

Checklist for Adult Sponsor (1)

This completed form is required for ALL projects.

To be completed by the Adult Sponsor in collaboration with the student researcher(s):

Student's Name()

Power of the Wind

Project Title:

- 1) ☒ I have reviewed the Intel ISEF Rules and Guidelines.
- 2) ☒ I have reviewed the student's completed Student Checklist (1A) and Research Plan.
- 3) ☒ I have worked with the student and we have discussed the possible risks involved in the project.
- 4) ☐ The project involves one or more of the following and requires prior approval by an SRC, IRB, IACUC or IBC:
 - ☐ Humans Potentially Hazardous Biological Agents
 - ☐ Vertebrate Animals ☐ Microorganisms ☐ rDNA ☐ Tissues
- 5) ☒ Items to be completed for **ALL PROJECTS**
 - ☒ Adult Sponsor Checklist (1) ☒ Research Plan
 - ☒ Student Checklist (1A) ☒ Approval Form (1B)
 - ☐ Regulated Research Institutional/Industrial Setting Form (1C) (when applicable after completed experiment)
 - ☐ Continuation/Research Progression Form (7) (when applicable)

6) **Additional forms required if the project includes the use of one or more of the following** (check all that apply):

- ☐ **Humans** (Requires prior approval by an Institutional Review Board (IRB); see full text of the rules.)
 - ☐ Human Participants Form (4) or appropriate Institutional IRB documentation
 - ☐ Sample of Informed Consent Form (when applicable and/or required by the IRB)
 - ☐ Qualified Scientist Form (2) (when applicable and/or required by the IRB)
- ☐ **Vertebrate Animals** (Requires prior approval, see full text of the rules.)
 - ☐ Vertebrate Animal Form (5A)—for projects conducted in a school/home/field research site (SRC prior approval required.)
 - ☐ Vertebrate Animal Form (5B)—for projects conducted at a Regulated Research Institution. (Institutional Animal Care and Use Committee (IACUC) approval required prior experimentation.)
 - ☐ Qualified Scientist Form (2) (Required for all vertebrate animal projects at a regulated research site or when applicable)
- ☐ **Potentially Hazardous Biological Agents** (Requires prior approval by SRC, IACUC or Institutional Biosafety Committee (IBC), see full text of the rules.)
 - ☐ Potentially Hazardous Biological Agents Risk Assessment Form (6A)
 - ☐ Human and Vertebrate Animal Tissue Form (6B)—to be completed in addition to Form 6A when project involves the use of fresh or frozen tissue, primary cell cultures, blood, blood products and body fluids.
 - ☐ Qualified Scientist Form (2) (when applicable)

Note: Certain projects involving microorganisms are exempt from the PHBA review and form requirements. See the full text for details

- ☐ **Hazardous Chemicals, Activities and Devices** (No prior approval required, see full text of the rules.)
 - ☐ Risk Assessment Form (3)
 - ☐ Qualified Scientist Form (2) (required for projects involving DEA-controlled substances or when applicable)

Paul Schollmeier

Adult Sponsor's Printed Name


Signature

11/6/13
Date of Review

507 494 1000 1441
Phone

paul.schollmeier@winona.k12.mn.us
Email

Student Checklist (1A)

This form is required for ALL projects.

- 1) a. Student/Team Leader: _____ Grade: 7
Email: _____ Phone: _____
b. Team Member: _____ c. Team Member: _____
- 2) Title of Project: Power of the wind
- 3) School: Winona Middle School School Phone: 507-494-1000
School Address: 1570 Homer RD.
Winona MN 55987
- 4) Adult Sponsor: Paul Schollmeier Phone/Email: paul.schollmeier@winona.k12.mn.us
- 5) Is this a continuation/progression from a previous year? ☐ Yes ☒ No
If Yes:
a) Attach the previous year's ☐ Abstract and ☐ Research Plan
b) Explain how this project is new and different from previous years on ☐ Continuation/Research Progression Form (7)
- 6) This year's laboratory experiment/data collection: (must be stated (mm/dd/yy))
12/28/13 12/28/13
Start Date: (mm/dd/yy) End Date: (mm/dd/yy)
- 7) Where will you conduct your experimentation? (check all that apply)
☐ Research Institution ☐ School ☐ Field ☒ Home ☐ Other: _____
- 8) List name and address of all non-school work site(s):
Name: _____
Address: _____
Phone: _____
- 9) Complete a Research Plan following the Research Plan instructions and attach to this form.
- 10) An abstract is required for all projects after experimentation.

A. DEFINE THE PROBLEM

Name: [REDACTED]
Topic of Interest Wind Machines_
Category ENERGY & TRANSPORTATION
Subcategory Renewable Energies

Define or explain the potential problem that you want to solve this year.

Wind turbines normally have 3 blades but are they spinning at maximum voltage output?
Wind turbines generally run at 30 to 40 percent capacity, ("Wind energy america," 2013)
Current wind turbines could be more energy efficient if you adjust the number of the blades to a higher amount so that wind would cause it to spin at a faster rate.

Who or what are the stakeholders that are involved with this project.

Wind Turbine blade producers Wind turbine producers, energy providers , people who rely on renewable energy for power, the environment, the unemployed

Why is this project important for you? the community? mankind?

It will reduce the dependence on fossil fuels. More on Renewable, more powerful energy sources. The people who use fossil fuels might switch to renewable energies because of the advantages created by this. People who don't have a job might get a job from the increase of turbines by working in wind turbine factories

List all practical applications of real life for this project.

Wind turbines create more electricity which would increase the amount of wind turbines which would result in less oil used for electricity which causes there to be less carbon dioxide in the air.

Why do you want to do this project?

That there is less fossil fuels being consumed to produce electricity which would result in a lower carbon dioxide buildup in the atmosphere. If it works it might affect future generations.

B. HYPOTHESIS

1. It has been hypothesized that increasing the number of blades on a wind turbines will increase the voltage output. If the voltage output increases that means more power for the people who use them. This would increase because the faster the turbine spins the more energy it produces. So increasing the blade number should cause more wind to turn it resulting in more energy.

C.EXPERIMENTAL DESIGN PLAN SHEET

Name

Project Title:

Power of the wind

Independent Variable:

the number of blades on a wind turbine

Dependent Variable:

the voltage produced

Control(s):

3 bladed turbine

Constant(s):

wind speed, wind direction, turbine blade size and shape, turbine engine

Repeated Trials:

4

Procedures:

1. Build Basic Plus wind turbine from KidWind project kit.
2. Test 3 bladed turbine for voltage output with a fan on high
3. Record Results in a scientific journal on a table graph
4. Add a blade onto the turbine rotor so the blade positions are even
5. Test altered turbine again with fan on high
6. Record Data again in scientific journal with a table graph
7. Repeat steps 2-6, 4 times

Materials Needed:

Fans

KidWind basic turbine plus kit

Duct tape

Template for blade

D.Sources

Chen, J., Wang, Q., Shen, W. Z., Pang, X., Li, S., & Guo, X. (2013). Structural optimization study of composite wind turbine blade. *Materials and Design*, 46, 247-255. doi:<http://dx.doi.org/10.1016/j.matdes.2012.10.036>

Chen, X., & Agarwal, R. (2012). Optimal placement of horizontal - and vertical - axis wind turbines in a wind farm for maximum power generation using a genetic algorithm. *International Journal Of Energy & Environment*, 3(6), 927-938.

S. Mathew, G.S. Philip, 2.05 - Wind Turbines: Evolution, Basic Principles, and Classifications, In: Editor-in-Chief: Ali Sayigh, Editor(s)-in-Chief, *Comprehensive Renewable Energy*, Elsevier, Oxford, 2012, Pages 93-111, ISBN 9780080878737, <http://dx.doi.org/10.1016/B978-0-08-087872-0.00205-5> .
(<http://www.sciencedirect.com/science/article/pii/B9780080878720002055>)

Keywords: Capacity factor; Darrieus rotor; Fixed and variable speed wind turbines; Horizontal axis wind turbine; Lift and drag coefficients; Power coefficient; Savonius rotor; Tip speed ratio; Torque coefficient; Vertical axis wind turbines; Wind energy; Wind power capacity

National Aeronautics and Space Administration. (1984). Turbine blade testing methods: Interim report. Cincinnati, Ohio : [Washington, D.C.: Dept. of Mechanical & Industrial Engineering, University of Cincinnati.

AHO, J. Y. (2013). CONTROLLING WIND ENERGY FOR UTILITY GRID RELIABILITY. *Mechanical Engineering*, 135(9), 4.

Liu, P. Q., Zhu, J. Y., & Zhao, W. L. (2011). Aerodynamic Performance of Wind Turbine with Horizontal Axis. *AIP Conference Proceedings*, 1376(1), 225-227. doi:10.1063/1.3651882

White, D. L., Musial, W. D., & National Renewable Energy Laboratory (U.S.). (2003). The effect of load phase angle on wind turbine blade fatigue damage: Preprint. Golden, Colo.: National Renewable Energy Laboratory.

Wind energy america. (2013, October 28). Retrieved from
<http://www.windenergyamerica.com/faqs.html>

Approval Form (1B)

A completed form is required for each student, including all team members.

1) To Be Completed by Student and Parent

a) Student Acknowledgment:

- I understand the risks and possible dangers to me of the proposed research plan.
- I have read the Intel ISEF Rules and Guidelines and will adhere to all International Rules when conducting this research.
- I have read and will abide by the following Ethics statement

Scientific fraud and misconduct are not condoned at any level of research or competition. Such practices include plagiarism, forgery, use or presentation of other researcher's work as one's own, and fabrication of data. Fraudulent projects will fail to qualify for competition in affiliated fairs and the Intel ISEF.

 Signature Date Acknowledged (mm/dd/yy)
 (Must be prior to experimentation.)

b) Parent/Guardian Approval: I have read and understand the risks and possible dangers involved in the Research

 Parent/Guardian's Printed Name Signature Date Acknowledged (mm/dd/yy)
 (Must be prior to experimentation.)

2) To be completed by the local or affiliated Fair SRC

(Required for projects requiring prior SRC/IRB APPROVAL. Sign 2a or 2b as appropriate.)

a) Required for projects that need prior SRC/IRB approval BEFORE experimentation (humans, vertebrates or potentially hazardous biological agents)

The SRC/IRB has carefully studied this project's Research Plan and all the required forms are included. My signature indicates approval of the Research Plan before the student begins experimentation.

 SRC/IRB Chair's Printed Name
 Signature Date of Approval (mm/dd/yy)
 (Must be prior to experimentation.)

OR

b) Required for research conducted at all Regulated Research Institutions with no prior fair SRC/IRB approval.

This project was conducted at a regulated research institution (not home or high school, etc.), was reviewed and approved by the proper institutional board before experimentation and complies with the Intel ISEF Rules. Attach (1C) and required institutional approvals (e.g. IACUC, IRB).

 SRC Chair's Printed Name
 Signature Date of Approval (mm/dd/yy)

3) Final Intel ISEF Affiliated Fair SRC Approval (Required for ALL Projects)

SRC Approval After Experimentation and Before Competition at Regional/State/National Fair
 I certify that this project adheres to the approved Research Plan and complies with all Intel ISEF Rules.

Regional SRC Chair's Printed Name	Signature	Date of Approval
State/National SRC Chair's Printed Name (where applicable)	Signature	Date of Approval