

MOAS Project: Wind Energy Demonstration

A large white wind turbine stands in a field with mountains in the background. The turbine is the central focus, with its three blades extending outwards. The background features a range of blue mountains under a cloudy sky. The foreground is a green field with a fence line.

Members

Nicholas Bembridge

Victor Fontecchio

Bradley Kroger

Michael Sheehan

Suzanne Shepherd

Outline

A large white wind turbine stands in a field with mountains in the background under a cloudy sky. The turbine is the central focus, with its three blades extending outwards. The background features a range of blue mountains under a sky filled with soft, white clouds. The foreground consists of a green field with a fence line, and a dirt road or path leads towards the turbine.

- Project Definition
- Concept Generation
- Concept Selection
- Component Selection
- Final Design Specifications
- Budget Analysis
- Future Work

Project Definition

A photograph of a white wind turbine in a field. The turbine is the central focus, with its three blades extending outwards. The background features a range of blue mountains under a blue sky with light clouds. The foreground is a green field with a fence line.

- The Mary Brogan Museum of Arts and Sciences (MOAS) is adding new exhibits showcasing alternative energy sources
- Our group was given the challenge of designing an exhibit for the museum that would educate the public about wind as an alternative energy source

Exhibit Expectations

A white wind turbine is the central focus, standing on a grassy hill. The background features a range of blue mountains under a cloudy sky. The foreground is a green field with a fence line.

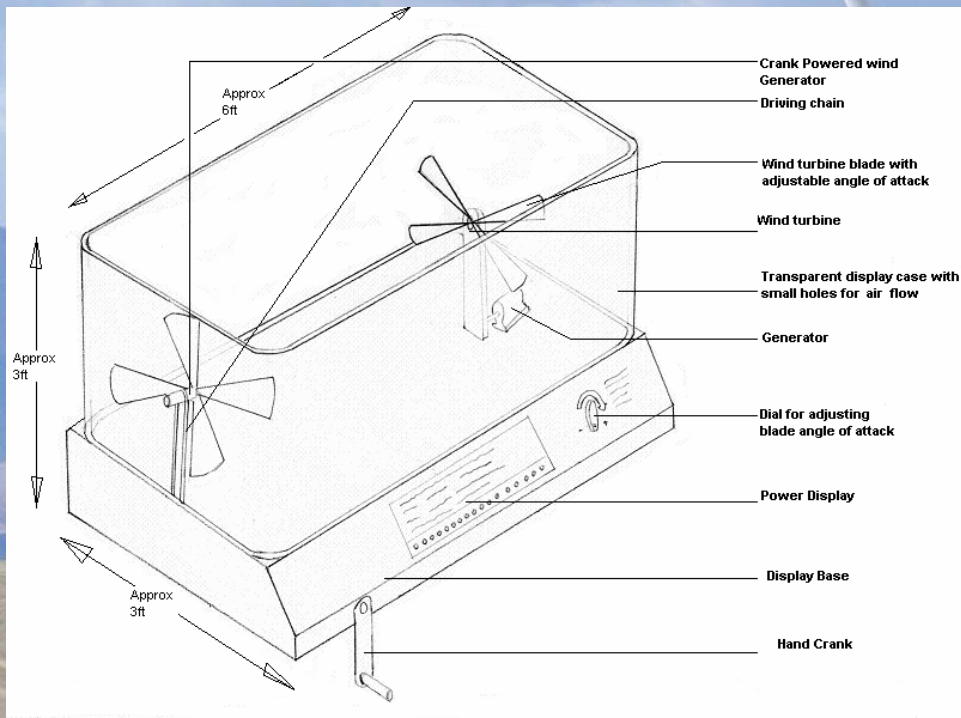
- Child friendly
- Entertaining for all ages
- Durable
- Interactive
- Visually Appealing
- Safe
- Budget
- Project must be completed by April

Concept Generation

A white wind turbine is the central focus, standing in a field with mountains in the background. The turbine has three blades, one of which is pointing upwards. The background features a range of blue mountains under a blue sky with light clouds. The foreground is a green field with a fence line.

- Before reaching a final design for the exhibit, it went through many iterations
- Ideas and suggestions came from both our sponsors as well as from group members

1st Concept



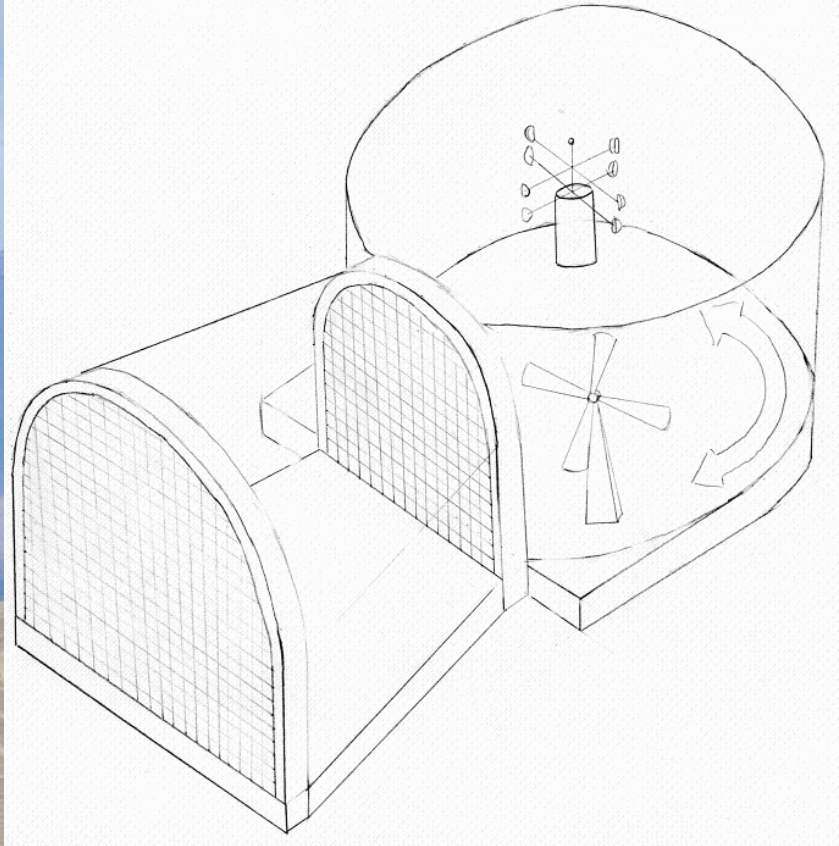
● Pros

- Power Meter
- DC Motor as power generator
- Adjustable wind velocity
- Visibility

● Cons

- Hand Crank
- Only one type of wind turbine

2nd Concept



- Pros

- Multiple Wind Turbines
- Variable Angle for wind turbines
- Flow Control

- Cons

- No Exit for the Air Stream
- Expensive Round Plastic Casing

3rd Concept

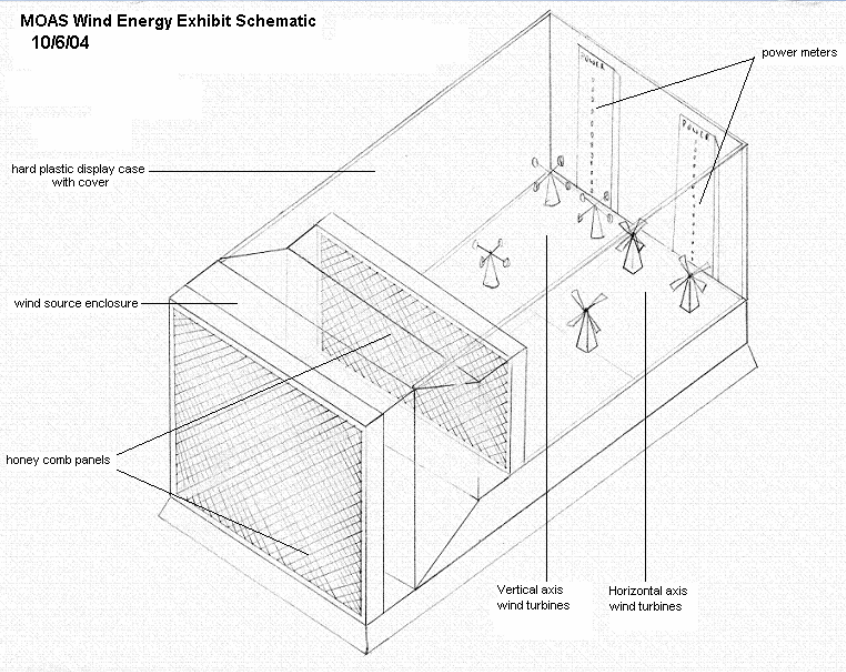
- Pros

- Power Meters
- Flow Control
- Multiple Wind Turbines
- Visibility

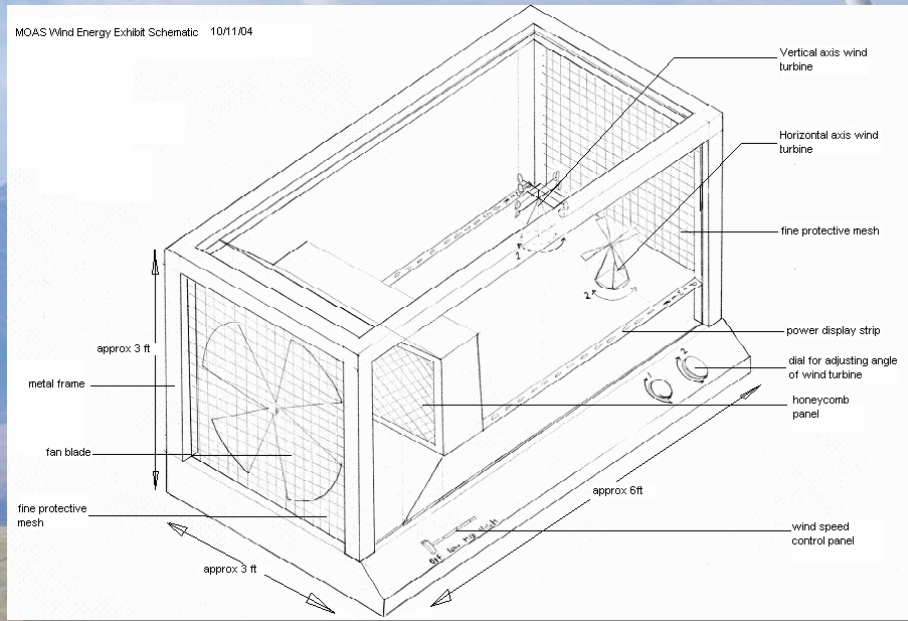
- Cons

- No Exit for the Air Stream
- Complex wiring for multiple turbines
- Unable to vary the wind stream attack angle

MOAS Wind Energy Exhibit Schematic
10/6/04



4th Concept



● Pros

- Multiple Wind Turbines
- Variable Angle Of Attack
- Power Meters
- Flow Control

● Cons

- Limited Visibility due to metal casing

This became the final design concept

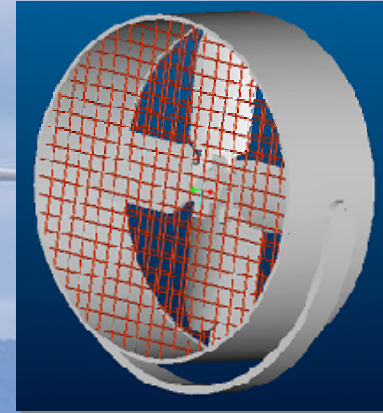
Component Selection

A large white wind turbine stands on a grassy hill with mountains in the background under a cloudy sky. The turbine is the central focus, with its three blades extending outwards. The landscape is a mix of green grass and brown, tilled earth, suggesting a rural or agricultural setting. The sky is filled with soft, white clouds, and the mountains in the distance are a hazy blue.

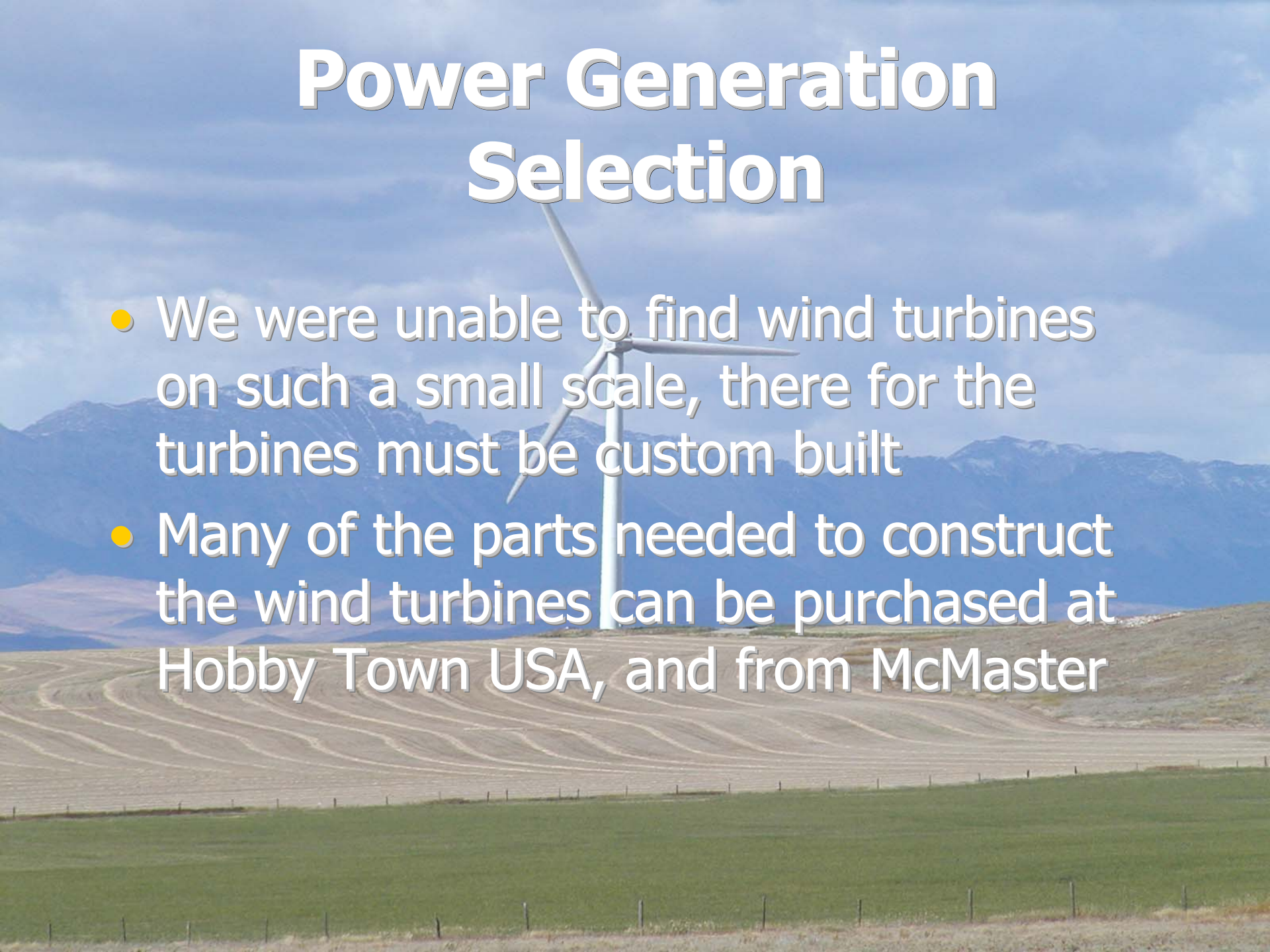
- Fan
- DC Motors for Turbines
- Exhibit Casing
- Electronics
- Pulleys

Wind Generation Selection

- To create a wind stream in the exhibit an electric fan needed to be selected.
- Qmark LDC20 - 20" fan
 - 3 speeds
 - 110V wall source compatible



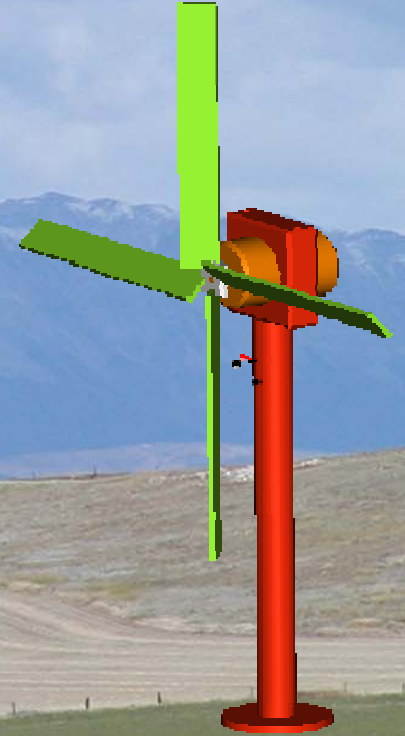
Power Generation Selection

A photograph of a white wind turbine standing in a field. The turbine is the central focus, with its three blades extending outwards. The background features a range of blue mountains under a cloudy sky. The foreground is a green field with a fence line visible.

- We were unable to find wind turbines on such a small scale, therefore the turbines must be custom built
- Many of the parts needed to construct the wind turbines can be purchased at Hobby Town USA, and from McMaster

Power Generation

- Two Types of Wind Turbines
 - Vertical Axis
 - Horizontal Axis
- Support Base
 - Single vertical pole similar to real world applications

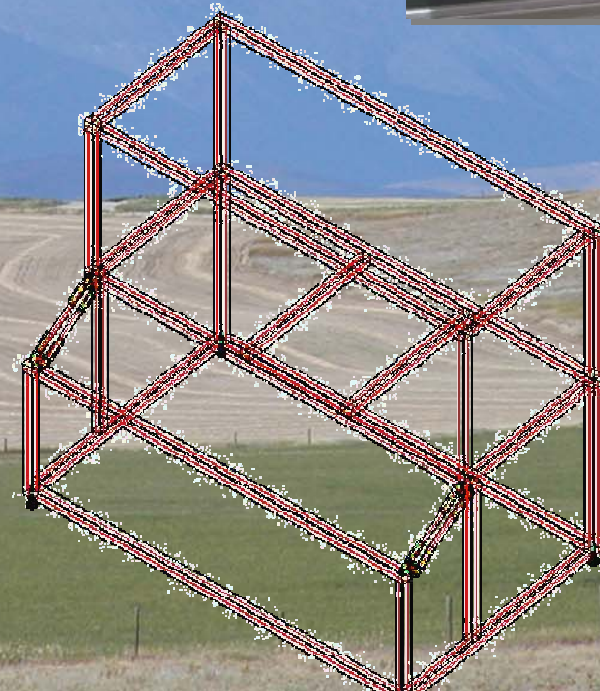


Vertical Axis

Horizontal Axis

Exhibit Casing Selection

- 80/20 – Aluminum Frame Manufacturer
 - Extruded Aluminum Modular Frame
 - Clear Polycarbonate Sheets to Fill the Openings and Provide an Unobstructed View to the Exhibit
 - Adjustable Leveling Feet
 - PVC Coated Wire Mesh, covers end openings allowing air to enter and exit exhibit

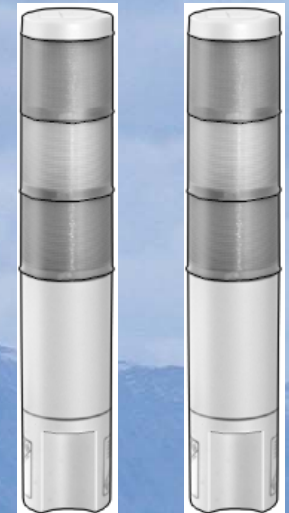


Electronics Selection

- Purchasing Light Towers from McMaster
- GT Electric will build circuits that will run the light towers from the DC motors
- Hot Wire Anemometer to display the wind speed
- Kill Switch that will turn off the the fan, a specification of the museum



Kill Switch

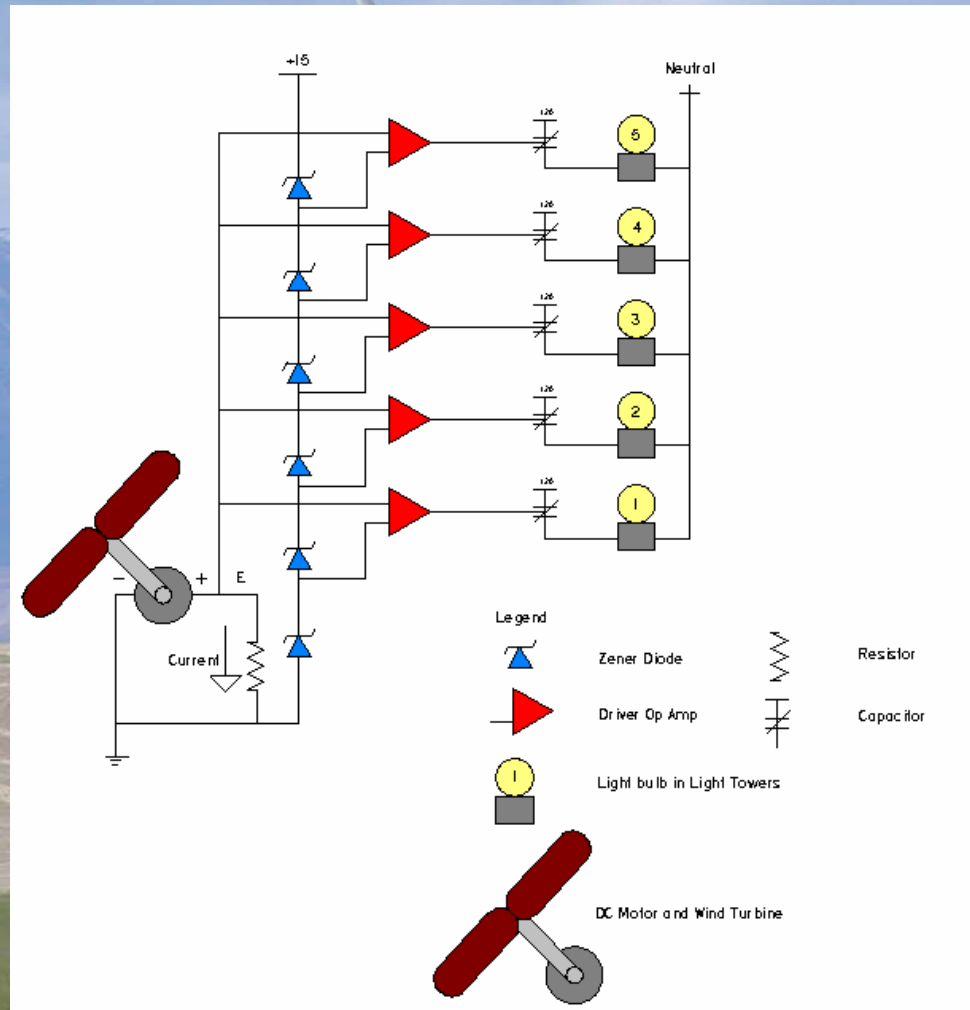


Light Towers



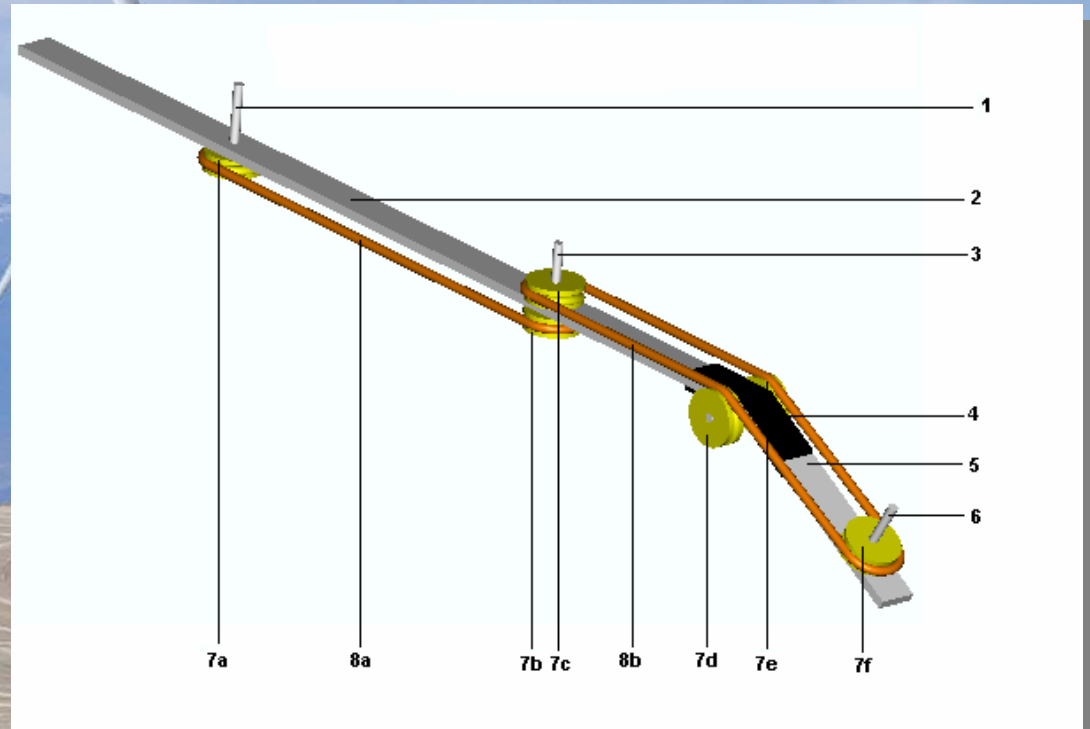
Anemometer

Electrical Circuit Diagram



Pulley Selection

- On the control panel there will be a knob that will allow a guest to rotate the turbines within the exhibit
- The rotation is made possible through the use of pulleys purchased from McMaster



Final Design Specifications

- Project Analysis

- Exhibit Dimensions and Frame Design
- Frame Material and Building Options
- Cabinet Maker
- Wind Generation & Velocity Measurement
- Electrician
- Budget Analysis

- Components

- Wind Turbines
- Power Meters
- Start Buttons
- Kill Switch
- Honeycomb
- Fan



Budget



● Wind Generation	\$415.25
● Power Generation	\$352.64
● Electrical Systems	\$1502.37
● Flow Management	\$100.00
● Exhibit Casing	\$1500.00
● Sub-Total	\$3870.26
● Total (With 20% Cushion)	\$4700.00

Future Work

- Make Formal Presentation to the Museum
- Begin Ordering Parts
- Start the Assembly of the Exhibit
- Testing of components



Acknowledgments

A vertical-axis wind turbine stands on a grassy hillside. The turbine is white with three blades. In the background, there are blue mountains under a cloudy sky. The foreground shows a green field with a fence line.

- Ms. Heather Whitaker – Director of MAOS
- Dr. Li - EE Department
- Dr. Cartes – ME Department
- Mr. Jason Schmidt – 8020 Representative
- www.Inspeed.com - Free Vertical Axis Rotor