Is Really Causing Renewable Project Failures in California?*, Envtl. Leader, May 17, 2011, http://www.environmentalleader.com/2011/05/17/what-is-really-causing-renewable-project-failures-in-california/.

permitting of renewable energy facilities by, among other things, creating a more coordinated permitting process for projects that must go through the California Energy Commission. However, one empirical study found that these projects actually take twice as long to be approved as those that get county approval.[151]

Some of these plants have faced considerable litigation.[152] As discussed below, the Ivanpah solar plant faced major difficulties due to the ESA. The county approvals have become obstacles in some cases; in August 2016, the San Bernardino County Board of Supervisors voted not to approve the 287-MW Soda Mountain Solar Project, which had been approved by BLM, but had drawn widespread opposition because of its proximity to the Mojave National Preserve and its potential impact on species habitat.[153] Moreover, according to one study, Texas is moving ahead of California in building renewable energy because Texas has been more stringent in enforcing its renewable portfolio standard, gives a single administrator the power to run the renewables program (as opposed to California's more decentralized system), and has done a much better job in building needed transmission.[154]

Some states other than Texas and California have begun moving aggressively to increase their renewables capacity. As noted above, Iowa is second only to Texas in its installed wind capacity. This amount may soon increase considerably; in August 2016, the Iowa Utilities Board approved a plan by MidAmerican Energy to erect 1,000 new turbines with a total capacity of 2,000 MW on several sites around the state at an estimated cost of $3.6 billion.[155] In June 2015, Hawaii enacted a law requiring all electric power to come from renewables by 2045.[156] In August 2016, the New York Public Service Commission approved the Clean Energy Standard supported by Governor Cuomo that requires 50% renewable energy use by the power sector by 2030.

Most states that have wanted to greatly expand their onshore renewable energy capacity have been able to do so without great legal difficulty, and many states have established processes for approval of renewable facilities.[157] It is seldom necessary to invoke eminent domain for new renewable energy generating facilities, as enough landowners have been willing to lease or sell their land for this purpose, though their neighbors are not always happy.

It is important to distinguish between state attitudes and local attitudes toward renewables siting. Most states have favored new renewables, but there are exceptions. Despite its abundant wind resource, Nebraska has not been especially hospitable to wind, partly due to resistance from its strong public power industry.[158] Connecticut had a moratorium on new wind projects from 2011 to 2014 while it developed regulations.[159] Ohio adopted setback rules in 2014 that have greatly impeded new wind development.[160] However, these states are the exceptions.

On the other hand, many municipalities have opposed wind farms, mostly due to objections from the neighbors, and some have used their land use power to stop projects. In 48 of the 50 states, local governments have significant control over the siting of commercial-scale wind facilities, and in 34 states, local governments have substantial autonomy to regulate such facilities.[161] The ability of states to limit local control varies, depending largely on the degree of "home rule" that each state's laws give its municipalities.

Several states have created siting councils to provide one-stop (or at least few-stop) procedures for major new energy facilities, including renewables; this can reduce the hurdles that project developers need to surmount, and at a minimum could help ensure that reviews are conducted simultaneously rather than sequentially. Some of these councils have the power under various circumstances to preempt local governments' ability to block such facilities.[162] (Other states' siting councils, such as the California Energy Commission, can only approve thermal electric plants.) Some states do not have siting councils, but nonetheless have statutes that preempt local control over certain renewables.[163]

The absence of local laws specifically aimed at the siting of renewable facilities has also inhibited construction in many places, and in some locations, there are laws specifically barring or inhibiting these facilities. Several organizations have prepared model wind or solar facility

151. Meaghan Mroz-Barrett, Utility Scale Solar Projects in California: An Initial Survey 14 (2015) (M.C.R.P. thesis, California Polytechnic State University), http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=2535&context=theses.

152. Laura Mulry, *Green vs. Green: Litigation for and Against Solar Power in California*, Climate L. Blog, Sabin Center for Climate Change L., May 18, 2011, http://blogs.law.columbia.edu/climatechange/2011/05/18/green-vs-green-litigation-for-and-against-solar-power-in-california/.

153. Louis Sahagun, *San Bernardino County Rejects a Controversial Solar Plant Proposed for the Mojave Desert*, L.A. Times, Aug. 24, 2016; Scott Streater, *Calif. County Rejects Massive BLM-Approved Project*, Greenwire, Aug. 24, 2016.

154. Maria C. Faconti, *How Texas Overcame California as a Renewable State: A Look at the Texan Renewable Energy Success*, 14 Vt. J. Envtl. L. 411 (2013).

155. *Iowa Utilities Board Approves Huge Wind Energy Project*, Des Moines Reg., Aug. 29, 2016.

156. H.B. No. 623 (2015).

157. Jesse Heibel & Jocelyn Durkay, *State Legislative Approaches to Wind Energy Facility Siting*, Nat'l Conf. of St. Legislatures, Nov. 1, 2016, http://www.ncsl.org/research/energy/state-wind-energy-siting.aspx.

158. Allan M. Williams, *The Winds of Change: How Nebraska Law Has Stalled the Development of Wind Energy and What Can Be Done to Spur Growth*, 47 Creighton L. Rev. 477 (2013/2014).

159. Douglas E. Lamb & Clare M. Lewis, *Connecticut's Moratorium on Wind Projects to End?*, McGuireWoods LLP, May 1, 2014.

160. Dan Gearino, *Amazon Official Criticizes Ohio's Wind Standards in Testimony*, Columbus Dispatch, May 19, 2016.

161. Environmental Law Institute, State Enabling Legislation for Commercial-Scale Wind Power Siting and the Local Government Role i (2011), *available at* https://www.eli.org/sites/default/files/eli-pubs/d21-02.pdf.

162. Among these are the Washington State Facility Site Evaluation Council; the Oregon Energy Facility Siting Council; the New York State Board on Electric Generation Siting and the Environment; Minnesota Public Utilities Commission; the Connecticut Siting Council; the New Hampshire Site Evaluation Committee; the Vermont Public Service Board; and the Rhode Island Facilities Siting Board. *See* K.K. DuVivier & Thomas Witt, *NIMBY to Nope—Or YESS?*, 38 Cardozo L. Rev. 1453 (2017); Uma Outka, *Intrastate Preemption in the Shifting Energy Sector*, 86 U. Colo. L. Rev. 927 (2015); Hannah Wiseman, *Expanding Regional Renewable Governance*, 35 Harv. Envtl. L. Rev. 477 (2011).

163. Wis. Stat. Ann. §66.0401; Minnesota Public Utilities Commission, Wind Turbine Siting Review Procedures (2008).

ordinances.[164] DOE has posted a catalog of 406 local wind energy ordinances.[165]

Some commentators have suggested enactment of a federal statute that would allow for preemption of local vetoes of renewable energy projects.[166] It is not clear if such preemption is needed. As just noted, several states have preemptive power. Municipal disapproval of wind projects was becoming a problem in New York,[167] so in 2011, the state amended the Public Service Law to allow the state siting board to preempt such disapprovals for projects of 25 MW or greater,[168] though smaller projects still face local law obstacles.[169] Iowa and Texas lack both preemptive power and state siting councils, but they nonetheless have led the nation in siting new wind facilities. Some proposed facilities have been blocked by local governments, but it is hard to tell if this has emerged as a major obstacle to increasing national wind and solar generating capacity by central station units. In other contexts, federal attempts to preempt state or local control over facility siting have backfired and have escalated opposition without actually leading to the construction of new facilities.[170]

Recommendations: Many states do not have adequate laws and procedures in place to review and approve large-scale renewable projects. Those states should emulate the states that do have such laws and procedures in place, such as California, New York, Oregon, and Washington.[171] The examples of Iowa and Texas show that special siting councils may not be essential in expanding construction of renewables, but their presence could certainly help smooth the way.

A major factor in securing local acceptance is whether municipalities and their residents see any benefit from the project. In some parts of the country, rental of land for wind turbines provides significant income. *Business Week* headlined one story "Wind Is the New Corn: In Some of the Poorest Rural Areas in the U.S., Turbines Are a Fresh Source of Wealth."[172] Many towns look for "benefit sharing," particularly payments (whether framed as taxes or otherwise). This method has proven successful in the siting of many kinds of facilities, such as solid waste landfills, resource recovery facilities, and transfer stations. Where the renewable energy facilities are to be located in minority communities, payments from the developers into those communities could help reduce environmental justice concerns.

Should local blockage become a major problem, a model for overcoming it is provided by the Telecommunications Act of 1996.[173] In the face of major difficulties in siting towers for the rapidly growing cellular telephone industry, Congress adopted a statute that left substantive siting decisions primarily with local governments, but imposed constraints on the approval process they could use. In particular, it prevented local governments from banning towers entirely, while still allowing localities to determine where the towers would go. It imposed time limits on their deliberations; if those limits were exceeded, it created a federal cause of action allowing the applicants to sue the municipalities in federal district court to obtain a speedy decision. The municipalities were also required to set forth detailed written explanations of any permit denials.[174] The one substantive restriction is that localities may not regulate towers "on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with [Federal Communications Commission] regulations."[175] The statute has proven very successful and has supported a tremendous expansion of cellular telephone service.[176]

Another potential model is the portion of the Energy Policy Act of 2005 pertaining to the siting of liquefied natural gas terminals.[177] It preempts certain state powers, gives special powers to FERC to coordinate federal reviews, and expedites judicial review. However, the process has not always gone smoothly, as states often resent preemption of their powers and may find alternative methods of impeding projects.[178]

Following the lead of the Telecommunications Act and the Energy Policy Act, a federal renewables statute could prohibit local governments from banning renewable energy facilities, require local governments to make decisions in facility siting within a reasonable period of time, require that the decisions be made in writing and supported by substantial evidence, and create a federal right-of-action for applicants to enforce these procedures.[179] Most states

164. *E.g.*, National Association of Regulatory Utility Commissioners, Wind Energy & Park Siting and Zoning Best Practices and Guidance for States (2012), *available at* http://pubs.naruc.org/pub/539BA6EE-2354-D714-5157-359DDD67CE7F; Sabin Center for Climate Change Law, http://columbiaclimatelaw.com/resources/model-laws-and-protocols/model-municipal-ordinances/. *See* James M. McElfish Jr. & Sara Gersen, *Local Standards for Wind Power Siting: A Look at Model Ordinances*, 41 ELR 10825 (Sept. 2011).

165. DOE, *WINDExchange*, http://apps2.eere.energy.gov/wind/windexchange/policy/ordinances.asp (last updated Nov. 24, 2015).

166. *E.g.*, Garrick B. Pursley & Hannah J. Wiseman, *Local Energy*, 90 Emory L.J. 877 (2011); Melanie McCammon, *Environmental Perspectives on Siting Wind Farms: Is Greater Federal Control Warranted?*, 17 N.Y.U. Envtl. L.J. 1243 (2009). *See also* Amy L. Stein, *The Tipping Point of Federalism*, 45 Conn. L. Rev. 417 (2012).

167. *See* Ecogen, LLC v. Town of Italy, 438 F. Supp. 2d 149 (W.D.N.Y. 2006) (upholding municipal moratorium on wind farms).

168. Michael B. Gerrard, *New York's Revived Power Plant Siting Law Preempts Local Control*, N.Y. L.J., Sept. 8, 2011.

169. Steve Orr, *D&C Investigation: Big Solar Coming to NYS, Some Are Wary*, Democrat & Chron., Nov. 22, 2016, http://www.democratandchronicle.com/story/news/2016/11/22/solar-power-energy-new-york-upsate/92844228/.

170. Michael B. Gerrard, Whose Backyard, Whose Risk: Fear and Fairness in Toxic and Nuclear Waste Siting (MIT Press 1994).

171. Thaler, *supra* note 83, at 1146-47.

172. Jennifer Oldham, *Wind Is the New Corn*, Bus. Wk., Oct. 16, 2016, at 16.

173. 42 U.S.C. §332(c)(7).

174. T-Mobile S., LLC v. City of Roswell, 135 S. Ct. 808 (2015).

175. 42 U.S.C. §332(c)(7)(B)(iv).

176. Ashira Pelman Ostrow, *Process Preemption in Federal Siting Regimes*, 48 Harv. J. on Legis. 289 (2011).

177. Energy Policy Act of 2005, Pub. L. No. 109-58, 119 Stat. 594, tit. III, amending Natural Gas Act, 15 U.S.C. §717-17w.

178. *See* Jacob Dweck et al., *Liquefied Natural Gas (LNG) Litigation After the Energy Policy Act of 2005: State Powers in LNG Terminal Siting*, 27 Energy L.J. 473 (2006); Kenneth T. Kristl, *Renewable Energy and Preemption: Lessons From Siting LNG Terminals*, 23 Nat. Resources & Env't 58 (2009).

179. This concept is discussed in detail in Patricia E. Salkin & Ashira Pelman Ostrow, *Cooperative Federalism and Wind: A New Framework for Achieving*

would also have the power to preempt local government bans. Whether the federal government or the states would be more inclined to adopt such provisions, of course, will largely depend on the federal and state politics at the particular time.

VI. Species Protection Laws

The federal ESA,[180] the Migratory Bird Treaty Act (MBTA) of 1918,[181] and other statutes designed to protect species, especially birds, have become an impediment to some utility-scale renewable energy projects, both wind and solar. These laws serve extremely important functions in protecting biodiversity and other values, but ways must be found to reconcile them with the environmental imperative of building a large number of new renewable energy facilities.

None of these species protection laws has a "green pass"—an exemption for projects that confer other environmental benefits.[182] Wind turbines can kill birds and bats; solar arrays can cover over the habitat of desert creatures; other adverse impacts can occur. This has led to tension within the environmental movement between the efforts to fight climate change and to protect biodiversity, especially given the scale of renewable energy construction that will be needed. By the time the ESA was enacted in 1973, the United States had already built the core of its massive national-scale infrastructure systems, including the interstate highway system, the Intracoastal Waterway, the oil and gas pipeline system, the electric power grid, and the major airports. When that infrastructure was built, rare creatures could be swept away.[183] That is no longer so.

These tensions have inevitably led to a large volume of litigation. Most of the suits challenging renewable projects because of their species impacts have failed,[184] but these claims do provide project opponents with legal and political ammunition. There appears to have been only one decision halting a project because of a violation of the ESA. That concerned a wind farm in West Virginia that had failed to obtain an incidental take permit (a requirement discussed below) for its impact on the endangered Indiana bat.[185] That project later obtained the needed permit and went forward, though with some restrictions.[186] Several other projects were found to violate NEPA because of inadequate analysis of species impacts; all of these were allowed to go back and prepare supplemental analysis.[187] Similarly, the National Historic Preservation Act[188] has sometimes proven to be a temporary obstacle, especially when Indian tribes are involved.[189]

Several projects in North America have been cancelled at least in part due to species issues, including the Palen solar project in California,[190] a 177-MW wind project on a rural area of Saskatchewan, Canada,[191] and a wind project at an Ohio National Guard base along Lake Erie (though this one may come back).[192] Others have been significantly reduced in size.[193] As discussed elsewhere in this Article, species impacts were major issues for the Cape Wind project and the Ivanpah solar project. The American Bird Conservancy is opposing any and all wind projects in the Great Lakes.[194]

Climate change itself will, of course, cause many species to go extinct; the warmer it gets, the more species will disappear.[195] The Intergovernmental Panel on Climate Change reports with "high confidence" that a "large fraction of species faces increased extinction risk due to climate change during and beyond the 21st century, especially as climate change interacts with other stressors."[196] One study found that more than one-third of North American birds face extinction risk, and climate change and sea-level rise are among the main reasons.[197] Another study classified more than one-half (314 of 588) of North

Sustainability, 37 Hofstra L. Rev. 1049 (2009).

180. 16 U.S.C. §§1531 et seq.
181. *Id.* §§703 et seq.
182. J.B. Ruhl, *Harmonizing Commercial Wind Power and the Endangered Species Act Through Administrative Reform*, 65 Vand. L. Rev. 1769, 1773 (2012).
183. *Id.* at 1774.
184. John Copeland Nagle, *Green Harms of Green Projects*, 27 Notre Dame J.L. Ethics & Pub. Pol'y 59 (2013); Lisa Wing Stone & Sara Zdeb, *Lessons Learned From Wind Farm Litigation*, Envtl. Litig. & Toxic Torts Committee Newsl. (American Bar Association), Mar. 2009, at 2. *See also Renewable Energy Project Challenges—Snapshot of the Litigation Landscape*, The Lawyer, Nov. 15, 2012.
185. Animal Welfare Inst. v. Beech Ridge Energy L.L.C., 675 F. Supp. 2d 540, 39 ELR 20278 (D. Md. 2009).
186. Gordon Smith, *Birds and Bats and Blades*, Envtl. F., May/June 2015, at 36.
187. Union Neighbors United Inc. v. Jewell, No. 15-5147, 46 ELR 20133 (D.C. Cir. Aug. 5, 2016); Public Employees for Envtl. Responsibility v. Hopper, No. 14-5301 (D.C. Cir. July 5, 2016); Oregon Natural Desert Ass'n v. Jewell, 823 F.3d 1258 (9th Cir. 2016); Bundorf v. Jewell, 142 F. Supp. 3d 1138, 45 ELR 20205 (D. Nev. 2015).
188. 54 U.S.C. §§300101 et seq.
189. Quechan Tribe of the Fort Yuma Indian Reservation v. U.S. Dep't of the Interior, 755 F. Supp. 2d 1104 (S.D. Cal. 2010) (granting preliminary injunction against solar project due to failure to consult with Indian tribe, in violation of National Historic Preservation Act).
190. *End of the Line for the Palen Solar Project*, KCET, Feb. 11, 2016; Sammy Roth, *Palen Solar Project Near Joshua Tree on Life Support*, Desert Sun, Dec. 10, 2015.
191. Press Release, Government of Saskatchewan, Wind Energy Project Denied to Protect Migratory Birds (Sept. 19, 2016).
192. John Seewer, *Birders Win Halt to National Guard Wind Turbine*, Columbus Dispatch, Feb. 9, 2014.
193. BLM, Silver State South Project and Las Vegas Field Office Resource Management Plan Amendment, Record of Decision (2014); BLM, Notice of Availability of the Record of Decision for the Final Environmental Impact Statement and the Proposed Resource Management Plan Amendment for the Silver State Solar South Project, Clark County, NV, 79 Fed. Reg. 9921 (Feb. 21, 2014), *available at* https://www.gpo.gov/fdsys/pkg/FR-2014-02-21/pdf/2014-03685.pdf. (solar project reduced from 350 MW to 250 MW, largely due to concerns about desert tortoise); Julie Cart, *BrightSource Energy Has Spent $56 Million So Far to Protect the Threatened Creatures, but Calamities Have Befallen the Effort*, L.A. Times, Mar. 4, 2012 (Ivanpah solar project).
194. Press Release, American Bird Conservancy, Wind Turbines on the Great Lakes Threaten Migratory Birds (Aug. 5, 2016). *See also* Hannah Treppa, *Not a Huge Fan: Deterring the Implementation of Wind Turbines in the Great Lakes*, 93 U. Det. Mercy L. Rev. 321 (2016).
195. Mark C. Urban, *Accelerating Extinction Risk From Climate Change*, 348 Science 571 (2015).
196. Intergovernmental Panel on Climate Change, Climate Change 2014 Synthesis Report Summary for Policymakers 13.
197. North American Bird Conservation Initiative, The State of North America's Birds 2016, *available at* http://www.stateofthebirds.org/2016/wp-content/uploads/2016/05/SoNAB-ENGLISH-web.pdf.

American bird species as climate-endangered or -threatened in this century.[198]

The impacts of wind turbines are negligible compared to other sources of bird mortality. Far more birds are killed by collisions with buildings and communication towers, attacks from cats, and poisoning from pesticides.[199] One study attempted to look at the life cycles of various power sources (including coal and uranium mining, fossil fuel combustion, etc.) and found that wind farms are responsible for roughly 0.27 avian fatalities per gigawatt-hour (GWh) of electricity, while nuclear power plants involve 0.6 fatalities per GWh and fossil fuel-fired power stations are responsible for about 9.4 fatalities per GWh.[200]

Several portions of the ESA have direct bearing on the construction of renewable energy projects. Section 4 requires species to be listed as endangered or threatened based on "the best scientific and commercial data available" about the threats posed to their existence, without regard to the consequences of listing.[201] Section 7 requires that all federal agencies "shall . . . insure that any action authorized, funded or carried out by such agency . . . is not likely to jeopardize the continued existence of any endangered species or threatened species."[202] Section 9 provides that no one—including private parties—may "take" (defined to mean "harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect")[203] any such species without a permit.[204] Under §10, a permit to modify habitat in a way that may "take" protected species may be issued only if the taking is "incidental" (i.e., not the purpose of the activity) and the applicant submits a habitat conservation plan.[205]

All central station wind and solar projects fall under §9, and unless they involve no onshore or offshore federal land or approvals, they will also invoke §7. Some may also involve state laws such as the California Endangered Species Act.

Section 7 is set up to deal with one species at a time, and §9 one project at a time. Preparing a habitat conservation plan under §10, with all the required consultations and studies, can take several years and require considerable staff time at FWS (the chief agency implementing the ESA) and elsewhere. That becomes a real obstacle for a plan to build a large number of big renewable energy projects in a fairly short period of time.

Prof. J.B. Ruhl, a leading authority on the ESA, wrote in 2012, "[A]fter almost ten years of policy development, permitting, and litigation, there is still no comprehensive, tested, reliable template for commercial wind power to secure expeditious ESA compliance."[206] FWS' first significant step to help wind developers understand what is expected of them came in 2003, with issuance of the Interim Guidelines to Avoid and Minimize Wildlife Impacts on Wind Turbines. In 2012, these were superseded by a much more detailed set of land-based wind energy guidelines, which were developed in close consultation with the wind industry.[207] Some progress has been made in accelerating the process.

In order to cope with the cumbersome process of preparing habitat conservation plans, and the need to consider the cumulative impacts of multiple projects in the same area, FWS has been employing regional habitat conservation plans, which allow the environmental assessment and wildlife permitting process to occur once for multiple species over a large geographic area, merging the NEPA and ESA processes. FWS began with three of these.[208] The Desert Renewable Energy Conservation Plan (for southern California) has already been discussed. The Upper Great Plains Wind Energy Plan, covering Iowa, Minnesota, Montana, Nebraska, North Dakota, and South Dakota, was finalized in July 2016. It overlaps with the Midwest Wind Energy Multi-Species Habitat Conservation Plan, which concerns Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, Ohio, and Wisconsin. The draft of that plan was released on April 15, 2016, and the comment period closed on July 14, 2016.

These measures should greatly ease the process of building major wind projects. Each project can rely on the regional habitat conservation plan and programmatic EIS, and focus just on site-specific issues. Another measure that has been found to speed the process is the use of programmatic biological opinions, in which FWS examines multiple similar actions or different actions proposed to occur within the same area.[209]

Private governance is also playing a role. In 2008, the American Wind Wildlife Institute, a partnership among the wind industry, scientific community, and conservation organizations, was formed to foster research and develop tools to promote timely and responsible wind energy development that minimizes impacts to wildlife and wildlife habitat. To address specific concerns about bats, the Bat Wind Energy Cooperative, a collaboration of the wind industry, Bat Conservation International, and DOE, was formed in 2003 and has developed various mitigation strategies.[210] The Nature Conservancy has created the Biodiversity and Wind Siting Mapping Tool for New York State to help wind developers avoid areas with particular ecological vulnerability.

198. National Audubon Society, Audubon's Birds and Climate Change Report 6 (2015), *available at* http://climate.audubon.org/sites/default/files/NAS_EXTBIRD_V1.3_9.2.15%20lb.pdf.
199. Benjamin K. Sovacool, *The Avian and Wildlife Costs of Fossil Fuels and Nuclear Power*, 9 J. Integrative Envtl. Sci. 255, 263 (2012).
200. *Id.*
201. 16 U.S.C. §1533(b)(1).
202. *Id.* §1536(a)(2).
203. *Id.* §1532(19).
204. *Id.* §1538(a)(1)(B).
205. *Id.* §1539(a)(2).
206. Ruhl, *supra* note 182, at 1788.
207. *Id.* at 1778-79.
208. *Id.* at 1783.
209. Melinda Taylor et al., *Protecting Species or Hindering Energy Development? How the Endangered Species Act Impacts Energy Projects on Western Public Lands*, 46 ELR 10924 (Nov. 2016).
210. Taber D. Allison et al., *Thinking Globally and Siting Locally—Renewable Energy and Biodiversity in a Rapidly Warming World*, 126 Climatic Change 1, 4 (2014).

Some scholars are resisting the idea of speeding up the approval process for large wind projects. They argue that the ecological risks and uncertainties are still too great, that the processes should go more slowly while better information is developed, and that more focus should be devoted to installing PV on rooftops, disturbed lands, and other less environmentally sensitive sites.[211] However, it is difficult to reconcile these recommendations with the extraordinary pace of construction required under the DDPP scenarios.

It is unquestionable that many uncertainties do exist. This is illustrated by the Ivanpah Solar Electric Generating System, the largest concentrating solar plant in the world. It is located on 3,500 acres of BLM land in San Bernardino County, California, near the Nevada border.[212] The private developer, BrightSource Energy, Inc., first filed its application in 2007. It obtained a series of state and federal approvals, broke ground in 2010, and began generating power in 2014. It consists of three 459-foot thermal collection towers, each surrounded by a field of mirrors—more than 173,500 in all—that direct sunlight to the towers. Boilers in the towers produce steam that drives conventional turbines that generate electricity, with a total capacity of 377 MW. Much of the attention during the environmental review went to an endangered species, the desert tortoise. Initial studies assumed that up to 38 tortoises lived on the project site and would need to be relocated during construction. However, once construction began, it became clear that far more tortoises lived there. Construction stopped while FWS prepared a new biological opinion and issued a new incidental take permit. Numerous measures to minimize and monitor impacts were adopted. The project also needed to acquire and permanently preserve more than 7,000 acres of off-site habitat for desert tortoises and other species.

After the plant opened, an unanticipated phenomenon occurred. In the words of Morgan Walton:

> [L]ocal observers noticed "smoke plume[s]" in the air when birds flew through the concentrated sun rays reflected off of the mirrors. The workers called these birds "streamers" for the image they created as the animals spontaneously ignited in midair and hurtled to the ground in a smoking, smoldering ball. These deaths are not isolated incidents where only a few stray birds—reports estimate that over 3,500 birds have experienced a similar fate during the plant's first year, although the exact number is a subject of debate.[213]

As this is written in June 2017, a technical solution has not been announced, and the regulatory implications remain unclear.[214] Also unclear is the future of concentrating solar power—partly because of the Ivanpah experience, and more importantly because of the plummeting cost of PV cells, and their lower water consumption.

When species impacts are anticipated (even if very imperfectly, as with Ivanpah), the first preference is to avoid or at least reduce them, and to the extent that some remain, mitigate them, which often involves finding substitute habitat. This is a tricky process, in part because of the scientific uncertainty about how various species will be affected, and whether and how long they would thrive in other locations, especially in a changing climate. DOI is trying to inject these issues into early project planning and to strengthen the scientific basis for decisionmaking.[215]

In addition to the ESA, two other federal statutes contribute to challenges in siting utility-scale renewable energy facilities. The first is the Migratory Bird Treaty Act (MBTA),[216] which makes it a criminal offense to kill a migratory bird "by any means, or in any manner." In 2001, President Bill Clinton signed an Executive Order clarifying that this applies to unintentional as well as intentional killing.[217] The MBTA currently covers more than 1,000 bird species. In two instances, wind facility operators were charged with violating this law. In 2013, Duke Energy Renewables, Inc. was prosecuted for the deaths of 14 golden eagles and 149 other protected birds at two wind projects in Wyoming. In 2014, PacifiCorp Energy was charged in the deaths of 38 golden eagles and 336 migratory birds at other facilities in Wyoming. Both companies pled guilty, paid substantial fines, and agreed to costly compliance plans. It appears that neither company followed FWS guidance that was in effect at the time.[218]

These prosecutions have led to some anxiety in the wind industry. However, there is a solution. The MBTA gives the Secretary of the Interior the authority to issue incidental take permits, but unlike for the ESA or the eagle law (discussed below), the secretary has not established procedures to issue such permits under the MBTA. Thus, wind farm operators cannot be sure that they are operating legally if birds die in their turbines, and they can be somewhat but not absolutely certain that they will not be prosecuted if they follow the guidelines. As several commentators have already urged, the secretary should use this authority and promulgate regulations for the issuance of incidental take

211. Amy Wilson Morris & Jessica Owley, *Mitigating the Impacts of the Renewable Energy Gold Rush*, 15 Minn. J.L. Sci. & Tech. 293 (2014); Kalyani Robbins, *Responsible, Renewable, and Redesigned: How the Renewable Energy Movement Can Make Peace With the Endangered Species Act*, 15 Minn. J.L. Sci. & Tech. 555 (2014).

212. This account is drawn from Morris & Owley, *supra* note 211; Morgan Walton, *A Lesson From Icarus: How the Mandate for Rapid Solar Development Has Singed a Few Feathers*, 40 Vt. L. Rev. 131 (2015); and BrightSource, Ivanpah Solar Electric Generating System (2014), *available at* http://www.brightsourceenergy.com/stuff/contentmgr/files/0/3eac1a9fed7f13fe4006aaab8c088277/attachment/ivanpah_white_paper_0414.pdf.

213. Walton, *supra* note 212, at 132 (citations omitted).

214. Louis Sahagun, *This Mojave Desert Solar Plant Kills 6,000 Birds a Year. Here's Why That Won't Change Any Time Soon*, L.A. Times, Sept. 2, 2016.

215. Hayes, *supra* note 54; FWS, Endangered and Threatened Wildlife and Plants: Endangered Species Act Compensatory Mitigation Policy, 81 Fed. Reg. 95316 (Dec. 27, 2016); Morris & Owley, *supra* note 211.

216. 16 U.S.C. §§703-712.

217. Exec. Order No. 13186, 66 Fed. Reg. 3853 (Jan. 17, 2001), Responsibilities of Federal Agencies to Protect Migratory Birds.

218. Cassie Tigue, *Wind Energy Development and Protection of Wildlife: Creating a Balance Between Two Competing Interests*, 45 Tex. Envtl. L.J. 223 (2015); Smith, *supra* note 186, at 36; Alan Kovski, *Cooperative Efforts Encouraged to Reduce Risk of Wind Farm Bird Deaths, Legal Action*, Daily Env't Rep. (BNA), Dec. 3, 2013, at A-9.

permits under the MBTA, coupled with whatever requirements are necessary to minimize bird deaths.[219]

The other relevant statute is the Bald and Golden Eagle Protection Act of 1940.[220] It bars the taking of either of these kinds of birds, but it allows FWS to issue permits for such taking. In 2009, FWS issued regulations authorizing issuance of permits for the taking of eagles. These permits would have a maximum term of five years. In 2013, partly to encourage new wind farms, FWS amended its regulations to extend the maximum term of permits to 30 years. Conservation groups were unhappy with this extension, and they sued. In 2015, a court invalidated the rule because FWS had not complied with NEPA in promulgating it; FWS should have prepared an environmental assessment or an EIS.[221] FWS then went back, prepared a programmatic EIS, and in December 2016, it published a final rule that extended the permit term to 30 years and also added more stringent conservation standards and more flexible mitigation requirements for permits.[222]

Recommendations: Professor Ruhl has made the following sensible recommendations for improving the ESA process for the review of renewable projects[223]:

1. FWS should enhance species impact databases and standardized metrics for take assessment. This would ease the process of evaluating projects' impacts on species.
2. After appropriate review, FWS should consider endorsing the work product of outside entities, such as the landscape assessment tool produced by the American Wind and Wildlife Institute. This would provide greater clarity and specificity to all parties—government agencies, applicants, and environmental groups—in assessing project impacts and identifying optimal siting.
3. FWS could develop standard methodologies for mitigation of harms from particular kinds of utility-scale projects, drawing from a wide set of mitigation options and recipes including habitat conservation banks and payment formulae.[224]
4. FWS should consider the positive environmental impact of renewable energy in granting mitigation credit under the §10 process,[225] and all federal agencies should consider these positive impacts in making decisions under NEPA.

These are additional specific actions that should be taken:

1. FWS should use its existing authority to issue incidental take permits under the MBTA so that renewable project operators do not face criminal prosecution if they take required precautions but nonetheless some birds die.
2. The president should issue an Executive Order, or the Secretary of the Interior should issue a departmental order, imposing time limitations (subject to limited extensions for good cause) for the ESA §10 incidental take permit process and consider other ways to make the process more efficient.
3. FWS should expand types of compensatory mitigation allowed for renewable energy project impacts on wildlife. Some examples of compensation for offshore wind projects, for example, could include protecting or expanding existing breeding habitat, such as seabird nesting islands; reducing mortality of adults of long-lived species, such as in marine mammal boat collisions or fisheries bycatch (birds, sea turtle, nontarget vulnerable fish species); and controlling pollutants, such as mercury, that reduce reproductive success.[226]
4. FWS and the U.S. Department of Justice should negotiate agreements with project applicants making clear that no enforcement actions will be taken against any renewable projects that fulfill specified protective measures.[227]
5. FWS, the scientific community, and the wind industry should continue to develop techniques to reduce bird and bat mortality from wind turbines. The most prominent techniques so far involve

219. Robert J. Martin & Rob Ballard, *Reconciling the Migratory Bird Treaty Act With Expanding Wind Energy to Keep Big Wheels Turning and Endangered Birds Flying*, 20 Animal L. 145 (2013); Krisztina Nadasdy, *Killing Two Birds With One Stone: How an Incidental Take Permit Program Under the MBTA Can Help Companies and Migratory Birds*, 41 B.C. Envtl. Aff. L. Rev. 167 (2014).
220. 16 U.S.C. §§668-668d.
221. Shearwater v. Ashe, No. 14-CV-02830-LHK, 45 ELR 20151 (N.D. Cal. Aug. 11, 2015).
222. FWS, Eagle Permits; Revisions to Regulations for Eagle Incidental Take and Take of Eagle Nests, 81 Fed. Reg. 91494 (Dec. 16, 2016); S. Keith Garner, *FWS Proposes, Again, to Issue 30-Year Eagle Act Permits*, Law360, June 21, 2016; Ankur K. Tohan et al., *Eagle Take Permit Program Revamped—Longer Permits and Clearer Mitigation Requirements*, K&L Gates, May 23, 2016.
223. Ruhl, *supra* note 182, at 1796-98.
224. *See* Elinor Benami et al., Stanford Law School, Comments and Recommendations for the Steering Committee on Federal Infrastructure Permitting and Review Process Improvement and the President's Chief Performance Officer, Director of OIRA, and Chair of the Council on Environmental Quality (2013), *available at* https://www-cdn.law.stanford.edu/wp-content/uploads/2015/04/WH-Comments-Final1-Permitting.pdf.
225. Several provisions in ESA §10 could provide support for this measure. These include the requirement that "the impact which will likely result from such taking" (§10(a)(2)(A)(i)) be considered, which does not limit consideration to local and immediate as opposed to global and cumulative impacts; that "alternative actions to such taking" (§10(a)(2)(A)(iii)) be considered, which should allow a broad review of the methods of reducing emissions from the energy sector; and the necessary finding that "the taking will not appreciably reduce the likelihood of the survival and recovery of the species in the wild" (§10(a)(2)(B)(iv)), which could also allow consideration of large-scale impacts of renewable energy.
226. M. Wing Goodale & Anita Milman, *Cumulative Adverse Effects of Offshore Wind Energy Development on Wildlife*, 59 J. Envtl. Plan. & Mgmt. 1, 12 (2016).
227. FWS did this in 2014 with EDF Renewable Energy. Andrew Bell, *A New Approach by USFWS Over Wind Energy Avian Issues*, Marten L., Jan. 21, 2016. *See also* The Edison Electric Institute's Avian Power Line Interaction Committee & FWS, Avian Protection Plan (APP) Guidelines (2005), *available at* http://www.aplic.org/uploads/files/2634/APPguidelines_final-draft_Aprl2005.pdf.

reducing turbine speed; turning them on only when wind speed is above a certain level; and turning them off during migration periods. Research should also continue on new technologies such as vertical-axis turbines (which spin around a central axis like a top), and ultrasonic acoustic systems and ultraviolet lights that deter bats. Use of some of these techniques and technologies will presumably come to be required by the permits for wind facilities.

In view of the serious obstacles that the ESA has posed to renewable projects, should the day come when we have a Congress that wants to preserve the ESA's essential values but wishes to promote aggressive construction of renewable facilities, it should consider creating an easier path under §§7 and 10 for renewable projects that have met certain tightly defined conditions, such as thorough habitat studies, adoption of all reasonable mitigation measures, and utilization of any available technologies and techniques to minimize impacts. This might include special provisions reducing the impediments to renewables caused by certain species, such as the Indiana bat. As Taber D. Allison and colleagues have written: "We argue the need to accept some and perhaps substantial risk of impacts to wildlife from renewable energy development in order to limit the far greater risks to biodiversity loss owing to climate change."[228]

VII. Needed Complementary Actions

This Article has discussed the legal obstacles to the construction of large numbers of central station wind and solar generating facilities, focusing on the facilities themselves. However, many other actions must take place in order for this to happen.

A. Grid Connection and Integration

As already noted several times, central station generators must be connected to the load they serve. This may involve running new power lines shorter or longer distances to the nearest suitable grid connection, and it may require upgrading the existing lines to handle the electricity supplied by the new renewable energy source.

It is not just a matter of plugging wires into the existing grid. The grid is a complex, finely tuned instrument, and its proprietors (in many parts of the country, these are regional transmission operators or independent system operators) require a close examination to make sure the new inflow of electrons will not disrupt the system. The grid operators often have long queues of potential generating units seeking access, and it can take many months and extensive studies to gain interconnection approval.

This is greatly complicated by the fact that the wind does not always blow and the sun does not always shine. This intermittency is one of the major impediments to broader use of wind and solar power. Several techniques are being developed to solve this problem. All manner of storage technologies are being developed and improved so that electricity generated during off-peak times can be used during peaks. Demand-response programs can lower demand during traditional peak times. Improved transmission lines and "smart grid" techniques allow electricity to be furnished from more distant locations where, for example, the wind may be blowing. Information technologies allow better balancing of supply and demand, especially over large areas, calling on various resources to take up the slack left by a lack of wind or sun. New meteorological techniques can improve wind prediction, allowing adjustments to be made in advance. If all else fails, the power lost because of darkness or still winds can be made up by backup fossil fuel generators, ideally with carbon capture and sequestration (CCS).[229]

B. Subsidies and Incentives

Between 2008 and 2015, the average cost of building capacity for land-based wind in the United States decreased by 41%, that of distributed PV by 54%, and that of utility-scale PV by 64%.[230] Though the plummeting costs of renewables, especially PV, are changing the situation, renewables have typically been more expensive than conventional fossil fuel sources, and subsidies or other incentives or requirements are necessary to induce the construction of new renewable capacity. Once built, however, renewables benefit from the absence of fuel costs and of their attendant volatility.

C. Land Allocation

The impacts of climate change, and efforts to fight it, will lead to several massive demands for land in addition to the siting of large wind and solar projects and associated transmission lines:

- The growing of bioenergy crops as a substitute for fossil fuels.
- The growing of crops for bioenergy CCS as a way of removing carbon dioxide from the air.
- The loss of habitable or arable land due to sea-level rise and drought, and the relocation of activities from that land to other locations.
- The set-aside of large areas of land, as some have proposed, for habitat for species that are threatened

228. Allison et al., *supra* note 210, at 1.

229. For additional information on the challenges of integrating renewables into the grid, see International Energy Agency & Clean Energy Ministerial, Next Generation Wind and Solar Power: From Cost to Value (2016) [hereinafter Next Generation Wind and Solar Power].

230. DOE, Revolution . . . Now: The Future Arrives for Five Clean Energy Technologies—2016 Update 1 (2016). *See also* Next Generation Wind and Solar Power, *supra* note 229, at 6; Mark Bolinger & Joachim Seel, Lawrence Berkeley National Laboratory, Utility-Scale Solar 2015: An Empirical Analysis of Project Cost, Performance, and Pricing Trends in the United States (2016).

by climate change and all manner of other human-caused threats.[231]

On top of this are globally massive demands for land to grow food for rising populations, and especially land to grow feed for animals to be consumed by the increasingly affluent residents of some developing countries, chiefly China. This is leading to many large-scale land acquisitions.[232]

Some land can simultaneously be used for several purposes. For example, the piers for wind turbines occupy very little land, and farming can continue below and around the turbines. As discussed below, solar panels can be put on buildings and on contaminated and otherwise unusable land. However, solar farms in a desert occupy most of the land under their large footprints.

No procedure or institution is in place, either domestically or globally, to balance these competing uses for large quantities of land. The federal government employs a variety of management approaches to address competing use demands for its large landholdings, with mixed results.[233] In December 2016, BLM adopted what it called the Planning 2.0 rule to facilitate large-scale planning of its immense landholdings in the western states,[234] but in March 2017, President Trump signed a bill adopted under the Congressional Review Act repealing this rule.[235] With the exception of the western states, however, states, local governments, and private parties are the principal landowners and there are few resources or inclinations by those entities to look more broadly at regional or national needs for land. We have an ungoverned patchwork that is not well-suited to deal with the unfortunate fact that wind and solar require much more land than fossil fuel or nuclear energy per unit of energy produced, though much less than biofuels.[236]

Prof. Uma Outka has identified five policy objectives for addressing and reducing the cumulative impacts of the demands for land created by renewable energy.[237] All five, listed in her order of priority, are:

1. Avoid new infrastructure/new land impacts (which can be advanced by energy-efficiency measures that reduce the need for new energy infrastructure).
2. Reuse land that has already been developed or otherwise disturbed.
3. Maximize land-efficient onsite and local energy potential.
4. Identify early the least-harm sites for energy projects and strengthen mitigation measures for facilities we need.
5. Link transmission planning and renewable energy policy more closely.

VIII. Conclusion

The task of building the enormous number of new utility-scale renewable energy facilities required to meet the DDPP goals is daunting indeed. It will require strong and unyielding commitment by the federal government and the states, and willingness to recognize the tradeoffs involved in selectively relaxing some cherished regulatory restrictions on new construction that have been shown to interfere with the construction efforts that are essential to prevent the worst impacts of climate change.

231. *See* Edward O. Wilson, Half-Earth: Our Planet's Fight for Life (2016).
232. Suzanne Verhoog, *The Global Land Rush Revisited—A Brief Analysis Based on Data From the Land Matrix in Current Dynamic and Complex Climate & Land Governance Discourse* (2016).
233. *See* Hayes, *supra* note 37, at 40.
234. 81 Fed. Reg. 89580 (Dec. 12, 2016), adopting 40 C.F.R. pt. 1600.
235. Kellie Lunney, *Trump Signs Resolution Repealing BLM Planning 2.0 Rule*, E&E News, Mar. 27, 2017.
236. Robert I. McDonald et al., *Energy Sprawl or Energy Efficiency: Climate Policy Impacts on Natural Habitat for the United States of America*, 4 PLoS ONE 1 (2009); David Malakoff, *New Energy Facilities Will Leave Massive Footprint on U.S., Study Concludes*, Sci. Insider, July 18, 2014.
237. Uma Outka, *The Renewable Energy Footprint*, 30 Stan. Envtl. L.J. 241, 297 (2011).