Model Wind Turbine Competition Grade 6-10 Students

This is an old scope which can act as a guide in the classroom until the new Technical Chair has a chance to edit.

WIND POWER is the fastest growing energy source in the world. In 2015, the total installed wind power capacity worldwide exceeded 450 gigawatts (GW), which represented a massive increase over the previous decade. Although a relative newcomer to wind farm development, Canada's energy industry has grown rapidly since 2000, with installed capacity increasing by an average of 51% annually. Canada's current installed capacity is 11,205 megawatts (MW).

In British Columbia, many sites on Vancouver Island have been identified as having good wind resource potential, with predicted average annual wind speeds of 6 to 8 m/sec. A full 50% of all new energy generation is to come from clean sources, a target chosen voluntarily by British Columbia's electricity distributors.

Accordingly, Skills Canada-BC would like to encourage students in Grades 6 - 10 across the province to use their knowledge, skills, leadership, teamwork and ingenuity to design and build a working model wind turbine in a one day competition.

The Challenge

Teams of one to four students from the same school will design and construct a working model wind turbine. The students will be given specific materials to construct the wind turbine and will have approximately **four hours** of building time at the competition site.

However, teams may **not** pre-construct a model wind turbine to use during the competition. Only the design sketches and blueprints may be brought to the competition.

The model wind turbine will need to be solidly constructed and able to generate electrical power, which will be measured. Wind simulation will be created by a fan situated at a measured distance from the wind turbine being tested.

Model wind turbines will be judged by the voltage-generating capacity. The wind turbine that produces the most energy will be declared the winner. Where a tie occurs, the quality of construction will be judged as the tie breaker. Turbine voltage generating capacity will be measured electronically and competitively in a progressive play down. Three medals will be awarded.

Teachers

Teacher advisors are allowed to provide guidance and advice **before** the competition starts. The challenge is designed to test problem solving skills and involves a broad base of curriculum including covered prior to the competition:

- Turbine and blade design research
- Wind power/energy and geographical constraints
- Electricity generation theory and practice
- Construction principles: structure and strength
- Adhesives and bonding
- Leadership
- Teamwork
- Time management

Eligibility

The winning team from a regional competition is eligible to register. Once all the regional gold medal teams are registered and if space is available then teams will be accepted on a first-come, first-serve basis. Extra teams will be placed on a waitlist and will be notified if there is space available.

Teams may consist of up to 4 students in grades 6 – 10.

Each team must have one teacher/advisor.

Check the website www.skillscanada.bc.ca in February for details on registration
The following items **may** be used to present design sketches and blueprints and will be provided by the competitor

Item	Quantity
Paper, regular bond, 8.5” x 11” sheets	2
Poster board, 22” x 28” sheets	2

The following items ***will be supplied by the sponsors*** for wind turbine construction on the day of competition:

Item	Quantity

- 3.5 volt hobby motor 1
- Balsa wood, 4" x 36" x 1/8" (10.2 cm x 91.4 cm x .32 cm), sheet 1
- Tape, masking, roll 1
- Hot glue gun(small) and glue sticks 1
- Propeller mount, max 12 hole, adjustable 1
- Wooden dowels, 1/4" diameter ..... max 12
- Utility knife, retractable 1
- Scissors, pair 1
- Geometry set 1
- Sand paper ..... selected

(Note: Propeller mount, motor, and dowels will be as shown at http://www.vernier.com/products/kidwind/wind-energy/kw-btpart/ No other tools or materials will be allowed in the construction of the model wind turbine.)

Power (Voltage Generation)

1. Highest voltage generated under test conditions.
2. Where a tie occurs, the quality of construction will be judged as the tie breaker.

Construction (Tie Breaker)

1. Adherence to design
2. Structural soundness
3. Economic use of materials
4. Quality of construction
5. Leadership, participation and teamwork

Voltage Generation Test Procedure

1. The model wind turbine is positioned on a 0.9m x 2m table, 60 cm from a three speed, 40 cm oscillating pedestal fan, which stands 100cm high, but is extendable to 125 cm. Manual support or touching of the turbine during the test period is not allowed. Weights will be provided to prevent the base from sliding.
2. Each team may test their wind turbine 3 times at any speed before the Official Test is given. THE OFFICIAL TEST, HOWEVER, WILL BE THE ONLY VOLTAGE RECORDED.
3. A stand will be provided to attach the propeller mount to.
4. A digital voltmeter is attached across the load device.
5. The fan is turned on and stepped through three speeds in until arriving at the highest fan speed.
6. The highest voltage reading at the highest speed is recorded.
7. The model wind turbine must survive the entire one minute test intact to be eligible to win in this category.
8. There will be a play down among the teams to determine the ultimate winner.

On the Competition Day

Team members should expect to arrive at the competition site facility on competition day at the time indicated on the Skills BC Website. T-shirts will be distributed at registration.

Recommended Schedule for the Day

9:00am- 9:30am	Announcements/Instructions
9:30am-12:00pm	Turbine Construction
12:00pm-12:30pm	Lunch (provided) (no advisor contact)
12:30pm-1:15pm	Final Touch Ups/Turbine
1:15pm- 1:45pm	Judging of Voltage Generation
2:00pm- 3:00pm	Awards Ceremony

For additional information:

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