



LOW WIND LLC

LowWind Hi-Tech™ Turbines & Windmills
Rugged. Reliable & Virtually Maintenance-Free

Richard Sutz
Founder & CEO

Introductory Note to Dr. Peter Jenkins Analysis and Report on the Low Wind Multiblade Turbine

The following document is the non-confidential analysis of Low Wind's SolidWorks model, conducted by Dr. Peter Jenkins.

Dr. Jenkins is the former Director of the Texas A&M Turbo Machinery Laboratory, former Dean of Engineering and current Professor of Mechanical Engineering at the University of Colorado.

He is a respected expert in Drag-Type multiblade wind machines.

His confidential detailed analysis, and report on Low Wind LLC Turbine's low wind features and characteristics, is available under a NDA.

Peter Jenkins, PhD, PE

Date: March 20, 2015

To: **Richard K. Sutz**

CEO, Low Wind LLC

From: **Peter E. Jenkins, PhD, PE**

Subject: Report on the Engineering Evaluation of the Design and Projected Performance Claims made for the Sutz Low Wind Speed Turbine.

Because my professional services have been retained under the restrictive terms and conditions of Low Wind's NDA, my report consists of two parts: Part One-Not Confidential, and Part Two-Confidential.

Part One - Not Confidential

I have conducted an engineering analysis of the Confidential and Proprietary information regarding the development of a multiblade wind turbine that Sutz claims can generate cost-effective utility-grid quality power in wind speeds beginning at 4 MPH.

My analysis and calculations have been based on material Sutz provided to me:

- A software model of his low wind speed turbine
- Backup calculations
- Subsequent information explicitly defining how this would be achieved in an operating wind machine

Based on the above information and after performing my own engineering analysis, my professional opinion is that I confirm the ability of Sutz's low wind machine to generate utility-grid quality power in wind speeds beginning at 4 MPH.

From my analysis, in comparing the power output from the Sutz turbine with a conventional turbine of comparable size, I found that the Sutz turbine provided more power output than the conventional turbine over a wind speed range of 4-45 mph.

On the question of can a commercial wind machine of Sutz's design be manufactured? Sutz has extensive, and to my knowledge, unique experience in the world of low wind speed multiblade wind machines.

He gained this experience during the development of the multiblade high performance water pumping wind-mill. Therefore, I am confident that he can lead the manufacture of such a wind machine, and I believe such a wind turbine can be manufactured by Sutz.

I look forward to subsequently performing a parallel analysis and validation on Sutz's plan to manufacture, instrument and test a scale model low wind speed turbine for testing in a wind tunnel

A positive engineering analysis of the scale model would permit extrapolation of the scale model results to full size commercial versions.

I would suggest that an additional benefit of the proposed scale model testing program will be the opportunity to optimize the performance of the turbine components.

Part Two - Confidential

Part Two - The confidential part of my Engineering Evaluation, Appendix A to Part Two, is available from Richard Sutz, Low Wind's CEO, subject to Low Wind's NDA terms and conditions.

A few non-confidential highlights of my Engineering Evaluation are:

- Sutz's proprietary low wind turbine technology describes several separate inventions, which in combination contribute to his claimed performance.
- Sutz's developments do not violate the limitations of the Betz Law. In fact, based on my analysis, the Sutz wind turbine could have a power coefficient of approximately 0.52, compared to the Betz factor of 0.593. This compares to a normal power coefficient of about 0.33; hence on this basis alone, the Sutz turbine would be more efficient than a standard wind turbine.
- Although having reviewed the software model and the information Sutz provided, and having confirmed the validity of Sutz's claims, I must emphasize that a final validation of his turbine's performance claims can only be made by testing a fully instrumented model in a low wind speed wind tunnel.