CLEAN AND GREEN PATHWAYS

for the Global Renewable Energy Buildout

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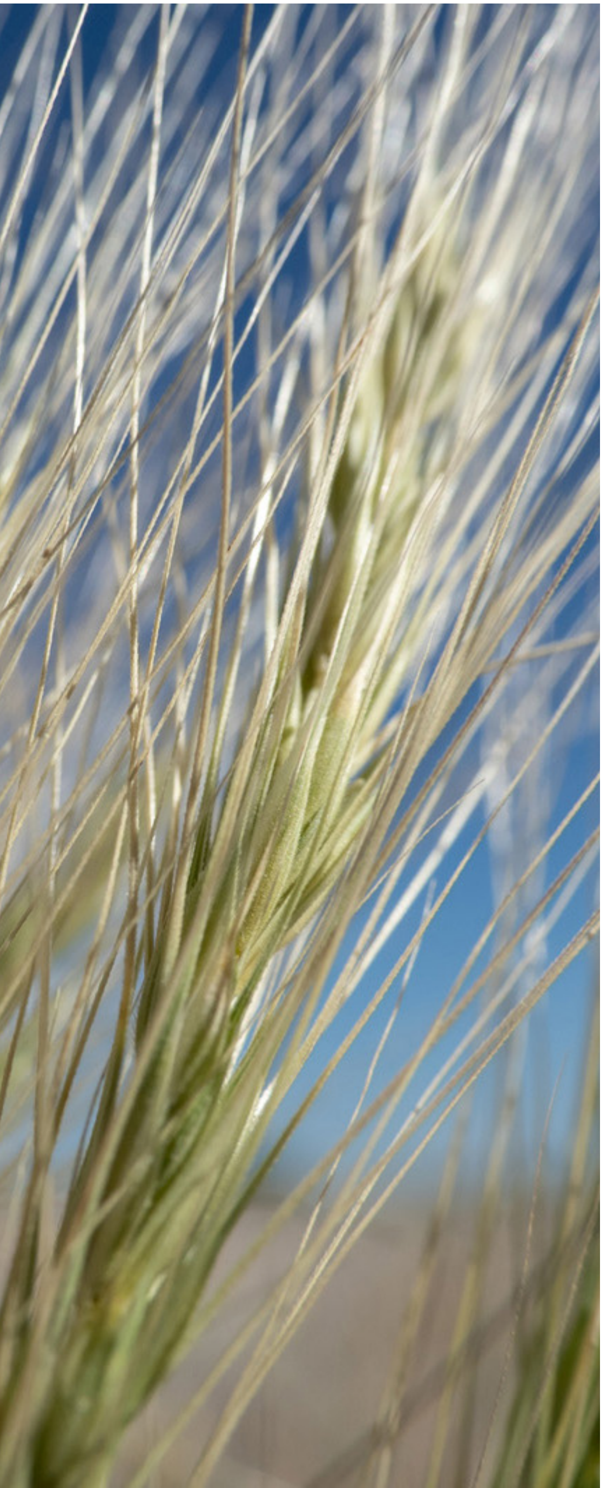

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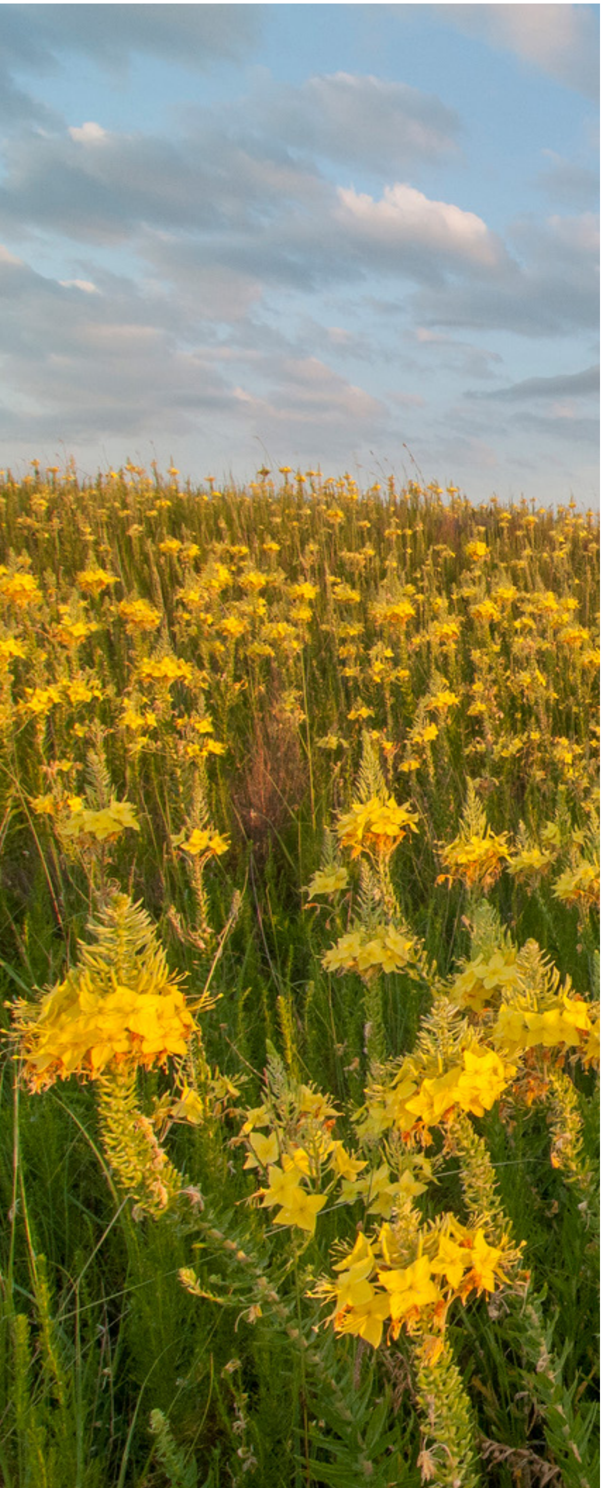

Executive Summary

Climate change is no longer a distant threat—it is happening now. In response, governments at all levels are promoting policies to support a shift to renewable energy. Market forces are also encouraging this transition through dramatic decreases in solar and wind energy costs, relative to other energy sources. Driven by these changes in policies and markets, the transition to clean energy is now entering a new phase. We are at the beginning of an enormous global buildout of renewable energy generation.

To meet the Paris Agreement goals, the world needs at least a nine-fold increase in renewable energy generation. Utility-scale onshore wind and solar energy projects, which are expected to make up the majority of new generation, require large areas for development. The land use challenges of this buildout could result in increasing environmental and social conflicts that delay renewable energy projects, drive up costs, and slow the clean energy transition. This cycle of conflict has been a hallmark of development in the fossil fuel sector. The world cannot afford to repeat it in the expansion of clean energy and expect to meet climate goals.

Building out renewable energy in low-impact areas—lands that have already been significantly altered for agriculture, infrastructure, and other development activities—provides an opportunity to avoid conflicts and accelerate the clean energy transition. This approach can increase local benefits for communities, reduce wildlife impacts, and avoid the release of CO_2 from converting forests and other natural lands for project development. The good news is, the world has an abundance of low-impact lands with high renewable energy development potential. These lands are more than enough—by many multiples—to meet the world's renewable energy needs.

To support a clean and green future, this paper identifies six pathways for promoting the buildout of renewable energy in low-impact areas. The focus is on proactive approaches in the public, corporate, and financial sectors that can influence the expansion of renewable energy worldwide and at significant national and subnational scales. A summary of the pathways and examples of their implementation is provided on the following page (Table 1).

TABLE 1. Clean and Green Pathways for the Global Renewable Energy Buildout

PATHWAY 01. Renewable Energy Zones	PATHWAY 02. Planning and Procurement Processes	PATHWAY 03. Guidelines for Project Siting and Design	PATHWAY 04. Programs to Promote Projects on Contaminated and Degraded Lands	PATHWAY 05. Corporate Procurement and Sustainability Commitments	PATHWAY 06. Renewable Energy Finance
OPPORTUNITY Identify and approve low-impact zones for renewable energy development, in advance, to support faster project approval	**OPPORTUNITY** Direct renewable energy projects to low-impact areas through long-term planning and purchasing processes	**OPPORTUNITY** Establish renewable energy siting and design guidelines to support low-impact projects	**OPPORTUNITY** Incentivize renewable energy projects on contaminated and degraded sites suitable for development	**OPPORTUNITY** Commit to low-impact renewable energy in corporate buyers' principles, procurement guidance, and criteria for project selection	**OPPORTUNITY** Ensure lending performance standards, due diligence processes, and technical assistance support low-impact renewable energy projects
EXAMPLES • Solar Energy Zones in the U.S. Southwest (Public Lands) • Texas Competitive Renewable Energy Zones (Private Lands)	**EXAMPLES** • California Community Choice Aggregation: The Clean Power Alliance • Massachusetts Procurement Legislation • New York Procurement Planning for Offshore Wind Energy • State Energy Siting Laws • State Approval for Capital Investments in Generation	**EXAMPLES** • U.S. Fish and Wildlife Service's Wind Energy Guidelines	**EXAMPLES** • U.S. Environmental Protection Agency: RE-Powering America's Lands • U.S. Bureau of Land Management: Arizona Restoration Design Energy Project • Massachusetts SMART Program	**EXAMPLES** • Salesforce's Renewable Energy Procurement Process	**EXAMPLES** • Jordan's Tafila Region Wind Power Cumulative Effects Assessment • IFC Performance Standard 6 • World Bank: Energy Sector Management Assistance Program • Inter-American Development Bank: NDC Invest & Sustainable Infrastructure Program

Public Sector Pathways (Pathways 01–04) | Private Sector Pathways (Pathways 05–06)

Introduction

The clean energy future is here. Markets and policies are driving a global transition of energy systems away from fossil fuels to renewable energy. Investment is rapidly shifting to solar and wind energy as costs have fallen dramatically relative to other energy sources. Solar and onshore wind—even without subsidies—are now the cheapest sources of energy for power generation in almost all major energy-consuming countries of the world.[1] Offshore wind costs are also dropping rapidly, reaching parity with fossil fuels in several countries.[2] With costs continuing to fall for solar, wind, and batteries, global energy forecasts to 2050 project over 85 percent of new investments in power generation capacity will be made in renewable energy—the vast majority in solar and wind.[3]

To avoid the most catastrophic effects of climate change for people and nature, the global shift to clean energy must happen fast. The world needs to transition to net-zero greenhouse gas (GHG) emissions by 2050.[4] To get us on this path, we will need to reduce emissions by at least 45 percent by 2030.[5] Because energy production currently contributes more than 70 percent of GHG emissions worldwide, meeting ambitious emission reduction goals will require massive and unprecedented shifts in the global energy sector away from fossil fuels to clean sources.[6] We will need to aggressively develop renewable energy, not only to meet current electricity demand, but also to meet growing demand from electrification of the transportation, heating, and industrial sectors.[7]

In response to this challenge, governments, international institutions, and the private sector are advancing new targets and policies to accelerate the clean energy transition. More than 185 countries have ratified the Paris Agreement, the goal of which is to reduce GHG emissions to keep global warming below 2°C above pre-industrial levels.[8] Under the agreement, countries are developing Nationally Determined Contributions (NDCs), which are country specific GHG emission reduction targets. For most countries, the greatest contribution to their NDCs will come from shifting their energy use to renewable energy sources.

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Countries are also supporting renewable energy to improve air and water quality, increase energy independence, expand energy access, and support new energy sector jobs.[9] To drive these multiple objectives for climate and society, governments and power purchasers (e.g., utilities, companies) are increasing their renewable energy goals, with a growing number making commitments to 100 percent renewable energy.[10]

THE NEXT CHALLENGE

The buildout will intensify pressure on the world's natural lands—places that have not already been significantly altered or converted by human activity—in ways that could affect biodiversity and climate goals.

As leadership, market forces, and policy innovation accelerate the demand for renewable energy, the next major global challenge will be the enormous buildout of new generation. A nine-fold increase in renewable energy generation will be needed worldwide to meet the Paris Agreement goals.[11] The expansion is projected to be a major driver of land-use change worldwide.[12] This is because utility-scale onshore wind and solar energy projects are expected to make up the majority of new generation[13] and these projects, and related transmission infrastructure, require large areas for development.[14]

The buildout will intensify pressure on the world's natural lands—places that have not already been significantly altered or converted by human activity—in ways that could affect biodiversity and climate goals.[15] It is estimated that renewable energy development to meet the Paris Agreement goals has the potential to convert over 11 million hectares of natural lands, impacting over 3.1 million hectares of Key Biodiversity Areas[16] and the ranges of 1,574 threatened and endangered species.[17] Indeed, about one-third of the areas with high potential for solar and wind energy globally are also areas with high biodiversity values.[18]

Converting natural lands for renewable energy development will also create a carbon debt equal to 8.6 percent of the overall Paris Agreement emission reduction goals.[19] This debt is due to the release of CO_2 from the clearing of forests and vegetation and the decomposition of organic carbon stored in plant biomass and soils.[20]

Environmental and social concerns vary depending on the type of renewable energy project and potential impacts. For wind energy development, potential impacts include wildlife collisions with wind turbines, habitat loss and degradation, and fragmentation of large habitat blocks into smaller segments that may not support sensitive species.[21] Utility-scale solar projects can also have significant habitat impacts where there is a need to clear forests and vegetation across large areas of land.[22] Community concerns about renewable energy projects range from potential visual impacts to socio-economic issues, such as the sharing of project benefits with communities and the potential impacts on property values.[23]

Concerns and conflicts over utility-scale solar and wind projects could have a significant influence on the buildout of renewable energy. For example, the project development success rate for onshore wind energy projects in the United States is estimated to be only between 25 to 50 percent, with significant pre-construction costs associated with wildlife considerations and community engagement.[24] To achieve the massive renewable energy expansion needed to make progress on climate goals, it is essential to find solutions that recognize the legitimate land use concerns for communities and nature, avoid environmental and social conflicts, and support the rapid deployment of renewable energy.

The good news is that if we take steps today to guide the buildout of renewables to areas that are low-impact for nature, we can develop more than enough low-carbon energy for a clean and green future.

THE OPPORTUNITY

The good news is that if we take steps today to guide the buildout of renewables to areas that are low-impact for nature, we can develop more than enough low-carbon energy for a clean *and green* future. We do not need to trade impacts to natural lands for renewable energy development.[25] Achieving a clean and green future will require deployment of a range of solutions, including reducing energy demand through energy efficiency, making grid upgrades, and increasing distributed renewable energy generation. We will also need to promote the buildout of utility-scale solar and wind energy in places that are low-impact for nature and supported by local communities (see Figure 1).

Fortunately, the world has more than enough low-impact areas—lands that have already been significantly altered for agriculture, infrastructure, and other development activities—that also have high renewable energy development potential. Globally, these areas are estimated to be more than 600 million hectares, or approximately 17 times what is needed for renewable energy development to achieve the Paris Agreement emission reduction targets.[26] All ten of the countries with the highest GHG emissions, as well as most of the other countries in the world, could meet their required energy targets for achieving Paris Agreement goals in low-impact areas.[27]

The world is only at the beginning of what will be an enormous buildout of renewable energy. Almost all countries have abundant solar and/or wind energy resources.[28] This provides a unique opportunity to plan for and incentivize the rapid development of renewable energy on low-impact lands, and in ways that integrate social considerations and community benefits. Promoting these pathways will be essential for achieving a clean and green future that meets goals for energy, climate, nature, and communities.

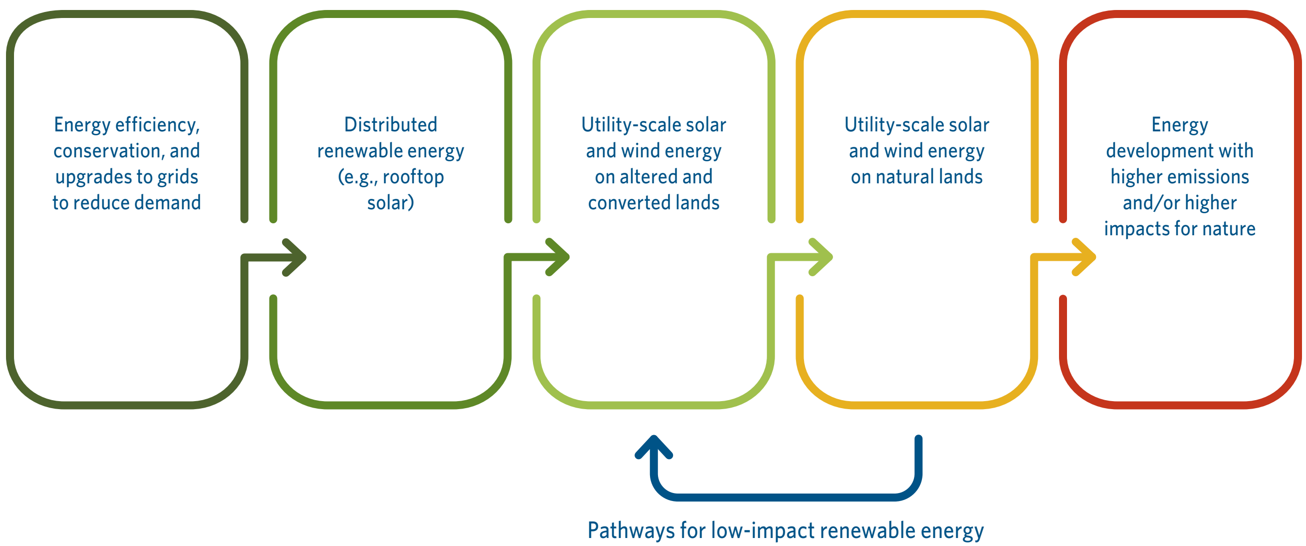

FIGURE 1. Towards a Clean and Green Future: Promoting Pathways for Wind and Solar Energy Development on Low-Impact Lands. Moving from left to right, the figure illustrates approaches to the energy transition that have lower impacts for nature and GHG emissions (dark green) to higher impacts (red). As denoted by the blue arrow, this paper focuses on pathways for avoiding utility-scale solar and wind energy on natural lands and increasing this development on altered and converted lands.

PURPOSE AND SCOPE

This paper is a global call to action—to energy, climate, and environmental policymakers and planners, renewable energy developers, power purchasers, investors, and civil society organizations—to promote pathways for renewable energy development in low-impact areas. Our aim is to raise awareness about pathways for a smart renewable energy buildout and to encourage adoption of these approaches in countries around the world. Such adoption will be especially critical for governments, power purchasers, and other institutions that have made strong commitments to both renewable energy and the environment and are now making decisions about how best to make the clean energy transition. Their leadership can play a vital role in putting us on the path to a clean and green future.

In defining the scope for the paper, we considered a range of policies, incentives, and approaches that support renewable energy. We focused on pathways that can promote renewable energy development *and direct or incentivize project deployment in low-impact areas*. We also concentrated on pathways that have the potential to influence deployment at a significant scale (global, national, subnational). For these pathways, we provided examples from around the world with the majority drawn from the United States.

A country-by-country assessment of pathways was beyond our scope, as countries vary considerably in the structure of their energy systems and their energy policies, planning, and procurement frameworks. We identified pathways that have potential for application worldwide, recognizing that additional, country-specific analyses will be needed to tailor solutions to different national contexts.

We focused primarily on pathways for utility-scale solar and onshore wind energy projects. We did not explore the significant potential of energy efficiency, grid upgrades, or distributed renewables to reduce the demand for new large-scale generation. We also did not assess pathways for energy development that has higher emissions and/or higher impacts for nature, such as fossil fuels, hydropower, or biomass.[29]

Lastly, we recognize that the rapid deployment of renewable energy will require overcoming both environmental *and social* conflicts associated with land use and other project development concerns. While this paper focuses on pathways for avoiding environmental conflicts, the integration of social considerations and community benefits into these pathways will also be critical for achieving a swift renewable energy buildout.

BENEFITS OF DEVELOPING RENEWABLE ENERGY IN LOW-IMPACT AREAS

Where renewable energy is sited matters for communities and nature. Developing renewable energy in low-impact areas can benefit the local economy, reduce conflicts and costs for renewable energy development, mitigate climate change, and minimize impacts to wildlife and habitat. Below we summarize some of these benefits.

LOCAL ECONOMIC BENEFITS. Renewable energy developed on low-impact lands is often compatible with other land uses in ways that benefit landowners, developers, and the local economy.[30] For example, farmers in the United States may receive $4,000–$8,000 annually per turbine when leasing cropland for wind energy development.[31] Likewise, opportunities for combining solar development and agriculture are emerging.[32] For developers, siting projects on these lands and

PHOTO: © Dave Lauridsen

involving local communities in the siting process can contribute to community support for a project. In addition, many of these sites—particularly former industrial sites—are generally nearer to demand centers, which reduces transmission costs that could otherwise be a barrier to development.[33]

LOWER POTENTIAL FOR CONFLICTS. Siting utility-scale solar and wind projects in low-impact areas helps to avoid environmental and social conflicts that could slow down development and raise costs. As the renewable energy transition accelerates and the buildout expands, concerns about the impacts of development could grow in frequency and intensity. The long history of conflicts over fossil fuels development is instructive. The fossil fuels sector has, for decades, experienced project delays, higher business costs, and project abandonment due to concerns about environmental and social impacts.[34] These conflicts have also affected the industry in deeper ways, including reduced trust in the sector that has harmed its broader “social license to operate.”[35] As the world strives to meet global climate goals by rapidly shifting to clean energy, we cannot afford to repeat this cycle of conflict.

Avoiding the clearing of forests and other natural lands for renewable energy development will support faster progress on climate goals.

CLIMATE CHANGE MITIGATION. Avoiding the clearing of forests and other natural lands for renewable energy development will support faster progress on climate goals. Over 11 million hectares of natural lands could be converted by the renewable energy buildout—enough to release 415 million tons of currently stored carbon, which is equal to 8.6 percent of the overall Paris Agreement emission reduction goals.[36] The carbon debt caused by land clearing would represent a step backwards that is counterproductive for achieving climate goals. Although most countries would see a small carbon debt, for 22 countries —including Japan, Germany and 11 other European Union countries—it would require operating their renewable energy for more than one year to make up for the carbon debt from land conversion. Given the urgent need to make immediate progress on reducing emissions,[37] instead of clearing natural lands we need to be restoring and expanding natural lands. Such actions to restore and conserve nature could help deliver up to 37 percent of the CO_2 mitigation required by 2030 to hold global warming below the 2°C target.[38]

NATURE CONSERVATION. Deploying renewable energy in areas that are low-impact for nature can support global biodiversity conservation goals.[39] Natural lands generally have a higher value for biodiversity than do lands altered or converted by human activity.[40] As noted above, the global renewable energy buildout could convert over 11 million hectares of natural lands.[41] Where such development causes wildlife impacts and fragments habitat, it could undermine important global biodiversity commitments. For example, the Aichi 2020 biodiversity targets, which 196 countries agreed to under the Convention on Biological Biodiversity, clearly articulate the international priority of conserving intact natural lands.[42] Likewise, the United Nations’ Sustainable Development Goals call for countries to sustainably manage forests, combat desertification, halt and reverse land degradation, and halt biodiversity loss.[43]

Pathways for Promoting Low-Impact Renewable Energy

Despite the many benefits of siting renewable energy in low-impact areas, utility-scale solar and onshore wind energy development has often involved clearing natural lands or fragmenting wildlife habitat.[44] These land-use impacts are expected to increase.[45] Driving more renewable energy development to low-impact areas will require improving planning approaches, procurement practices, and market incentives in ways that better acknowledge and reward low-impact project siting. The remainder of this paper highlights pathways for promoting the buildout of low-impact renewable energy, with examples for each pathway to illustrate current approaches.

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01.

RENEWABLE ENERGY ZONES

PATHWAY AT-A-GLANCE

- Governments should identify renewable energy zones that are priorities for generation and transmission and include environmental and social considerations in the selection of zones.
- Governments should adopt policies that actively incentivize projects in renewable energy zones by making approval of such projects faster, cost-effective, and of lower financial risk to developers.

Renewable energy zoning can be an effective way to drive renewable energy and related transmission to low-impact areas for nature at national and subnational levels. Renewable energy zones (REZ) are designated areas that are pre-approved or otherwise identified in advance of development to allow for faster renewable energy project approval. REZ are generally areas that have "high-quality renewable energy resources, suitable topography and land use designations, and demonstrated interest from developers, all of which support cost-effective renewable energy development."[46] REZ identification processes can also integrate environmental and social considerations.[47]

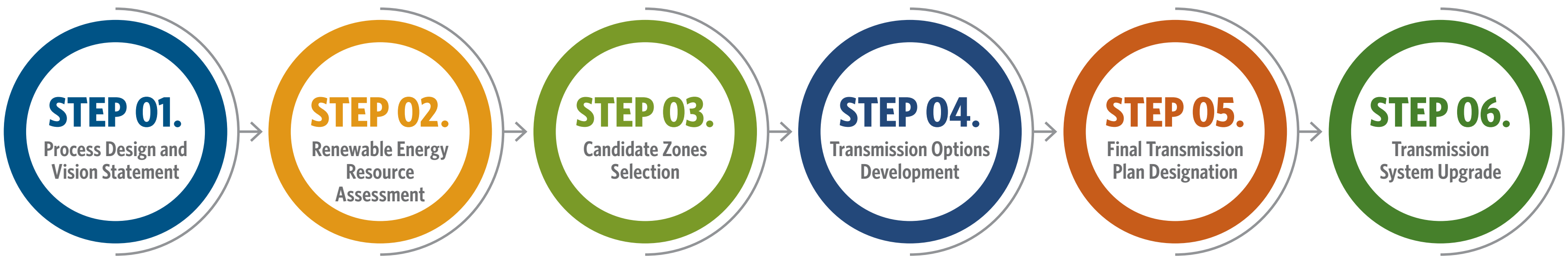
Significant planning and technical resources have been developed to support renewable energy zoning.[48] Planning may be undertaken to guide the establishment of REZ and transmission together, renewable energy siting alone, or the development of transmission that can connect zones to the grid. The approach is most effective for planning future generation and transmission simultaneously, especially when renewable energy expansion is constrained by a lack of existing transmission.[49] REZ may be less valuable for directing renewable energy deployment in a region when suitable areas for renewable energy are already limited.[50]

The process for establishing REZ includes undertaking a renewable energy resource assessment in which planners identify areas with high renewable energy resource potential and screen them for factors including topography, land-use, and developer interest (see Figure 2).[51] The REZ approach can support the deployment of low-impact renewables when this process also uses the best available data on wildlife and habitat to inform the determination of REZ. Several tools have been developed to support the REZ planning process, including the Energy Zones Mapping Tool, which was funded by the U.S. Department of Energy. The tool allows users to select from over 300 Geographic Information System data layers, including many related to conservation values.[52]

PHOTO: © Jerod Foster

The potential for renewable energy zoning differs from country to country. In the United States, renewable energy zoning has been carried out at the statewide and multi-state level, as well as in portions of states with promising renewable energy resources.[53] The approach is particularly well-suited to public lands where federal agencies oversee land-use decision-making across large regions of the West. REZ in the U.S. have supported the rapid buildout of renewable energy to meet targets years ahead of schedule, with reduced project approval times and costs (see Examples: Solar Energy Zones in the U.S. Southwest (Public Lands); and Texas Competitive Renewable Energy Zones (Private Lands)).

Outside of the U.S., renewable energy zone mapping has been carried out in India[54] and across 21 African nations.[55] Much of the work beyond the U.S. has been supported by the MapRE initiative, a program sponsored by the U.S. Department of Energy's Lawrence Berkeley National Laboratory and the International Renewable Energy Agency (IRENA).[56] The U.S. Agency for International Development also supports partner countries in developing renewable energy zones through its Scaling Up Renewable Energy (SURE) project.[57]



STEP 02.

SUMMARY
Select areas with highest potential

OUTPUT
Study areas map and supply curves

- Assess resource
- Screen exclusion areas
- Identify the areas with the highest quality, developable resource

STEP 03.

SUMMARY
Identify zones with highest probability of development

OUTPUT
Candidate zone map and supply curves (one per area)

- Gauge commercial interest
- Identify areas where high quality resources interact with commercial interest

STEP 04.

SUMMARY
Bundle candidate zones and conduct analysis of the options

OUTPUT
Cost, benefit, and reliability impacts for each transmission alternative

- Select scenario creation (bundling)
- Conduct cost-benefit analysis of options
- Steady-state, dynamic stability, production cost, and reliability analysis

STEP 05.

SUMMARY
Select transmission option according to pre-set criteria

OUTPUT
Final transmission order

- Select transmission option that best complies with predetermined criteria, including reliability standards, economic benefits, and environmental goals

FIGURE 2. **Renewable Energy Zones Transmission Planning Process.** *Source: Lee, Nathan, Francisco Flores-Espino, and David Hurlbut. September 2017. "Renewable Energy Zone (REZ) Transmission Planning Process: A Guidebook for Practitioners." U.S. Agency for International Development and the National Renewable Energy Laboratory.*

Several large-scale solar projects have been approved in the zones and the project approval time for these projects was cut by more than half.

→ EXAMPLE

Solar Energy Zones in the U.S. Southwest (Public Lands)

The U.S. Bureau of Land Management adopted a first-of-its-kind Solar Programmatic Environmental Impact Statement (PEIS) in October 2012 to accelerate utility-scale solar energy development on public lands while minimizing negative environmental, social, and economic impacts.[58] This was the central effort of the Department of the Interior's Western Solar Plan.[59] The PEIS applies to a six-state region of the southwestern U.S.—Arizona, California, Colorado, Nevada, New Mexico, and Utah—where the federal government owns a significant portion of the land. The approach sought to advance solar development by "pre-approving" zones that are appropriate for both solar potential and environmental values rather than requiring project-by-project impact analyses. The PEIS identifies 1,153 km^2 of "solar energy zones" and excludes about 320,000 km^2 of lands from solar energy development that would not be "the highest and best use of public lands." Since approval of the PEIS, several large-scale solar projects have been approved in the zones and the project approval time for these projects was cut by more than half—approval of these three projects took 10 months instead of the typical 18 to 24 months.[60] As a result, not only were the developers' costs and risks reduced, but the projects were developed on lands deemed of low conservation value.

PHOTO: © Dave Lauridsen

➔ EXAMPLE

Texas Competitive Renewable Energy Zones (Private Lands)

Although Texas is well-known for oil and gas development, it is also home to significant wind generation potential. Like many states, Texas faced a circular conundrum that is a common impediment to renewable energy development (see Figure 3). Namely, renewable energy developers have difficulty securing financing for projects if they cannot demonstrate access to transmission, and regulators generally cannot allow transmission developers to recover costs through their rate structure unless they can guarantee that there will be demand for new lines.[61] Even when existing transmission is close to potential new wind sites, that transmission must have the capacity to accept new generation onto the grid. When wind projects are connected to transmission that is congested, they are often required to curtail—shut down or produce less power than they are capable of producing—to ensure grid stability. The more curtailment that is required, the less economically viable the wind project becomes.[62]

Texas sought to tackle these problems by passing legislation in 2005 that supported two crucial advancements.[63] First, the legislation directed the state's public utility commission to work with the state's independent system operator, the Electric Reliability Council of Texas (ERCOT), to designate competitive renewable energy zones (CREZ) and plan for construction of new transmission infrastructure that would stimulate the deployment of wind resources.[64] Second, the statute changed the rules used by the state public utility commission that determine whether transmission developers can fold the costs of new development into their rates.[65]

FIGURE 4. Texas Competitive Renewable Energy Zones. *Source: Electric Reliability Council of Texas. 2008. "Competitive Renewable Energy Zones (CREZ): Transmission Optimization Study." ERCOT.*

ERCOT initially identified 25 potential zones based on wind resource potential and input from developers and stakeholders.[66] It then undertook a transmission analysis to identify a menu of options for connecting the highest amount of wind generation capacity with limited curtailment at the lowest capital cost.[67] ERCOT presented its final recommendations in 2008, which identified five CREZs in West Texas and the Texas Panhandle (see Figure 4).[68] Although the CREZ program did not consider potential impacts to wildlife and habitat in the identification of zones or optimization of new transmission, there is potential to adapt environmental considerations, such as those included for solar energy zones on public lands, to future REZ processes on private lands.

As of December 2017, Texas could boast being home to over 22,500 megawatts of installed wind capacity—more than any other state in the nation.[69] The CREZ program has been credited with the addition of more than 18,000 megawatts of that wind generation capacity[70] and the development of more than 3,500 miles of transmission from the zones to load centers.[71] It helped spur not only the development of new wind resources, but it also allowed existing wind facilities to maximize their output.[72] By 2015, Texas was able to meet its 2025 renewable energy target more than twice over.[73]

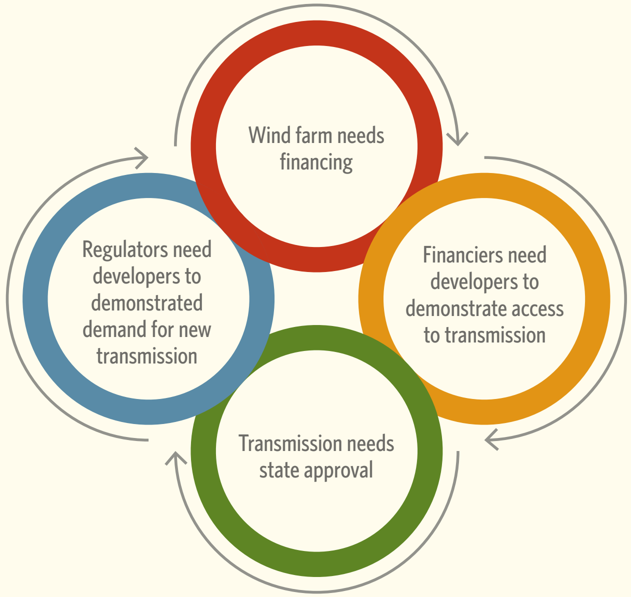


FIGURE 3. Meeting Demand for Renewable Energy and Transmission: The Circular Challenge. *Source: U.S. Agency for International Development. "Implementing Renewable Energy Zones for Integrated Transmission and Generation Planning."*

02.

PLANNING AND PROCUREMENT PROCESSES

PATHWAY AT-A-GLANCE

- Electricity resource planning should consider the potential environmental, social, and land-use impacts of meeting future energy demand and incorporate these considerations into long-term plans.
- Procurement of renewable energy should mandate development in low-impact areas or incentivize low-impact renewable energy through locational evaluation criteria.

Electricity resource planning, procurement processes, and markets vary widely from country to country (and at subnational and local levels) depending on laws, rules, market structure, and other factors. In light of the complexity of electricity markets, we focus here on planning and procurement in the United States and how they can direct low-impact renewable energy development. These examples are intended to be illustrative of opportunities that may be available in an array of countries and can support further assessment.

In the United States, state laws and policies play a stronger role in governing planning and procurement than does federal policy.[74] State laws and policies largely dictate the requirements for electricity resource planning,[75] sector structure (i.e., who owns and operates generation, transmission, and distribution), the mechanisms that may be used to procure power,[76] and the types or amount of power that must be procured from different sources. Therefore, approaches for improving planning and procurement processes to support low-impact renewable energy deployment will need to be tailored to address differences in state laws and policies, sector structure, and markets (see sidebar on p. 16, “Overview of U.S. Electricity Sector Structure and Markets”).

ELECTRICITY RESOURCE PLANNING

Long-term electricity resource planning is conducted through a variety of approaches, including integrated resource plans (IRPs) and long-term procurement plans. IRPs are defined broadly as long-term plans for how utilities will meet energy demand, ensure electricity reliability, plan for the procurement of new generation, and do so in a manner that minimizes costs.[77] As best practice, IRPs consider load forecasts, supply-side (e.g., new generation) and demand-side (e.g., energy efficiency measures) resource options, transmission and distribution factors, and the environmental and social impacts of different resource options.[78] IRP policies also require consideration of relevant state laws, including renewable portfolio standards,[79] and may require the identification of a preferred resource portfolio—the mix of energy resources that minimizes cost and risk to retail ratepayers, and satisfies energy efficiency and renewable energy targets.[80] As of 2015, at least 30 U.S. states had IRP planning rules and filing requirements (see Figure 5).[81] While IRPs may be required by many states, adherence to the plans is generally not legally binding[82] and studies suggest the linkages are often limited between these planning and procurement processes.[83]

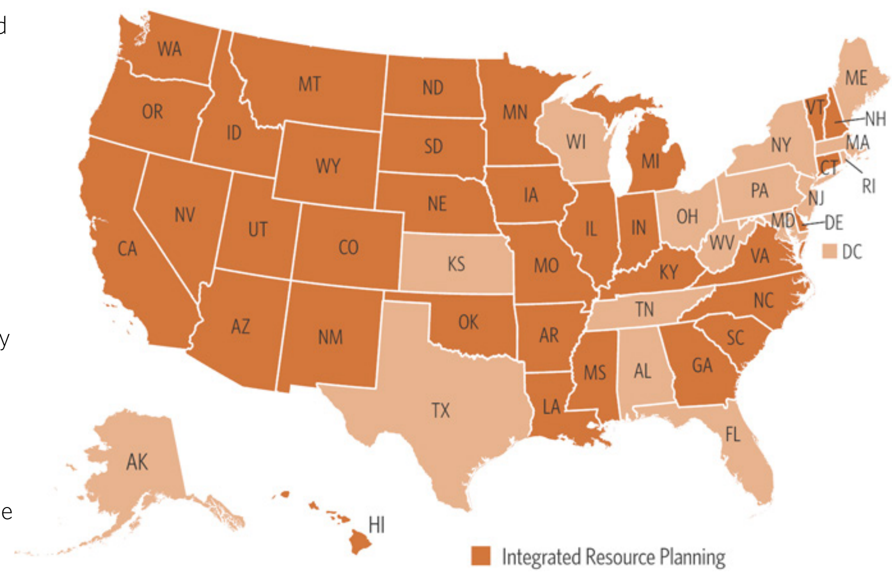


FIGURE 5. States with IRP Requirements. *Source: Wilson, Rachel. August 13, 2019. “Integrated Resource Planning: Rules, Best Practices, and Emerging Issues.” Synapse Energy Economics, Inc. Prepared for the Institute of Public Utilities, Michigan State University.*

Overview of U.S. Electricity Sector Structure and Markets

Although most state electricity markets in the U.S. remain regulated, some states have deregulated their markets. As of 2017, 13 states had fully deregulated electricity markets and five additional states had partial retail electricity choice (see Figure 6). States with **regulated markets** have "vertically integrated" utilities that own or control the generating electricity, transmission, and distribution. Customers only have one option for their electricity provider. In **deregulated (restructured) markets**, utilities do not own generation and transmission. They are only responsible for distribution, operation, billing ratepayers, and maintenance from your interconnection to the power grid at your electric meter. Retail customers—industrial or commercial users or homeowners—have a choice of who they buy their energy from among multiple, competitive retail electric suppliers. Utilities do, however, act as a default service provider or provider of last resort when customers do not select a retail provider and so are still subject to regulation by the state regulatory agency. In deregulated states, utilities purchase power from wholesale providers.

State regulatory agencies—commonly referred to as public utility commissions (PUCs) or public service commissions—are charged with ensuring that utilities provide electricity reliably and at a fair and reasonable price. They do this by, among other things, overseeing long-term electricity resource planning and the costs that utilities can pass on to customers through their electric rates. In regulated states, PUCs regulate generation, transmission, and distribution. In deregulated states, PUCs may play a more limited role in these activities, but do approve contracts between utilities and generation owners. Finally, regional transmission organizations (RTO) or independent system operators (ISO) ensure reliability, hold capacity auctions, and generally oversee the wholesale generation market and transmission system but do not play a regulatory role.

Sources: Allen, Doug, et al. 2008. "Survey of Utility Resource Planning and Procurement Practices for Application to Long-Term Procurement Planning in California." Draft. Energy and Environmental Economics, Inc. and Aspen Environmental Group; American Public Power Association. July 2017. "EPA Energy and Environment Guide to Action." Issue Brief; Bright Energy. "How to Make Sense of Regulated and Deregulated Energy Markets"; Federal Energy Regulatory Commission. "Electric Power Markets: National Overview"; Monast, Jonas. 2015. "Maximizing Utility in Electric Utility Regulation." *Florida State University Law Reporter*, 43(1); Regulatory Assistance Project. March 2017. "Electricity Regulation in the US: A (Brief) Guide." U.S. Department of Energy and Regulatory Assistance Project; U.S. Environmental Protection Agency. 2010. "An Overview of PUCs for State Environment and Energy Officials"; U.S. Environmental Protection Agency. 2015. "Energy and Environment Guide to Action State Policies and Best Practices for Advancing Energy Efficiency, Renewable Energy, and Combined Heat and Power." Chapter 7; U.S. Environmental Protection Agency. "Understanding Electricity Market Frameworks & Policies"; Zummo, Paul. 2018. "Retail Electric Rates in Deregulated and Regulated States: 2017 Update." American Public Power Association.

Under state policies, states may prescribe factors that must be taken into consideration in the development of IRPs. This may provide an opportunity to encourage or require consideration of the environmental, social, and land-use impacts of meeting future energy demand. For example:

- Arizona regulations direct all utilities to consider adverse environmental impacts and compliance with "existing and expected environmental regulations" in their annual resource plans.[84] The Arizona PUC also has the authority to consider the environmental impacts of resource choices and alternatives when determining whether the IRP is "reasonable and in the public interest."[85]
- In Georgia, public utilities are required to submit an integrated resource plan that must demonstrate "the economic, environmental, and other benefits" to the state and customers.[86]
- Vermont state regulations stipulate that regulated utilities must submit "least-cost integrated plans" that meet the public's need for energy, taking into consideration, among other things, environmental costs.[87]

Some utilities have opted to consider habitat value in their long-term planning voluntarily. For example, the IRP submitted to the California Public Utilities Commission by Valley Clean Energy Alliance, a Community Choice Program in California, states that it will evaluate long-term renewable energy procurement based on a number of criteria, including "responsible siting practices (both environmental and land-use)."[88] These criteria were then used in the company's 2018 procurement solicitation (see Example: California Community Choice Aggregation: The Clean Power Alliance).

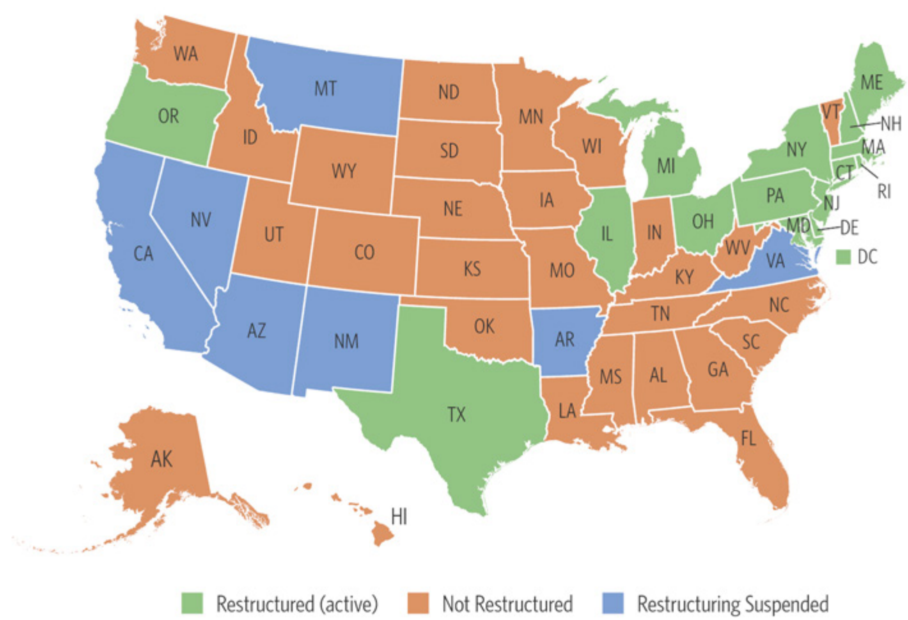


FIGURE 6. State Electricity Market Regulatory Structure. *Source: U.S. Environmental Protection Agency. 2015. "Energy and Environment Guide to Action State Policies and Best Practices for Advancing Energy Efficiency, Renewable Energy, and Combined Heat and Power." Chapter 7.*

Procurement Mechanisms

Procurement mechanisms fall into four general categories:

1. **Competitive solicitations:** Process whereby developers submit project proposals to the procuring entity (e.g., utility) and bids are based on a number of non-price criteria.
2. **Bilateral contracting:** The procuring entity enters into direct negotiations with a sponsor or group of sponsors.
3. **Feed-in Tariffs:** Offers guaranteed grid access and guaranteed energy payment over a long-term contract to all developers within a set of eligible technologies, project sizes, and locations. FIT contract prices are typically set administratively based on location-specific cost criteria.
4. **Auctions:** Process whereby developers submit project proposals and bids are based on price alone (although potential bidders must meet a set of criteria to submit a bid).

Competitive solicitations and bilateral contracting are the most common mechanisms used in the U.S. Outside of the U.S., auctions are an increasingly popular approach with the number of countries adopting auctions growing from six in 2005 to 67 countries by 2016.

Sources: African Legal Support Facility and Commercial Law Development Program. "Understanding Power Project Procurement." U.S. Agency for International Development and Power Africa; Kreycik, Claire E., Toby D. Couture, and Karlynn S. Cory. 2011. "Procurement Options for New Renewable Electricity Supply." National Renewable Energy Laboratory. NREL/TP-6A20-52983; REN21. 2016. "Renewables 2016 Global Status Report. Renewable Energy Network for the 21st Century." Paris, France.

PROCUREMENT PROCESSES

Utilities[89] seek approval from regulators for the procurement of energy resources—such as for investment in the direct development of new generation and transmission or for indirect financial acquisition of these resources.[90] In the U.S., state policies may dictate the available procurement mechanisms (see sidebar at left, "Procurement Mechanisms"), length of procurement contracts,[91] and the amount or types of energy that must be procured (see Example: Massachusetts Procurement Legislation). While considerable research has evaluated the relative advantages and challenges of procurement mechanisms and identified successful design elements, these studies have not focused on the potential for different procurement tools to influence renewable energy siting.[92] Renewable Portfolio Standards (RPS), state policies that require utilities to provide a specified minimum percentage of customer sales or satisfy a certain amount of generating capacity from renewable energy, have been credited with spurring the expansion of renewable energy. We were not, however, able to identify examples of these policies encouraging or requiring consideration of environmental, social, and land-use considerations (see sidebar on p.18, "RPS: Mandating More Renewables").

Some potential ways that procurement mechanisms could direct renewable energy development to low-impact areas include, restrictions on locational eligibility and/or the use of bid evaluation criteria. Such approaches could require or incentivize renewable energy projects to be located in specific regions or zones (see Example: New York Procurement Planning for Offshore Wind Energy), or evaluate proposed projects based on specific criteria, such as locating on disturbed lands or outside of areas with high conservation values (see Pathway 04).

In addition to the role of states in procurement policy, states may affect procurement through: (a) energy siting laws that regulate where a project can be sited; and (b) state approval processes for capital investments that regulate whether an investment in generation and/or transmission is allowed (see Examples: State Energy Siting Laws; and State Approval for Capital Investments in Generation).

U.S. communities are also driving procurement of renewable energy through municipal aggregation, often referred to as Community Choice Aggregation (CCA). Under these programs, local governments procure power on behalf of their residents, businesses, and municipal accounts from an alternative supplier while still receiving transmission and distribution services from their existing utility provider.[93] CCA supports communities that want more local control over their electricity sources, more clean energy than is offered by their utility, and/or lower electricity prices. By aggregating demand, communities are better positioned to negotiate rates with suppliers and require clean energy sources. CCA programs can be designed to prioritize generation from renewable energy projects that offer multiple benefits for air, water, and nature, and de-prioritize projects in high-conflict areas (see Example: California Community Choice Aggregation: The Clean Power Alliance). CCAs are an available mechanism in California, Illinois, Massachusetts, New Jersey, New York, Ohio, Rhode Island, and Virginia.[94]

RPS: Mandating More Renewables

Renewable Portfolio Standards are state policies that require utilities to provide a specified minimum percentage of customer sales or satisfy a certain amount of generating capacity from renewable energy sources. RPS are now in place in 29 states and states have largely been successful at meeting their interim RPS targets. Experts believe that roughly half of all growth in U.S. renewable electricity generation and capacity since 2000 can at least partially be attributed to state RPS requirements. The mechanism has been particularly effective at supporting renewable deployment in specific regions of the country and stimulating specific resource types—solar in particular, although its influence on wind development has increased in recent years.

Given the significant role of RPS in driving renewable energy deployment in the U.S., these policies could play an important role in directing new renewable energy generation to low-impact areas. Where RPS are in place, over half of the policies have been amended to accomplish specific goals, such as raise targets and add carve-outs for specific types of renewable energy. This suggests there may be potential to amend RPS to incorporate environmental, social, and land-use considerations.

Sources: Barbose, Galen. 2018. "U.S. Renewables Portfolio Standards: 2018 Annual Status Report." Lawrence Berkeley National Laboratory; Barbose, Galen. 2019. "U.S. Renewables Portfolio Standards: 2019 Annual Status Report." Lawrence Berkeley National Laboratory; Cox, Sadie and Sean Esterly. January 2016. "Renewable Electricity Standards: Good Practices and Design Considerations." National Renewable Energy Laboratory Technical Report. NREL/TP-6A20-65507; North Carolina Clean Energy Technology Center. "Database of State Incentives for Renewables & Efficiency: Glossary."

➔ EXAMPLE

California Community Choice Aggregation: The Clean Power Alliance

In California, there are 19 CCAs serving more than 10 million customers.[95] The Clean Power Alliance (CPA), California's largest CCA, has adopted an environmental stewardship principle and criteria to guide its procurement of clean energy: "Clean Power Alliance is committed to being an environmental leader by providing customers with energy that delivers multiple benefits for air, water, and nature."[96] To apply this principle, CPA included criteria in its 2018 long-term Request for Offers for clean energy, making a commitment to "prioritize projects that are considered multi-benefit renewable energy and projects located in areas zoned for renewable energy development. CPA will de-prioritize projects located in high-conflict areas."[97] These criteria are supported by a set of questions for evaluating the environmental stewardship of renewable energy project bids, including geo-spatially explicit questions that require project developers to screen their projects for conflicts with avoidance areas and alignment with multi-benefit areas.[98]

➔ EXAMPLE

Massachusetts Procurement Legislation

In 2016, the Massachusetts legislature enacted a comprehensive energy diversity law,[99] which directs the state's utilities to solicit long-term contracts for 1,600 megawatts of offshore wind development and another 1,200 megawatts of clean energy.[100] Another provision of the bill directs utilities to solicit proposals for 9,450,000 megawatts-hours of clean energy generation,[101] which will make it easier for utilities to finance renewable energy projects and related transmission.[102] Both of these provisions outlined criteria that all of the proposals are required to meet, including cost and environmental benefits.[103] The offshore portion of the legislation also stated that proposals must mitigate, "where possible," any environmental impact.[104]

The state identified an "Area for Consideration" that has the highest potential to provide cost-effective offshore wind in a location with the fewest potential conflicts with other ocean uses, natural resources, infrastructure, and wildlife.

➔ EXAMPLE

New York Procurement Planning for Offshore Wind Energy

In 2018, the New York State Energy Research and Development Authority (NYSERDA) released its "Offshore Wind Master Plan," which provides a roadmap for the state to deploy 2,400 megawatts of offshore wind energy by 2030.[105] Development of the plan began in 2016 and included a wide range of state agencies overseeing the energy sector (e.g., regional power authorities and the state PUC), labor, commerce, and the environment. It outlines, among other things, the most favorable areas for potential offshore wind energy development. Identification of the areas took into account a wide variety of environmental, social, economic, regulatory, and infrastructure-related issues, including potential direct, indirect, and cumulative impacts to wildlife and marine habitat. Based on this analysis, the state identified an "Area for Consideration" that has the highest potential to provide cost-effective offshore wind in a location with the fewest potential conflicts with other ocean uses, natural resources, infrastructure, and wildlife (see Figure 7). The area is over 1 million acres and is capable of supporting the state's aggressive offshore wind goals.

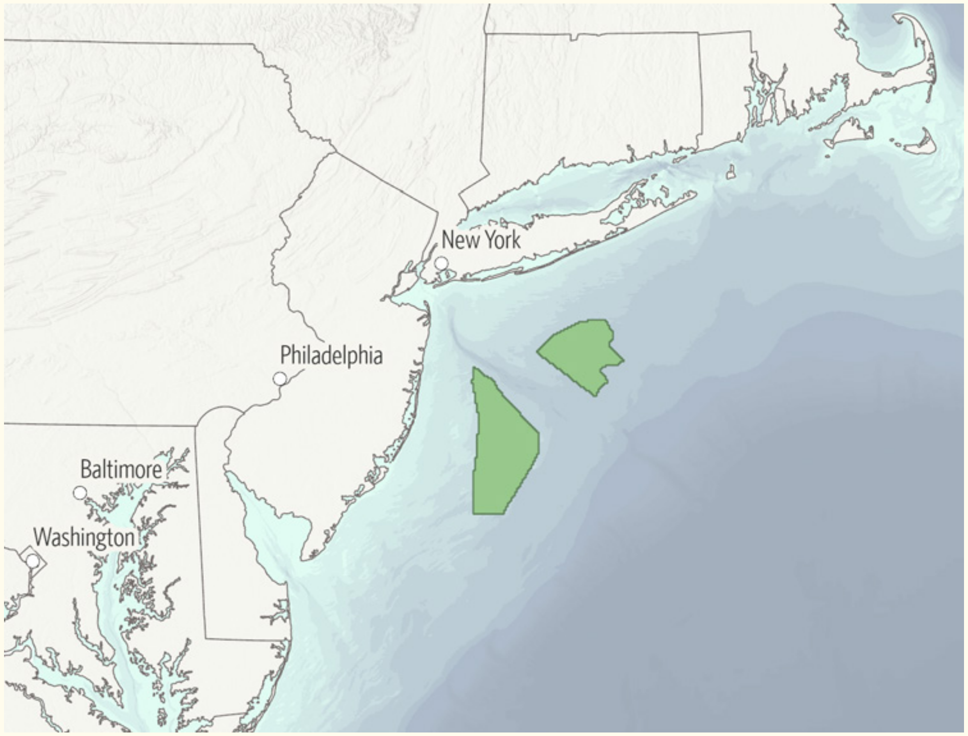


FIGURE 7. New York State Area for Consideration for the Potential Locating of Offshore Wind Energy Areas.
Source: New York State Energy Research and Development Authority. 2018. "New York State Offshore Wind Master Plan." NYSERDA.

➔ EXAMPLE

State Energy Siting Laws

While impacts to specific habitat types and species are regulated at the national level in the U.S., with some exceptions, states largely regulate energy and transmission siting on private lands.[106] A number of states have energy facility siting boards or commissions with authority over energy siting, generally at or above a specified megawatt threshold; other states delegate this authority to the PUC.[107]

For example, in Ohio, wind facilities over 5 megawatts and solar projects over 50 megawatts must secure approval from the Power Siting Board and must provide information on environmental impacts, including those to wildlife areas, nature preserves, and other conservation areas.[108] In New Hampshire, the state legislature directed the Site Evaluation Committee to establish criteria to ensure that the benefits of wind projects “are appropriately considered and unreasonable adverse effects avoided through a comprehensive, transparent, and predictable process.”[109] The Committee must also consider, among other things, “cumulative impacts to natural, scenic, recreational, and cultural resources,” “impacts to the environment, air and water quality, plants, animals and natural communities,” and “practical measures to avoid, minimize, or mitigate adverse effects.”[110]

Other states with energy siting boards include Connecticut,[111] Massachusetts,[112] New York,[113] Oregon,[114] Rhode Island,[115] and Washington State.[116] Some of these state statutes apply equally to all energy facilities (Massachusetts), just generation (New York and Washington), or specific resource types, such as wind (Connecticut).

In Minnesota, the state PUC is delegated the authority to issue site permits for wind facilities over 5 megawatts.[117] The PUC may only issue site permits for projects that are compatible with “environmental preservation, sustainable development, and the efficient use of resources...”[118] In their applications, developers must identify the effects of proposed projects on “wildlife” and “rare and unique natural resources.”[119]

PHOTO: Wind development in Mower County, Minnesota. © ColdSnap Photography

➔ EXAMPLE

State Approval for Capital Investments in Generation

Many states require utilities to secure approval—a Certificate of Public Convenience and Necessity (CPCN)—from the state PUC for large capital investments in generation or transmission infrastructure.[120] Certificates are most frequently required in regulated states and for providers of last resort in deregulated states.[121] While the primary purpose of these proceedings is to ensure that utilities' expenditures are justified, financially sound, and in the best interest of customers, the process and rules governing the issuance of certificates may provide an opportunity for states to consider or require siting issues.[122]

For example, in North Dakota, utilities must secure certificates from the Public Service Commission for the construction of generation facilities and transmission corridors.[123] When considering issuance of certificates, the Commission is directed to consider effects from the project's location, construction, and operation on "natural resources, and the environment," "[a]dverse direct and indirect environmental effects that cannot be avoided," and effects from project siting on "areas unique because of biological wealth or because the areas are habitats for rare and endangered species."[124] Certification issuance must also consider "problems raised by federal agencies, other state agencies, and local entities."[125] The North Dakota Commission has used this policy to review, and in some cases, reject projects that were deemed to be sited poorly due to their wildlife and habitat impacts.[126]

In Iowa, developers must secure a "certificate of public convenience, use and necessity" from the Iowa Utilities Board for the construction, maintenance, and operation of electric power generating plants and associated transmission. The Board considers economics and reliability but must also demonstrate that the project "will be consistent with reasonable land use and environmental policies and consonant with reasonable utilization of air, land, and water resources, considering available technology and the economics of available alternatives."[127]

Likewise, utilities in Virginia must receive a "certificate of convenience and necessity" from the Public Utility Commission for the construction and operation of electrical generating facilities. While the Commission primarily considers the effects of such projects on rates and reliability, the agency is directed to also give consideration to the environment.[128]

03.

GUIDELINES FOR PROJECT SITING AND DESIGN

PATHWAY AT-A-GLANCE

- Renewable energy siting guidelines should direct project development to low-impact areas that avoid and minimize impacts to wildlife and habitat.
- Siting guidelines should be implemented with the support of spatial information, decision-support tools, examples of best practices, training, and transparent mechanisms for evaluating compliance.

Renewable energy siting guidelines provide a framework for evaluating potential impacts to wildlife and habitat. This can influence the location and configuration of new renewable energy projects and help drive development to low-impact areas. In the United States, the leading guidelines are the U.S. Fish and Wildlife Service (USFWS) "Land-Based Wind Energy Guidelines," which were released in 2012 and are commonly referred to as the Wind Energy Guidelines or WEGs (see Example: U.S. Fish and Wildlife Service's Wind Energy Guidelines).[129] The WEGs are voluntary guidelines developed in collaboration with a Wind Turbine Guidelines Advisory Committee, which included representatives from federal energy and wildlife agencies, state energy commissions and wildlife agencies, tribes, renewable energy companies, conservation organizations, and academia.[130] As yet, no similar guidelines have been developed for offshore wind or for solar energy.

Several factors can support the effectiveness of voluntary guidelines. First, it is important to have industry commitment to apply the voluntary guidelines. This can be expressed by having industry associations promote the guidelines across the sector and support on-going training for their application in accordance with best practices. Second, adherence to voluntary guidelines can be promoted when regulatory agencies, investors, and other parties set expectations for their application. Finally, application of voluntary guidelines is enhanced by voluntary certification programs that evaluate whether, and how rigorously, guidelines are applied, or by encouraging public reporting on the results of all or some of the analyses undertaken in conformance with guidelines.

PHOTO: © Ami Vitale

Site Wind Right

The Nature Conservancy has developed a map of low-impact areas for wind siting in the 17-state "Wind Belt" (see Figure 8). This region of the country includes 80 percent of the installed or planned wind capacity in the U.S.

The map was developed to encourage wind energy development to avoid siting in areas of high ecological significance. The conservation criteria incorporated in the tool are based on best available science and data identified through research and discussions with partners, including local, state, and federal wildlife agencies.

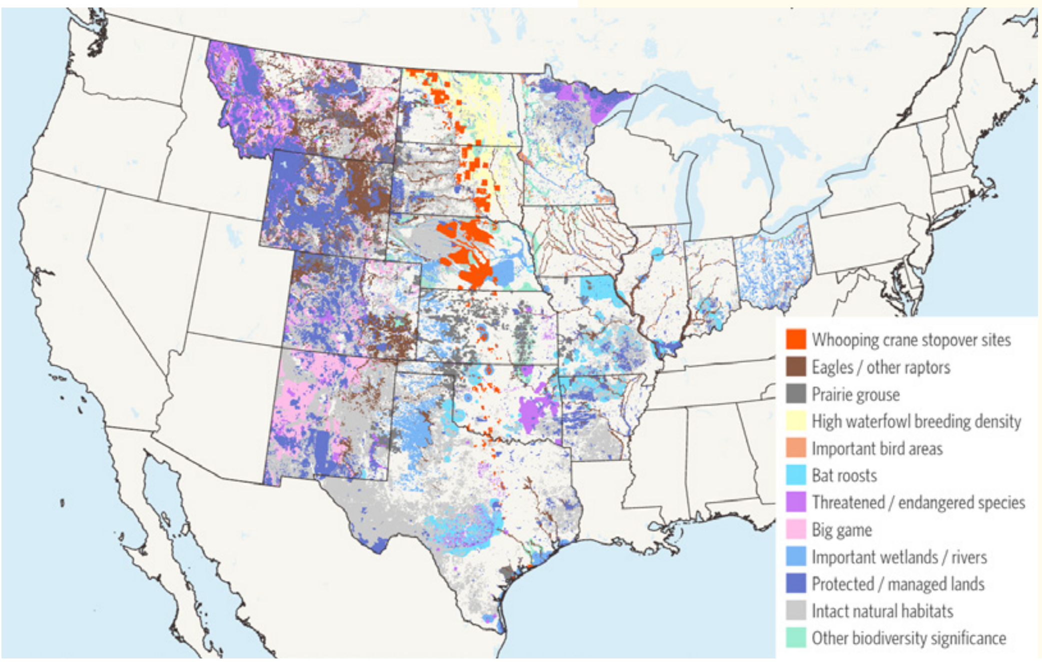
Sources: American Wind Energy Association. 2019. "U.S. Wind Industry Fourth Quarter 2018 Market Report." AWEA, Washington, D.C.; The Nature Conservancy. "Site Wind Right."

➔ EXAMPLE

U.S. Fish and Wildlife Service's Wind Energy Guidelines

The Wind Energy Guidelines (WEGs) are a decision-making framework that ensures companies are aware of, and take into consideration, impacts to wildlife and habitat, including landscape-level considerations. The WEGs use a stepwise process or "tiered approach" for assessing potential adverse effects to species of concern and their habitats. At each step in the process, additional information of increasing levels of detail is considered to determine the extent of impacts to wildlife and habitat and how such impacts can be avoided, minimized, or offset. At the end of the first several tiers, the developer is encouraged to consider whether the project under consideration has a high probability of significant adverse impacts to species of concern or their habitat. If so, the guidelines recommend that the developer abandon the project.[131] However, as the guidelines are voluntary, developers are not required to abandon problematic projects. They may continue to explore whether such impacts can be mitigated (avoided, minimized, or offset) and, if so, advance the project along the path to development.

Soon after USFWS adopted the WEGs, the American Wind Energy Association, a major industry association representing wind energy, committed in writing to the USFWS that it supports using the WEGs, will urge its members to use the WEGs, and is committed to training its members on application of the WEGs.[132] Investors are also helping to drive support for the WEGs. They may ask to review the results of WEG analyses to evaluate risks and avoid investments in projects that are determined to be high-risk to wildlife and habitat.



Because the USFWS Wind Energy Guidelines were designed to be applicable nationwide, they are general in nature. Though few state wildlife agencies in the U.S. have the authority to approve or deny renewable energy projects, they do play an influential role in identifying risks and encouraging low-impact siting. Several state wildlife agencies have used the national guidelines to create state-specific versions to communicate expectations for wind siting in a transparent manner.[133] Other organizations have created resources designed to support application of the WEGs, such as The Nature Conservancy's Site Wind Right map (see sidebar at left, "Site Wind Right").[134]

FIGURE 8. Site Wind Right Map. *Sources: The Nature Conservancy. July 2019. "Site Wind Right: Accelerating Clean, Low-Impact Wind Energy in the Central United States." The Nature Conservancy's Great Plains Renewable Energy Initiative.*

04.

PROGRAMS TO PROMOTE PROJECTS ON CONTAMINATED AND DEGRADED LANDS

PATHWAY AT-A-GLANCE

- Government programs should promote renewable energy development on contaminated and degraded lands by streamlining redevelopment processes and incentivizing projects to locate on these lands.
- Program implementation should be supported by inventories of existing contaminated and degraded sites with high renewable energy potential and guidelines on how to navigate the redevelopment of these lands.

In many industrialized countries, there are significant areas of contaminated and degraded lands that may be available for renewable energy development. Contaminated or potentially contaminated sites in particular have long been identified as ideal locations for siting renewable energy projects. Because the productive uses of these areas may already be limited, their reuse for utility-scale renewable energy is more likely to enjoy community support. Some sites, such as former mined lands, may be especially attractive for renewable energy because of their large land areas and existing transmission infrastructure.

From country to country, and state to state in the U.S., the classifications and definitions of contaminated lands differ, as do restrictions on their reuse. Such lands may include sites that were once in industrial use and are simply no longer operational, those that were classified as contaminated and have been cleaned up but still have some use restrictions, and those that are still considered contaminated and are subject to legal or other use restrictions intended to minimize exposure to humans and wildlife. These sites include former mined lands, closed landfills, former industrial sites, and locations at which chemical or oil spills have occurred.

Federal and state agencies in the U.S. have taken steps to direct renewable energy development to contaminated and degraded lands through the identification of appropriate sites and state policies defining appropriate reuse of these lands (see Examples: U.S. Environmental Protection Agency: RE-Powering America's Lands; and U.S. Bureau of Land Management: Arizona Restoration Design Energy Project). The U.S. Environmental Protection Agency (EPA) has identified more than 11,000 contaminated sites in the U.S. that might be eligible for renewable energy development. These sites encompass 15 million acres and have the potential to support 1 million megawatts of solar, wind, biomass, or geothermal generation.[135] At the state level, Nevada recently updated state regulations that stipulate eligible uses of formerly mined sites, adding "renewable energy development and storage" to the list of approved uses for former mined lands, and the Massachusetts solar energy incentive program makes intact habitat ineligible for the program while incentivizing projects on previously developed properties (see Example: Massachusetts SMART Program).[136]

PHOTO: Solar on Blumenthal closed landfill in Germany. © fotograupner/stock.adobe.com

BLM's state office in Arizona identified disturbed or previously developed sites within its portfolio of lands, such as landfills, retired agricultural lands, and abandoned mine lands, that could be made available for renewable energy development.

➔ EXAMPLE

U.S. Environmental Protection Agency: RE-Powering America's Lands

The U.S. Environmental Protection Agency, in partnership with the National Renewable Energy Laboratory (NREL), operates a program designed specifically to encourage renewable energy siting on contaminated or potentially contaminated lands. The program, RE-Powering America's Lands,[137] identifies potential sites, assesses their renewable energy potential, and develops resources for communities, developers, industry, state and local governments, and others to help them navigate the often complex path to redeveloping these sites. The program had developed case studies that highlight examples of renewable energy facilities sited on formerly contaminated sites.[138] The examples include a 7-megawatt solar photovoltaic system constructed on a former municipal solid waste landfill that had been designated as a Superfund site in New Jersey, a 35-megawatt wind installation on a former steel production site in New York, and a 10.8-megawatt solar farm on a 43-acre former industrial facility and Superfund site in Indiana.[139]

➔ EXAMPLE

U.S. Bureau of Land Management: Arizona Restoration Design Energy Project

Over 25 percent of the U.S. land base—more than 630 million acres—is in public land ownership. The Bureau of Land Management (BLM) owns 240 million acres of public lands, the largest amount of any other single federal agency.[140] BLM is mandated by federal statute to manage its lands for multiple uses.[141] This means that although the BLM must manage lands to ensure their protection and ability to support wildlife,[142] it must also allow for the use of those lands for such activities as grazing, timber production, energy production, and mining. The end result is that there are significant degraded lands under the jurisdiction of the BLM.

In 2009, the BLM's state office in Arizona directed its staff to implement a new effort—the Restoration Design Energy Project (RDEP)—to identify disturbed or previously developed sites within its portfolio of lands, such as landfills, retired agricultural lands, and abandoned mines, that could be made available for renewable energy development.[143] The project also aimed to streamline the process for renewable energy development on these lands by designating them for solar development and laying out, in advance, the agency's expectations for avoidance, minimization, and compensation measures. Under the RDEP, the BLM identified 192,100 acres of degraded land at 25 sites that were appropriate for renewable energy development. In addition to selecting degraded lands, BLM also screened the sites for those that are low conflict with conservation values and in proximity to transmission and load centers.[144]

➔ EXAMPLE

Massachusetts SMART Program

The Solar Massachusetts Renewable Target (SMART) program was established by legislation in 2016.[145] The tariff-based incentive program was designed to yield 3,200 megawatts of new solar generation and includes eligibility requirements and a sliding scale of incentives depending on the category of land proposed for projects and other factors.[146] The program encourages solar development in areas designated as brownfields, eligible landfills, and "previously developed areas," which is defined as those "with pre-existing paving, construction, or altered landscapes and does not include altered landscapes resulting from current agricultural use, forestry, or use as preserved natural area."[147] Ineligible lands include those designated as "Priority Habitat," "Core Habitat" or "Critical Natural Landscape," as defined in the statute.[148]

PHOTO: Palmer Airfield solar project on a qualified brownfield in Palmer, Massachusetts. © Greg M. Cooper/Borrego Solar

05.

CORPORATE PROCUREMENT AND SUSTAINABILITY COMMITMENTS

PATHWAY AT-A-GLANCE

- Companies should source renewable energy from projects that avoid impacts to nature and are supported by local communities, consistent with leading corporate sustainability principles.
- Companies should incorporate environmental, social, and land-use criteria into their renewable energy buying principles, procurement guidance, requests for proposals, and evaluation criteria for selecting projects.

Corporate sourcing of renewable energy is increasing rapidly. The majority of companies that are active in renewable energy sourcing are headquartered in Europe and North America, with emerging markets on the rise.[149] Globally, 13,400 megawatts of clean energy contracts were signed by 121 corporations in 21 different countries in 2018, up from 6,100 megawatts in 2017. [150] Corporate sourcing of renewable electricity represented approximately 18.5 percent of total renewable electricity demand in the commercial and industrial sector.[151] This positions companies alongside utilities as major buyers of clean energy globally.

Companies could play an increasing role in promoting low-impact renewable energy development for several reasons. First, many companies have established triple bottom-line commitments (i.e., environment, social equity, and financial profitability). Renewable energy projects that deliver clean energy, avoid impacts to nature, and support local communities are consistent with those commitments. Consumer-facing companies may have even greater incentives to reduce the potential public relations and project cancellation risks associated with poorly sited projects.[152] Second, companies have more flexibility to make low-impact energy sourcing decisions than public utilities, as they do not face the same constraints as state-regulated utilities. Third, companies are increasingly exercising their buying power, coming together in alliances such as the Renewable Energy Buyers Alliance (REBA), to make their principles and criteria clear for purchasing renewable energy.

To meet their triple bottom-line, more than 180 companies have committed to sourcing 100 percent of their electricity consumption from renewable energy.[153] Many of the largest companies in the world, including at least 71 of the Fortune 100 companies and 215 of the Fortune 500 companies, have made renewable energy sourcing commitments.[154] Many of these companies are also committed to sustainability principles that include conserving biodiversity. For example, about one-third of the Fortune 100 companies have made commitments to conserve biodiversity, including preventing biodiversity impacts, protecting and restoring forests and natural habitat, and safeguarding ecosystem services.[155]

PHOTO: © Nick Hall

Companies can support their dual commitments to renewable energy and biodiversity conservation by sourcing renewable energy from projects sited in low-impact areas. A key step is incorporating siting and land-use criteria into their buying principles, procurement guidance, requests for proposals, and evaluation criteria for selecting projects (see Example: Salesforce's Renewable Energy Procurement Process). Procurement guidance that includes geo-spatially explicit questions requiring project developers to screen their projects for conflicts with conservation values, in combination with bid evaluation criteria that favor siting in low-impact areas, will incentivize developers to identify low-impact sites for their project proposals. Bid evaluation criteria can, for example, allocate higher scores to projects proposed on contaminated or degraded lands.

Salesforce procures renewable energy by evaluating each project against a set of environmental, social and economic attributes.

➔ EXAMPLE

Salesforce's Renewable Energy Procurement Process

Salesforce is a leading cloud-based software company based in San Francisco, California, and one of the largest U.S. companies by revenue—285th on the Fortune 500 list in 2018. Salesforce considers the environment to be a key stakeholder and is working to address the challenge of climate change to support a just transition to a low-carbon economy.[156] In 2013, Salesforce became one of the first cloud companies to commit to powering all data center operations with renewable energy. In 2015, Salesforce expanded this 100 percent commitment to cover its global operations by 2022.[157] To meet this commitment, Salesforce will purchase renewable energy equivalent to what it uses to power global operations on an annual basis, with a focus on adding new renewable energy to the grid in a manner that avoids and reduces the greatest possible emissions.

Consistent with these goals and its corporate values, Salesforce procures renewable energy by evaluating each project against a set of environmental, social and economic attributes. Currently, this includes over 35 unique attributes or sets of criteria, including "Land Use."[158] Information gathered during the Request for Proposal process is used to evaluate projects and guide the selection process. The Land Use criteria, in particular, was developed to help Salesforce select well-sited renewable energy projects that avoid negative impacts to wildlife and habitat.

As a global company that procures renewable energy worldwide, Salesforce modeled its Land Use criterion after the performance standards developed by the International Finance Corporation (IFC) of the World Bank Group.[159] These standards have been adopted by over 100 international finance institutions and many multinational companies to guide investments and development. Specifically, the Land Use criterion asks whether proposed renewable energy projects will be located in *Critical*, *Natural*, or *Modified Habitat*, as defined by the IFC performance standard on biodiversity and its accompanying guidance note.[160]

Salesforce is currently conducting its first procurement process that includes the full Land Use criteria. The procurement favors projects located in modified habitat—places where human activity has substantially modified the area's primary ecological functions and species composition (e.g., lands managed for agriculture, built areas, or lands degraded by other human interventions). Because of the high biodiversity values of critical habitat, Salesforce has chosen not to accept any projects located in those areas.

06.

RENEWABLE ENERGY FINANCE

PATHWAY AT-A-GLANCE

- Financial institutions should ensure that their investments in renewable energy avoid impacts to nature and are supported by communities, based on environmental and social performance standards and due diligence processes.
- Financial institutions should provide technical assistance for the low-impact buildout of renewables by supporting energy sector planning, pre-investment project portfolios, and environmental, social, and cumulative impact assessments.

Financial institutions can influence renewable energy siting through their environmental and social performance standards, due diligence processes, and technical assistance. Performance standards (also referred to as safeguards) are intended to guard against unforeseen risks and impacts, improve financial and operational performance, and support a social license to operate.[161] Clients seeking financing from these institutions must provide information regarding the environmental and social risks and impacts of their proposed projects, which the financial institution then assesses against its standards as part of its decision-making.

Financial performance standards can be designed and applied to help drive low-impact renewable energy siting. The standards support identifying and managing environmental and social risks, including the potential cumulative impacts of multiple projects in a region (see Example: Jordan's Tafila Region Wind Power Cumulative Effects Assessment). The World Bank Group's International Financial Corporation (IFC) Performance Standards, which include Performance Standard 6 on biodiversity conservation (see Example: IFC Performance Standard 6), are generally considered the leading global standards. These standards are the basis for the "Equator Principles," which have been adopted by over 100 of the world's leading financial institutions in 37 countries.[162] Given the scope of the Equator Principles Financial Institutions (EPFIs), many international companies—especially in the energy, mining, and infrastructure sectors—are committed to applying these performance standards for all of their projects regardless of whether they are seeking financing from IFC or EPFIs.

Providing technical assistance is another way that financial institutions can promote low-impact renewable energy siting. Multilateral banks provide support to low- and middle-income countries for national and subnational energy planning and to develop pipelines of renewable energy projects that contribute to U.N. Sustainable Development Goals[163] (SDGs) and Paris climate commitments (see Examples: World Bank: Energy Sector Management Assistance Program; and Inter-American Development Bank: NDC Invest & Sustainable Infrastructure Program). By helping governments deploy renewables to low-impact areas, financial institutions can support countries in making a rapid transition to renewable energy that also meets SDG 15 on biodiversity and ecosystems.[164]

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➔ EXAMPLE

Jordan's Tafila Region Wind Power Cumulative Effects Assessment

The World Bank Group's International Finance Corporation commissioned the Tafila Region Wind Power Project (TRWPP) Cumulative Effects Assessment (CEA) to help promote more sustainable wind energy investments in Jordan.[165] The CEA was in support of the government's 2020 goal of obtaining 10 percent of the country's energy supply from renewable sources. The CEA focused on potential cumulative biodiversity impacts of wind energy development because "([a]lthough the renewable energy sector, including wind energy, is considered 'green,' adverse environmental and social (E&S) impacts of renewables also need to be considered and managed." Jordan sits on the Rift Valley/Red Sea flyway, the second largest flyway for migratory birds in the world. The country also has several protected areas of national and international significance. The study area for the CEA includes Jordan's largest nature reserve—the Dana Biosphere Reserve (BR) and the surrounding Dana Important Bird and Biodiversity Area (IBA).

The CEA was made possible through a partnership with developers, conservation organizations, financial institutions, and government. The five wind farm developers agreed to share and pool their pre-construction environmental survey data. This collaborative approach supported a consistent method for identifying and managing E&S risks. The CEA proposes measures that wind farm operators can take to mitigate, monitor, and manage threats to bats and 13 species of birds, including siting and designing projects with the lowest impact, and monitoring threatened bird species during the operations.

PHOTO: Dana Biosphere Reserve—Jordan's largest—is a melting pot of over 960 species from Europe, Africa, and Asia. © Johannes/stock.adobe.com

Performance Standard 6 calls for clients to avoid impacts to biodiversity and ecosystem services.

➔ **EXAMPLE**

IFC Performance Standard 6

Performance Standard 6 (Biodiversity Conservation and Sustainable Management of Living Natural Resources) is one of the IFC's eight performance standards.[166] It calls for clients to avoid impacts to biodiversity and ecosystem services. This standard and its associated guidance[167] help drive the siting of new projects, including renewable energy projects, away from critical and natural habitat. Performance Standard 6 recognizes "that sustainable development cannot be achieved if either biodiversity or ecosystem services are lost or degraded by development efforts." It requires no net loss of natural habitat and net gain of biodiversity for critical habitat, directing clients to "consider project-related impacts across the potentially affected landscape or seascape."[168]

For the purposes of implementing Performance Standard 6, habitats are divided into modified, natural, and critical habitat. Critical habitats are a subset of modified or natural habitats that have higher biodiversity value.[169] In areas of critical habitat, clients may not implement any project activities unless all of the following are demonstrated:

- No other viable alternatives within the region exist for development of the project on modified or natural habitats that are not critical;
- The project does not lead to measurable adverse impacts on those biodiversity values for which the critical habitat was designated, and on the ecological processes supporting those biodiversity values;
- The project does not lead to a net reduction in the global and/or national/regional population of any Critically Endangered or Endangered species over a reasonable period of time; and
- A robust, appropriately designed, and long-term biodiversity monitoring and evaluation program is integrated into the client's management program.[170]

➔ EXAMPLE

World Bank: Energy Sector Management Assistance Program

The Energy Sector Management Assistance Program (ESMAP) is a partnership between the World Bank Group and 18 partners to help low- and middle-income countries develop environmentally sustainable energy solutions that reduce poverty and improve economic growth.[171] The partnership works with governments to accelerate the clean energy transition in support of meeting Sustainable Development Goals and Paris climate commitments. This includes facilitating private sector engagement and providing financing for project preparation. ESMAP's Renewable Energy Resource Mapping component helps countries map their energy resource potential through spatial mapping and supports the incorporation of these data into national planning.

➔ EXAMPLE

Inter-American Development Bank: NDC Invest & Sustainable Infrastructure Program

To accelerate sustainable infrastructure development in Latin America that is aligned with Sustainable Development Goals and Nationally Determined Contributions (NDCs) under the Paris climate agreement, the Inter-American Development Bank (IDB) and the United Kingdom Department for Business, Energy and Industrial Strategy have partnered to establish the NDC Invest platform and the Sustainable Infrastructure Program (SIP).[172] Within NDC Invest, the NDC Pipeline Accelerator supports pre-investment planning, design, and preparation of sustainable infrastructure projects and portfolios, including for renewable energy. Likewise, the SIP provides a wide range of instruments, including grants for technical cooperation and blended finance for loans, equity and guarantees, to address barriers to private investment in sustainable infrastructure.[173] SIP focuses on Brazil, Colombia, Mexico, and Peru.

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Conclusions

Making a rapid transition to renewable energy is critical to address the climate challenge. The spatial extent of this buildout will be significant and global. Concerns over related impacts to nature and communities are expected to increase the frequency and intensity of conflicts over renewable energy siting. These conflicts could slow the clean energy transition.

Achieving a clean and green future—one that supports goals for energy, climate, nature, and communities—will be one of the defining challenges of the coming decade.

We believe that the set of pathways identified here hold significant potential across most countries for prioritizing the deployment of renewable energy in low-impact areas. The pathways can serve as a framework for additional, country-specific analyses.

We strongly recommend that countries and subnational governments, companies, and financial institutions explore adoption of these and other approaches that can accelerate the deployment of low-impact renewable energy. Doing so will promote a faster and cheaper transition to a clean energy future.

PHOTO: © Dave Lauridsen

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The Nature Conservancy

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