

DOD weighs in on wind

WASHINGTON, D.C. — The report on commercial wind turbines and their effect on military radar was released recently by the U.S. Department of Defense.

It was commissioned under the National Defense Authorization Act and submitted to the Committee on Armed Services of the Senate and the Committee on Armed Services of the House of Representatives.

The military assessed the effects of industrial wind utilities on radar installations and made conclusions about technologies that might keep the turbines from interfering with radar.

“There is growing public and private sector interest in generating electrical power using wind energy,” the report states. “According to the Department of Energy, over 60,000 megawatts of wind power capacity is in operation worldwide with over 10,000 megawatts installed in the United States. These systems are largely comprised of installations of up to several hundred wind turbines with rotating blades reaching to heights of up to 500 feet. The numbers, height and rotation of these wind turbines present technical challenges to the effectiveness of radar systems that must be carefully evaluated on a case-by-case basis to ensure acceptable military readiness is maintained.”

DOD said since wind energy use in the U.S. is dramatically increasing, “research and interagency coordination is warranted.”

The report focused on the effects of wind plants on air defense and missile warning radars. It included radar test results from multiple flight trials near wind plants by the United Kingdom’s Ministry of Defence, which showed turbines can have a “significant impact” on air defense radar. “The Doppler frequency shift produced by its rotating blades can impact the ability of a radar to discriminate the wind turbine from an aircraft,” DOD said. “Those tests also demonstrated that the wind farms have the potential to degrade target tracking capabilities as a result of shadowing and clutter effects.”

The DOD conducted its own tests, and concluded, “Only three methods so far have been proven to be completely effective in preventing any impairment of primary radar systems. Employment of these or other approaches that could produce marginal, but acceptable, impacts on defense capabilities need to be assessed on a case-by-case basis.”

DOD says developing other technologies to avoid interference is important so wind gen-

eration can continue to be developed.

“The Department of Defense strongly supports the development of renewable energy sources and is a recognized leader in the use of wind energy,” it said. “As one of the largest consumers of energy, the department is keenly aware of the budgetary pressures that recent increases in the cost of energy have created for all Americans and continues to invest in the development of alternative energy sources. However, the department is also mindful of its responsibility to maintain its capabilities to defend the nation.”

DOD’s conclusions

The department made the following conclusions and recommendations:

- Turbines in “line of sight” of air defense radars can impact the ability to detect objects in the air, and how much of an impact they have depends on the number and location of turbines. If the ability of the radar to unambiguously detect and track objects by primary radar alone is sufficient, the readiness of U.S. forces to perform the air defense mission is impacted.

- The only way to completely prevent any impact is to avoid putting turbines in radar line of sight by distance, terrain masking, or terrain relief.

- DOD has begun to develop more mitigation methods, but they are still in development stages.

- Turbines close to military training, testing, and development sites can impact the “train and equip” mission. Existing processes for talking to local and regional planning boards should be used.

- Wind turbines close to Comprehensive Test Ban Treaty monitoring sites can have an adverse impact because they can increase ambient seismic noise levels.

- DOD defers to the Federal Aviation Administration about possible impacts on Air Traffic Control radars, and the National Weather Service for weather radars.

Testing

The U.K.’s study of wind turbines and radar provided “important insights,” the DOD said, but data were taken at only a single frequency and did not measure behavior when two or more turbines were in the line of sight. However, DOD said, that kind of testing is “very difficult to perform accurately for such large structures due to the difficulty in replicating fine details at the extremely large scaling fac-

tors that are required. Thus, their ability to predict with confidence behavior for other commonly employed radar bands is limited.”

But testing in the U.K., the department said, “provided incontrovertible evidence that the ability to track aircraft by primary radar return alone was degraded over wind farms.”

In its own studies, DOD created a database of radar signatures for wind turbines for all common radar bands using the Air Force Research Laboratory’s Mobile Diagnostic Laboratory.

Only a few techniques for mitigation have been proven to actually work and can be used today, DOD said. “All of the others are best characterized as ‘works in progress’ requiring further development.”

DOD explored hardware and software that could help radar be effective around wind facilities, but decided most were unproven and needed further testing.

Other potential impacts

Wind turbines near where the military holds training missions can also impact military readiness, DOD says. “It is important to note that ... it would be inappropriate to draw sweeping or broad-based conclusions that these (impacts) would occur at all facilities and sites employed by the department,” it said.

A utility could pose a problem in one place but not another, and studies need to be conducted individually, DOD explained.

The same kinds of impacts “can be posed by other tall objects such as radio antennas, cell phone towers, and buildings proposed for construction,” DOD added. The agency is addressing those impacts and says, “To date, the department has not identified any specific information that would lead to the conclusion that those methods would not be similarly effective for addressing potential impacts from proposed wind farm developments.”

As for aircraft flying over head, it said, “The potential impact of any tall vertical development near department airfields is virtually identical to the risks associated with development near civilian airports such as potential interference with flight operations during take off, departure, approach and landing,” DOD says. “In relation to flight operations away from airfields, excessive development of wind turbines in, under or adjacent to airspace, test ranges and training ranges where low-flying operations are conducted may adversely affect the altitude at which operations can be conducted.”

DOD added that overhead transmission lines connecting wind turbines can pose a hazard to low-flying aircraft. The project proposed for Highland County, however, would have its transmission lines under ground.

In addition to height issues, wind turbines have a unique electromagnetic “signature” that can vary based on environmental conditions that could also have an impact, DOD said. “The potential impact could be on Department installations or in areas where the Department conducts operations. This includes systems under development as well as those already fielded. Special analyses will need to be conducted to evaluate situations where potential electromagnetic signature impacts could occur.”

To avoid problems, DOD says “multi-agency stakeholder groups” should be established “to improve the processes used by developers and the federal, state and local governments in the proposal and evaluation phases ... Any unique, site-specific impact, would be addressed by the appropriate department organization and the potentially impacted facility.”

DOD concludes that “given the expected increase in the U.S. wind energy development, the existing siting processes as well as mitigation approaches need to be reviewed and enhanced in order to provide for continued development of this important renewable energy resource while maintaining vital defense readiness.”