

RENEWABLE ENERGY INNOVATION FOR TELECOM TOWERS

APRIL 2016



Windular's 10 KW wind system installed in Pakistan.

TELENOR AND WINDULAR RESEARCH AND TECHNOLOGIES PARTNER WITH STATE-OF-THE-ART WIND PILOT

Telenor Group and Windular Research and Technologies have partnered on a pilot initiative installing Windular's state-of-the-art wind system on Telenor's tower in Pakistan.

Windular's innovative technology employs a 10 kW wind turbine and an optional 2.25 kW solar array that are mounted directly on the tower by way of a customized rail and carriage system. Through the application of proprietary power electronics, the turbine can travel 360 degrees around the tower seeking out the most efficient wind. Similarly, Windular's power electronics propel the solar array 180 degrees around the tower while it tracks the rise and fall of the sun from east to west.

The wind system has been placed at the 26 m level of the 37 m self supporting tower.

Grid and cycling diesel generators charging a bank of sealed lead acid batteries have historically powered this Telenor site. Windular's hybrid renewable energy system will now utilize the wind as the primary power sources to charge the batteries, thereby reducing grid and possibly eliminating diesel genset run-time, fuel consumption and the resulting carbon emissions. The pilot initiative provides a long-term, cost-efficient, renewable energy source for powering Telenor's towers.

Windular's innovative technology allows mobile network operators to install wind and/or solar systems at any elevation on any type of telecom tower and its state-of-the-art power electronics make Windular's systems the most efficient renewable energy application available to the industry.

The Telenor site is the first installation of Windular's technology in Asia and only the second of its kind in the world. Telenor leads the way in employing this innovative renewable energy technology in the telecom sector.

Windular is currently looking at other sites for prospective clients.

Windular Research and Technologies Inc. is a, Ontario, Canada based company that designs, manufactures and installs hybrid renewable energy systems specifically for the global telecom industry. For additional information see: www.windular.com.





THE 10 KW WIND SYSTEM HAS BEEN PLACED AT AN ELEVATION OF 26M ON THE 37M TOWER

The transfer of energy from the wind and solar systems is achieved through Windular's proprietary energy transfer platform utilizing a multiple brush and buss bar application to deliver energy down the tower where it is inverted and rectified before charging the batteries.

In order to minimize the destructive forces of extreme weather conditions, Windular's 10 kW wind system employs a number of protective mechanisms more commonly found in big wind turbines. Firstly, the system utilizes a two-piece patented blade technology that allows the blades to "pitch" when winds become too intense, thereby eliminating over-spin and the possible

destruction of the turbine. In addition, in extreme winds in excess of 25 m/s, the system's power electronics are programmed to drive the turbine into a safe position out of the wind where an electronic brake is deployed. Once the system detects acceptable operating winds, the brake is released and the turbine automatically repositions itself to optimize wind direction and speed. It is, if you will, smart wind technology!

Windular's technology also includes an on-board weather station allowing technicians to monitor wind speed, wind direction and solar irradiance and, in turn, determine the best locations for Windular's wind and solar tracking systems.

Windular's rail and carriage system has been designed to adapt to virtually any tower configuration globally. The rail can be expanded or contracted to accommodate guy wire towers, three and four-legged, self-supporting towers, and monopole towers.

One benefit of Windular's technology is the ability to install powerful renewable energy systems using the existing tower infrastructure. Windular's 10 kW wind and 2.25 kW solar systems can be installed at any elevation on the under-utilized sections of the tower. This allows the systems to maximize the wind and solar resources available on site and eliminates the requirement for, and resulting costs of, installing additional concrete foundations and ground-mount infrastructure.



Energy Monitoring

The Telenor site is equipped with remote monitoring capabilities allowing technicians to view wind speed, wind direction, solar irradiance and kWh of power produced, among other data. With a load of approximately 1.8 kW, preliminary data from the site has proven very promising in an area where winds have historically not been strong. Windular's wind system has generated up to 50%-100% of the daily power requirement with additional data to be gathered moving forward. This productivity translates into significant reductions in power operating costs and carbon emissions for the Telenor site where grid power is not reliable. With Windular's technology, Telenor has taken a world-leading role in the effort to reduce the use of carbon-based power sources.



Windular's Global Reach

Above, are Windular's 10 kW wind and 2.25 kW solar system that is deployed in northern Canada on a 523' guyed tower.

Below, is the wind system installed at the 205' level of the 523' tower. Both systems are working together to reduce the diesel generator's operational time.



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