



## Colorado Science and Engineering Fair

## 2024 Individual Project Abstract Form

**Please print 2 copies of the completed form. Sign both copies, keep 1 for your notebook and submit 1 copy to your Regional Fair Director with your other paperwork.**

Title of Project: Which Windmill Blade Type Works Best?

Finalist's Name: Alex Nuzzo

School and City: South High School, Pueblo

Sponsor's Name: Briana Nuzzo

Category: Energy (ERGY)

Division: Senior (9th - 12th grades)

Abstract (250 words or less):

Efficiency and reliability are necessary in the production and use of energy. This applies to renewable sources of energy as well as traditional sources. The main factors that affect the efficiency of wind power are the weight of the blades, the speed they spin, and the torque they apply to the generator. In order for wind energy to be a sustainable source and be cost effective, it must be as efficient as possible.

Various different designs of windmill blades were designed and 3D printed. The different designs ranged from different blade profiles to the number of blades. The different designs were then placed in front of a small leaf blower while mounted on a DC motor and then used to spin the motor and produce voltage. The voltage produced was then measured using a voltmeter and recorded along with the average wind speed produced by the leaf blower.

While the results showed that the lightest design that had the least amount of material worked the best, this is because it had less mass that needed to be moved. This design had a thin profile and a simple concave curve to it with only two blades. Even though the designs with the airfoil shape produced less voltage than the design with a concave curve, the designs showed that the more blades added the more voltage they produced. For future tests, the designs will be modified to be closer in weight and have a change in the angle of the blade.

*I hereby certify that the above statements are correct and the information provided in the Abstract is the result of one year's research. I also attest that the above properly reflects my own work.*

Finalist's Signature:

*Alex Nuzzo*

Date:

*3/2/24*

In addition, all students must complete the ISEF Student Checklist (1A), Research Plan, Approval Form (1B), and Checklist for Adult Sponsor (1), and any other ISEF forms required for this type of project. See the International Rules and Guidelines for form requirements. Return COPIES of all of these forms to your Regional Fair Director with you Finalist Verification/Permission Form. A signed copy of this form must be included in your notebook.