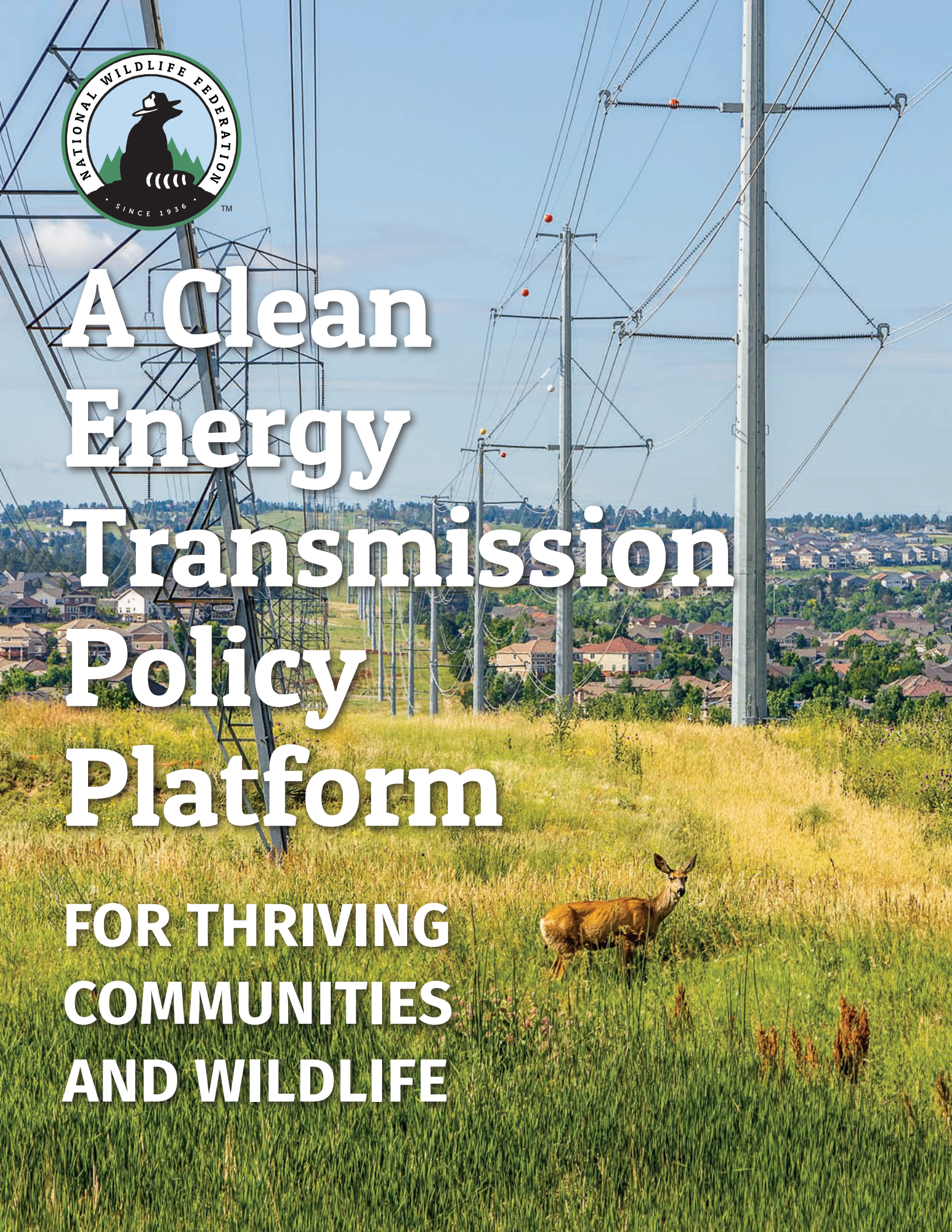

A Clean Energy Transmission Policy Platform

FOR THRIVING COMMUNITIES AND WILDLIFE

A Clean Energy Transmission Policy Platform

FOR THRIVING COMMUNITIES AND WILDLIFE

Lead Author: Veronica Ung-Kono, Esq.

We appreciate the work and dedication to conservation of all National Wildlife Federation staff and our affiliate partners, who help make efforts like this possible. In particular, we would like to thank the following for their contributions to this report: Shannon Heyck-Williams, David DeGennaro, Lindsay Kuczera, Jessica Arriens, Amber Hewett, Mike Leahy, Garrit Voggesser, Jeremy Romero, Corina Newsome, John Kanter, TJ Brown, Simon Buzzard, Kit Fischer, and Erin Farris-Olsen.

Suggested citation: Ung-Kono, Veronica. 2023. A Clean Energy Transmission Policy Platform for Thriving Communities and Wildlife, Washington, D.C.: National Wildlife Federation.

National Wildlife Federation
1200 G Street NW, Suite 900
Washington, D.C. 20005
www.nwf.org

Executive Summary

The National Wildlife Federation recognizes that all people, wildlife, and our natural resources urgently need a world free of toxins that provides clean air and water, safe communities, easy and equitable access to nature, and protection from the ravages of climate change. Addressing climate change includes utilizing natural climate solutions and human-made technological solutions, like renewable energy generation. Jointly, equitably, and justly applying these protections brings the foundation of the conservation movement and its ethos into the 21st century.

GETTY IMAGES

To meet the interdependent needs of wildlife and people in a rapidly changing world affected by climate change, our power system must not rely on toxic fossil fuels. Unfortunately, eliminating our reliance on fossil fuels is not as easy as simply building wind and solar facilities. We must ensure renewable energy rapidly reaches everyone in the United States. Transmission infrastructure is the key to ensuring everyone receives the benefits of low-cost renewable energy.

Buildout of an interconnected power grid that provides renewable energy generation to all communities may be the greatest infrastructure accomplishment in the United States, since construction of interstate highways. Our current terrestrial and offshore transmission needs represent an opportunity to demonstrate how we have learned from our history of environmental mistakes and social injustices.

Buildout of an interconnected power grid that provides renewable energy generation to all communities may be the greatest infrastructure accomplishment in the United States, since construction of interstate highways.

Energy transmission in the United States necessitates rapid buildout and updating how transmission buildout occurs. Proactively planned infrastructure buildout within and among regions—enabled by flexible tariffs and modernized wholesale market reform—must be informed by:

- upgraded transmission systems;
- the needs of wildlife and our ecosystems;
- multi-value planning;
- the needs of local communities through early, frequent, and sustained community involvement;
- long-term scenario-based planning;
- and distributed generation buildout that occurs concurrently with transmission buildout.

Vision Statement

Electricity allows our communities to function; clean electricity allows our communities to thrive. Shifting the electric grid to clean generation will require a massive buildout of new generation sources, battery storage, greater energy efficiency upgrades, a modern, resilient grid—and transmission. The choices we implement in the next 10 years will make or break our efforts to reach net-zero greenhouse gas emissions by mid-century. Net-zero greenhouse gas emissions will ensure we avoid the most catastrophic climate impacts on water security, food supply, human health, wildlife populations, and more.

To meet our climate goals—and provide affordable and reliable clean energy to our communities—electric transmission capacity must more than double within this decade. This infrastructure development must be resilient in the face of increasing severe weather events and will have significant, potential impacts on our lands, wildlife, cultural resources, and more. The National Wildlife Federation is committed to accelerating America's clean grid buildout and protecting people and wildlife through responsible investments in clean energy transmission.

Responsible investment in energy transmission:

I. Centers the priorities of and seeks to empower[1] local communities, with particular emphasis on environmental justice communities, Tribal Nations[2] and Indigenous peoples, to ensure the impacts are not borne by already overburdened communities, and ratepayers to ensure they receive the lowest cost generation with electricity rates that are just and reasonable;
II. Responsible transmission development maximizes coordination of decision makers;
III. Avoids wildlife habitat in siting transmission infrastructure while prioritizing already disturbed areas;
IV. Applies mitigation measures that conserve and restore ecosystems and wildlife habitat and populations; and
V. Applies proactive, interregional long-term energy transmission planning that equitably invites collaboration among communities, state, regional, and federal stakeholders, regulators, and tribes.

This document lays out the National Wildlife Federation's national policy recommendations to swiftly increase the capacity of the transmission system through operational and restructuring upgrades and the buildout of new transmission infrastructure. Recommendations are structured around several analytical categories based on the stages of the transmission project development process.

The United States can deploy a range of transmission planning and building strategies to meet the nation's clean energy goals that prioritize the health and function of our ecosystems, and to enhance human and wildlife health, equity, and justice to protect cultural and natural resources.

Table of Contents

Key Advocacy Areas

A Intersecting Equity, Justice, and Transmission Investments

Background

Transmission projects are infrastructure projects that will significantly help the United States meet its climate goals. However, these projects are still human-made projects that may interfere with ecosystem function and human communities. Proactively designing projects with developers by applying the knowledge of federal and state agencies, conservationists, and local communities including tribal communities and environmental justice communities will create transmission projects that benefit everyone with as few negative impacts to natural ecosystems as possible.

I. Responsible investment centers the priorities of and seeks to empower[3] local communities, with particular emphasis on environmental justice communities, Tribal Nations[4] and Indigenous peoples, to ensure the impacts are not borne by already overburdened communities, and ratepayers to ensure they receive the lowest cost generation with electricity rates that are just and reasonable.

Environmental Health

Policy Recommendation: Transmission investments should be paired with natural climate solutions to address existing environmental health issues. Many communities cannot take part in the transition to a clean grid when burdened by pollution and degraded natural resources.

Policy Recommendation: State and federal regulators should apply a cumulative impacts analysis in siting transmission infrastructure to prioritize equity in transmission siting decisions.

Relying on fossil fuels to generate electricity disproportionately harms underserved and overly burdened communities. Expanding the transmission system will address existing environmental health issues exacerbated by climate change by transitioning communities from dependence on polluting fossil fuel-based power to clean, renewable power. In the United States, people of color,

people with disabilities or health conditions, low-income communities, tribal communities, immigrants, the elderly, children, people who are not fluent in English, and other marginalized people face disproportionate challenges in adapting to or recovering from climate change impacts.[5]

There is a direct link between the health of our natural ecosystems and our public health. In just one example, the development and survival of ticks and the bacterium that causes Lyme disease are strongly influenced by climatic factors such as temperature, precipitation and humidity.[6] Increasingly mild winters in the U.S. Northeast are characterized by greater numbers of over-wintering ticks that weaken moose health, and spread Lyme disease to human populations. Poorly sited energy projects, including transmission projects, can exacerbate these challenges facing biodiversity and the health of our ecosystems, which could create poor health outcomes for our most underserved communities.

Additionally, many communities are disproportionately subjected to unreliable power through rolling blackouts during extreme weather events[7] and severe energy burdens.[8] Approximately 30.6 million households in the United States experience an energy burden. Nearly 70 percent of low-income households have a high energy burden and 60 percent have a severe energy burden.[9] The average energy burden for low-income communities is three times higher than non-low-income households.[10]

Resolving these inequities by ensuring underserved communities have access to low-cost clean energy falls under the Federal Power Act's public interest standard, which the federal government and states have an obligation to uphold.[11] Federal regulators[12] and members of Congress[13] have recently made strides to define environmental justice and environmental justice communities. Still, there is no clear definition qualifying "environmental justice" across all agencies involved in the environmental siting decisions for major infrastructure, like transmission projects. The Biden-Harris administration released the *Executive Order on Revitalizing Our Nation's Commitment to Environmental Justice for All* mandating that each agency identifies, analyzes, and addresses the disproportionate effects of federal permitting regimes, including those related to cumulative impacts.[14] State regulators have also begun to recognize and address these disproportionate challenges by applying a "cumulative impacts" analysis to environmental siting decisions to renew or issue a permit. New Jersey[15] and New York[16] each apply a cumulative impacts assessment to siting decisions; notably, each law varies in scope. New Jersey and New York remain the only two states to adopt a cumulative impacts analysis for environmental siting reviews.

GETTY IMAGES

The Biden-Harris administration released the Executive Order on Revitalizing Our Nation's Commitment to Environmental Justice for All mandating that each agency identifies, analyzes, and addresses the disproportionate effects of federal permitting regimes, including those related to cumulative impacts.

Labor

Policy Recommendation: Investment in transmission should include local workforce training programs and hiring agreements, especially for constructing new transmission infrastructure.

GETTY IMAGES

Investment in transmission accompanied with community agreements, local workforce training programs and hiring plans will create notable job growth for our most underserved communities. Constructing, operating, and maintaining energy and transmission infrastructure will create ample opportunities for local communities to expand job opportunities. In 2021, transmission, distribution, and storage (TDS)[17] jobs increased by 21,460.[18] Traditional transmission, the largest TDS technology, added the most jobs of any category, 13,088 (1.4%).[19] The largest gains were in the construction industry, with 17,612 new jobs.[20]

It is important to note that such employment opportunities may adversely affect the economic security of communities by reducing opportunities for other commercial uses of land, altering property values near energy infrastructure, and displacing workers from the fossil fuel industry. Still, if federal agencies, state agencies, and project developers implement a formal Project Labor Agreement (PLA), Community Benefit Agreement (CBA), or Community Workforce Agreement (CWA) tailored to the needs of local communities, then these entities can mitigate or avoid these economic effects.[21]

Constructing, operating, and maintaining energy and transmission infrastructure will create ample opportunities for local communities to expand job opportunities.

Community Engagement

Policy Recommendation: Transmission project developers and federal, state, and tribal governments should coordinate and provide resources for underserved communities to have meaningful input from the project's conception to the post-construction phase and beyond.

Policy Recommendation: Federal and state regulators should begin building meaningful relationships based on trust with Tribal Nations and communities, before a developer proposes a project.

Policy Recommendation: Federal and state regulators should collaborate with potentially affected Tribal Nations and communities to find measures that will mitigate project impacts.


GETTY IMAGES

Policy Recommendation: Federal and state agencies and developers should apply free, prior, and informed consent process throughout contact with Tribal Nations and Indigenous peoples.

Policy Recommendation: Developers should begin outreach to consult such communities from the genesis of a project's development. If developers begin this outreach at the design phase, then they and communities can begin to build trust and ultimately create a more cost-effective project that benefits the community.[22]

Policy Recommendation: Developers should be open to collaborating with communities to create innovative revenue sharing or project ownership configurations that can build long-term financial equity into communities.

Policy Recommendation: Transmission developers should use Community Benefit Agreements (CBAs) in designing projects and build lasting relationships with communities.

Policy Recommendation: State and federal governments should require CBAs and proof of equitable and just engagement in generation and transmission project applications.

Policy Recommendation: All federal and state agencies distributing funding for transmission and clean energy generation projects should create simplified application processes to efficiently and fairly distribute available funds.

Relationships between governments, project developers, and underserved communities are strained from histories of unfair, extractive, transactional relationships and reneged promises. It is time to change. Building real, meaningful relationships with longevity takes time and requires trust. Especially for regulators, this requires regulators to meet with, listen to, and learn from communities before a project docket opens at their agency.[23]

CBAs can help developers build such relationships. CBAs consist of benefits a developer agrees to confer upon a community, while a community agrees to support a project. Benefits can range from commitments to hire the construction workforce from a specific community, to contributions to economic trust funds, to local workforce training guarantees.

For federal and state governments, building such relationships should take a different form. Federal and state governments' recognition of disproportionate climate change impacts and historical socioeconomic inequities has led to their governments allocating more resources to such communities. Still, it is not enough to offer resources. *How* federal and state governments offer resources is equally important.

GETTY IMAGES

Governmental outreach processes should apply a model of consultation that emphasizes consent from Indigenous Peoples and Tribal Nations.[24] In fact, the federal government has trust responsibilities and special fiduciary obligations[25] to protect Native resources and observe and uphold the rights of Tribal Nations to govern themselves on tribal lands,[26] and the self-determination imbued in the Indian Self-Determination and Education Assistance Act.[27] In fulfilling these duties, the federal government is "bound by every moral and equitable consideration to discharge the federal government's trust with good faith and fairness."[28] Additionally, the United States endorsed the United Nations Declaration on the Rights of Indigenous peoples (UNDRIP) on December 16, 2010. UNDRIP Article 32 mandates that nation-states consult with Tribal Nations—here known as Tribal Nations— "... in order to obtain their free and informed consent prior to the approval of any project affecting their lands or territories and other resources, particularly in connection with the development, utilization or exploitation of mineral, water or other resources."[29] Free, prior, and informed consent can be withdrawn at any point. So, it is important for any entity interacting with Tribal Nations and Indigenous peoples to honor consent throughout all interactions.

Outreach must also recognize past historical inequities, injustices, and legal contexts. Notably, Tribal Nations are not stakeholders, but sovereign nations. Engagement with Tribal Nations and Indigenous peoples is distinct from environmental justice communities broadly. While some Tribal Nations and Indigenous peoples may have similar experiences to environmental justice communities, the unique legal status of Tribal Nations and history of all Indigenous peoples requires elements not normally present in definitions of environmental justice or engagement with environmental justice communities.[30]

For all communities, outreach should involve early, frequent, consistent, and sustained involvement and collaboration throughout the interaction with the entity allocating resources. Practically, initial outreach should include invitations to communities to engage in projects before a docket reaches a permitting agency. In addition, in-person meetings should accommodate the residents of affected neighborhoods. This means the meetings should, at minimum, occur in the neighborhoods of the communities that will be affected, not solicit personal information from residents, such as their address, and should physically create a non-adversarial atmosphere by ensuring speakers are not isolated from their peers when speaking.

The processes created to access funds, technical expertise, and other resources must also be as respectful, simple, and efficient. This means simplified concept papers, clear timelines, fewer layers of review, and more time spent with communities. Specifically, timelines to propose and review projects must recognize that under-resourced communities may take longer to complete their respective project analyses.

Competition

Policy Recommendation: Independent System Operators (ISOs) and Regional Transmission Organizations (RTOs)[31] should make their solicitation processes[32] more competitive.

Policy Recommendation: States should remove laws that hinder competitive transmission projects and create more competitive processes to procure transmission projects.

Independent System Operators (ISOs) and Regional Transmission Operators (RTOs) oversee and manage the transmission grid on a regional basis. These entities derive their form and function from FERC Orders 888/889 and Order 2000.

One of the primary goals of FERC Order 1000 is to advance just and reasonable rates in the development of transmission, partly driven by increased competition.[33] Yet, there are few new transmission developers who can participate in the current solicitation process for transmission development. This is because ISO/RTOs, and some state laws, exclude too many types of transmission projects that may otherwise qualify. In fact, only about three percent of electric transmission projects face competition.[34]

Applying a competitive solicitation process can save approximately 20 to 30 percent of project costs compared to business as usual.[35] This means ratepayers ultimately pay less for these projects. Some ISOs/RTOs have successfully enhanced competitive engagement by widening the scope of their solicitations.[36] A more competitive process can also include cost containment mechanisms, which assist in mitigating the cost escalation risks,[37] at least in part.[38] Likewise, state policymakers can explore changes to or remove various existing state laws hindering competition for transmission projects.[39]

Interstate transmission projects are massive infrastructure projects. These projects will change the landscape of many areas of the United States—that means they will affect biodiversity, natural resources, and wildlife habitat.

B Siting Transmission Projects

Background

Interstate transmission projects are massive infrastructure projects. These projects will change the landscape of many areas of the United States—that means they will affect biodiversity, natural resources, and wildlife habitat. Still, the

impacts to our natural ecosystems from climate change will be significantly worse without a rapid shift in the power grid supplied with low-cost, clean energy generation available for everyone. Notably, conservation advocates, their partners and local communities can inform what this new landscape looks like through collaboratively and proactively designing projects with developers, wildlife scientists, and climate scientists.

II. Responsible transmission development maximizes coordination of decision makers.

State Permitting Process

Generally, states have primary authority over the siting of intrastate and interstate electric transmission projects from Section 216(h) of the Federal Power Act.[40] Each state has different procedures to follow for approving a transmission project, including different environmental siting criteria.

Federal Permitting Process

The Department of Energy's Authority

VERONICA UNG-KONO

The Energy Policy Act of 2005 (EPAct) declares that it is a national policy to enhance and, to the extent possible, increase the coordination and communication among federal agencies with authority to site electric transmission facilities. Generally, the Department of Energy has the authority to designate national interest electric transmission corridors (NIETCs).

The Department of Energy has jurisdiction under Section 216(h) of the Federal Power Act to coordinate, not site, applicable federal authorizations and related environmental reviews (including the National Environmental Policy Act, or NEPA) for transmission projects.[41] Coordination includes *engaging in or participating with other entities in designing, developing, constructing, operating, maintaining, or owning* electric power transmission facilities and related facilities needed to upgrade existing transmission facilities.[42] Within the last decade, the Department of Energy (DOE) has not sited any new NIETCs.[43]

Federal Land Management Agencies' Authority

Many federal agencies have the authority to issue permits for interstate transmission facilities. Federal land management agencies including the Department of the Interior's Bureau of Land Management (BLM), Fish and Wildlife Service, and National Park Service, and the Department of Agriculture's Forest Service (USFS) have the authority under the Federal Land Policy and Management Act, National Wildlife Refuge System Improvement Act, National Forest Management

Act, and other laws over whether and where to issue rights of way for electric transmission lines and other infrastructure crossing and impacting wildlife habitat, public lands, and a variety of natural resources.[44]

Federal Fish and Wildlife Agencies' and Authorities

The Fish and Wildlife Service and the National Oceanic and Atmospheric Administration (NOAA) Fisheries have jurisdiction under the Endangered Species Act (ESA) over species listed as endangered and threatened under that law, and over ensuring clean energy transmission infrastructure does not adversely affect listed species or adversely modify their critical habitat. The Fish and Wildlife Service has jurisdiction over migratory birds under the Migratory Bird Treaty Act and other laws, and over bald and golden eagles under the Bald and Golden Eagle Protection Act, and over any harm to those species from clean energy production or transmission. Human impacts on marine mammal populations are managed by a combination of NOAA Fisheries, the Fish and Wildlife Service, and the Marine Mammal Commission.

Federal Energy Regulatory Commission's Authority

FERC generally has ratemaking authority, not siting authority, over transmission projects on public lands. However, FERC has limited siting authority pursuant to Section 216 of the Federal Power Act, under limited circumstances within NIETCs. Court decisions and the Bipartisan Infrastructure Law (BIL) have created ambiguity as to the extent of this authority,[45] especially with regard to creating a more complicated process related to NEPA.[46]

Responsible investment in energy transmission avoids wildlife habitat in siting transmission infrastructure while prioritizing already disturbed areas.

III. Responsible investment in energy transmission avoids wildlife habitat in siting transmission infrastructure while prioritizing already disturbed areas.

Transmission infrastructure comprises the transmission lines, which are held up by transmission towers, and transmission poles. These towers, poles, and lines are connected to a substation that transfers the energy from the transmission lines to a form of energy that can be transported along distribution lines. Transmission projects can be composed of one or all of these various infrastructures, each of which has varying impacts on wildlife and the surrounding ecosystem. Generally, the projects with the greatest effects on working lands, wildlife, and the surrounding ecosystem are projects consisting of all of these components. Regulators and developers should utilize the best available science, including reviewing and incorporating Indigenous Knowledges and existing mapping and modeling tools[47] to identify wildlife habitat and migration corridors and connectivity, and site transmission development in the least interfering way possible.

GETTY IMAGES

Policy Recommendation: Federal and state agencies should apply Indigenous Knowledges in reviewing transmission project permit applications.

Policy Recommendation: Indigenous Knowledges should be accorded appropriate stature alongside western science.

Policy Recommendation: Congress and federal and state agencies should expand the areas that may qualify as sacred sites and cultural resources.

Policy Recommendation: State and federal regulators should ensure Tribal Nations and impacted stakeholders[48] have clear opportunities to engage in the permitting process of proposed projects.[49]

Policy Recommendation: State and federal regulators should incorporate the knowledge of Tribal Nations and impacted stakeholders to build the foundation for future NIETCs' designations and future state permitting regulations.

Policy Recommendation: FERC and other federal agencies should clarify how they will coordinate with other agencies, which will also need to issue permits for interstate transmission projects. FERC should lead an efficient and expedited process that allows agencies to work together. FERC can foster this collaboration by identifying the information each agency needs and communicating this information to developers as early as possible.

Policy Recommendation: Energy transmission developers should prioritize locating projects on already developed, fragmented, or disturbed areas of land within DOE's designated National Interest Electric Transmission Corridors (NIETCs).[50]

Policy Recommendation: Congress and state legislatures should dedicate funding to continue research into impacts—actual and potential—that transmission projects have on wildlife and our natural ecosystems both on and offshore.

Policy Recommendation: Within each Bureau of Land Management and Forest Service district, land and resource management plans should clearly designate those areas suitable and unsuitable for transmission and energy generation infrastructure. Plans should be revised or amended on a regular schedule to incorporate updated science and technology on wildlife habitats and clean energy and transmission infrastructure.

Policy Recommendation: Congress and states should fund agencies to keep all of their land and resource management plans, recovery plans, and wildlife state action plans updated.

Policy Recommendation: States should require assessments of proposed projects' impacts on wildlife movement needs, migration corridors and seasonal habitat, including for big game and non-game species during the environmental impact assessment phase.

Policy Recommendation: Developers should select sites for transmission projects by reviewing and applying the most updated science from scientists, local environmental groups, and state and federal agencies.

Policy Recommendation: Regulators should ensure developers minimize permanent road development in areas where new transmission lines are necessary.

Policy Recommendation: Where possible, regulators and developers should manage early successional and shrub habitats created by transmission projects for shrubland-based native plants and wildlife.

Policy Recommendation: Federal, state, territorial, and tribal agencies should be adequately funded to maintain, update, and implement plans, programs, and projects providing for the habitat and management needs of native species and proactively identifying essential core habitat and connectivity areas.

Indigenous Knowledges

Regulators should affirm Indigenous Knowledges with appropriate stature alongside western science. Indigenous Knowledges, including Indigenous Traditional Ecological Knowledges[51] are a living body of observations, oral and written knowledge, practices, and beliefs that encourage environmental sustainability and the responsible stewardship of natural resources by examining relationships between humans and environmental systems. They are applied across biological, physical, cultural and spiritual systems.[52] Indigenous Knowledges have evolved over thousands of years and continue to evolve.[53] Such knowledges includes evidence-based information acquired through direct contact with the environment, long-term experiences, and generational information passed on through teachings.[54] Indigenous Knowledges are naturally peer-reviewed and validated and should be accorded appropriate stature alongside western science. Indigenous Knowledges can also adapt effectively to deforestation and biodiversity loss on ancestral lands.[55] Moreover, lands stewarded by Indigenous peoples are generally the most biodiverse and best conserved on the planet.[56]

Indigenous Knowledges, including Indigenous Traditional Ecological Knowledges is a living body of observations, oral and written knowledge, practices, and beliefs that encourage environmental sustainability and the responsible stewardship of natural resources by examining relationships between humans and environmental systems.

Preserving and increasing habitat connectivity and wildlife corridors is one of the most frequently recommended climate adaptation strategies for biodiversity management.

Under the Biden-Harris administration, the Office of Science and Technology Policy and Council on Environmental Quality formally recognize that Indigenous Traditional Ecological Knowledges contribute to the scientific, technical, social, and economic advancements of the United States and our collective understanding of the natural world.[57] Additionally, various laws already require some application of Indigenous Knowledges. Some of these laws include the National Environmental Policy Act,[58] The Native American Graves Protection and Repatriation Act,[59] and the National Historic Preservation Act.[60] However, these laws do not offer proper protections for sacred sites and cultural resources, because where Indigenous Knowledges may qualify a site as a sacred site or cultural resource, these laws do not often reach the same conclusion. Still, the extent to which regulators apply Indigenous Knowledges in their analysis must expand. With this expansion, regulators should ensure Indigenous Knowledges are protected from public disclosure, including Freedom of Information Act requests.[61]

Habitat Connectivity and Wildlife Corridors

DANIELLE FARRELL

Developers should avoid important areas of habitat connectivity and wildlife corridors, as human development in these areas can fundamentally alter environmental conditions. Wildlife corridors and connectivity allow movement of species between blocks of habitat, particularly during seasonal migrations and in response to changing environmental conditions from human intervention and climate change.

Preserving and increasing habitat connectivity and wildlife corridors is one of the most frequently recommended climate adaptation strategies for biodiversity management.[62] Maintaining connected habitats also aids in ensuring the benefits that flow from nature to people (ecological services) remain intact. This includes flood risk reduction, extreme heat mitigation, livelihoods, access to nature, subsistence, health and public safety, and hunting and fishing.[63]

Information about habitat connectivity or wildlife corridors that may be impacted or avoided during the siting of transmission projects may be found in state wildlife action plans, recovery plans for federally endangered or threatened species, or, with respect to deer, elk, and pronghorn in the thirteen westernmost states, information developed for implementation of Department of Interior Secretarial Order 3362.[64] This information may also be found through consultation with tribes, and through communication with local hunting, wildlife watching or conservation organizations.

Public Lands

In designing transmission projects, it is important to limit projects sited on public lands used for important habitat conservation, land management, and recreational and cultural purposes, as identified in federal land and resource management plans as long

as they have been updated consistent with their statutory or regulatory deadlines. This will preserve the integrity of our natural recreational spaces and provide opportunity for all people to have access to these spaces.

Transmission developers should prioritize locating energy transmission projects in areas with already disturbed and degraded land; this includes: existing transportation corridors including roads and railways, existing rights-of-way (ROWs), and locations with existing transmission infrastructure.

GETTY IMAGES

Previously Developed Sites

Transportation Corridors: Highways, Railways, and Existing ROWs

Siting transmission projects along transportation corridors[65] and existing ROWs[66] can support a broad array of electrification projects while minimizing effects on natural ecosystems and wildlife habitats and populations. These corridors already have disturbed lands[67] on the outer edges of roads, which can connect many urban, suburban, and rural communities. This means project development along these corridors should not cause new habitat fragmentation nor increase edge effects.

Siting transmission projects along transportation corridors and existing ROWs can support a broad array of electrification projects while minimizing effects on natural ecosystems and wildlife habitats and populations.

Locations within the Footprint of Existing Transmission Infrastructure

Generally, a preferred place to build transmission infrastructure is in the footprint of existing transmission infrastructure. However, if the existing transmission infrastructure causes severe impacts to human communities or wildlife and natural ecosystems, then the buildout of new infrastructure should not occur in that footprint, as it may exacerbate, negative effects of the existing infrastructure.

Existing Superfund Sites and Brownfield Sites

Existing superfund sites and brownfield sites[68] are preferred sites to build new transmission infrastructure, when they are not situated near already overburdened communities. Developers should consider these sites, which are already disturbed and degraded and not suitable for housing or farming, or are not fully recovered. Developers may even receive monetary incentives for building on this land[69] and can receive assistance from the Environmental Protection Agency (EPA)[70]

Abandoned Industrial Sites

Abandoned industrial sites may be smart sites to build new transmission infrastructure. These already disturbed lands are typically suitable for industrial uses. Such sites

GETTY IMAGES

Many species, especially those most sensitive to habitat disturbances, require tracts of undisturbed and uninterrupted habitat for necessary life functions, like nesting, foraging, breeding, or migrating. Habitat fragmentation, the most common consequence of transmission development, can have a wide range of impacts on wildlife.

may prove especially important as energy generation projects[71] and grid enhancing technologies such as energy storage are becoming increasingly used in these locations.[72] Further, opportunities for various combinations of these projects are increasing as more coal-fired and nuclear plants are decommissioned.[73]

Abandoned Mine Lands

There are an estimated 500,000 abandoned coal and hardrock mines in the United States, posing health and environmental risks.[74] These sites may be suitable for transmission development when they are near existing infrastructure and are in easily accessible terrain. Abandoned mine lands are not suitable sites for development where there are already reclaimed mines providing wildlife habitat, such as reclaimed mines in the heart of the elk's range in the Allegheny Plateau in Pennsylvania, which provides habitat for 15 to 20 percent of the elk population. Much like with abandoned industrial sites, it is becoming easier for developers to locate these possible transmission project sites with tools such as the Eastern Pennsylvania Coalition for Abandoned Mine Reclamation (EPCAMR) Solar Sustainability Tool[75] and EPA's Re-Powering America's Land Initiative.[76]

C Mitigating the Wildlife and Natural Resource Impacts in Siting

Background

Land conversion and fragmentation due to the construction, presence, and maintenance of transmission lines and substations affect wildlife species through displacement, disturbance, or other changes to the ecosystem that make it more difficult for species to meet their essential needs or to thrive. Many species, especially those most sensitive to habitat disturbances, require tracts of undisturbed and uninterrupted habitat for necessary life functions, like nesting, foraging, breeding, or migrating. Habitat fragmentation, the most common consequence of transmission development, can have a wide range of impacts on wildlife. Fragmentation of habitat can give predators advantages in hunting, or give competitors advantages in accessing food or occupying habitat, give rise to an increase

in disease transmission, or allow invasive species to take hold. For example, transmission infrastructure can provide perches for various bird species that may increase predation on ground-dwelling birds and mammals. Mitigation measures may be used to offset some of these impacts, including the acquisition of private lands surrounded by public lands, which also causes fragmentation.[77]

Another area of concern is the effect of transmission lines' noise on wildlife. Many wildlife species are sensitive to the low hum of powerlines that can be noticeable to humans, though more research is needed throughout the United States to measure the actual effects of prolonged exposure.[78] There are various types of noise that transmission lines give off and the level of noise depends on conductor size and configuration, voltage and weather conditions.[79]

Roughly, more than 30 million birds die each year in the United States from poorly sited power lines, and power lines electrocute tens to hundreds of thousands more birds annually.

Still, wildlife's interaction with transmission lines and towers remains concerning, especially for birds. Birds can be particularly susceptible to these negative effects because various birds use power poles for hunting, resting, roosting and nesting—particularly in habitats where trees, cliffs, or other natural substrates are scarce. Roughly, more than 30 million birds die each year in the United States from poorly sited power lines,[80] and power lines electrocute tens to hundreds of thousands more birds annually.[81] Still, climate change itself is perhaps the greatest threat to birds, with two-thirds of North American species at risk of extinction if we fail to meet climate goals.[82]

Similarly, our natural resources including wetlands, waters, soils, and native plant species are particularly susceptible to degradation from transmission projects, as these resources have already borne the brunt of climate change from dwindling supplies of fresh water and the increasing frequency of extreme weather events. Poor planning can exacerbate these consequences of climate change. For example, a transmission project that clears out an entire area's native plant species can allow invasive plant species to take hold in that area, which can destroy wildlife food supplies and increase the threat of wildfires.[83] More research is needed to determine the extent of potential adverse effects on certain wildlife species and natural resources from direct and indirect impacts of transmission projects, plus mitigation measures for developers.

IV. Responsible investment in energy transmission applies mitigation measures that conserve and restore ecosystems and wildlife habitat and populations.

Policy Recommendation: Transmission developers should work with state and federal agencies, tribes with potentially affected interests, private biologists, conservation and environmental advocacy groups, and local communities' wildlife and conservation departments to design transmission projects that produce the fewest impacts to wildlife and natural resources as possible.

Policy Recommendation: Congress and state legislatures should allocate funding to federal and state agencies to monitor and study the impacts of transmission projects on natural ecosystems and improve mitigation solutions.

Policy Recommendation: State and federal regulators and developers should proactively work with climate scientists and wildlife scientists to apply the most accurate science to mitigation measures.

Policy Recommendation: Points of interconnection and locations to lay transmission cables for offshore wind facilities should be planned proactively by states and developers to ensure they do not harm sensitive habitat, wildlife populations, and already overburdened human communities.

Although transmission infrastructure creates substantial impacts to wildlife and natural ecosystems, natural resources and wildlife will suffer far greater losses with continued fossil fuel reliance. Given the known impacts of transmission projects on wildlife and natural ecosystems, regulators, developers, scientists, and local communities must work together to apply best practices to mitigate project impacts.

Best Practices in Mitigating Transmission Impacts on Wildlife and Natural Resources

Terrestrial and offshore projects each have unique environmental impacts. There are a range of practices that can assist developers and regulators in designing transmission projects where the project footprint causes the least amount of negative effects on wildlife and the natural environment and conserves or even restores natural ecosystems. Regulators' proper analysis of project design alternatives is especially important, as some mitigation measures may be beneficial for some species and cause great harm to other species. This analysis should therefore be informed by wildlife scientists and local conservationists. For example, in New England, the New England cottontail rabbit has avoided becoming a federally listed endangered species because planners applied a comprehensive conservation strategy[84] to transmission project development[85] and similar infrastructure projects. This conservation strategy outlines specific objectives for habitat creation and enhancement, land protection, research, monitoring, population management, education and outreach, and most notably continued conservation efforts.

Terrestrial Projects

When designing transmission projects, there are a variety of project design elements that developers and regulators should consider to create a space that carries cost-effective, clean energy to ratepayers and do minimal harm to our natural ecosystems. As detailed above, best practices for developers and regulators include locating projects in already disturbed areas of land

where human communities are not already overburdened by existing infrastructure, little or no additional right-of-way clearing, and incorporating Indigenous Knowledges. Developers and regulators should use modeling and mapping tools to identify and avoid building in: 1) wildlife movement pathways and wildlife corridors and connectivity; 2) sensitive natural ecosystems; 3) identify sensitive cultural heritage sites and archeological sites; and 4) waterbodies and riparian areas important to migratory birds and the health of watersheds.


GETTY IMAGES

Developers should also choose the distance between phase conductors and the distance between grounded hardware and energized phase conductors based on National Electrical Safety Code standards and local jurisdictional standards (both of which are often minimum standards) and the wrist-to-wrist and head-to-foot ratios of birds that are most often electrocuted in the area.[86] Projects should also include bird nesting tubes and/or nesting platforms with energized parts of the tower equipment covered.[87]

Likewise, when constructing transmission projects, developers should apply best practices such as erosion control to minimize runoff of topsoil and disturbances to natural areas. Developers should also use wide-track vehicles and matting to reduce soil compaction and rutting in sensitive soils and natural areas, when possible.[88]

Transmission developers have the science and technology to apply regenerative mitigation measures to transmission projects. For example, monarch butterflies have experienced significant population and habitat losses from climate change. Transmission developers can plant native plants at the site of a transmission project crossing the migratory flyway corridor through the central United States. **Tools like NWF's Native Plant Finder** can assist developers in deciding what types of native plants will ensure monarch butterflies have suitable habitats and ample food sources while migrating.

The practices and timing of applying these practices can be important to conserving wildlife populations and natural ecosystems. When considering when to construct a project, developers and communities should consider harvest times of agricultural lands, noise during migration, and mating seasons of sensitive wildlife species, while consulting the state wildlife and local NWF affiliates and partners.

In the post-construction phase of transmission projects, developers and communities have an opportunity to create environments that can maximize co-benefits to water, wildlife, air quality, farm resilience, soil health, and biodiversity. Some best practices developers and communities must consider include relaying soils such that they are

Best practices for developers and regulators include locating projects in already disturbed areas of land where human communities are not already overburdened by existing infrastructure, little or no additional right-of-way clearing, and incorporating Indigenous Knowledges, modeling and mapping tools.

restacked in the order they were in the preconstruction phase and the decompaction of agricultural soils for minimal impacts to crop yields. Developers should also re-vegetate ROWs in natural areas. With the guidance of the state natural resources agency and local environmental groups, developers can remove invasive plant species—if any previously existed—and plant native species that may be used for habitat for wildlife. Such measures must also recognize that adaptive management of various wildlife populations[89] near the project site may require further mitigation measures post-construction.

BIGSTOCKPHOTO

Offshore Wind Projects

In the offshore wind context, transmission project impacts differ from terrestrial projects though many of the same general impacts may occur to wildlife and natural ecosystems. To interconnect an offshore wind project[90] to the terrestrial power grid, a single or multiple transmission lines (sometimes referred to as onshore or offshore export cables) will typically run from the wind turbines to an onshore substation. The interconnecting transmission line(s) often require cables buried beneath the ocean floor, or submarine cables.[91] Depending on the configuration of the project, there may also be some transmission cables that interconnect offshore substations.

In the offshore wind context, transmission project impacts differ from terrestrial projects though many of the same general impacts may occur to wildlife and natural ecosystems.

Determining the appropriate cable route for the transmission line can drastically reduce environmental risks. This includes the location where the landfall or export cable reaches the terrestrial grid. Various bird and benthic (ocean floor) habitats and known migration corridors for pelagic (above the ocean floor) species are often the most sensitive to such development. Any design as part of the planning process must minimize the total number of cables to serve offshore wind development. Proactive planning can ensure about 2,000 (50 percent) fewer miles of marine transmission cable installations disturb the seabed and 60–70 percent fewer shore crossings and necessary onshore transmissions upgrades.[92] A holistically planned, coordinated and shared transmission system such as backbone transmission (as compared to individual transmission known as radial or generator lead line transmission), can significantly decrease environmental impacts and habitat disturbance by reducing the number of interconnection points and transmission lines.

When designing transmission routes, the project construction schedule, vessel traffic (including speeds of vessels), cable type (high voltage direct current or high voltage alternating current), wildlife entanglement considerations, construction method, and cable placement and removal are all key considerations that can shape the

environmental impacts of a project during the construction, operation, and decommissioning phases.[93] Developers must therefore conduct comprehensive, spatially-explicit ecological surveys to understand baseline conditions and apply the most updated data and best available science, including data from local communities with practical knowledge.

Notably, during the operation phase of the project, the transmission lines will introduce electromagnetic fields (EMF). Electrosensitive species include some fish[94] such as sturgeon, lamprey, eel, catfish, and elasmobranchs (shark, skates, rays);[95] magnetosensitive species may include elasmobranchs,[96] loggerhead sea turtles,[97] cetaceans,[98] and some invertebrates,[99] such as snails, lobsters, and crabs.

GETTY IMAGES

VERONICA UNG-KONO

D Transmission Investments

V. Responsible investment in energy transmission applies proactive, interregional long-term energy transmission planning that equitably invites collaboration among communities, state, regional, and federal stakeholders, regulators, and tribes.

Background

The power grid is a national security asset. It provides electricity to keep our homes warm during blizzards and cool during hot summers. It is also the backbone of our society's other infrastructure, allowing wastewater treatment plants to run, keeping our hospitals powered, and so much more.

The power grid is a national security asset. It provides electricity to keep our homes warm during blizzards and cool during hot summers. It is also the backbone of our society's other infrastructure.

Improving transmission investments, investment planning, regulatory reviews, and modernizing wholesale energy markets are the preventative medicine to ensuring this national security is maintained through reliable and resilient infrastructure, especially during severe weather events.

The policy recommendations in this section aim to align the public interest and regulatory utility incentives to produce a healthy energy market and facilitate the necessary buildout of transmission infrastructure.

Upgrading Current Physical Infrastructure and Expanding New Infrastructure

Policy Recommendation: Congress should allocate funding incentives and research to grid-enhancing technologies (GETs), advanced transmission technologies (ATTs), and other technologies that can inform transmission buildout.

Policy Recommendation: State and federal regulators should incentivize utilities to invest in GETs and ATTs.

Policy Recommendation: Utilities should integrate transmission system upgrades into their future investment portfolios.

New transmission is important to reduce our reliance on traditional energy and will provide communities with access to renewable energy. However, improving *existing* projects will save ratepayers money and improve the resiliency and reliability of the grid, especially during extreme weather events. Both must occur simultaneously.

System upgrades in the form of applying new technologies, like GETs and ATTs, can reduce the scope of transmission buildout, associated environmental impacts, and ratepayer costs. The DOE recognizes a full suite of GETs, including energy storage.[100] ATTs include dynamic line ratings[101] and advanced power flow controllers.[102] GETs can reduce congestion by at least forty percent and are cost-effective, as they pay for themselves within a year of operation.[103] During the construction of transmission projects, using GETs with existing infrastructure can similarly reduce congestion costs by at least forty percent.[104] Further, GETs can increase utilization on new lines by as much as sixteen percent and improve the benefit to cost ratio of new lines.[105] Transmission planners should therefore factor these technologies into their transmission planning, as they can reduce the distance of transmission lines or reduce the need for building out new transmission facilities.

Unfortunately, current utility incentives provide the greatest financial rewards for building new projects, not improving existing projects. Now is the time to change these incentives. Utilities have not upgraded our existing power grid in years; seventy percent of lines in the United States are reaching the end of their lifespan.[106] FERC even contemplated requiring transmission planners to consider the additions of these technologies in transmission planning in a 2022 cost allocation and regional planning rule proposal. In addition, energy storage is rapidly emerging as a key transmission technology, and Congress allocated significant resources to energy storage deployment in the IRA.

Optimizing Existing Planning Processes to include Long-Term Scenario-Based Planning


GETTY IMAGES

Policy Recommendation: Scenario-based planning for energy transmission should apply minimum and maximum planning horizons of twenty years and forty years for long-term planning scenarios.

Current transmission developers build transmission on a project-by-project basis based off of short planning horizons and the needs of the existing region. Long-term scenario-based[107] planning for large capital investments will ensure we meet our clean energy goals, prioritize equitable energy solutions to keep costs just and reasonable, and increase the grid's resiliency by allowing for new technologies to increase the efficiency of clean generation and transmission.

Energy transmission requires transmission owners and regulators to engage in scenario-based planning, *before* approving of changes to the grid. This task becomes more difficult as more generation resources, distributed energy resources, and grid-enhancing technologies are added and change demand and capacity capabilities of the energy grid. All of these technologies can improve the resiliency of the grid, but without such long-term planning there is little incentive for developers to consider investing in these technologies.

Energy transmission requires transmission owners and regulators to engage in scenario-based planning, before approving of changes to the grid.

Setting minimum and maximum planning horizons of twenty years and forty years for long-term planning scenarios ensures transmission planners balance multiple factors: the long lead time required to construct new transmission facilities; the needs of the grid based on resource mix, demand, and capacity; the expected life of most transmission assets.[108] Long-term planning also cost-effectively meets such transmission needs by considering long-term benefits of energy transmission investment and allocating costs according to the guiding beneficiary pays principle.[109] Moreover, this minimum and maximum will ensure energy transmission investment costs are just and reasonable and not unduly discriminatory or preferential.

Optimizing Existing Planning Processes to include Proactive Interregional Planning

Policy Recommendation: States and RTO/ISOs should coordinate and lead interregional transmission planning.

GETTY IMAGES

Policy Recommendation: Transmission developers should consider interregional implications of transmission projects in developing their portfolios.

Policy Recommendation: Western states should create an RTO to receive state-specific and regional economic benefits as well as a more reliable, clean, and resilient grid.

Policy Recommendation: An offshore grid necessitates proactive interregional planning to minimize environmental harms to the greatest extent possible and minimize project cost.

Proactive interregional planning requires states and regions with an RTO or ISO to share information and plan transmission together. Such planning will increase the resiliency of the grid by ensuring utilities, RTOs, and ISOs solicit transmission projects based on the needs of nearby regions, in addition to their respective regions. Overall, this will reduce unnecessarily buildout of transmission and create more thoughtfully planned projects, which will reduce ratepayer costs.

Many regions of the United States have an electric market and regional entities that manage the transmission of electric power throughout their region. These entities are responsible for regional planning, operating the markets where wholesale energy is bought and sold, and operating the transmission grid to balance the supply of energy and demand. These regional entities include RTOs and ISOs and engage in portfolio planning to help decide what areas of the energy grid require investment. They are profit-neutral and maintain independence from their members.

However, there is a general lack of oversight in interregional transmission planning and infrastructure development. Each of the regional entities typically focuses on their respective regional needs; they do not share information on how to execute planning processes across regions, nor do they engage in proactive generation and load planning, multi-value planning, scenario-based planning, portfolio planning, and interregional planning. Yet, nearly all of these entities have experience historically in engaging in the aforementioned planning processes.[110]

Although each region has varied resource mixes and demand needs, these shared insights would help in creating a comprehensive analysis of the overall grid and promote resiliency and cost-effective investment in each region.

In the offshore wind context, proactively planned transmission solutions, such as interregional planning could lower the cost of reaching 2050 U.S. offshore wind goals by at least $20 billion and reduce environmental and community impacts by about fifty

percent. Even modest delays in proactively planning for long-term transmission needs reduces the benefits of doing so by about half.[111]

Where there are no RTOs or ISOs, states and utilities should decide how to share their resources through a more streamlined approach. For example, in the West, creating a Western RTO could generate between 159,000 and 657,000 permanent jobs through 2030, and up to $79.2 billion in additional gross regional product per year across the eleven Western states.[112] Forming an RTO in this region could create more cohesive collaboration with other regions.

Where there are no RTOs or ISOs, states and utilities should decide how to share their resources through a more streamlined approach.

Proactive Multi-Value Benefit Planning for Long-Term Scenarios

Policy Recommendation: RTO/ISOs should incorporate multi-value planning into their regional transmission planning.

A single transmission project can serve a variety of needs and provide a variety of benefits. Traditionally, when planning for transmission projects, many needs and benefits are not assessed that could create a compelling argument for the project and assist planners in pairing transmission buildout with other support technologies, like storage and dynamic line ratings.

Multi-value planning can comprehensively identify investments that cost-effectively address all categories of needs and benefits.[113] For multi-value benefit planning processes, the benefit analysis cannot be qualified too narrowly and needs to be consistent between regions.[114] The benefits should be varied (e.g., insurance and risk mitigation benefits, reduced congestion, and restoration of ecosystems),[115] range across multiple states or regions depending on the project size, include the effects on a diversified pool of market participants (including customers (especially environmental justice communities), generators, and transmission owners), and be adjustable, so that various benefits can be valued differently at different points in time.[116] For practical use, this analysis should be limited to only long-term projects.

Incorporating Local Planning Authorities, States, and Local Communities into Transmission and Grid Planning

Policy Recommendation: Simplify and modernize RTO and ISO governance policies to permit meaningful engagement and collaboration from local planning authorities, states, and local communities in transmission and grid planning.

Market and regional entities (RTOs, ISOs, and other organized entities) study the transmission system to guide cooperative regional investment meant to improve reliability and enable the competitive markets to work as designed. These studies review the needs of the transmission grid and inform Regional System Plans (RSPs), which inform transmission owners' decisions to initiate projects.

Rapid and continued buildout of clean energy generation will drastically reduce air pollution, diversify the United States' energy supply, reduce dependence on imported fuels, and create economic development and jobs in American manufacturing, installation services, and more.

Keeping local planning authorities, states, and local communities updated on forthcoming transmission projects, including the needs and benefits such projects will meet, will help these entities stay informed and can build collaborative networks with developers.

Currently, there is a lack of communication and opportunities for engagement between these market and regional entities, tribes, states, and local communities. This is largely because states and local communities generally do not have the resources to understand or meaningfully engage with these studies or the results of these studies. Therefore, the people most directly impacted by the results of these studies are left out of these planning processes and do not know what projects are expected to come to their states and communities in the coming years.

Continued Development of Distributed Generation

Policy Recommendation: Congress should continue to support clean energy generation buildout with grants, tax credits, and other incentives.

Rapid and continued buildout of clean energy generation will drastically reduce air pollution, diversify the United States' energy supply, reduce dependence on imported fuels, and create economic development and jobs in American manufacturing, installation services, and more.

Centrally planned, cost of service transmission[117] will not displace market-based generation.[118] Rather, the buildout of transmission may encourage generation buildout by reducing interconnection constraints for new generation projects and inform responsible generation buildout. The IRA allocated substantial funding for generation and transmission and in doing so recognized both types of infrastructure are needed for the United States to meet national and state climate goals.

Optimizing Regulatory Reviews to Produce Flexible Tariffs

Policy Recommendation: FERC and RTO/ISOs should build flexibility into tariffs. Tariffs dictate the rates and the applicable design of the rates that customers and generators pay to use transmission and distribution lines. Joint operating agreements (JOAs) dictate the use of these lines.

DENNIS-SCHROEDER-NREL

Flexible tariffs permit developers to apply varied technologies to accompany the buildout of transmission projects, as well as permit planning entities to substitute project approaches based on supply chain constraints and other variable factors. This can permit more rapid development of transmission projects and reduce project costs, thereby saving ratepayers money in the long-term.

Overly-prescriptive tariffs and joint operating agreements are barriers to regional and interregional transmission planning.[119] FERC's current tariffs are overly specific for some RTOs.[120] These overly-prescriptive tariffs and narrow joint operating agreements are problematic as they limit a broader view of interregional planning. FERC and ISO/RTOs should reevaluate and update their tariffs to allow for more flexibility and interregional planning.

Modernizing Wholesale Energy Markets

Reforming wholesale energy markets to prioritize a variety of technologies that emit little to no GHGs in their use will increase the resiliency and reliability of the energy grid and provide more competitive markets, which will ultimately result in lower consumer costs.

Policy Recommendation: Wholesale energy markets process and valuation of generation resources should be modernized to accommodate the influx of renewable energy resources.

Policy Recommendation: RTO and ISO governance structures should require improvements to build equity into engagement and decision-making processes

Energy markets shape the energy generation resources available for investment. When the United States first created this energy markets system, solar, wind and other technologies were not viable options to generate energy on a wholesale level. The entry of renewable energy generation into energy markets presents new operational market opportunities. Moreover, improved processes can create more meaningful engagement and transparency, which can increase the scope of knowledge applied in decision-making.

There are a variety of widely-supported avenues to enact market reform including:

1) Increasing harmonization between state and federal policies and wholesale markets (such that the intentions of the former do not hinder the outcomes of the latter);[121]

2) Creating processes to allow those who buy and sell energy in the energy markets to easily join and leave energy markets;[122]

3) Maintaining competitive energy markets with a diverse portfolio of generation options;[123]

4) Facilitating and increasing demand-side participation and grid flexibility;[124]

5) Minimizing market manipulation tactics that creates unfair advantages for those buying and selling energy in energy markets;[125] and

6) Increasing transparency of energy market decision-making processes and creating simplified, non-exclusionary processes for energy market membership.[126]


DONNA JOHNSON

Conclusion

Upgrade and buildout of an interconnected power grid that provides reliable, affordable renewable energy generation to all communities may be the greatest U.S. infrastructure accomplishment of the century. The current terrestrial and offshore transmission needs represent an opportunity to demonstrate how the U.S. has learned from its history of injustices, conservation missteps, and convoluted administrative processes, and can move towards creating a future where everyone benefits.

Endnotes

1 Empower means giving environmental justice communities the knowledge and resources, including funding and access to technical expertise to exercise their own agency to meaningfully participate in the siting and development of transmission projects.

2 Tribal Nations in this platform is defined as federally-recognized sovereign governments.

3 Empower means giving environmental justice communities the knowledge and resources, including funding and access to technical expertise to exercise their own agency to meaningfully participate in the siting and development of transmission projects.

4 Tribal Nations is defined as federally-recognized sovereign governments.

5 Climate Effects and Environmental Health, Env't Health and Equity Collaborative of the American Public Health Ass'n (2020), https://apha.org/-/media/Files/PDF/topics/environment/Partners/EHC_Fact_Sheet_Climate_Change.ashx; See also Augustin Martin & Megan Latshaw, Environmental Health Competencies Prepared for the Env't Health & Equity Collaborative's Workforce & Education Workgroup, Env't Health and Equity Collaborative of the American Public Health Ass'n Rev. (Apr. 2020), https://apha.org/-/media/Files/PDF/topics/environment/Partners/Environmental_Health Competencies.ashx.

6 Climate Effects and Environmental Health, Env't Health and Equity Collaborative (2020).

7 *See* Final Root Cause Analysis: Mid-August 2020 Extreme Heat Wave, California Independent System Operator (CAISO), California Public Utilities Commission (CPUC), and California Energy Commission (CEC) at 48 (Jan. 13, 2021), http://www.caiso.com/Documents/Final-Root-Cause-Analysis-Mid-August-2020-Extreme-Heat-Wave.pdf); The Value of Transmission During Winter Storm Elliott, Grid Strategies and ACORE (Feb. 2023), https://acore.org/wp-content/uploads/2023/02/The-Value-of-Transmission-During-Winter-Storm-Elliott-ACORE.pdf.

8 U.S. Environmental Protection Agency, Power Plants and Neighboring Communities, Number of Plants in Communities by Key Demographic, https://www.epa.gov/airmarkets/power-plants-and-neighboring-communities (last visited, January 5, 2022) (defining energy burden as paying more than six or ten percent of income on energy bills); Low-Income Energy Solutions, Department of Energy, Office of State and Community Energy Programs (last visited Feb. 13, 2023), https://www.energy.gov/scep/slsc/low-income-community-energy-solutions#:~:text=Energy%20burden%20is%20defined%20as,which%20is%20estimated%20at%203%25 (defining energy burden is defined as the percentage of gross household income spent on energy costs, and acknowledging the national average energy burden for low-income households is 8.6 percent, three times higher than for non-low-income households, which is estimated at 3 percent).

9 Energy Burdens at 11, available at https://www.aceee.org/sites/default/files/pdfs/u2006.pdf; See also U.S. Department of Energy, Office of Energy Efficiency & Renewable Energy, Low-Income Household Energy Burden Varies Among States—Efficiency Can Help In All of Them, ACEEE (last visited, August 14, 2022), https://www.energy.gov/sites/prod/files/2019/01/f58/WIP-Energy-Burden_final.pdf.

10 United States Census Bureau, U.S. Department of Energy Uses American Community Survey Data to Power the Low Income Affordability Data (LEAD) Tool, available at https://www.census.gov/programs-surveys/acs/about/acs-data-stories/lead-tool.html;
Energy Burdens at 11 (last visited Jan. 3, 2023), https://www.aceee.org/sites/default/files/pdfs/u2006.pdf.

11 16 U.S.C. 824(a); Nat'l Ass'n for Advancement of Colored People v. Fed. Power Comm'n, 425 U.S. 662, 669-670 (1976) (holding that "in order to give context to the words 'public interest' as used in the [FPA]," one must consider the purpose for which FPA was adopted: "to encourage the orderly development of plentiful supplies of electricity . . . at reasonable prices").

[12] U.S. EPA, Environmentail Justice, (last updated Jan. 10, 2023), https://www.epa.gov/environmentaljustice; Cumulative Impacts Research, EPA at 7 (Sept. 2022), https://www.epa.gov/system/files/documents/2022-09/Cumulative%20Impacts%20Research%20Final%20Report_FINAL-EPA%20600-R-22-014a.pdf; EJScreen: Environmental Justice Screening and Mapping Tool, EPA (last updated Jan. 30, 2023), https://www.epa.gov/ejscreen; Environmental Justice Index (EJI), Agency for Toxic Substances and Disease Registry, (last updated Aug. 10, 2022), https://www.atsdr.cdc.gov/placeandhealth/eji/index.html.

[13] Environmental Justice For All Act, S.872, 117th Cong. (2021-2022).

[14] Exec. Order No. 14096 on Revitalizing Our Nation's Commitment to Environmental Justice for All, 88 F.R. 25251 (Apr. 26, 2023).

[15] 54 N.J.Reg. 971(a) (June 6, 2022) (formerly S.232).

[16] N.Y. L. 2022, ch. 840, as amended (formerly S. 8830).

[17] United States Energy and Employment Report 2022, Dep't of Energy at 65 (2022), https://www.energy.gov/sites/default/%20files/2022-06/USEER%202022%20National%20Report_1.pdf (defining "Traditional Transmission and Distribution" as infrastructure that allows energy, including both fuels and electricity, to move across the country through infrastructure such as "poles and wires," pipelines, trucks, rail, and air).

[18] Id. at 3.

[19] Id. at 65.

[20] Id.

[21] *See* DE-FOA-0002811: Response to the Department of Energy's Request for Information on the Bipartisan Infrastructure Law Clean Energy Demonstration Program on Current and Former Mine Land, BlueGreen Alliance, (Aug. 15, 2022) (contending these agreements give power and voice to communities, and help ensure projects build a high-road path to economic revitalization. CWAs often include local hire provisions, targeted hire of low-income or disadvantaged workers, and the creation of pre-apprenticeship pathways; CBAs include broader economic benefits and a community input process).

[22] EPA, *See also* Case Study: Savannah Pilot, EPA (July 2020), https://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100ZN7Z.pdf.

[23] *See* Exec. Order No. 14094 Modernizing Regulatory Review, 3 C.F.R. 21879 (Apr. 6, 2023) (finding regulators must ensure oopportunities for public participation to promote equitable and meaningful participation including underserved communities).

[24] *See also* Montana v. United States, 450 U.S. 544 (1981); Carla Fredericks, Operationalizing Free, Prior, and Informed Consent, 80 ALB. L. REV. 429, 438-439, 447 (2016); Memo on Uniform Standards for Tribal Consultation, 2022, 47 WEEKLY COMP. PRES. DOC. (Nov. 30, 2022), https://www.govinfo.gov/content/pkg/DCPD-202201083/pdf/DCPD-202201083.pdf;

[25] Seminole Nation v. United States, 316 U.S. 286 (1942).

[26] Eric v. Sec'y of U. S. Dep't of Hous. & Urban Dev., 464 F. Supp. 44 (D. Alaska 1978).

[27] Indian Self-Determination and Education Assistance Act, 25 U.S.C. § 5301 (1975).

[28] United States v. Payne, 264 U.S. 446, 448 (1924); accord Yukon Flats School Dist. V. Native Village of Venetie Tribal Govt't, 101 F.3d 1286 (9th Cir. 1996) rev'd on other grounds 522 U.S. 520 (1998); *see also* 84 Fed. Reg. 1200– 01 (Feb.1, 2019) (including 229 Alaska Native entities in the list of tribes recognized as having the immunities and privileges of "acknowledge Tribal Nations by virtue of their government-to-government relationship with the United States.") Note that the trust doctrine includes duties to manage natural resources for the benefit of tribes and individual landowners, and the federal government has been held liable for mismanagement. (*See* United States v. Mitchell, 463 U.S. 206 (1983) (holding that the Department of the Interior was liable for monetary damages for mismanaging timber resources of the Quinault tribe in violation of the agency's fiduciary duty.)

[29] United Nations, General Assembly, United Nations Declaration on the Rights of Indigenous Peoples A/RES/61/295 at 5, 11 (Oct. 2 2007), https://www.un.org/development/desa/indigenouspeoples/wp-content/uploads/sites/19/2018/11/UNDRIP_E_web.pdf.

[30] Dina Gilio-Whitaker, As Long As Grass Grows at 17, 26, 31, 33, 136, (2019) (contending a definition of "environmental justice" that may apply to and encapsulate the experiences and history of Indigenous peoples in the United States would necessitate: 1) applying of the term "colonialism" to describe the sociopolitical and legal structure between the United States Federal government and Indigenous peoples that still governs this relationship and will continue to as long as the legal system recognizes land as property, 2) recognizing Indigenous peoples experience specific, localized conditions, 3) conforming to decolonizing theories and Indigenous research methodologies, 4) advocating for justice that transcends a capitalist model, 5) and recognizing the scope of environmental devastation for Indigenous peoples is of a genocidal kind).

[31] FERC Order 888, 18 CFR Parts 35 and 385 (Apr. 24, 1996) (suggesting the concept of an Independent System Operator as one way for existing tight power pools to satisfy the requirement of providing non-discriminatory access to transmission); FERC Order 2000, 18 CFR Part 35 (Dec. 20, 1999) (encouraging the voluntary formation of RTOs to administer the transmission grid on a regional basis throughout North America (including Canada)).

[32] *See* Competitive Transmission Solicitation Enhancements Key Project, ISO-NE (last visited Feb. 18, 2023), **https://www.iso-ne.com/committees/key-projects/implemented/competitive-transmission-solicitation-enhancements/**
(explaining the ISO-NE hosts The Competitive Transmission Solicitation Enhancements project which continuously solicits opportunities for projects to enhance the region's competitive wholesale electricity markets and ensure reliable operation of the power grid).

[33] FERC Order 1000, 18 C.F.R. Part 35 (2011).

[34] Johannes P. Pfeifenberger, Judy Chang, Akarsh Sheilendranath, J. Michael Hagerty, Simon Levin, and Wren Jiang Cost Savings Offered by Competition in Electric Transmission, The Brattle Group, at 19 (Apr. 2019), **https://www.brattle.com/wp-content/uploads/2021/05/16726_cost_savings_offered_by_competition_in_electric_transmission.pdf**

[35] Id.

[36] Cost Savings Offered by Competition in Electric Transmission The Brattle Group at 21 (Apr. 2019);
See also Judy W. Chang, Johannes P. Pfeifenberger, J. Michael Hagerty, and Jesse Cohen, Response to Concentric Energy Advisors' Report on Competitive Transmission, The Brattle Group at 3 (Aug. 2019), **https://www.brattle.com/wp-content/uploads/2021/05/16873_response_to_concentric_energy_advisors_report_on_competitive_transmission.pdf**.

[37] Such risks are normal and derivative of regulations and market operation and changes in markets faced by transmission end users and developers.

[38] Id.

[39] Id.

[40] Section 1221 of the Energy Policy Act of 2005 added Section 216 of the Federal Power Act.

[41] Federal Power Act, 16 U.S.C. § 824p(h) (2018).

[42] 42 U.S.C. § 16421.

[43] This is largely because in Cal. Wilderness Coalition v. U.S. Dep't of Energy, the U.S. Court of Appeals for the Ninth Circuit vacated the DOE's first two NIETC designations, finding that the agency had failed to consult adequately with the states as required by the Federal Power Act. Cal. Wilderness Coalition v. U.S. Dep't of Energy, 631 F.3d 1072 (9th Cir. 2011).

[44] 43 U.S.C. §§ 1761–1771.

[45] In Piedmont Env't Council v. FERC, the court held that FERC may not permit transmission facilities, if a state denied the applicant's request to site transmission facilities. FERC may permit the transmission facilities only in the event the state has not acted on the applicant's request for more than one year. Also, the Court vacated the Commission's transmission-related amendments to its regulations implementing NEPA, finding that the Commission had failed to consult with the Council on Environmental Quality (CEQ) before adopting the revisions. Piedmont Env't Council v. FERC, 558 F.3d 304 (4th Cir. 2009). However, the Infrastructure Investment and Jobs Act (IIJA) or the Bipartisan Infrastructure

Law (BIL) grants FERC authority to supersede a State Public Utility Commission transmission siting permitting decision in three scenarios: 1) when the state authority has not made a determination on a transmission permit application for more than one year, or 2) when the state authority has conditioned its approval of a permitting application in such a manner that the proposed construction or modification will not significantly reduce transmission capacity constraints or congestion in interstate commerce or is not economically feasible; or 3) when the state authority denied the siting permit. H.R. 3684 117th Cong. § 40105(b)(1)(C). No current case law has tested whether the IIJA would survival judicial review on this issue.

46 Subject to specific exclusions and exceptions, federal agencies like FERC must assess the environmental impact of, and alternatives to, "major federal actions" significantly affecting the environment. This may require developing an EIS. CEQ regulations implementing NEPA define "major federal action" to include "actions with effects that may be major and which are potentially subject to [f]ederal control and responsibility." 42 U.S.C. § 1508.18(b).

47 *See also* Secretarial Order 3362: Improving Habitat Quality in Western Big-Game Winter Range and Migration Corridors, BLM (2018); U.S. Geological Survey (USGS) volumes and mapping tool, **https://www.usgs.gov/news/national-news-release/new-big-game-migration-maps-support-conservation-planning-across-west** (Not every state wildlife agency contributed data. So, developers should not treat this as an exhaustive resource.) For example, WAFWA's Legacy Crucial Habitat Assessment Tool is an excellent example of the types of resources regulators should create and maintain: **https://www.wafwachat.org/**

48 Impacted stakeholders are wildlife, natural resources, and cultural heritage concerns of local residents, communities, tribes, hunters, anglers, wildlife watchers, and conservation experts.

49 H.R. 3684 117th Cong. § 40105(a)(3) (adding criteria that an area must meet to qualify as a NIETC under Section 216(a)(4): 1) "the designation would enhance the ability of facilities that generate or transmit firm or intermittent energy to connect to the electric grid; 2) the designation maximizes existing rights-of-way; and avoids and minimizes, to the maximum extent practicable, and offsets to the extent appropriate and practicable, sensitive environmental areas and cultural heritage sites; and the designation would result in a reduction in the cost to purchase electric energy for consumers").

50 IIJA/BIL H.R. 3684 117th Cong. § 40105(a)(2) (2021) (directing DOE to conduct a Congestion Study at least once every three years, and the results of this study may designate the following areas as NIETCs: 1) "an area experiencing electric energy transmission capacity constraints or congestion that adversely affects consumers; or 2) an area that is expected to experience such energy transmission capacity constraints of congestion").

51 Memorandum on Indigenous Traditional Ecological Knowledge and Federal Decision Making, 2022, 45 WEEKLY COMP. PRES. DOC. (Nov. 15, 2022), **https://www.whitehouse.gov/wp-content/uploads/2021/11/111521-OSTP-CEQ-ITEK-Memo.pdf.**

52 Inuit Circumpolar Council, Indigenous Knowledge, (last visited Feb. 20, 2023), **https://www.inuitcircumpolar.com/icc-activities/environment-sustainable-development/indigenous-knowledge/**.

53 U.S. Fish and Wildlife Service, Traditional Ecological Knowledge Fact Sheet, (Feb. 2011), **https://www.fws.gov/sites/default/files/documents/TEK-Fact-Sheet.pdf**

54 Inuit Circumpolar Council, Indigenous Knowledge; U.S. Fish & Wildlife Service, *Traditional Ecological Knowledge Fact Sheet*.

55 Almut Arneth, Humberto Barbosa, Tim Benton et. al., Summary for Policymakers. In: Climate Change and Land: an IPCC special report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems at 29 (2019), **https://www.ipcc.ch/srccl/chapter/summary-for-policymakers/**.

56 101 Richard Schuster et. al., Vertebrate biodiversity on indigenous-managed lands in Australia, Brazil, and Canada equals that in protected areas, Env't Science & Policy at 1-6 (Nov. 2019); Julia E. Fa, James E.M. Watson, Ian Leiper et. al., Importance of Indigenous Peoples' lands for the conservation of Intact Forest Landscapes, 18 Frontiers in Ecology and the Env't 3 at 114 (Apr. 2020) **https://doi.org/10.1002/fee.2148**.

[57] Memorandum on Indigenous Traditional Ecological Knowledge and Federal Decision Making, 2022.

[58] 40 C.F.R. § 1502.23 (May 20, 2022). NEPA requires agencies to analyze, consider, and disclose the effects of major federal actions on the human environment. CEQ's implementing NEPA regulations direct agencies to "make use of any reliable data sources" in carrying out their responsibilities under NEPA.

[59] 25 U.S.C. §§ 3001(8) & 3005. Siting entities receiving funding have an obligation to repatriate Native American human remains and cultural items to lineal descendants, Tribal Nations, and Native Hawaiian Organizations.

[60] 54 U.S.C.A. § 106.

[61] The Need for Confidentiality within Tribal Cultural Resource Protection, Tribal Legal Dev. Clinic, UCLA Sch. of Law (Dec. 2020), https://law.ucla.edu/sites/default/files/PDFs/Native_Nations/239747_UCLA_Law_publications_ConfidentialityR2_042021.pdf.

[62] Heller, N.E., and E.S. Zavaleta, Biodiversity management in the face of climate change: a review of 12 years of recommendations, Biological conservation at 14-32 (Jan. 2009).

[63] Memorandum on Guidance for Federal Departments and Agencies on Ecological Connectivity and Wildlife Corridors, 2023, 12 WEEKLY COMP. PRES. DOC. (Mar. 21, 2023), https://www.whitehouse.gov/wp-content/uploads/2023/03/230318-Corridors-connectivity-guidance-memo-final-draft-formatted.pdf.

[64] Secretarial Order 3362; *See also* Western Big Game Seasonal Habitat and Migration Corridors Fund, Nat'l Fish and Wildlife Found., www.nfwf.org/programs/rocky-mountain-rangelands/western-big-game-seasonal-habitat-and-migration-corridors-fund.

[65] *See also* Armando L. Figueroa-Acevedo et. al., Design and Valuation of High-Capacity HVDC Macrogrid Transmission for the Continental U.S. (2019), https://home.engineering.iastate.edu/~jdm/WebJournalPapers/SeamsTransPowerSystems_ALF_Mar-11-2019.pdf; NextGen Highways Feasibility Study for the Minnesota Department of Transportation: Buried High-Voltage Direct Current Transmission, NGI Consulting and The Ray (2022), https://rayweb.wpenginepowered.com/wp-content/uploads/2022/04/NexGen-Highways-Analysis-Report-4.6.22-v7.pdf.

[66] FERC, Report on Barriers and Opportunities for High Voltage Transmission, FERC (June 2020), https://cleanenergygrid.org/ wp-content/uploads/2020/08/Report-to-Congress-on-High-Voltage-Transmission_17June2020-002.pdf; Initial Comments of the Railroad Electrification Council for Docket No. RM20-10-000 the Railroad Electrification Council (July 2, 2020), https://www.nema.org/docs/default-source/council-documents-library/documents/incentive-nopr-comments-july-2-2020.pdf?sfvrsn=1b4cdc8c_0.

[67] Disturbed land is land that has been changed through human intervention, often resulting in soil erosion and changing the ability of the soil to hold nutrients.

[68] Initial Comments of the Railroad Electrification Council for Docket No. RM20-10-000 (July 2, 2020).

[69] EPA, Solicitations for Brownfield Grants, (Nov. 21, 2022), https://www.epa.gov/brownfields/solicitations-brownfield-grants#tab-2.

[70] EPA, About the Superfund Cleanup Process, (July 13, 2022), https://www.epa.gov/superfund/about-superfund-cleanup-process#reuse.

[71] Reclaiming Appalachia Coalition, Restoration and Renewal The New Appalachian Economy, Reclaiming Appalachia Coalition, (2020), https://appvoices.org/resources/AML-RAC/AML_RAC_report-2020-b-low-res.pdf. RAMLIS GIS Tool, (last visited Feb. 28, 2023), https://epcamr.org/home/current-initiatives/technical-assistance/gis-data-and-map-services/ramlis-gis-tool-development-reclaimed-abandoned-mine-land-inventory-system/.

[72] Roman Sidortsov, Shardul Tiwari, Timothy Scarlett, Ana Dyreson, and David Watkins, PUSHing for Storage: A Case for Repurposing Decommissioned Mines for Pumped Underground Storage Hydro (PUSH) in the United States (Unpublished), Michigan Technical Univ. Keweenaw Energy Transition Lab (Oct. 2021), https://www.eia.gov/todayinenergy/detail.php?id=33792

[73] U.S. Energy Info. Admin. (EIA), Decommissioning nuclear reactors is a long-term and costly process; Decommissioning nuclear reactors is a long-term and costly process, (Nov. 17, 2017), https://www.eia.gov/todayinenergy/detail.php?id=33792; *See* More U.S. coal-fired power plants are decommissioning as retirements continue, EIA (July 26, 2019), https://www.eia.gov/todayinenergy/detail.php?id=40212#.

[74] Cody Nelson, The dizzying scope of abandoned mine hazards on public lands, (Jan. 28, 2022), https://www.hcn.org/articles/south-mining-the-dizzying-scope-of-abandoned-mine-hazards-on-public-lands.

[75] Restoration and Renewal The New Appalachian Economy, (2020); RAMLIS GIS Tool.

[76] EPA, Re-Powering America's Land, EPA (last updated Aug. 30, 2022), https://www.epa.gov/re-powering.

[77] *See* Federal Land Transaction Facilitation Act, 43 U.S.C.A. § 2301 (2018), https://www.blm.gov/programs/lands-and-realty/federal-land-transaction-facilitation-act.

[78] Id. at 60.

[79] Id.

[80] Murphy, Jim and Lauren Anderson, Responsible Wind Power and Wildlife, Nat. Wildlife Fed'n (Jan. 2019), https://www.nwf.org/-/media/Documents/PDFs/NWF-Reports/2019/Responsible-Wind-Power-Wildlife.ashx (finding in comparison to the 30 million bird deaths from transmission projects, 200 million bird deaths occur from automobiles, almost 600 million from buildings and windows, 67 million from pesticides on agricultural lands, and up to 2.4 billion from cats).

[81] Manville, Albert M. II, Bird strike and electrocutions at power lines, communication towers, and wind turbines: state of the art and state of the science - next steps toward mitigation, USDA Forest Serv. Gen. Tech. Rep. at 1051, 1055 (2005), https://www.fs.usda.gov/psw/publications/documents/psw_gtr191/psw_gtr191_1051-1064_manville.pdf.

[82] *Climate Initiative,* Audubon (2023), https://www.audubon.org/conservation/climate-initiative.

[83] *See also* Invasive Species, Nat. Wildlife Fed'n, https://www.nwf.org/Educational-Resources/Wildlife-Guide/Threats-to-Wildlife/Invasive-Species (finding Cogongrass is spreading through the Southeast, displacing native plants. It provides no food value for native wildlife, and increases the threat of wildfire as it burns hotter and faster than native grasses).

[84] Fuller, S. and A. Tur., Conservation Strategy for the New England Cottontail (Sylvilagus transitionalis) (Mar. 16, 2017), https://newenglandcottontail.org/sites/default/files/research_documents/Conservation%20Strategy%20Updated%20%203-16-17.pdf

[85] Patrick, MIke, New England Powerline Habitats in Danger, Associated Press (May 30, 2016), https://newenglandcottontail.org/news/new-england-powerline-habitats-danger.

[86] Suggested Practices for Avian Protection On Power Lines: The State of the Art in 2006, Avian Power Line Interaction Comm. at 56, 59 Table 5.2 (2006), https://www.aplic.org/uploads/files/2643/SuggestedPractices2006(LR-2).pdf.

[87] Id. at Figures 6.10, 6.11, 6.12, 6.19 and 6.20.

[88] Environmental Impacts of Transmission Lines, Public Service Comm'n of Wisconsin at 3 (July 2013).

[89] *See also* Boyd, Diane, A Review of Lessons Learned to Inform Colorado Wolf Reintroduction & Management, Nat'l Wildlife Fed'n Rocky Mountain Reg'l Ctr. at 26 (2022), https://www.nwf.org/-/media/PDFs/Rocky-Mountain/NWF_Boyd_Wolf_Report_Web-compressed_FINAL.ashx?la=en&hash=B0EB93BEE478F8706AC4BC9B75085C4A24AEBE9B; Meghan Cornwall, Saving the Sagebrush Sea: An Imperiled Western Legacy, Nat'l Wildlife Fed'n (last accessed Feb. 18, 2023), https://www.nwf.org/-/media/PDFs/Wildlife/Sportsmen/SavingtheSagebrushSea-AnImperiledWesternLegacy.ashx.

[90] An offshore wind project here means a project with multiple wind turbines.

[91] Submarine cables are transmission lines that lay on top of the ocean floor.

[92] Pfeifenberger, Johannes P., Joe DeLosa III, Linquan Bai et. al., The Benefit and Urgency of Planned Offshore Transmission: Reducing the Costs of and Barriers to Achieving U.S. Clean Energy Goals, Brattle Group at 17 (Jan. 24, 2023) https://www.brattle.com/wp-content/uploads/2023/01/Brattle-OSW-Transmission-Report_Jan-24-2023.pdf.

93 *See* Offshore Wind Transmission Technical Review – Initial Report, Det Norske Veritas (DNV) at 43-45 (Feb. 18, 2022), https://www.maine.gov/energy/sites/maine.gov.energy/files/inline-files/Maine%20OSW%20DNV%20Offshore%20Wind%20Transmission%20Technical%20Review%20Initial%20Report.pdf.

94 Formicki, Krzysztof, et. al., Magnetoreception in fish, 95 Journal of Fish Biology 73 (May 4, 2019), https://onlinelibrary.wiley.com/doi/10.1111/jfb.13998; H. Westerbberg and I. Lagenfelt, Sub-sea power cables and the migration behaviour of the European eel, 15 Fisheries Mgmt. and Ecology 369 (Oct. 22, 2008), https://doi.org/10.1111/j.1365-2400.2008.00630.x; A. Peter Kimley, Megan T. Wyman, and Robert Kavet, Chinook salmon and green sturgeon migrate through San Francisco Estuary despite large distortions in the local magnetic field produced by bridges, PLOS ONE (June 2, 2017), https://doi.org/10.1371/journal.pone.0169031; Nathan F. Putman et. al., A sense of place: pink salmon use a magnetic map for orientation, 223 Journal of Experimental Biology (Feb. 2020), https://doi.org/10.1242/jeb.218735.

95 Zoe L. Hutchinson, et. al., Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables, Bureau of Ocean and Energy Mgmt. (Mar. 2018); Zoe L. Hutchinson, et. al., The Interaction Between Resource Species and Electromagnetic Fields Associated with Electricity Production by Offshore Wind Farms, Oceanography (2020), https://tos.org/oceanography/assets/docs/33-4_hutchison2.pdf.

96 Id.

97 Kenneth J. Lohmann et. al., The magnetic map of hatchling loggerhead sea turtles, 2 Current Opinion in Neurobiology 336 (Apr. 2012), https://doi.org/10.1016/j.conb.2011.11.005.

98 Maria Zapetis and Angela R Szesciorka, Cetacean Navigation, Springer International Publishing AG (2018), https://www.researchgate.net/profile/Angela-Szesciorka/publication/323365164_Cetacean_Navigation/links/5d544bb645855153040754972/Cetacean-Navigation.pdf); Thomas E. Ferrari, Cetacean beachings correlate with geomagnetic disturbances in Earth's magnetosphere: an example of how astronomical changes impact the future of life, 16 Int'l Journal of Astrobiology 163 (June 24, 2016), https://doi.org/10.1017/S1473550416000252; Dorothee Kremers et. al., Behavioural evidence of magnetoreception in dolphins: detection of experimental magnetic fields, Naturwissenschaften, (2014), https://pubmed.ncbi.nlm.nih.gov/25267469/.

99 Milton S. Love, et. al., Identical Response of Caged Rock Crabs (Genera Metacarcinus and Cancer) to Energized and Unenergized Undersea Power Cables in Southern California, USA, Bulletin, Southern California Acad. of Sciences (Apr. 1, 2015), https://bioone.org/journals/bulletin-southern-california-academy-of-sciences/volume-114/issue-1/0038-3872-114.1.33/Identical-Response-of-Caged-Rock-Crabs-Genera-Metacarcinus-and-Cancer/10.3160/0038-3872-114.1.33.short Zoe L. Hutchinson, et. al., Electromagnetic Field (EMF) Impacts on Elasmobranch (shark, rays, and skates) and American Lobster Movement and Migration from Direct Current Cables; Zoe L. Hutchinson, et.al., A modelling evaluation of electromagnetic fields emitted by buried subsea power cables and encountered by marine animals: considerations for marine renewable energy development, 177 Renewable Energy (Nov. 2021), https://www.sciencedirect.com/science/article/abs/pii/S0960148121007175?via%3Dihub; Wolfgang Wiltschko and Roswitha Wiltschko, Magnetic orientation and magnetoreception in birds and other animals, Journal of Comparative Physiology A Neuroethol Sensory Neural Behavioral Physiology 675 (Sept. 2005), https://pubmed.ncbi.nlm.nih.gov/15886990/

100 U.S. Department of Energy, *See* Advanced Transmission Technologies, U. S. Dep't of Energy (2020), https://perma.cc/H3RB-SEVU.

101 Id. at 6 (defining dynamic line ratings as used to appropriately update the calculated thermal limits of existing transmission lines based on real-time and forecasted weather conditions).

102 Id. at 16 (defining power flow controllers as used to push and pull power, helping to balance overloaded lines and underutilized corridors within the transmission network).

[103] T. Bruce Tsuchida et. al., Building a Better Grid: How Grid-Enhancing Technologies Compliment Transmission Buildouts, The Brattle Group at 13 (Apr. 20, 2023), https://watt-transmission.org/wp-content/uploads/2023/04/Building-a-Better-Grid-How-Grid-Enhancing-Technologies-Complement-Transmission-Buildouts.pdf.

[104] Id. at 15.

[105] Id. at 5.

[106] American Society of Civil Engineers (ASCE)'s 2021 Report Card Marks the Nation's Infrastructure Progress (Mar. 3, 2021), https://www.asce.org/publications-and-news/civil-engineering-source/civil-engineering-magazine/issues/magazine-issue/article/2021/03/asce-2021-report-card-marks-the-nations-infrastructure-progress.

[107] Scenario-based planning is a planning process through which various data sets are tested. The outcomes of these tests reveal possible outcomes that decisionmakers can then consider in their planning processes.

[108] Standard regulatory practice for a benefit-cost analysis is typically the life of the asset.

[109] FERC Order 890 18 CFR Parts 35 and 37 (2007), (establishing nine principles including cost allocation and finding cost allocation must be reasonably proportionate to measurable economic or reliability measures); FERC Order 1000 (linking regional planning and cost allocation and providing six generalized cost allocation principles, including: 1) allocation of cost must be commensurate with benefits, 2) those not receiving benefits must not be involuntarily allocated costs, and 3) if a benefit to cost ratio is applied, then the threshold must not be too high). The United States generally observes a beneficiary pays methodology to effectuate all the aforementioned principles, although a regulated cost recovery model is the most often applied.

[110] Johannes Pfeifenberger, The Benefits of Interregional Transmission: Grid Planning for the 21st Century, at 18 (Mar. 15, 2022), https://www.brattle.com/wp-content/uploads/2022/03/The-Benefits-of-Interregional-Transmission-Grid-Planning-for-the-21st-Century.pdf.

[111] The Benefit and Urgency of Planned Offshore Transmission: Reducing the Costs of and Barriers to Achieving U.S. Clean Energy Goals, Brattle Group at 17.

[112] Western RTO Economic Impact Study, Advanced Energy Economy at 2 (2022), https://info.aee.net/hubfs/Western%20RTO%20Economic%20Impact%20Study%20Report.pdf

[113] Aubrey Johnson, Long Range Transmission Planning, MISO (New England Electricity Restructuring Roundtable (Sept. 20, 2022) (finding MISO just applied a version of this multi-value planning process to their 2020 to 2022 process).

[114] Johannes Pfeifenberger, 21st Century Transmission Planning: Benefits Quantification and Cost Allocation (NARUC Joint Federal-State Task Force on Electric Transmission Jan. 2022).

[115] Aubrey Johnson, Long Range Transmission Planning.

[116] Id.

[117] Cost of service regulation is the regulatory process through which the regulator determines the revenue requirement (the cost of service) that must be collected by a utility in their rates to recover their costs and earn a reasonable return.

[118] Market-based generation is energy generation sold in competitive electricity markets.

[119] Johannes Pfeifenberger, 21st Century Transmission Planning: Benefits Quantification and Cost Allocation (NARUC Joint Federal-State Task Force on Electric Transmission Jan. 2022).

[120] Johannes P. Pfeifenberger, Kasparas Spokas, J. Michael Hagerty, John Tsoukalis, A Roadmap to Improved Interregional Transmission Planning, The Brattle Group at Slide 14 (National Transmission Planning Study Presentation to DOE Office of Energy Efficiency, Nov. 30, 2021), https://www.brattle.com/wp-content/uploads/2021/11/A-Roadmap-to-Improved-Interregional-Transmission-Planning_V4.pdf.

[121] Sonia Aggarwal, Steven Corneli, Eric Gimon et. al., Wholesale Electricity Market Design for Rapid Decarbonization at 11 (June 2019), https://energyinnovation.org/wp-content/uploads/2019/07/Wholesale-Electricity-Market-Design-For-Rapid-Decarbonization.pdf; *Cf.* Johannes Pfeifenberger Judy Chang Roger Lueken, Market and Regulatory Advances in

Electricity Storage at 17 (MIT CEEPR Spring 2018 Workshop Cambridge, MA May 2018), https://www.brattle.com/wp-content/uploads/2021/05/14480_market_and_regulatory_advances_in_electricity_storage.pdf; *Cf*. Principles for Reforming Capacity Markets to Meet State and Customer Clean Energy Goals, Advanced Energy Economy at 2, 9 https://info.aee.net/hubfs/AEE%20Principles%20Capacity%20Market%20Reform.pdf.

122 Sonia Aggarwal, Steven Corneli, Eric Gimon et. al., Wholesale Electricity Market Design for Rapid Decarbonization at 9; Reforming Capacity Markets to Meet State and Customer Clean Energy Goals, Advanced Energy Economy at 5-6; *See also* Toward 100% Carbon-Free Electricity, Brattle Group at 38 (Oct. 2021), https://www.brattle.com/wp-content/uploads/2022/06/Toward-100-Carbon-Free-Electricity.pdf; *Cf*. Johannes Pfeifenberger Judy Chang Roger Lueken, Market and Regulatory Advances in Electricity Storage at 33.

123 Reforming Capacity Markets to Meet State and Customer Clean Energy Goals, Advanced Energy Economy at 4; Sonia Aggarwal, Steven Corneli, Eric Gimon et. al., Wholesale Electricity Market Design for Rapid Decarbonization at 11.

124 *See also* Sonia Aggarwal, Steven Corneli, Eric Gimon et. al., Wholesale Electricity Market Design for Rapid Decarbonization at 9; Reforming Capacity Markets to Meet State and Customer Clean Energy Goals, Advanced Energy Economy at 5; Net Zero Market Reform Phase 3 Conclusions, Nat'l Grid at 5.

125 Id. at 9.

126 *See* Stephanie Lenhart and Dalten Fox, Participatory democracy in dynamic contexts: A review of regional transmission organization governance in the United States, 83 Energy Rsch. and Soc. Science (Jan. 2022), https://doi.org/10.1016/j.erss.2021.102345; *see generally* Christopher A. Parent, et.al. Governance Structure and Practices in the FERC-Jurisdictional ISOs/RTOs, Exeter Associates, Inc. (Feb. 2021), https://nescoe.com/resource-center/isorto-governance-feb2021/

National Wildlife Federation
1200 G Street NW, Suite 900
Washington, D.C. 20005
www.nwf.org