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RENEWABLE WIND ENERGY: BALANCING MILITARY AND PRIVATE LAND-USE CONCERNS

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CONTENTS

Introduction 1
Military Property Disputes and the Role of the FAA 1
Renewable Energy Technology and Public Use 2
Creation of the DoD Siting Clearinghouse 3
Internal Resistance to Wind Energy 4
A Closer Look at Wind Energy and Military Operations 4
Impact on Air Traffic Control Radar 4
Impact on Training and Testing 5
Cumulative Impacts 5
Solutions 6
Conclusion 7
About the Authors 7

INTRODUCTION

In recent years, the growth of wind energy has provided numerous benefits to the broader economy. Indeed, in many parts of the nation that were hit hardest by the 2008-2009 recession, new technologies in renewable energy have produced an entirely new industry with good paying jobs. Along with those jobs, ranchers and farmers in the Great Plains have benefited tremendously from leasing land for wind energy development. Annual lease payments for even one large, wind tower run into the tens of thousands of dollars, and lease terms are generally 25 years. This is an important windfall (both figuratively and literally) for many landowners who seek to diversify the use of their land to offset both the impacts of harsh weather and fluctuating international agricultural commodity prices. It is not an exaggeration to say that wind royalties have kept a number of family farms and ranches in their owners' hands.

As with any new technology, however, wind has its detractors. In particular, there has been a growing trend to try to restrict wind development based on the purported negative effects it has on military base operation and functionality. These arguments deserve to be taken seriously, as it is vital that America's armed forces receive the best training and finest equipment we can provide. After all, improvements in military equipment, doctrine and training have greatly reduced the number of casualties generated in current conflicts, while supporting national interests and policies just as (if not more) effectively than in past wars. Indeed, the motto of soldiers, sailors, airmen and marines is to: "Train as we fight, fight as we train." And, we have successfully developed military bases, training ranges, low-level flight routes and weapons-testing ranges that enable that motto to hold true.

However, many of the conflicts between military bases and wind energy production are more speculative than real. As such, any actual conflict can easily be mitigated through collaboration and technological fixes that can be implemented by both sides. More importantly, where conflicts do arise, existing processes are often able to resolve them. Accordingly, the rare instance when a wind farm siting might conflict with military readiness does not justify broader restrictions on the deployment of wind power.

MILITARY PROPERTY DISPUTES AND THE ROLE OF THE FAA

Conflicts between landowners and airports began within just a few years of the Wright brothers' first flight. And, while law and legal precedent have evolved over the last 115 years, the Supreme Court and Congress have never fully answered the question of who owns the sky. Instead, a practical con-

vention has emerged that establishes landowner property rights up to 199 feet. Anything that extends 200 feet or more above ground level is subject to review by the Federal Aviation Administration's (FAA) Obstruction Evaluation/Airport Airspace Analysis (OE/AAA) program, which was originally intended to protect flights from single radio or cell phone towers and other tall structures.[1]

However, since most cell phone towers were 200 feet tall or less, they did not reach military training airspace, which usually begins at 300 to 500 feet above ground level. This meant that they did not merit FAA intervention but the military nevertheless trained its pilots to "see and avoid" cell towers on training flights, realizing that they would have to avoid them on almost any battlefield on earth, particularly as cell phone technology became available to more people worldwide.

Today, as aerial technology continues to develop, proposed structures on windfarms also fall under the purview of the OE/AAA program. Under it, federal agencies with significant aviation-related equities review proposed projects and assess their potential impact on their areas of responsibility. In doing so, the FAA looks for dangers to both commercial and civil aviation, while each of the military Services and DoD assess any impact on military missions. These aeronautical studies generally find in one of three ways: 1) that the proposed structure is not a hazard and therefore requires nothing further; 2) that the proposed structure would be acceptable if certain mitigating alterations were made (like lighting or otherwise marking the structure); or 3) that the proposed structure does, in fact, pose a hazard to air navigation.[2] In the first two cases, the FAA concludes the study process by issuing a "Determination of No Hazard." If negative impacts to civil safety are found, the project developer is provided with a "Determination of Hazard."

It is important to note, however, that the Determination of Hazard does not forbid the development of the proposed project. In fact, a developer and their landowner partner are free to ignore the FAA's findings and to leave the mitigation of impact up to the cognizant Federal agency. That said, there are very few instances where projects that received a Determination of Hazard were actually built. This is because of the potential for liability to the landowner if an accident does occur, the related inability to insure the project and the hesitation of lenders to provide financing.

RENEWABLE ENERGY TECHNOLOGY AND PUBLIC USE

Throughout the 1990s, the renewable energy industry grew slowly and was largely focused on applications to single homes or buildings and the retail consumer. This slow growth produced minimal and geographically disparate impacts on military missions and facilities. However, around the turn of the 21st century, new technological advances combined with strong social and economic pressures to find alternatives to traditional coal, nuclear or natural gas generation. This made both solar and wind energy generation even more efficient and competitive, and large-scale, wholesale generation of electrical energy through renewable resources became economically viable.[3] National policy decisions also helped the evolution of the industry but land use policies did not simultaneously adjust to help balance large-scale energy generation with the needs of, for example, federal weather radar systems and military missions.

In particular, the recent rapid development of the renewable energy industry, particularly with respect to wind, took Department of Defense (DoD) planners by surprise. They had become used to dealing with the land-use compatibility issues outlined above but had not anticipated the policy and technological changes that made wind power both financially viable and technically competitive with other forms of electricity generation.[4] Further, the OE/AAA system was not intended or equipped to address issues specific to the military and it is in part for these reasons that the first conflicts between this new technology and the DoD occurred near test and training ranges and long-range radar sites. It also quickly expanded to include concerns around military training routes.

The National Oceanic and Atmospheric Administration (NOAA) was the first federal agency to notice the impacts of commercial-scale wind energy generation when National Weather Service radars began picking up returns that looked like thunderstorms but remained in the same place day after day, around the clock, even when there were no clouds in the sky.[5] What these weather radars were picking up was a Doppler shift caused by the rapid spin of wind energy turbine blades. The downside of these non-weather radar returns was the potential for them to mask real weather, making the identification of tornadoes and other severe weather prob-

1. Safe, Efficient Use, and Preservation of the Navigable Airspace, 14 CFR Part 77, Jan. 1, 2012. https://www.gpo.gov/fdsys/pkg/CFR-2012-title14-vol2/xml/CFR-2012-title14-vol2-part77.xml.

2. U.S. Federal Aviation Administration, "FAA Determinations," Obstruction Evaluation, Jan. 4, 2018. https://oeaaa.faa.gov/oeaaa/external/content/faaDeterminations.jsp.

3. "Wind Brings Jobs and Economic Development to All 50 States," American Wind Energy Association, March 9, 2017.

4. See, e.g., Range Commanders Council Sustainability Group "Commanders Guide to Community Involvement," U.S. Dept. of Defense, 2012. http://www.repi.mil/Portals/44/Documents/Primers/Primer_CommunityInvolvement.pdf; and Range Commanders Council Sustainability Group "Commanders Guide to Renewable Energy," U.S. Dept. of Defense, 2013. http://www.repi.mil/Portals/44/Documents/Primers/Primer_RenewableEnergy.pdf.

5. Richard J. Vogt et al., "Weather Radar Coexistence," National Oceanographic and Atmospheric Administration, 2009. www.roc.noaa.gov/WSR88D/Publicdocs/WindPower2009_Final.pdf.

lematic for forecasters. But these forecasters developed work arounds to such challenges and the NOAA largely dropped the issue for a number of years.[6]

However, between 2008 and 2010, renewable energy projects emerged that threatened serious impacts to two high-priority national defense assets: the Nevada Test and Training Range and the Fossil Air Route Surveillance Radar. In the case of the Nevada Test and Training Range, several different project proposals that used concentrated solar technologies would have created both physical and electromagnetic encroachments on defense installations that are critical to the testing and evaluation of new weapons systems, and to the training of fighter pilots. The Shepherd's Flat Wind Farm in Fossil, Oregon would have created the same kind of Doppler interference that the National Weather Service had previously encountered. Only this time, it would affect radar that provided combined air traffic control for the Federal Aviation Administration (FAA) and long-range surveillance for the North American Aerospace Defense Command (NORAD).

At the Nevada Test and Training Range the Air Force worked proactively with the energy developers to help them understand the importance of the military missions their projects threatened, and created a collaborative approach to mitigating those impacts through joint identification of a win-win site for the solar facilities.[7]

At Fossil, however, the opposite happened: NORAD's commander, a four-star general, objected very late in the process of permitting and development, and caused a controversy that, while it delayed the development of the wind farm, created an adversarial situation that cost the wind developer millions of dollars, delayed lease income for landowners and threatened to make America's military look like uncompromising bullies.[8] And all of this happened for an old radar, part of the long-range surveillance system, that helps provide an air picture over a national nuclear facility.

CREATION OF THE DOD SITING CLEARINGHOUSE

Congressional reaction to the Shepherd's Flat debacle was predictable, with senior DoD officials called to testify before Congress about why NORAD was picking on an industry that was creating jobs in a time of recession and impinging upon the constitutional property rights of landowners.[9] What Congress learned was that the only system then in place for the DoD even to be made aware of proposed wind projects was the FAA OE/AAA system, which focused on civil safety rather than military effectiveness.

At the urging of Congress, the United States Air Force took the lead to convene leaders of Congress, all the Military Services and other DoD agencies, the FAA, the NOAA and representatives of the renewable energy industry to discuss the issues and to begin working out solutions.[10]

The conference convened in Las Vegas, near the Nevada Test and Training Range, and in a community that was benefitting from the growth of the renewable energy industry, despite significant unemployment elsewhere. A second conference was held the following year, near Washington, D.C. Each of these helped to define protocols to create communication and coordination channels and to move the stakeholders from an adversarial to a collaborative relationship. Despite this, Congress did not feel that progress was happening rapidly enough.

In the 2011 National Defense Authorization Act,[11] it therefore directed the DoD to create a process and a corresponding office to evaluate and mitigate the effects of renewable energy developments on military missions. After establishing the organization, the DoD published a federal rule that created two tiers of coordination and review, both of which were focused on compromise and mitigation, as opposed to adversarial regulation.[12] This initiative was further defined and clarified in a DoD Instruction.[13] Thus was born the DoD Siting Clearinghouse—since renamed the Military Aviation and Installation Assurance Siting Clearinghouse, (the "Clearinghouse"). And since its inception, the DoD has worked to balance mission requirements with energy development and property rights.

In both 2017 and 2018, Congress amended the law, each time coming down more in favor of protecting military missions than supporting the development of renewable energy. Nevertheless, it kept essentially the same process in place that was established under the 2011 provision, although signifi-

6. Ibid.

7. As Installation Commander, the co-author personally conducted these negotiations.

8. Statement of Dr. Dorothy Robyn, Deputy Undersecretary of Defense, Installations and Environment, "Wind Farms: Compatible with Military Readiness," Hearing Before the Subcommittee on Readiness of the Committee on Armed Services, House of Representatives, 111th Congress, 2010. https://www.gpo.gov/fdsys/pkg/CHRG-111hhrg61770/html/CHRG-111hhrg61770.htm.

9. Ibid.

10. Amaani Lyle, "Senators weigh in on renewable energy at Nevada Forum," Secretary of the Air Force Public Affairs, Aug. 27, 2010.

11. Ike Skelton National Defense Authorization Act for Fiscal Year 2011, Pub. L. No. 111-383, § 358. https://www.gpo.gov/fdsys/pkg/PLAW-111publ383/pdf/PLAW-111publ383.pdf.

12. Mission Compatibility Evaluation Process, 32 CFR § 211, Dec. 5, 2013. https://www.ecfr.gov/cgi-bin/retrieveECFR?gp=1&SID=284108d7dca87a6bea95165fd1c1b0be&ty=HTML&h=L&r=PART&n=32y2.1.1.1.16.

13. U.S. Dept. of Defense, "Implementation and Management of the DOD Mission Compatibility Evaluation Process," DOD Instruction 4180.02, Nov. 20, 2017. http://www.esd.whs.mil/Portals/54/Documents/DD/issuances/dodi/418002p.pdf.

cantly, Congress never explicitly mentions the rights of or a role for private landowners in the law.

Today, the Clearinghouse functions just as its name implies. It coordinates the review and input of the various military services analyzing the potential impacts of a project. It also serves as a point of contact with industry, other federal agencies, state and local government and interest groups. And, in instances wherein all efforts to compromise or mitigate negative impacts have failed, it performs the critical function of recommending that the Secretary of Defense sign a finding that a project presents an unacceptable risk to national security. However, since the law went into effect in 2011, this has happened only once, while literally thousands of projects have moved forward without DoD objection. Significantly, no energy project has ever been built over a Clearinghouse objection. Instead, developers have either mitigated the adverse impacts identified in the Clearinghouse process or abandoned the proposal.

Internal Resistance to Wind Energy

Beyond the duties described in the law that created the Clearinghouse, it also acts unofficially behind-the-scenes as an arbiter of interests within the bureaucracy of the DoD and military services. Defense agencies are conservative by nature, and rightly so. No one wants to gamble with the security of the nation, particularly since we have had the vulnerability of that security so clearly identified by terrorist attacks. However, this hesitancy also means that defense agencies are adverse and resistant to change.

Such resistance manifests itself in myriad ways with respect to wind energy. For instance, even though technologies exist that can mitigate the negative impacts of windfarms on radar and even though the 2011, 2017 and 2018 laws create a mechanism for windfarm developers to pay for such mitigation, locally based DoD and military service representatives sometimes take an all-or-nothing approach to wind projects.

The same applies to low-level flight training. Standard flight paths within Military Training Routes (MTRs) have been modified and altered many times due to events like the development of the cellular telephony network, and even the growth of ostrich, emu and mink farms. Despite this, suggesting an alteration of a route or even changing of flight procedures is often seen as an impossibility by the people on the local level who are tasked with managing them. Even worse, local military installation representatives sometimes appear before planning boards and even state legislatures to express opinions that run contrary both to DoD policy and to the proper application of Clearinghouse rules in a given situation.[14]

14. Ibid.

As a result of this quasi-adversarial situation within the DoD, from time to time, wind developers and landowners have found themselves receiving conflicting information and competing official letters from various command levels and the Clearinghouse. This causes frustration and increases the financial risk of projects. It has even led to legislative proposals in a number of states, such as Texas, North Carolina and Oklahoma, to restrict wind development around bases, radars and MTRs.[15] However, all of this could and should be avoided through thoughtful and constructive communication, coordination and cooperation.

A CLOSER LOOK AT WIND ENERGY AND MILITARY OPERATIONS

There are four main concerns that DoD representatives have with respect to wind energy: 1) the impact of windfarms on air traffic control radar; 2) the impact of windfarms on low-level flight training and testing airspace both on MTRs and on or around bombing ranges; 3) how cumulative impacts could create a situation in which one wind turbine could perhaps be worked around but 500 may cause mission failure; and 4) negative impacts on the ability of the DoD to test new weapons and sensor systems. Each of these is discussed in further detail below.

Impact on Air Traffic Control Radar

There is no doubt that the nation's air traffic control system is old. This is true of both civilian radar operated by the FAA and military radar. While programs of retrofit and upgrade are underway, most of these efforts only put band-aids on a growing problem. And, while it is true that windfarms can obscure the view of radar systems, which rely upon the line of sight to operate, mitigations and new technologies do exist. For example, scientists at the Massachusetts Institute of Technology's Lincoln Laboratory have designed a faster, more powerful "sidecar" computer processor to solve the interference issue experienced at Shepherds Flat.[16] Further, newer digital radars can be programmed to ignore Doppler interference at a specific location. Moreover, radars can be linked together to look on all sides of a wind project, while the new technology of 3-D radars allows them to see through and above wind farms. Accordingly, all that is needed here is the will to pay for and implement these and similar measures, which is long overdue in any case.

15. See, e.g., Tex. Loc. Gov. Code § 43.001 (as amended 2017). https://legiscan.com/TX/text/SB6/id/1644616; N.C. S.L 2017-192, H.B. 589 (2017). https://www.ncleg.net/EnactedLegislation/SessionLaws/HTML/2017-2018/SL2017-192.html; and Ok. S.L. 2018, H.B. 3561 (2018). https://www.ncleg.net/EnactedLegislation/SessionLaws/HTML/2017-2018/SL2017-192.html.

16. Personally witnessed by the co-authors in their roles with the DoD Siting Clearinghouse.

Impact on Training and Testing

With respect to low-altitude training, many imagine that a tower standing over 400 feet tall with giant blades spinning up to 200 miles per hour could seriously damage an aircraft. Such an imaginary scenario has even been brought to life in popular culture, as in one of the *Mission Impossible* movies, a helicopter tried to slalom through a wind farm, with predictably disastrous results. However, as is often the case, Hollywood's representation does not really comport with reality. While it is true that most Military Training Routes have "floors" of just 300 or 500 feet above ground level, those routes are actually corridors, which can vary from four or five to ten or twenty miles in width. This gives pilots plenty of space to maneuver around obstacles. Moreover, since the early days of flight, one of the most fundamental rules a pilot must understand is that it is his or her responsibility to see and avoid hazards, including other aircraft, birds, mountains and manmade obstructions.

Low-level flight training is almost always conducted in visual meteorological conditions, with at least three miles of visibility.[17] In such conditions, wind turbines (with "wingspans" larger than 747s') are much easier to see even than radio and cell towers.[18] As previously discussed, the military has already learned to alter its routes in response to those obstructions and to complaints and claims for damages from ranchers and farmers. And those alterations consist simply of notes that a pilot is responsible for reading and following during their use of a given route. These are published quarterly and updated daily as required through a system called "Notices to Airmen." There is little reason to believe that this same system would be any more onerous for avoiding the hazards posed by windfarms.

However, there are scenarios in which windfarms can cause irreparable harm to a Military Training Route; specifically, in cases where a given route or segment of that route offers some unique value for training or testing. For example, windfarm developers often site their turbines along ridgelines because this is where the best wind resources exist. Likewise ridgelines are attractive to military pilots because the terrain can mask their approach to a target. This provides protection from anti-aircraft fire and an element of surprise in attacking an enemy.

In some MTRs, aviators use terrain-following radars to fly at low levels in periods of poor visibility. If aviators are to "fight as they train," they must have the opportunity to practice this kind of flying often, and those MTRs must be preserved. But that does not mean that every proposed windfarm that impinges on a Military Training Route should be opposed. In fact, the proliferation of wind energy projects in Europe and Asia suggests that providing pilots with practice in flying close to windfarms is actually a beneficial training element that, at least to some degree, needs to be incorporated. After all, wind turbines are proliferating throughout China and the Taiwan Strait, and the current National Defense Strategy lists China as a critical potential adversary of the United States. In light of this, our pilots should be trained to identify a wind farm on their radar screen and to adjust accordingly before they fly into combat. In any case, each proposal for a windfarm should be thoughtfully evaluated and potential changes or mitigations to a windfarm project or a Military Training Route (or both) should be considered in a productive and cooperative framework.

Cumulative Impacts

The concern about cumulative impact is something of a red herring, particularly with respect to radar. Not only do the FAA and the Clearinghouse processes already account for it but, as in the case of air traffic control systems, new technologies and mitigations can effectively minimize those impacts.[19] Similarly, the military already gets ample opportunity to identify the potential for cumulative impacts on Military Training Routes and to mitigate or eliminate those through negotiation with the wind developer. Some local advocates for military installations worry that these impacts, combined with other mission encroachments such as urban sprawl, will become major factors in a future Base Realignment and Closure (BRAC) process. However these concerns are unfounded at this time, as the current Administration and Congress decline to include language in either Appropriations or Authorizations bills for DoD.[20]

There is no doubt that the soldiers, sailors, airmen and marines we send into combat deserve nothing less than the finest equipment and weapons we can give them. However, by definition, this requires the ability to research and test on the same geographic scales our warfighters will face. And, in some cases, it means having an electromagnetic environment that is as-near-pristine as possible. Vast stretches of these test and training ranges already exist, primarily over land in the West, but also over the coastal waters of the Atlantic, Pacific and the Gulf of Mexico. These testing ranges are colossal and can survive a certain amount of negative impact from either the physical obstructions of windfarms or from the electromagnetic interference turbines create. In other cases, wind developers can simply agree to slow or stop their

17. U.S. Department of Defense, "Area Planning – Military Training Routes – North and South America," *Flight Information Publication AP/1B*, Sept. 13, 2018. https://www.daip.jcs.mil/pdf/ap1b.pdf.

18. Both authors have personal experience with this from their military service.

19. Safe, Efficient Use and Preservation of the Navigable Airspace. https://www.gpo.gov/fdsys/pkg/CFR-2012-title14-vol2/xml/CFR-2012-title14-vol2-part77.xml.

20. Cohen Dan, "BRAC Hiatus Won't Extend Indefinitely," Association of Defense Communities, June 21, 2018. https://www.defensecommunities.org/blog/congress-dod/brac-hiatus-wont-extend-indefinitely.

turbines during certain test profiles. In any event, the wind industry has already demonstrated that it recognizes that, in some cases, zero impact is the maximum the DoD can tolerate, as it has voluntarily walked away from projects wherein mission impacts could not be mitigated.

SOLUTIONS

"NIMBY" (Not in My Backyard) is simply not the answer to finding the balance between private property rights, economic development and national security. Measures that heavily favor military missions over landowner rights or moratoria on wind development—such as those enacted in 2017 by the Texas and North Carolina legislatures—arbitrarily trample on landowners' rights, deprive them of the fair use of their property and take money out of their pockets without any compensation whatsoever.[21] And the courts do not have the technical expertise to evaluate impacts on military missions and radar.

The good news is, however, that for many situations, radar technology offers clear solutions. Investment in new radar systems by the DoD, FAA and NOAA is required, and industry must be willing to fully fund mitigations. In addition, as it has often done in recent years, the Defense Advanced Research Projects Agency should continue to partner with academia and industry to develop new technologies and fully examine the potential for cumulative impacts. [22] Indeed, the John McCain National Defense Authorization Action of 2019 directs the DoD to join with the NOAA to conduct additional study.[23] Put simply, all that is required is for Congress to foot the bill.

Military Training Routes and training ranges require case-by-case analysis accompanied by thoughtful and productive dialog, rather than adversarial posturing. One thing that would help this is more education and training by the DoD and the military services to develop individuals at every base who are conversant in the issues and who can speak for their leadership in meetings with industry, landowners, regulators and local government. At the same time, the DoD must significantly improve communications and coordination between representatives at the local, regional and national level to ensure they speak to industry and landowners with one consistent message. While each military service conducts public outreach at its bases, all could follow the lead of the Navy and Marine Corps, and establish Community Plans and Liaison Officers (CPLO) at every base. The CPLO program has been in place for well over a decade, and has proven to be an effective tool in creating the conditions necessary for cooperation and collaboration to find mutually beneficial solutions to issues.[24]

At the state level, legislators must remain true to the Constitution and our dearly held private property rights. Rather than restricting those rights and creating new, burdensome forms of regulation, states should follow the model created in Oklahoma in 2018, which mandates early, productive conversation between wind developers and military officials from local bases, intermediate commands and the Pentagon.[25] Before construction, developers must prove to state officials that they have coordinated with the DoD to develop mitigation plans and receive FAA determinations of "No Hazard." While some critics have complained the legislation has no "teeth," the early results are promising. Four major developers have voluntarily redesigned wind projects, taking considerable financial losses, to preserve training airspace in the state.[26]

Finally, DoD agencies must embrace the market-based solutions available to them. In 2003, to address encroachment by urban sprawl and species, the DoD worked with Congress to establish the Readiness and Environmental Protection Integration (REPI) program.[27] This program provides funding to pay landowners at market-value rates for easements on their property that can prevent new housing developments or protect habitat. The DoD Clearinghouse needs a similar fund, or the REPI program needs to be expanded and altered to do the same for landowners in terms of renewable energy development. This national mitigation funding mechanism, which is authorized in the law that creates the DoD Sighting Clearinghouse, could be funded by fair and proportionate fees paid as part of a renewable energy project's financing package .[28]

Professor Troy Rule of Arizona State has called for a rethinking of the Takings Clause of the Constitution, and adjustments to the Federal government's approach to private landowners.[29] At the very least, Congress should join the debate and foster a national discussion about the interface between

21. See, e.g., Tex. Loc. Gov. Code § 43.001 (as amended 2017). https://legiscan.com/TX/text/SB6/id/1644616; and N.C. S.L. 2017-192, H.B. 589 (2017). https://www.ncleg.net/EnactedLegislation/SessionLaws/HTML/2017-2018/SL2017-192.html.

22. Roy Olsson, "Signal Processing at RF (SPAR)," Defense Advanced Research Projects Agency Program Information, accessed Sept. 25, 2018. https://www.darpa.mil/program/signal-processing-at-rf.

23. John S. McCain National Defense Authorization Act for Fiscal Year 2019, Pub. L. No. 115-232, § 318. https://www.congress.gov/115/bills/hr5515/BILLS-115hr5515enr.pdf.

24. "Guide to Community Involvement." http://www.repi.mil/Portals/44/Documents/Primers/Primer_CommunityInvolvement.pdf.

25. Okla. Leg. S.B. 1576, Wind energy facility site requirements, 2018. https://legiscan.com/OK/bill/SB1576/2018.

26. Personally negotiated by the co-author.

27. Readiness and Environmental Protection Integration Program, "DoD's REPI Program," U.S. Dept. of Defense, accessed Sept. 25, 2018. http://www.repi.mil.

28. Ike Skelton National Defense Authorization Act for Fiscal Year 2011, Pub. L. No. 111-383, § 358. https://www.gpo.gov/fdsys/pkg/PLAW-111publ383/pdf/PLAW-111publ383.pdf.

29. Troy A. Rule, *Solar, Wind and Land: Conflicts in Renewable Energy Development* (Routledge, 2014).

society's needs, the military's and those of landowners and renewable energy developers. To leave the onus on the Secretary of Defense to determine what constitutes an unacceptable threat to national security and then depending upon the financial community to pull their funding away from a wind development is a gamble that we should not have to take. Going forward, Oklahoma-style collaboration, as opposed to restrictive legislation and regulation, should be the model.

CONCLUSION

Few disagree that landowner property rights are among the most sacrosanct that exist under the Constitution and therefore restrictions on private property, even to serve as vital a purpose as national security, must be thoughtful and minimal. Conflict, however, is not inevitable.

While these disputes will sometimes require litigation and appellate review, the courts should always be the venue of last resort. Compromise, compensation, and mitigation among reasonable people and organizations who recognize each other's interests often lead to outcomes that minimize the negative impacts while enabling the positive benefits of wind energy development. Technologies exist that eliminate many of the negative impacts on radars. Experts can provide analysis of impacts on low-level flying training and test missions, and provide thoughtful advice on siting of wind turbines that can protect the military's interests, allow wind developers to prosper, and put money in landowners' pockets.

Approaching these challenges with good, and honest, information and data is critical. Technology can also help, particularly with regard to impacts on radar and instruments or weapons that depend upon the electromagnetic spectrum, but it can't solve every issue. Successfully balancing these elements of the public good relies on the willingness of parties to communicate transparently and frequently to search for effective compromises, work arounds, and mitigations.

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