WIND FARMS AND THE WSR-88D, 2013 UPDATE

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It's time for an update on the wind energy industry, a look at how successful/lucky we have been in preventing wind farms from getting too close to our radars, and the ROC's recent efforts to mitigate the potential impacts of wind turbine clutter (WTC) on the WSR-88D.

WIND ENERGY INDUSTRY UPDATE

Although the past three years have seen a decreased rate of wind industry expansion (Fig 1), the ROC continues to receive and evaluate a reduced but steady stream of proposed wind energy projects. As the economy revives, and if the federal Production Tax Credit (PTC) is renewed, annual wind farm installations will likely rebound to record levels, especially in states with renewable energy mandates.

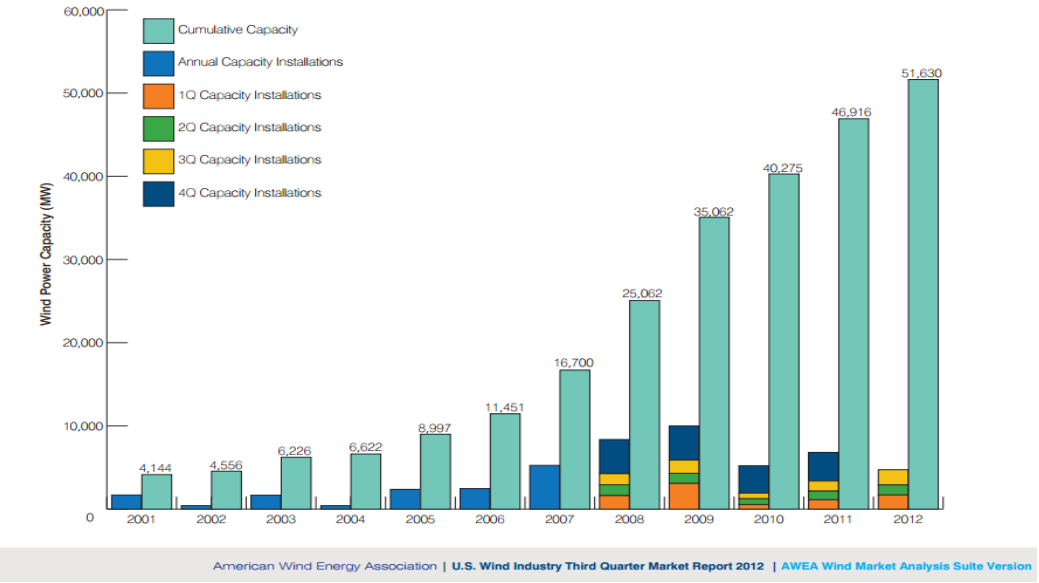

Fig. 1. Annual wind turbine installations peaked in 2009 and are slowly recovering (Source: American Wind Energy Association (AWEA) 3rd Quarter 2012 Market Report).

Figure 2 shows the uneven distribution of wind farms across the country. The Great Plains states from Texas to North Dakota, and to a lesser extent the Great Lakes area, have vast wind resources and plenty of available land on which to build wind farms. The number of wind farms developed near WSR-88Ds is likely to increase, especially in those two geographic areas. Off-shore wind projects are being planned in the New England and Mid-Atlantic area, from Massachusetts to Virginia, with the first project, called Cape Wind, recently approved south of Rhode Island. For the foreseeable future, off-shore wind projects should be confined to the northern portion of the Atlantic coastline. We don't anticipate any off-shore development on the west or Gulf coasts.

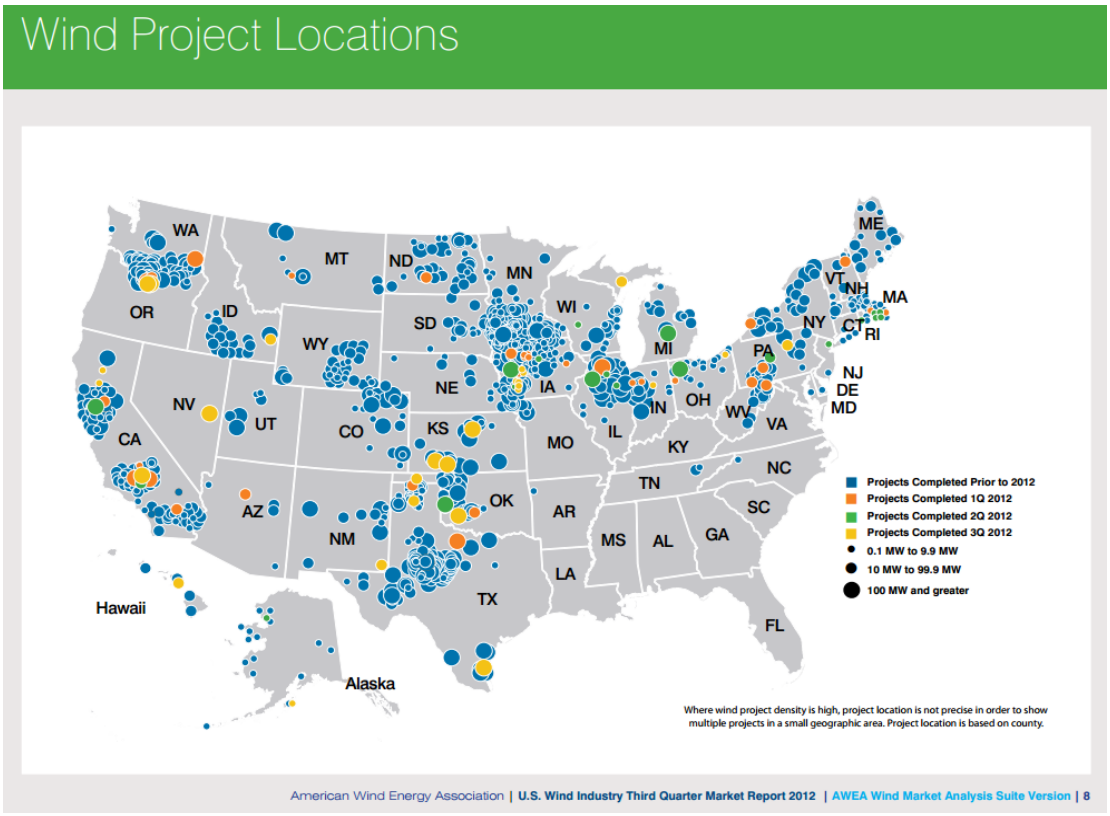

Fig. 2. Wind Energy Project Locations and project size (by Megawatt capacity) as of Sep 2012. (Source: American Wind Energy Association (AWEA) 3rd Quarter 2012 Market Report).

HOW SUCCESSFUL HAVE WE BEEN IN PREVENTING WIND FARMS FROM GETTING TOO CLOSE?

Currently, the closest wind farm is 4km from the Ft Drum, NY WSR-88D. That wind farm causes significant clutter from multipath scattering out to 15—20km from the radar over approximately 120 degrees of azimuth and impacts the 3 lowest elevation scans (through 1.5 degrees). When we receive proposals that would be very close to a WSR-88D, including single-turbines projects within 3km, we make an effort to engage the developer to ensure they understand the potential impacts on the radar and forecast and warning operations. We place greater emphasis on proposed wind farms with the potential for high and moderate impacts (i.e. those within 3km and within 18km of a WSR-88D). Those developers proposing wind farms within 3km—and we have had a handful of those--get serious attention. Fortunately, the vast majority of wind farm developers want to do the right thing and we have been successful, with the help of local WFOs, in convincing several developers proposing to build within 3 km of a WSR-88D, not to do so. Some close projects are still in the works, but have not been built yet.

Unfortunately, with respect to the few that want to build on private land very close to a WSR-88D, the federal government has no land-use authority over private land. Other federal agencies with Doppler radar assets, including the FAA, DHS, and DOD, also do not have land-use authority, despite the potential risks to aviation safety and national security. A further hurdle is the federal Anti-Lobbying Act (18 US Code § 1913) which bars federal employees and agencies

from lobbying or influencing any other government official at any level (federal, state, or local) to favor or oppose "any legislation, law, or appropriation." This would include trying to get a city or county planning board officials to change their permitting regulations for siting wind turbines so that they don't impact our radars. However, according to the NOAA General Counsel office, the Act does not prohibit NOAA employees from presenting city or county officials factual information about the impacts of a wind farm on the WSR-88D.

RECENT ROC INITIATIVES

In most of WTC situations, forecasters can "work around" the impacts without impacting severe weather forecast/warning operations, just as they do for other clutter issues, such as those caused anomalous propagation, terrain blockage, migratory birds, etc. With the on-going deployment of dual-polarization (D-P), the ROC has taken a preliminary look at some data and, so far, D-P does not appear to reduce WTC. However, the ROC has several on-going initiatives for both forecasters and wind project developers to work-around or mitigate wind turbine clutter impacts.

1. Updated AWIPS GIS wind farm files were uploaded in July 2012 onto the NOAA1 server for WFOs/RFCs to download and create overlays of wind farms. Two types of files are available--polygons of wind farm locations (Figure 3, right) based on long-accumulation (12-month) radar-QPE data developed by NSSL (Figure 3, left) and individual turbine locations from the FAA and ROC databases. These GIS wind-farm overlays are particularly useful for distant wind farms that intermittently appear in the radar data. Forecasters should consider setting up Exclusion Zones to prevent known areas of WTC from contaminating precipitation products.

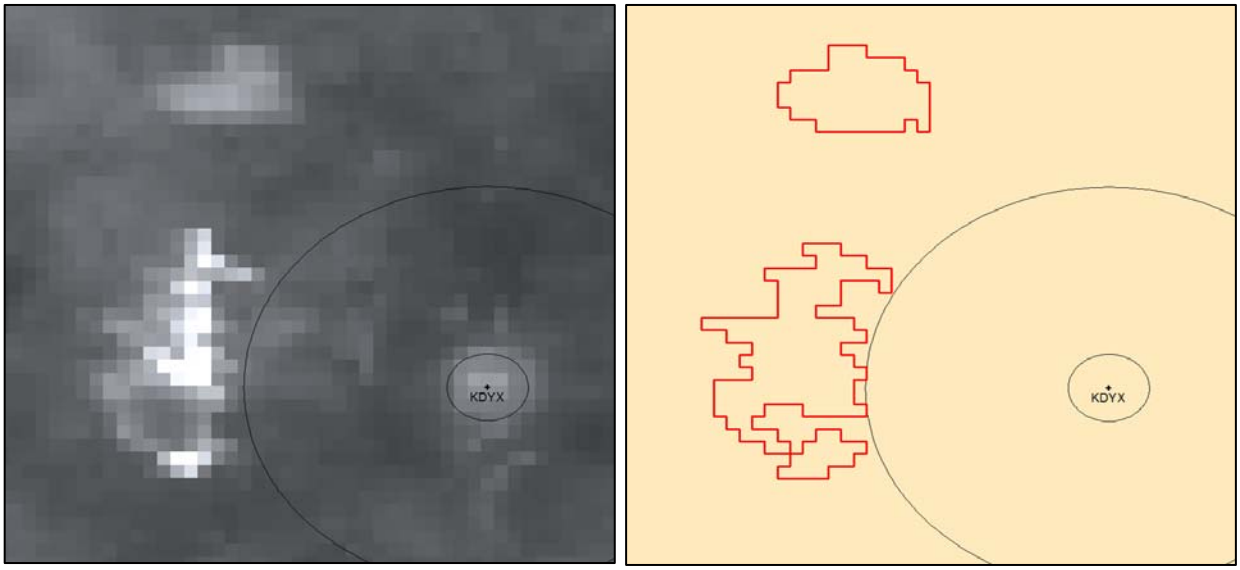

Fig. 3. Left image: 12-month Q2 QPE showing bright "hot spots" west of Dyess AFB, TX WSR-88D (KDYX) with 3- and 18-km range rings. Right image: NSSL-generated polygons outlining QPE "hot spots".

2. The Warning Decision Training Branch (WDTB) has a Commerce Learning Center course, released in 2011, that provides initial training on identifying wind farms on radar products, some mitigation strategies, and ROC outreach efforts. NWS Forecasters can access this course (and bypass the search requirement) by clicking the following link:

Login for National Weather Service LearnCenter. NWS partners and others can access the course at the following link: National Weather Service - Warning Decision Training Branch.

3. To help developers avoid placing off-shore wind projects too close to our coastal radars, the ROC is working with NOAA's National Ocean Service (NOS) Coastal Services Center to place GIS maps of WSR-88D turbine impact zones on the joint NOS-Bureau of Ocean Energy Management (BOEM) Marine Cadastre web site.

4. This year the ROC was successful in coordinating the first signed agreements, technically called Letters of Intent (LOIs), between two WFOs and three wind farm developers/owners to voluntarily curtail operation of wind turbines under certain severe weather situations. These operational curtailment LOIs give the WFOs a way to eliminate the wind turbine clutter in critical weather situations by asking the wind farm operator for a temporary shutdown of part or all of the wind farm causing the WTC.

5. The ROC was also recently successful in coordinating the first individual wind farm--WFO data sharing agreement, whereby the wind farm would share wind, and other meteorological data if available, from its 80-meter meteorological towers with the local WFO. We should also note that NOAA/NWS recently signed major data sharing agreements with two wind energy companies, Iberdrola Renewables LLC and NextEra Energy Resources LLC, to provide proprietary company-wide (all wind farms) data to NOAA for inclusion in numerical weather prediction models. Hopefully this agreement will result in NOAA getting better model initialization, and wind energy companies getting better wind forecasts in return.

THE ROC NEEDS YOUR HELP

While NOAA supports renewable energy development, we must ensure we preserve our ability to issue accurate and timely severe weather warnings and forecasts using radar data. To that end, the ROC is still looking for the support of field offices to better define the impacts of wind turbines on the WSR-88D and warning operations, and to convincingly make the case for those impacts. If you are already dealing with WTC and encounter cases that impact your forecast and/or warning operations, especially significant cases related to missed or delayed weather warnings, the ROC wants to hear about them. As a further step, WFOs may want to develop and document a "climatology" of the clutter (e.g. how often, under what conditions, products affected, etc.).

If you learn about a proposed wind farm that would be located close to a WSR-88D, including single turbines within 3 km, please notify the wind energy team at the ROC by sending an email to wind.energy.matters@noaa.gov . We will follow up.

To learn more about the WTC issue please visit previous NEXRAD NOW articles and/or the Wind Farm Interaction section on the ROC web site (Radar Operations Center - WindFarm Index). We have posted several posters, papers and briefings on this web page.