

Northeast Ohio KidWind Challenge

KidWind Website: <https://www.kidwind.org/>

LBMS KidWind Website: <https://thonnings.blog/kidwind/>

Goal of KidWind:

To challenge students to research, design, build, test, and compete with model wind turbines following constraints

Purpose

- Get students excited about the promise and opportunities of renewable energy—specifically wind power—and its relationship to global climate change.
- Foster opportunities for students to build, test, explore, and understand wind energy technology at a manageable scale.
- Get students—particularly girls and underrepresented populations—excited about careers in STEM fields related to renewable energy.
- Build capacity of teachers, coaches, and other educators to better understand wind energy technology and development, as well as its promise and limitations.
- Connect students to mentors and role models in the renewable energy industry.

Teams work together building cars with *guidance* from a parent, teacher, or coach to compete in race and design categories.

Open to:

Any middle school/student in Northeast Ohio.

Teams:

Please limit the number of students per team to 2 or 3

Signup:

Email Kurt Thonnings at thonnings@wlake.org and directions will be sent to you.

See middle school students working on KidWind project: <https://photos.app.goo.gl/XZLOsiwiptHuKcES2>

Rules:

[Download official rules](#) from KidWind site

Notice @1:

This KidWind Challenge at this NE Ohio event is only open to middle school students this year. If you have high school students that would like to be in a Challenge, please let me know and if there's a demand, we'll try fitting you folks in next year.

Notice #2:

We run things a bit different at this challenge because of the limited time. Basically, we do only the wind tunnel part of the challenge. We also have two categories - Geared and Non-Geared - which will be recorded

separately. The geared turbines will compete in a 4 fan tunnel and the non-geared turbines will compete in a 1 fan tunnel.

Rules from KidWind

General Challenge Rules

- Each team that registers must have its own turbine. You will not be allowed to modify another team's turbine and use it for testing. You cannot have one turbine shared between teams and simply change blades or other parts for each team.
- Your team's turbine must be able to fit inside the wind tunnel and must be able to operate within its 48" × 48" internal dimensions (Geared). Non-geared tunnel will be 32"x32"x32". Sand bags or other weights will be available to hold the turbine in place in the tunnel.

Turbine Design Rules

- Turbines must use [KidWind Wind Turbine Generator \(KW-GEN\)](#) as the sole power generator for your wind turbine.
- Your turbine may have only one of these generators.
- Power must be generated solely by wind using the wind tunnel.
- Your turbine can either be built on a vertical or horizontal axis.
- You may attach parts to the generator to increase how fast or hard it spins (e.g. gears, bearings, supports, etc.).
- Your turbine may use a gearbox or pulley system to increase power output. You may use pre-manufactured gearboxes and other parts, but keep in mind that innovation is a critical judging criteria, and parts that you make on your own will earn you more points.
- You cannot use pre-manufactured wind turbine blades or airfoils/sheets.
- Your wind turbine must be free standing. A tower/ stand will not be provided.
- Metal, plexiglass, and other dangerous blade materials will not be allowed. Please be aware that turbines will be disqualified if they are deemed unsafe by the local judges.
- 3D printed parts and components are allowed. While you do not have to use files you created yourself, you should bring documentation about the CAD files to the Challenge and be prepared to discuss the design and the 3D printing process. Judges will want to make sure you understand this technology if you decide to use it.
- You must have two wires at the base of your turbine. You must label which wire is positive and negative, and the turbine must produce DC power for our data logging system.



Turbine Testing Time

- Prior to performance testing, teams will be given time to test their devices in the wind tunnel. This will give you a chance to evaluate the conditions. How long each team gets will be dependant upon the available time and the number of teams participating.

Turbine Performance Procedures

- Once the testing session begins, you will be given two minutes to set up your wind turbine inside the tunnel.
- The wires at the base of your turbine will be attached to a circuit with a 30 ohm resistor in series and will simultaneously measure voltage and amperage.
- In order to receive full marks for functionality, your wind turbine must be able to start producing power without external assistance once the wind tunnel is activated.

- During testing, the wind tunnel will be running constantly. Teams will not be allowed in the tunnel at any time the fans are operational.
- We will collect power output data between 30–60 seconds. Your energy output score will be calculated using a Vernier data-logging system that collects voltage and amperage readings simultaneously.
- The tunnels will either ‘suck’ in the air or push the air towards the turbine. This will be determined by the main judge running the Challenge.
- If your wind turbine slips, breaks, or falls over before the timer is started, you will either be given two minutes to set up your wind turbine again, or you will be allowed to remove the turbine to make repairs. In the latter case, you will be moved to the back of the line for retesting.
- You will only be given one restart opportunity. It may be granted before the 60 second test begins, or once it has begun, but not both! Local judges have final say on rulings and protests. Depending on your local Challenge rules, size, and timeframe, you may have between 1 and 3 trials for testing, and only your best trial will contribute to your final score.

Judging

If we have enough available judges, the following judging rubric will be employed:

Energy Produced (70% of Score)

The total energy output of your turbine over the 30 or 60-second trial period will be collected using data logging software. Each team’s energy output will be ranked relative to that of other competitors. Each team will receive points corresponding to its rank. Energy scores will be ranked on a comparative basis. The highest producing turbine will receive the full number of available points, and following turbines will follow in rank.

Turbine Design (30% of Score)

A panel of judges will examine your wind turbine design before testing it in the wind tunnel. You must be prepared to discuss/defend the choices you incorporated into the design. The design criteria you will be judged on include:

- The choices and mechanisms by which you maximized power output
- Craftsmanship of your design, creativity, and economic and environmental decisions. Did you use recyclable materials? Can you take your turbine apart after the competition and reuse the parts? The judges will be very interested in how you developed and constructed specific parts of your turbine. Make sure you understand the decisions you made when constructing the following components:
 - 10% Blades
 - 10% Drivetrain
 - 10% Innovation