



Frontier Pro Services offers experts with over 25 years of experience in operating and maintaining wind turbines. Our mobile technicians provide reliable, quality, on-demand services throughout the United States and Canada. Our technicians have a working knowledge of wind turbine mechanics, hydraulics, controllers and composites. Operating under a safety-themed umbrella, we apply our skill sets leveraging proprietary technology and techniques to offer you a differentiated and value added service.

Dynamic ProBalance™

THE FRONTIER PRO SERVICES DIFFERENCE

- Frontier Pro Services utilizes a patent-pending method to both assess and precisely correct rotor unbalance in situ
- Rotor balance correction is performed without removing blades or the rotor, utilizes a minimum amount of corrective weight, and does not interfere with the aerodynamics
- In situ Rotor balance assessment of a wind farm is inexpensive
- Our method allows wind farm operators to manage the Balance Quality of their wind turbine rotors at key stages in the life of a wind turbine:
 - OEM Delivery
 - End of Warranty
 - Blade Repair and/or Replacement

OUR EXPERIENCE

A Case Study in Balance Quality Assessment and Correction

Frontier Pro Services recently assessed 71 turbines over three wind farms. Only 25% of these turbines met an acceptable level of rotor balance quality

A study was conducted on the affects of balancing one of these turbines which was in the top 10% of the worst rotor balance group. Using our patent-pending method, we corrected a wind turbine rotor that had an initial Balance Quality of ISO G94 to a final Balance Quality of ISO G5. By recording wind speed and power before and after the corrective balance, we determined:

- Power production was extended at lower wind speeds.
- Power production increased throughout the entire wind speed profile by an average of 17%



Dynamic ProBalance™

UNBALANCED WIND TURBINE ROTOR → LOST REVENUE AND INCREASED LIFE CYCLE COSTS

- Rotor unbalance can exist at time of installation or can occur anytime the mass distribution of any one or more blades of the rotor is altered over its lifetime (blade repair, blade replacement, etc.)
- Unbalanced wind turbine rotors reduce operating revenue and accelerate wear of the mechanical life of the wind turbine
- Rotor unbalance is undetected in all but the very extreme cases due to the slow rotation and height of the rotor
- Operating revenue is lost as wind energy is consumed to provide power to the rotor unbalance rather than being converted to electrical power for revenue generation
- Mechanical fatigue increases as structural and drive train components work harder to resist and move these unbalance forces
- Rotor unbalance may be a leading contributor to frequent and costly maintenance of yaw systems, structures, and fastening hardware
- Traditional methods of rotor balance assessment are time consuming, are expensive, require downtime and are often inaccurate
- Establishing a precision balance on wind turbine rotors is highly sophisticated and could be outside the skill set of wind turbine maintenance personnel

WHO WE SERVE

An experienced, professional outsource provider of O & M Services, Frontier Pro Services proudly serves many of the wind industry's leading firms. Some of our customers include:

- AES Corporation
- Acciona
- Bluarc
- Clipper Windpower
- DNV Global Energy Concepts Inc. (DNV-GEC)
- Energy Unlimited, Inc.
- First Wind
- GE Energy
- Iberdrola Renewables
- NextEra Energy Resources (FPL)
- Oak Creek Energy Systems Inc.
- Terra-Gen Power LLC
- Vestas

FRONTIER PRO SERVICES

- Tractel Trained
- High Angle Rescue Trained
- Avanti Certified (Service Lift)
- HazMat Certified
- OSHA Certified
- Forklift Certified

www.frontierpro.com

Call us to discuss a Rotor Balance Assessment on your wind farm.

Find out how much additional revenue you may be missing due to unmeasured and unmanaged Rotor Balance Quality.

866-584-9PRO(9776)

760-250-0189