



## *OCAS<sup>®</sup> Wind Turbine Solution Obstacle Collision Avoidance System*



*The New Standard in Obstruction  
Marking Safety*

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## Wind Development Visual Impact Concerns

The Wind Industry is both applauded and criticized for its effect on the local communities where wind farms are being built. In most cases, the main concern of local residents is the viewshed or unappealing visual impact caused by new wind farm development. In fact, viewshed disruption is the most cited argument against new wind installations.<sup>1</sup> Local residents are concerned about the visual effects of the wind farm on their property value, the potential decrease in tourists to their area and the general destruction of the natural environment in which they live. It is evident that being a good steward of the environment and addressing these issues is a cornerstone of any successful wind developer's business model.

A major contributor to the visual impact of a wind farm is the FAA required night time strobe lights that are installed to warn low flying aircraft. Since wind turbines often exceed the FAA's 200ft requirements, they are considered obstacles to the general aviation air space. For this reason, it is important that all wind farms meet the recommendations and guidelines via the FAA Advisory Circular 70/7460-1K Obstruction Marking and Lighting which describes the standards for marking and lighting structure in the airspace.

### ...And Don't Forget about the Birds

Studies have indicated that like other obstacles equipped with bright lights for air safety, turbine lights can disorientate birds causing fatal injuries during the night.

## How Can OCAS Help Address These Issues?

The OCAS technology is a revolutionary new technology that addresses both the night time visual impact issues of a wind farm while also meeting or exceeding the safety standards per the FAA AC70/7460-1K guidelines.

OCAS lowers the environmental impact of the wind farm by providing an intelligent means to activate FAA approved lighting. The lights are **ONLY** activated when aircraft are operating in the vicinity thereby reducing excessive light pollution and annoyance to nearby communities. The OCAS technology can lead to an easier acceptance of the wind farm in the community and assist in the permitting process. OCAS is currently the only wind turbine lighting solution approved by the *International Dark Sky Association*.

Which view would **YOU** prefer?



<sup>1</sup> IEEE, Wind Turbine Siting <http://www.ieee.org/web/emergingtech/discourses/windpower/siting.html>

As the height of wind turbines are only expected to grow over the next several decades, ensuring both adequate safety and environmental measures are met is a challenge. OCAS provides an ideal solution in meeting these challenges.

OCAS uses low powered radars that can be attached to the outside of the wind turbine tower in order to provide a proximity obstruction marking and warning system that is capable of delivering both visual and audible warnings to aircraft flying too closely to the airspace surrounding wind parks.

Utilizing the unique OCAS surveillance capabilities limits the obstruction light run times to actual threats thus eliminating the light pollution associated with legacy obstruction marking applications which traditionally run their lighting system on a continuous basis to maintain compliance with aviation administration safety recommendations.

The OCAS application is further differentiated from other obstruction marking systems, requiring no additional equipment in the approaching aircraft to provide the audible alarm to the aircraft's cockpit radio. Installation of the system is compatible with wind park layouts and will not compromise or complicate the generation equipment sighting process.

### **Can OCAS Improve the ROI of Wind Farm Development?**

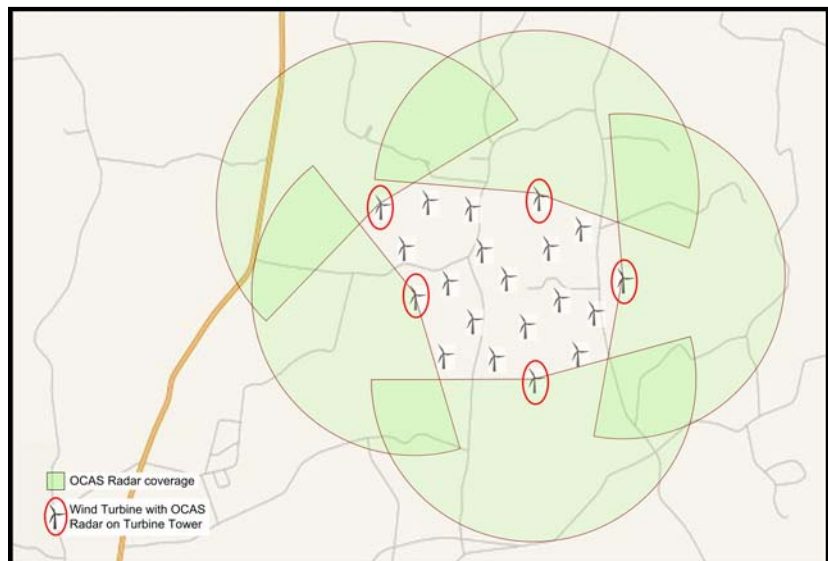
OCAS provides a way for wind developers to work with local communities by addressing their concerns, enabling local acceptance and permitting in locations where it was previously not possible and by decreasing the risk of a stalled or stranded project.

As wind turbines are expected to increase in size, there may be concerns that cause local regulators to limit hub heights. In this case, OCAS can provide a solution to address both the safety concerns of these turbines as well as the increased viewshed implications allowing the wind developer to capture more value from the project by allowing for taller turbines set to the site's optimal height.

### **OCAS Solution Operational Overview**

OCAS COVERAGE: Each OCAS system is configured to protect a sector of the wind farm and the required number of systems varies based on the layout of the wind farm and the geography of the location. See figure 1.

Figure 1: Sample Turbine/OCAS Layout. OCAS will only be placed on the exterior turbines with adequate spacing to allow for maximum coverage.



## The Warning Capabilities

**INITIAL WARNING - MEDIUM INTENSITY RED STROBE LIGHTS:** The configurable detection threshold provides an initial visual warning to aircraft by activating the required strobe lights. This means that the strobe lights remain off until they are absolutely necessary thus preserving the dark skies environment while still adhering to the strict safety standards required by regulators.

**SECOND WARNING - AUDIO BROADCAST:** If the initial visual warning does not cause the pilot to alter the flight path to avoid entering the wind farm then a programmable VHF radio is activated and broadcasts an additional obstruction warning directly to the cockpit of the aircraft. The VHF warning range is adjusted based on local requirements and terrain.

With both the visual and audio warning features, the system provides 24/7/365 warning functionality and is unencumbered by adverse visual conditions.

## Core Technologies



The OCAS system is comprised of innovative low-power surveillance radars, visual warning lights and audio warning VHF radio transmitters.

OCAS has the flexibility to tailor solutions for unique wind farm requirements and can offer full turn-key delivery (engineering, installation, monitoring and maintenance) based on the wind developers unique needs and capabilities.

- **Radar System:**  
The radar is based on state-of-the-art technology used for detecting and tracking the aircraft's proximity

to the wind turbines. The radar unit is mounted on the outside of the turbine tower. In addition, each radar system includes a power unit that will reside in the base of the tower. See Figure 2 for a sample Turbine Configuration.

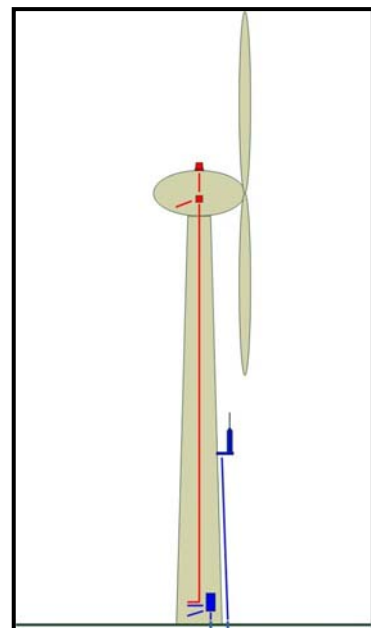


Figure 2: Sample Turbine Configuration. The blue components indicate the radar components; the red components indicate the light components. Some turbines might have just the red, just the blue, both or no OCAS components.

- **Light Warning System:** OCAS uses only wind turbine approved off the shelf medium intensity red LED strobe lights which can be integrated into the OCAS light control system. The light control system consists of one central controller and one controller for each light (normally located in the nacelle).
- **Communications:** OCAS uses a LAN infrastructure for coordination of warnings between radars, as an interface to each light control systems and for supervision/monitoring purposes.



### **OCAS 24x7 Monitoring Support**

Through the OCAS Control Center (OCC) via the LAN infrastructure or wireless modems (optional), OCAS provides 24/7/365 monitoring of the OCAS systems. In addition to the standard quarterly reporting of the operational health and status of the system, the OCC will also provide notification in the event of a system issue/outage to the client and OCAS support personnel allowing them to notify the FAA in the form of a Notice to Airman (NOTAM) if required. The OCC will also assist in troubleshooting and keeping the FAA informed of any status changes.

In addition, when required, OCAS can provide clients with date-logged, radar track records including aircraft speed, heading and altitude when investigating specific events in the area.

### **Certifications**

Testing and validation of this system has been done in close cooperation with federal regulators and meets all the requirements of the:

- US: FAA AC 70/7460-1K Obstruction Marking and Lighting
- Canada: CAA CAR 621.19 Obstruction Marking and Lighting Standards
- Norway: BSL E2-2 and BSL G6-1

OCAS has a significant track record of over 500,000 operational hours.