Advanced Wireless Solutions for Wind Turbines

SUPERCHARGE WIND-GENERATED POWER WITH CONNECTED TECHNOLOGIES

RFS

Introduction

The growth in sustainable energy is huge. The EU alone is expected to install 200 GW of new wind power capacity over 2024-2030, and this commitment and investment in wind power is mirrored across the globe. Key to the longevity and performance of wind farms is their communication capabilities.

Implementing advanced connectivity in wind turbines unlocks real-time monitoring, data-driven maintenance, seamless remote control, optimized performance, and reduced operational costs. **But what should that connectivity look like?**

Connecting a Wind Turbine

RFS offers a range of solutions that can be combined to deliver complete fixed and wireless, internal and external coverage. The below scheme demonstrates the typical approach we take to deliver comprehensive coverage for wind turbines.

Wireless coverage

RFS delivers seamless internal and external wireless coverage for wind turbines through advanced, easy-to-install solutions.

For coverage inside the turbine, we can support **Private Mobile Radio (PMR)** using either the 150MHz or TETRA bands, depending on requirements.

We use a pre-terminated radiating or "leaky feeder" system to ensure efficient signal distribution across the entire turbine. To deliver complete coverage in the nacelle, we use and use omni-directional antennas for TETRA bands or **stick antennas** for 150MHz coverage.

For simple installation, the system attaches to the main access ladder, eliminating the need for tower drilling. We also support wireless connectivity for **IoT devices** using the Ethernet 802.11 standard at 2.4 and 5GHz, with custom solutions like **RLKAX12** and **RLKX114** for various tower heights.

Externally, there is a need for **cellular connectivity** to support applications like drone-based visual inspections. We can provide all components needed for cellular coverage and discuss the durable cable fixings and RF connector sealings needed to withstand harsh environments.

Fiber Optic Coverage

Alongside wireless coverage, there is a need for fiber optic solutions to support the full range of connectivity requirements.

There is an initial need for fiber optic **subsea cable** to bring connectivity to offshore wind turbines.

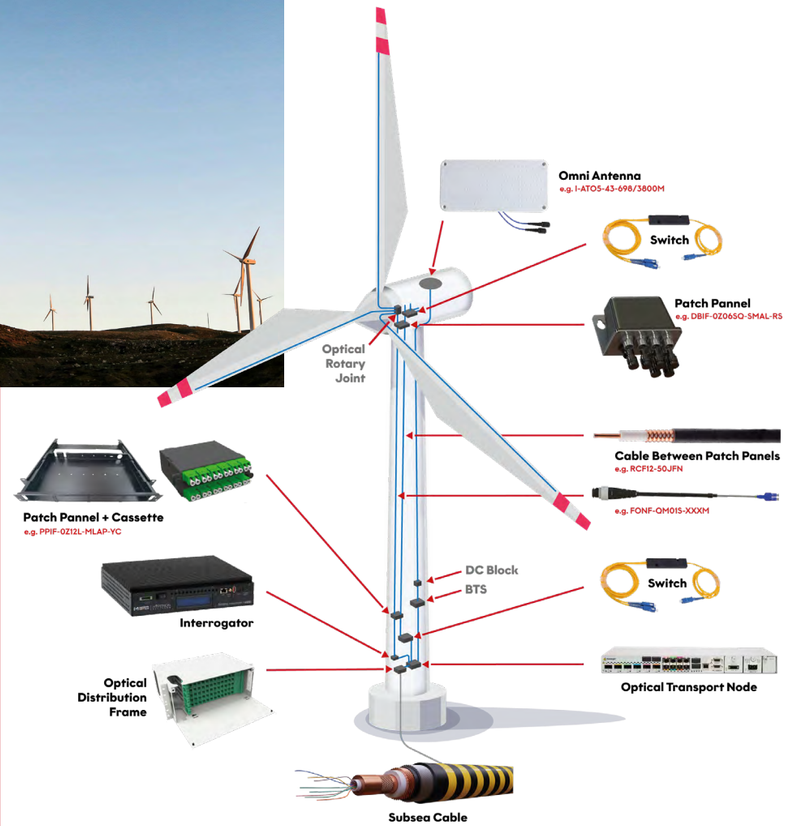
Alongside the wireless connectivity discussed, there is a need to create a small **ethernet network** across the tower and nacelle.

We use two types of **multi fiber connector pre-terminated solutions**: multimode and single mode, which each support different applications within the turbine.

All of the multi fiber connector pre-terminated solutions do not require specific patch panels/termination boxes; they instead use **compact interface modules**, which can be located almost anywhere for discreet installation.

For flexibility, we offer hybrid options, which have been developed for **Distributed Radio Systems (DRS)**.

These cables combine fiber connectivity with power to allow for easier installation where a power source may be an issue.



How RFS can help

The overside of this flyer explains what connectivity within a wind turbine looks like and how we achieve complete coverage. **But what are the benefits this unlocks for wind farm operators?**

1 Predictive Maintenance

Connected turbines enable **sensors** to detect early signs of wear, damage, or component failure. For example, the fiber optic connectivity installed throughout the tower and nacelle can also carry analogue FBG (Fibre Bragg Grating) sensing links. These detect blade stress levels and link to specific interrogators, which are connected via a traditional SNMP Ethernet interface to allow **remote monitoring**.

This allows for proactive maintenance, extending the lifespan of equipment and minimizing costly repairs.

2 Drone Controlled Observation

The remote nature of most wind farms means they often lack reliable commercial cellular coverage. Installing dedicated cellular technology to the top of a turbine is ideal for supporting drone-controlled monitoring. This **minimizes the need for on-site personnel** and reduces downtime.

3 Ongoing Safety

As is the case with offshore oil and gas, there is a crucial need for mission-critical systems to ensure the safety of personnel visiting a turbine for any reason. RFS meets **the highest standards for delivering offshore mission-critical coverage** to meet regulatory requirements across the globe.

4 Future-proofing

There are an increasing number of **IoT** sensors available to support greater remote monitoring of wind turbines. But, for them to be effective, they need a connectivity backbone. Putting in place the communications infrastructure from the outset allows operators to take advantage of **emerging technologies** that rely on connectivity.

5 Data-Driven Decision Making:

Aggregating data from multiple turbines allows wind farm operators to make informed decisions about energy management, turbine upgrades, and overall farm efficiency. However, to access this data in real-time, connectivity needs to be built into every wind turbine with sensors **collecting and sending back real-time data.**

Mini Case Study: UK Windfarm

A major UK-based offshore wind farm needed to increase the connectivity of its wind turbines, wanting to balance maximum connectivity with minimal disruption during installation. Our 'no drill' solution attached to turbine access ladders, with its signal radiating properties giving complete coverage from a quick and straightforward installation.

At RFS, we are poised to implement the connectivity infrastructure needed for future-ready wind turbines. With multiple large-scale deployments under our belt, we have the experience and expertise to deliver seamless connectivity that futureproofs wind turbines for years to come. **Get in touch to discuss how we can help.**

Sustainable Energy, Lifetime Connectivity

Discover how our premium solutions ensure uninterrupted connectivity for your wind turbines, optimizing performance for the long term. **Scan the QR code to learn more and connect with our experts.**

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