INSTANT CHALLENGE: IDEA BANK

At a KidWind Challenge students prepare for a few major categories of competition.

At every KidWind Challenge there will be a wind tunnel and turbine performance testing. This is the hallmark event at each challenge. We also hope that students are judged on their knowledge of wind energy concepts, how well they have documented their construction process and their overall turbine design.

In recent years some sites have developed instant challenges that happen the day of the event. Typically students do not formally prepare for these events and they may or may not count towards their total score at the KidWind Challenge. As we want KidWind Challenges to be locally run we leave those kinds of decisions up to the local organizations!

Here are some instant challenges that have been used at prior events. We have provided descriptions of the events and then some judging rubrics. You are free to use these as is or adapt for your situation. While they are not all wind related, they are all fun!

Sail Car Challenge: Students have 20-30 minutes to construct a wind powered car that goes as far as possible using only the parts provided on the table and the fans provided.

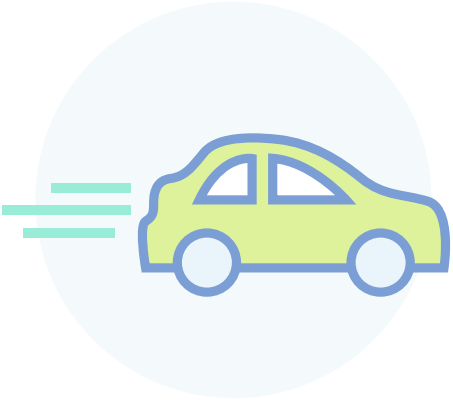
MacGyver Windmill Challenge: Students are provided with a bag of junk and are given 30 minutes to construct a windmill that lifts as much weight as possible.

Offshore Wind Challenge: This instant challenge is a little more complicated as you need a small pool of water. Students have to construct a floating turbine that survives waves and wind and does not move around too much.

Solar Boats Challenge: Students have to construct a solar boat with the materials provided and then at a predetermined time near the end of the day they have to race.

Wind Farm Challenge: In this challenge students are presented with a series of maps and must select the best location for a wind farm. There is a digital, paper & pencil and a physical version of this event being planned.

SAIL CAR INSTANT CHALLENGE



Sail car instant challenge is as simple as it gets - but that is what makes it totally fun. This challenge can be done with students as young as 2nd grade, but it will also provide a challenge to high schoolers as well. Basically what students are trying to do is construct a wind powered car that travels the farthest.

Here's what you need:

- Sail Car Kit from REcharge Labs
- 50 -100ft tape measure
- Scissors, scotch tape, and masking tape
- 2 simple box fans
- A long hallway to do your testing.

You can watch a video here on what this event looks like.

There are two ways to do this with students - limited or unlimited materials.

Unlimited:

Put all materials on the table and let the students go at it. I like to have the sail car decks premade so the students don't have to spend time constructing that part. Students can then use as much tape, paper skewers and whatever they need to make their sail car.

Limited:

Each team gets a sail car deck and a bag of materials. While they can use as much tape as they want they will not get anymore paper, skewers etc. They have to do the best with what they have.

Testing

We allow students to test their cars as many times as they can in the 20-30 minute challenge. We take their longest run as their final score.

Scoring

You can score this challenge anyway you like, we typically do comparative scoring on an event like this.

Example: Sail Car event is worth 10 points at the Minneapolis KidWind Challenge. Team A has the best car that travels 60 meters. Team C car travels 20 meters. Team A gets 10 points, Team C gets 3.33 points.

SAIL CAR INSTANT CHALLENGE SCORING SHEET

TEAM NAME: _____

LEVEL: ☐ Middle School ☐ High School

Sail Car Challenge Distance Trials

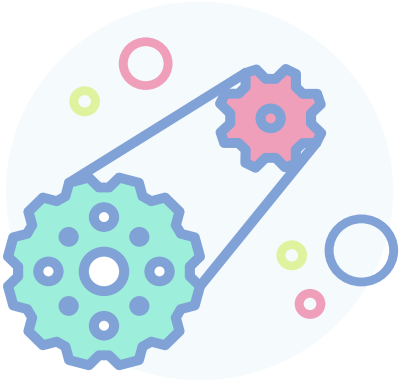
Teams may construct and test as many cars as time allows.

Trial #1	_____ m
Trial #2	_____ m
Trial #3	_____ m
Trial #4	_____ m
Trial #5	_____ m
Trial #6	_____ m
Performance: How far did their best car travel?	_____ **m**

RANK:	_____/_____ total teams

Comments:

MACGYVER WINDMILL INSTANT CHALLENGE



In the MacGyver windmill Challenge student have to construct a windmill that lifts as much weight as possible in 30 minutes. This challenge can be done with students as young as 4th grade, but it will also provide a challenge to high schoolers as well.

Here's what you need:

- MacGyver Windmill Kit from REcharge Labs
- 2-4 Box Fans
- Scissors, duct tape and other basic tools
- 2 simple box fans

There are two ways to do this with students - limited or unlimited materials.

Unlimited:

Put all materials on the table and let the students go at it. Students can then use as much tape and whatever they need to make their windmill.

Limited:

Each team gets a bag of materials and 1 foot of duct tape. They have to do the best with what they have.

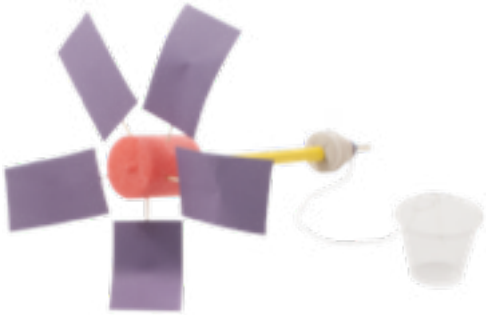
Testing

Testing is pretty simple students have until the end of the 30 minutes to do a test in front of a fan to see how many washer they can lift. Lifting means that the washers that are connected to the drive train are moving. The other way to do this challenge is to give students 8 washers. They have to use all eight washers and you time how long it takes for the washers to move through 50cm.

Scoring

You can score this challenge anyway you like we typically do comparative scoring on an event like this.

Example: MacGyver Windmills event is worth 10 points at the Minneapolis KidWind Challenge. Team A has a windmill that lifts 40 washers. Team C has a windmill that lifts 20 washers. Team A gets 10 points, Team C gets 5 points.



MACGYVER WINDMILL INSTANT CHALLENGE RUBRIC

TEAM NAME: _____

LEVEL: ☐ Middle School ☐ High School

Option #1: Lift as much weight as you can!

How many washers did the team lift?	

The washers must be moving through a 20 cm distance to be counted!

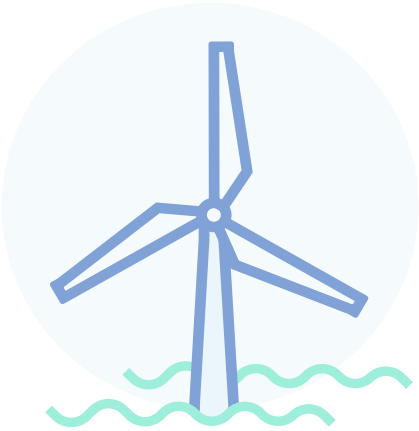
Option #2: How fast can you lift 8 washers?

How many washers did the team lift?	

Time took for the washers move through the 50 cm window?

Comments:

OFFSHORE WIND INSTANT CHALLENGE



During this activity, teams will design an object resembling an floating offshore wind turbine that needs to float in water and remain as stationary as possible in wind and waves. Teams will build one platform to test. Platforms will be tested in water with wind (fan) and waves (paddle). Platforms will be evaluated based on floatation, stability of the platform, and material costs.

This activity is based on a great lesson by University of Maine Advanced Structures & Composites Center:

Here's what you need:

- Desktop Wind Turbine (Check Amazon)
- Rubber bands
- Duct tape
- Pool noodles or foam squares
- Plastic bottles
- Concrete mixing tub or kiddie pool
- Fake money
- Paper clips
- Balloons
- Washers
- Dowels or popsicle sticks
- String
- Zip Ties
- Pocket Lab

Rules:

- Each team must purchase one desktop wind turbine.
- Teams can purchase any materials available to build their platforms.
- Teams have a total of 30 minutes for this Challenge:
  - 20 minutes to gather materials and build
  - 5 minutes to test
  - 5 minutes to clean up
- Teams will test their turbines in the pool provided
- Once teams demonstrate that their turbine floats, a PocketLab sensor will be mounted on the base of the turbine, wind and waves will be created, and a stability measurement will be taken over 30 seconds.

Scoring Criteria:

1. Does the team work well together? N = 0 points Y = 2 points
2. Does the turbine floats? N = 1 points Y = 2 points
3. How stable is the turbine?
   - Max acceleration in the X & Y planes over 30 seconds >4 m/s2 = 0 points
   - Max acceleration in the X & Y planes over 30 seconds <4 m/s2 = 1 point
   - Max acceleration in the X & Y planes over 30 seconds <2 m/s2 = 2 points
4. How much did it cost to build?
   - Costs >$60 = 0 points
   - Costs <$50 = 1 points
   - Costs <$40 = 2 points
5. How cool is the overall design? 0-2 Points
   - How does the overall design look? Well made? Innovative? Interesting?

OFFSHORE WIND INSTANT CHALLENGE RUBRIC

TEAM NAME: _____

LEVEL: ☐ Middle School ☐ High School

Did the team work well together?	Y: 2 pts, N: 1 pt	
Does it float?	Y: 2 pts, N: 1 pt	
Was it stable? How stable?	Max acceleration in the X & Y planes over 30 seconds >4 m/s2 = **0 points** Max acceleration in the X & Y planes over 30 seconds <4 m/s2 = **1 point** Max acceleration in the X & Y planes over 30 seconds <2 m/s2 = **2 points**	

Material	**Manufacturing Cost**
1 - Desktop Wind Turbine	$10
4 - Rubber Bands	$3
4” - Duct Tape	$5
1 - Foam Cube or Pool Noodle Section	$12
1 - Plastic Bottle	$5
4 - Paper Clips	$3
1 - Balloon	$4
4 - Washers	$5
8 - Dowels or Popsicle Sticks	$2
6” - String	$4
2 - Zip Ties	$8
Costs >$60 = 0 points Costs <$50 = 1 point Costs <$40 = 2 points	Total Cost: _____ Total Score: _____

Overall design (0-2 points)	

Comments:

TOTAL SCORE:	