

### WIND APPLICATION BRIEF



# Over 67,000 wind turbines worldwide operate with Maxwell's ultracapacitor energy storage for reliable and fail-safe emergency pitch control.

Wind turbine pitch controls are critical to the safe operation of a turbine. During operation, they adjust the pitch angle of the blades to control rotational speed. Pitch control systems are also used to brake the turbine when needed, protecting against risks to equipment and personnel.

To ensure the pitch system can stop the turbine during emergencies, such as in the event of power loss or dangerous weather conditions, each blade has an energy storage backup system. Turbine manufacturers and operators rely on Maxwell ultracapacitor energy storage as the preferred choice for pitch control backup power.

Advantages of Maxwell's ultracapacitors include an operating life of 10 to 15 years or more, minimal maintenance and reliable long-term performance across the full ambient temperature range.\* Our products have earned a reputation for no-fuss functionality.

Maxwell is a global provider of ultracapacitor technology to operators, OEMs and pitch manufacturers. Our products have helped operators slash operating costs and run their farms with confidence for over two decades. We offer a range of options for OEMs and retrofit products for wind farms experiencing poor battery performance.



### **Features and Benefits**

- Design life up to 15 years\*
- Resilient in cold and hot temperatures (-40°C to 65°C)\*
- > Highly reliable, minimal maintenance
- Retrofit products designed for drop-in compatibility
- Full electrical discharge for safe handling and easy storage
- Environmentally friendly with no hazardous material requirements
- Predictable aging and performance characteristics
- Configurable for a wide variety of voltage and energy needs
- > Minimal technician training needed



\*Results may vary. Additional terms and conditions, including the limited warranty, apply at the time of purchase. See the warranty details for applicable operating and use requirements.



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# Wind farms: Replace batteries with reliable ultracapacitor retrofit modules

A wind turbine's average lifespan is 20 to 25 years. As the years go by, components require more maintenance and replacements.

Erase recurring battery system troubleshooting and maintenance off your to-do list by retrofitting your fleet with Maxwell's ultracapacitor retrofit modules for emergency pitch control.

Our customers report that retrofitting turbines with our rugged and resilient energy storage modules results in reduced operations and maintenance costs, reduced repeated spending on battery system component replacements, fewer pitch faults, fewer unscheduled turbine climbs to troubleshoot or replace faulty batteries, improved turbine availability, increased number of production hours, and improved safety for wind technicians.

Maxwell's retrofit solutions are form-fit-functional replacements for battery systems with seamless communication to the turbine SCADA system (if required). We offer retrofit modules for GE and Clipper turbines.

16V 500F

# OEMs: Deliver the highest performance pitch systems to your end customers

As wind energy proliferates and becomes cost competitive; reliability, system availability and low operating cost are key to maximize generation output. Partner with Maxwell to take full advantage of our proprietary and field-proven ultracapacitor technology for pitch control backup power.

As you bring more efficient turbines to market or repower installed fleets, make sure they are not limited by unreliable energy storage systems. Every component that resides up-tower must contribute to minimal maintenance efforts so that your wind farm customers can be competitive and profitable.

Lead-acid batteries have inherent disadvantages due to the nature of their electrochemical process. This is the reason why ultracapacitors have become the energy storage technology of choice for electric pitch control systems.

Maxwell ultracapacitor modules offer rugged design for long life and reliable performance in the most demanding conditions. Look to Maxwell to partner with you on your next wind turbine design.

### We look forward to serving you.



16V 56F



75V 94F



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90V 10F

160V 5.8F



240V 3.75F





54V 136F for use in GE use in Clipper 1.5MW turbines 2.5MW turbines

Nesscap Co., Ltd.

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Enabling Energy's Future

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