2026 KidWind Challenge Teacher Workshop

Hosted by the Kansas Energy Program

- Manhattan (10/13)
- Kansas City, Kansas (10/16)
- *Dodge City (10/28)*

Who are you talking with today?

We are part of Kansas State University Engineering Extension. The Kansas Energy Program (KEP) was established in 2016 through a partnership with the Kansas Corporation Commission Energy Office.

Introductions and Teams

- Name
- School
- Subject and grade level you teach
- Experience with KidWind

For today's Challenge, we'll split up into teams.

Before we get started . . .

- KidWind Padlet
- Parking lot – questions, ideas, vocab
- Please ask questions!
- No requirement to compete in KidWind
- Vocabulary handout
- Slides will be shared
- Flexible schedule today
- We’ll cover many age-levels (4^{th} - 12^{th})

KidWind Challenge Padlet!

Today is for Exploring

We're covering a lot today! No need to remember everything. We want you to walk away with ideas, inspiration, and resources. Plus, you'll get a copy of everything.

What we hope you will gain today

- Knowledge of available energy-related resources
- Ideas to implement resources at your school or program
- Ongoing relationship with KEP and others here today
- Confidence to bring KidWind (in some form) to your students
- What the KidWind Challenge is like

Remember: Everything we do at KEP is free for educators!

What won't be covered

- A specific lesson breakdown
  - No school or program is alike
  - We provide multiple free lessons/resources for you to choose
- In-depth discussions beyond the basics
  - We provide the platform and basic knowledge.
  - Some teachers/ students have surpassed our knowledge on topics such as DIY generators and 3D printing.
- Memorization
  - We want to focus on concepts
  - Problem solving and inquiry are crucial skills for students to learn

Newsletter Announcements

Subscribe to our monthly newsletter for KidWind and energy education updates
(use QR code or kansasenergyprogram.org/signup)

@KansasEnergyProgram

@kansasenergyprogram

@kansasenergyprogram

https://kansasenergyprogram.org

Today's Agenda

We'll walk you through a typical KidWind Challenge event day. You'll get to explore and test each aspect of the competition.

- 9:00-9:30: Introduction
- 9:30-9:50: Wind Energy Resources & Activities
- 9:50-10:40: Instant Challenge
- 10:40-10:50: Break
- 10:50-11:00: Add-On Activities & Resources
- 11:00-12:15: Wind Turbine Building and Design
- 12:15-12:45: Lunch
- 12:45-1:05: Knowledge Quiz
- 1:05-2:20: Wind Turbine Testing (wind tunnel)
- 2:20-2:40: Judges Panel
- 2:40-3:00: Regionals, State, Worlds - Oh my!
- 3:00-3:15 Wrap Up and Q&A

Introduction to the KidWind Concept

What is KidWind?

Benefits of KidWind

- NGSS-Aligned Science and Engineering standards
- Career connections
- Project-based
- Compete with peers in a supportive environment
- Students learning and using soft skills
- Support from KEP (events, resources, equipment, reimbursements)

What your students will learn through KidWind

(based on feedback from 2025 KidWind teachers/coaches)

Opportunities Are All Around!

STEM-Focused Classes

Career & Technical Education

Clubs & Competitions

Job Shadowing & Internships

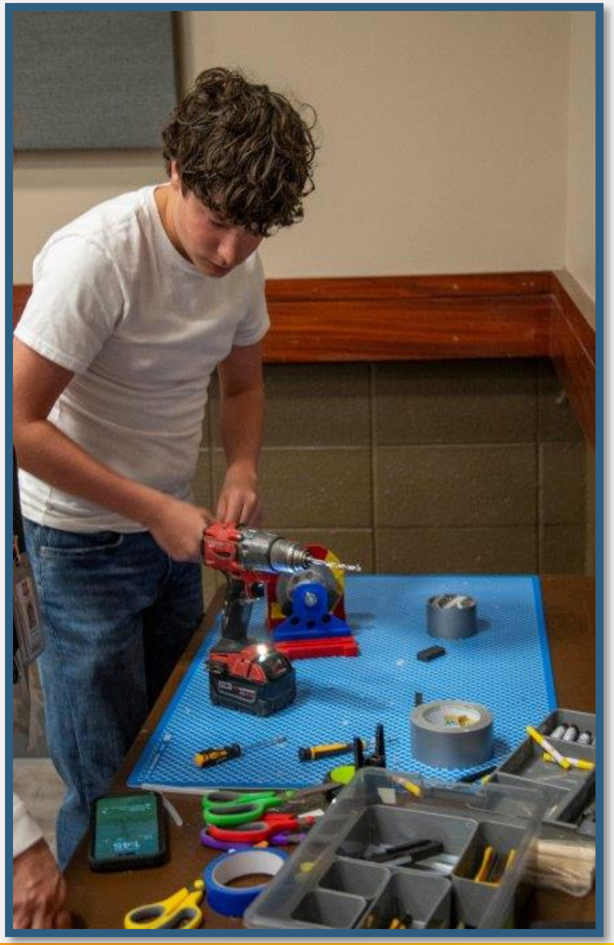
Dual Credit or Technical College Courses

Many Energy Educational Opportunities in Kansas

- **Colby Community College** – Wind Technology, Solar Photovoltaic
- **Cloud County Community College** – Wind, Solar, Blade Repair, Substations, Drones
- **Hutchinson Community College** – HVAC, Industrial Electrical Tech, Industrial Mechanical Maintenance, Renewable Energy Technology, Welding, Automation Engineer
- **Johnson County Community College** – Automation Engineer, Data Analytics, Electrical/Electronics, HVAC
- **Kansas City KS Community College** – Electrical Technology, Electronics Engineering Technology, Env. Studies, HVAC, High Voltage Line Tech
- **Manhattan Area Technical College** – Electric Power & Distribution, HVAC, Welding, Industrial Maintenance Technology
- **K-State** – Engineering, Agriculture, Chemistry, Education
- **KU** – Law (Env, Energy, Natural Resources), Engineering, Chemistry

Other Fields of Study that are Needed in the Energy Industry

- Accounting and Finance
- Biology
- Chemistry
- Communications
- Computer Science
- Education
- Graphic Design
- Law
- Leadership and Management
- Sociology



Basic Competition Overview

1. Form teams (typically 3-5 students) in three divisions *(4th-5th, 6th-8th, or 9th-12th grade)*
2. Students design and build a wind turbine, learn about energy, and prepare a presentation
3. Optional: Host a Challenge at Your School
4. Attend a 1-day regional KidWind Challenge (four competition areas)
5. Winners advance to State and World Challenges

Four Parts in Photos *(more details later)*

How Points Are Scored

Turbine Performance (40 points)

Judges Panel (40 points)

Knowledge Quiz (10 points)

Instant Challenge (10 points)

(more details later as we discuss each part of the Challenge)

KidWind Rules and Logistics

We'll share more on this toward the end of the day

KidWind Fellow

Brendan Devening

devening1230@ksu.edu

ksenergyprog@ksu.edu

Discussion Question

Why are you here today? How do you hope to use what you learn?

Teaching Wind Energy - Resources and Activities

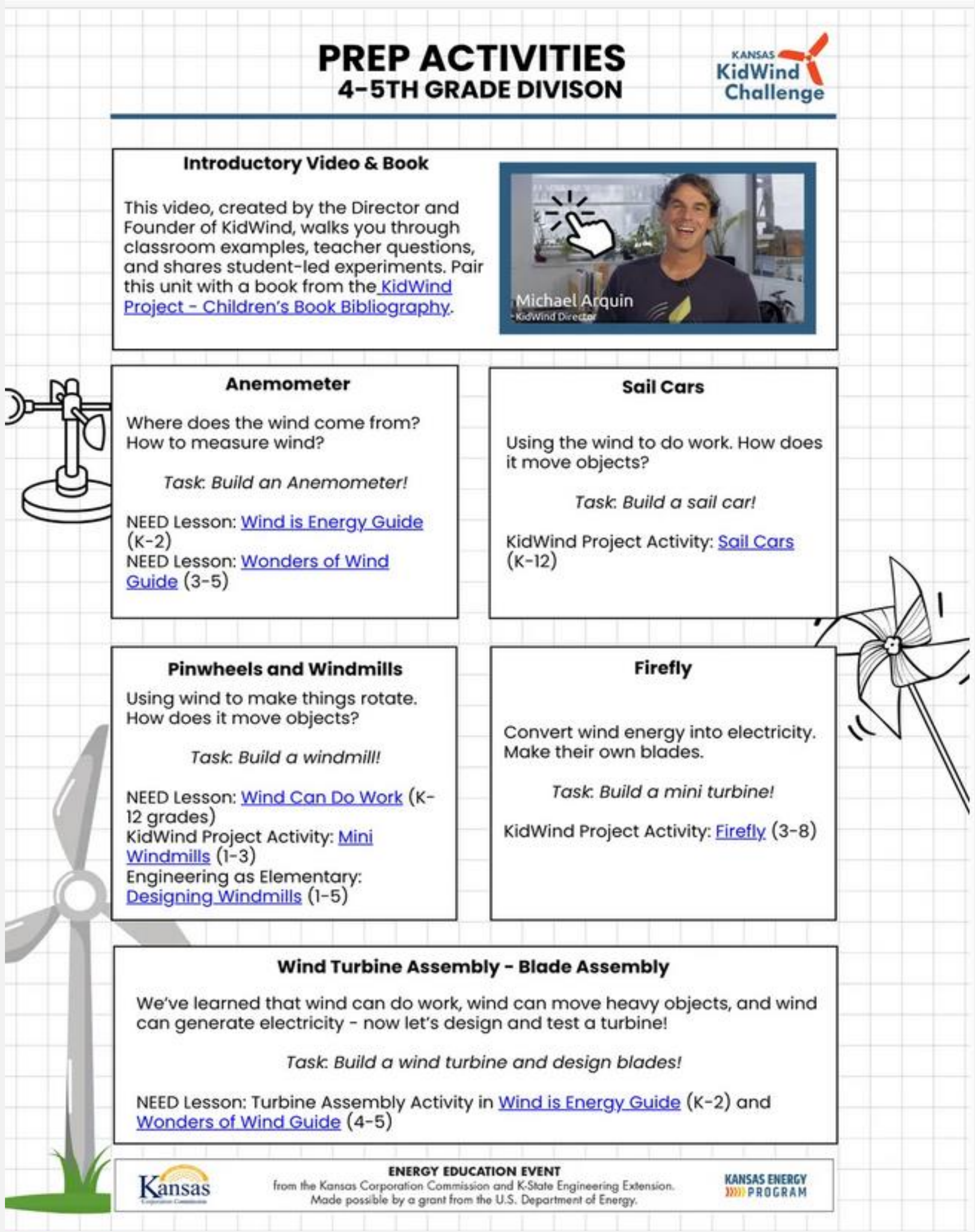
Ideas and examples of resources available through KEP

Where to start?

One-page "Prep Activities" by age division available on Padlet.

All KidWind-specific resources are available on the KEP website at

https://kansasenergyprogram.org/educators/kidwind-challenge/kidwind-resources



PREP ACTIVITIES
4-5TH GRADE DIVISON

KANSAS KidWind Challenge

Introductory Video & Book

This video, created by the Director and Founder of KidWind, walks you through classroom examples, teacher questions, and shares student-led experiments. Pair this unit with a book from the KidWind Project - Children's Book Bibliography.

Michael Arquin
KidWind Director

Anemometer

Where does the wind come from? How to measure wind?

Task: Build an Anemometer!

NEED Lesson: Wind is Energy Guide (K-2)
NEED Lesson: Wonders of Wind Guide (3-5)

Sail Cars

Using the wind to do work. How does it move objects?

Task: Build a sail car!

KidWind Project Activity: Sail Cars (K-12)

Pinwheels and Windmills

Using wind to make things rotate. How does it move objects?

Task: Build a windmill!

NEED Lesson: Wind Can Do Work (K-12 grades)
KidWind Project Activity: Mini Windmills (1-3)
Engineering as Elementary: Designing Windmills (1-5)

Firefly

Convert wind energy into electricity. Make their own blades.

Task: Build a mini turbine!

KidWind Project Activity: Firefly (3-8)

Wind Turbine Assembly - Blade Assembly

We've learned that wind can do work, wind can move heavy objects, and wind can generate electricity - now let's design and test a turbine!

Task: Build a wind turbine and design blades!

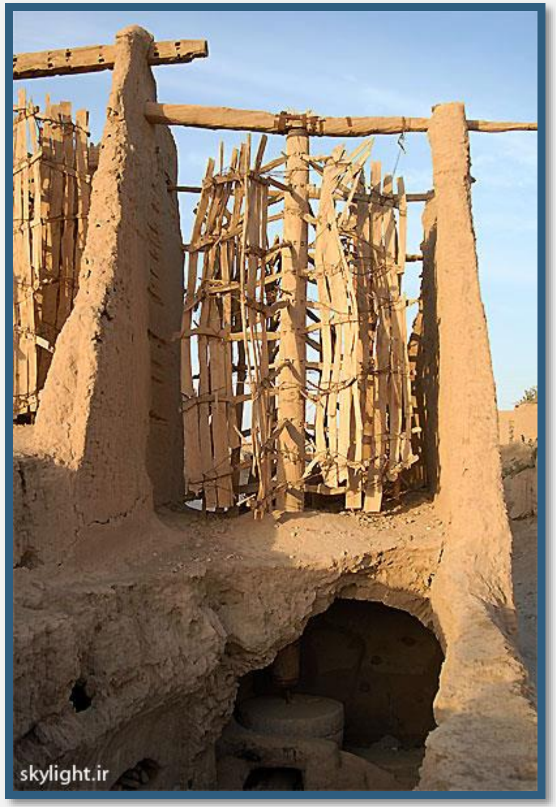
NEED Lesson: Turbine Assembly Activity in Wind is Energy Guide (K-2) and Wonders of Wind Guide (4-5)

Kansas Corporation Commission
ENERGY EDUCATION EVENT
from the Kansas Corporation Commission and K-State Engineering Extension.
Made possible by a grant from the U.S. Department of Energy.
KANSAS ENERGY PROGRAM

How did humans first harness wind energy?

Wind-Powered Sailcar Activity

- Great intro activity for older students or as a lower primary-level activity.
- Watch our how-to video at: www.youtube.com/watch?v=ieFaGsl8tww
- View the curriculum at https://kidwind.org/activity/sail-cars/
- Supplies and support available



What is the difference between a wind mill and a wind turbine?

MacGyver Challenge

- Great intro activity for older students or as a lower primary-level activity.
- How-to video at: www.youtube.com/watch?v=ieFaGsl8tww
- View the curriculum from KidWind at https://kidwind.org/activity/macgyver-windmills/
- Supplies and support available

Fireflies

Students build a small wind turbine that captures kinetic energy from moving air, converts it into mechanical rotation, and then into electrical energy that can power a small LED or other low-power device.

https://kansasenergyprogram.org/educators/kansas-energy-programs-equipment-library/inventory/firefly-kit

Build the Turbine

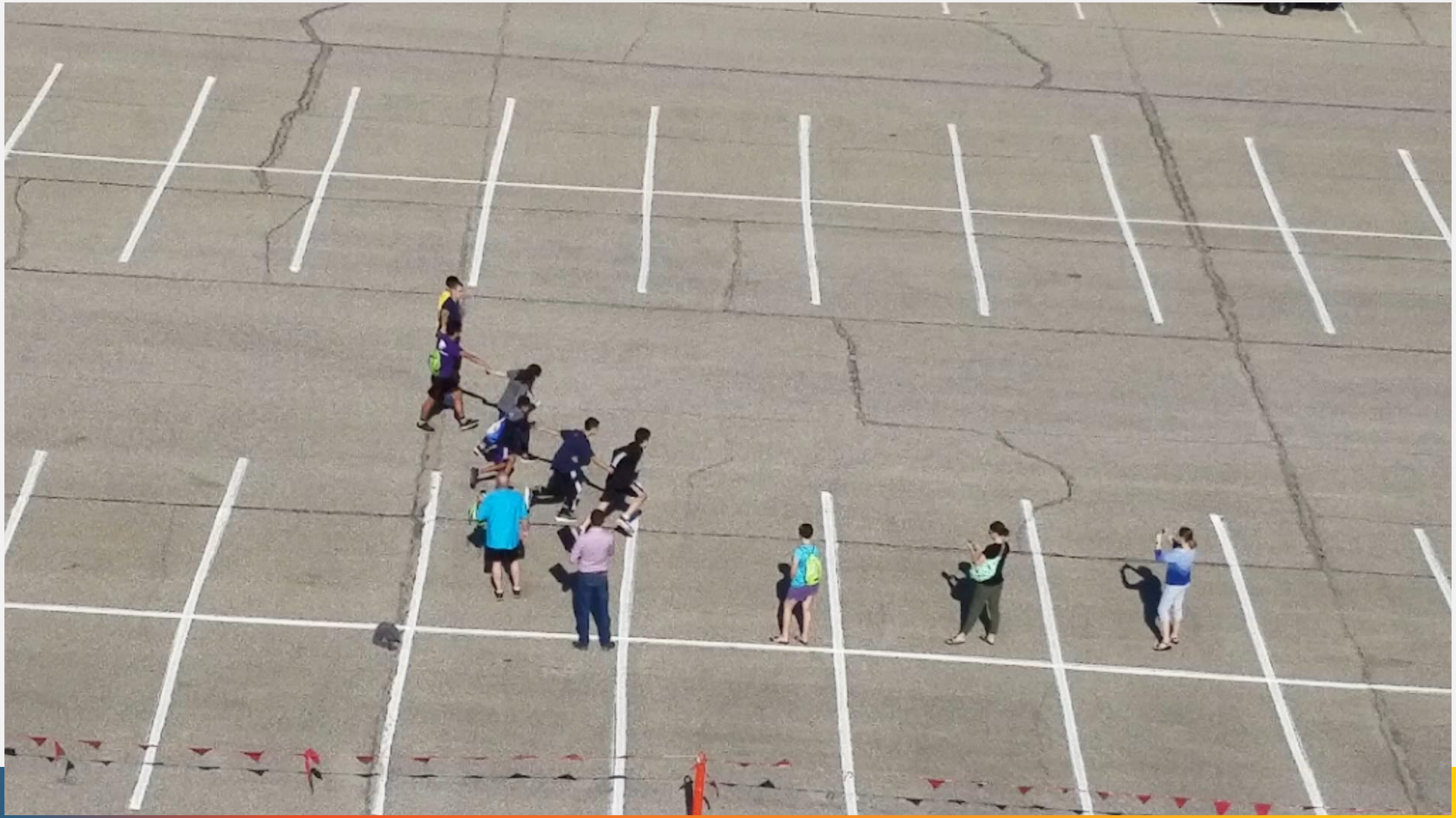
Students work in teams to “build” a wind turbine by rotating through challenge stations, learning turbine parts, and assembling a labeled drawing by the end.

https://kansasenergyprogram.org/educators/activities-and-curricula/build-turbine-activity

Build Your Own Generator

The simpleGEN is an easy-to-build generator that allows students to explore the basics of electrical generator design.

Be the Blade



Be-the-Blade Follow-Up Activity: Calculate wind tip speed

Assume 400′ rotor diameter (200′ radius); 10 revolutions per minute (10rpm)

$$Distance\ traveled\ (circumference)\ in\ one\ revolution = \pi\ x\ diameter \quad OR \quad 2\pi\ x\ radius$$

$$Distance\ traveled\ per\ revolution = \pi\ x\ 400\ feet = 1{,}256.6\ feet$$

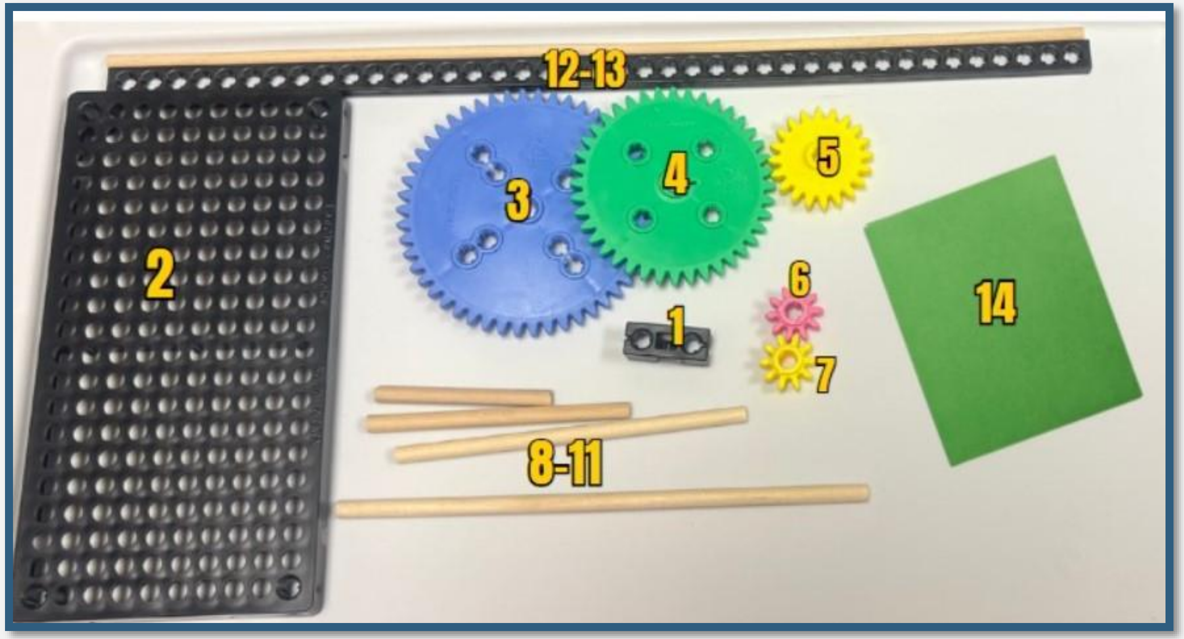
$$\frac{10\ revolutions}{1\ minute}\ x\ \frac{1{,}256.6\ feet}{1\ revolution}\ x\ \frac{1\ mile}{5{,}280\ feet}\ x\ \frac{60\ minutes}{1\ hour} = 143\ \frac{miles}{hour}$$

https://kansasenergyprogram.org/educators/activities-and-curricula/be-blade-activity

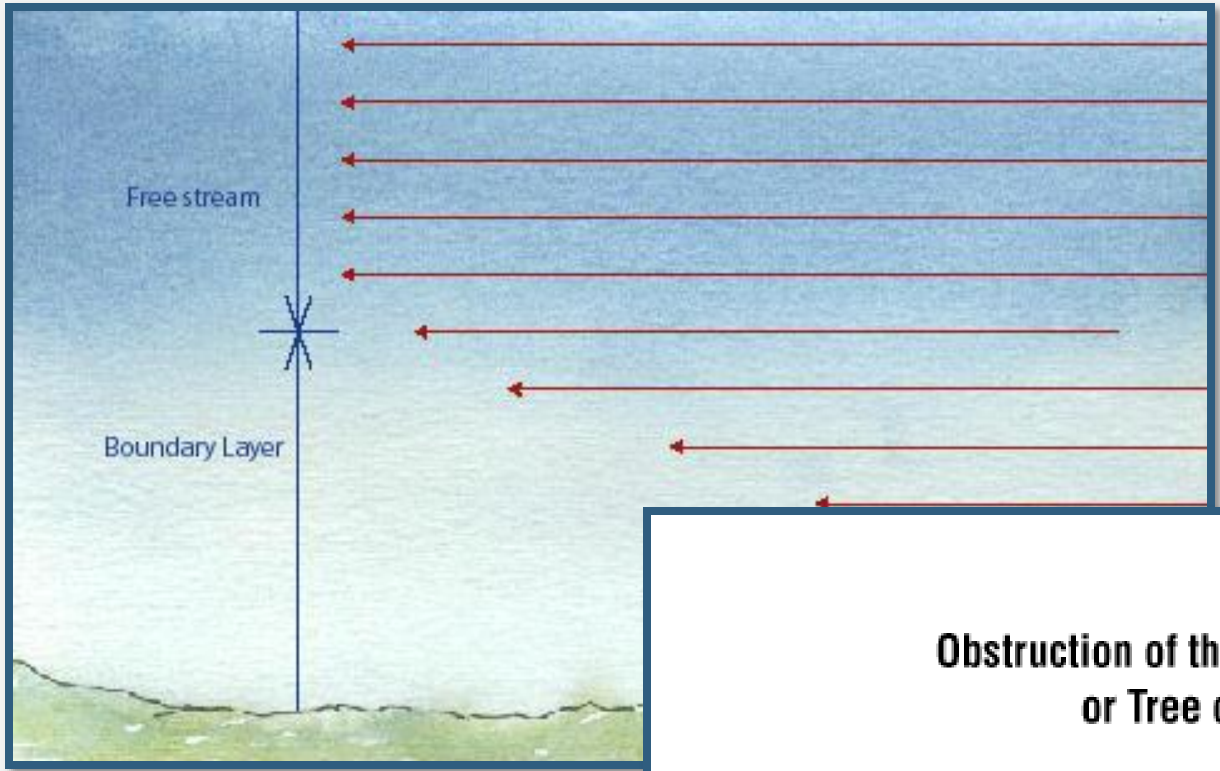
Gear Ratio Kit

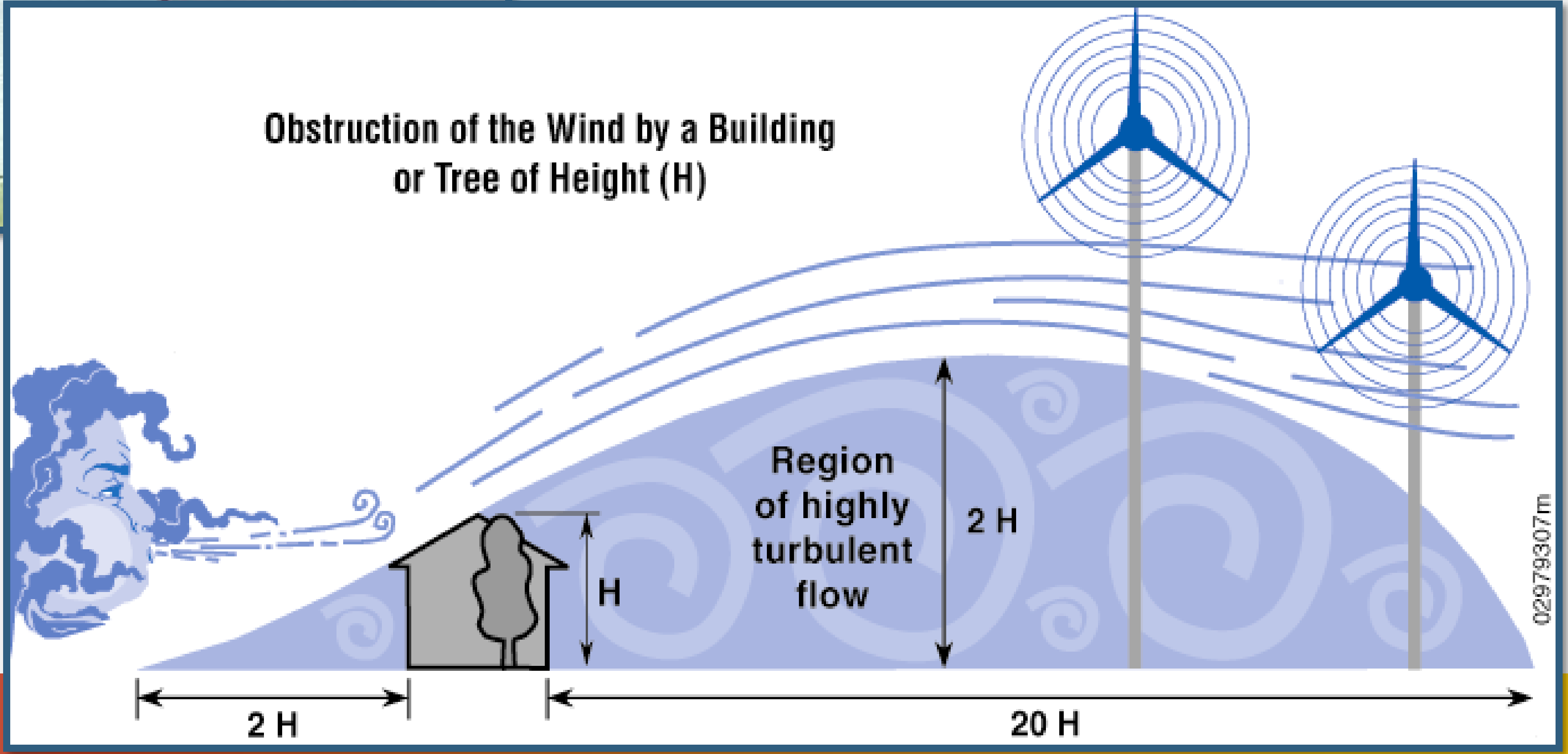
Students create different gear ratios and evaluate which ratio would benefit electricity production the most.

(We'll talk more about gears later)

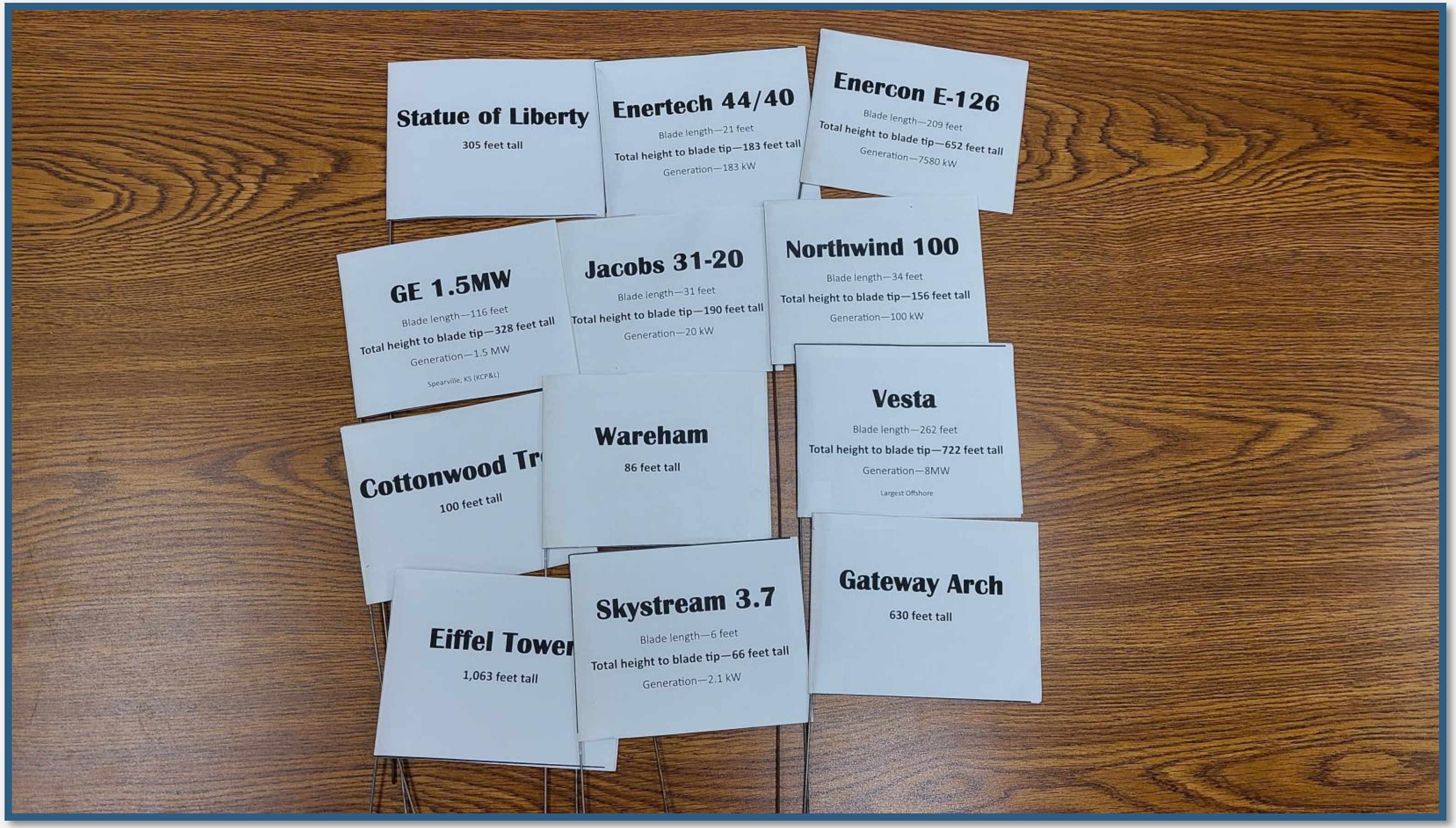


Why are Wind Turbines so tall?





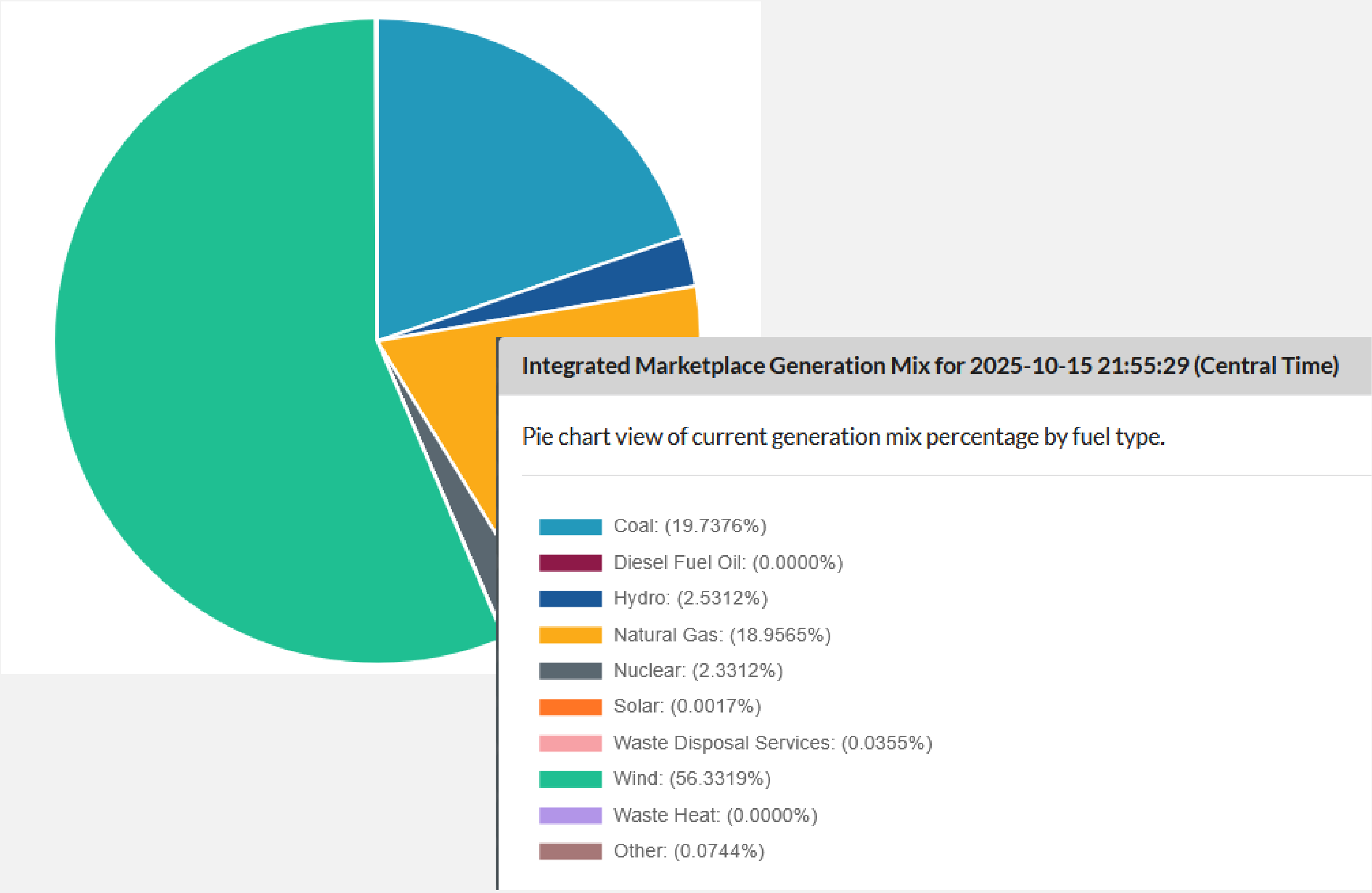
Go the Distance



https://kansasenergyprogram.org/educators/activities-and-curricula/measure-distance-activity

What's Powering Our Grid?

In Kansas, the electric grid is overseen by the Southwest Power Pool (at least a portion of 14 states are included). Check on the current mix of sources at any time! https://portal.spp.org/pages/integrated-marketplace-generation-mix



Other Resources about Wind As a Resource

- Wind farm locations - https://eerscmap.usgs.gov/uswtdb/viewer/#7.18/38.514/-98.32
- Wind turbines in KS, MO, and U.S. - https://energy.usgs.gov/uswtdb/data/
- Kansas state energy profile - https://www.eia.gov/state/?sid=KS
- Wind energy in Kansas - https://windexchange.energy.gov/states/ks
- NEED Project (energy curricula) - https://www.need.org/educators/

Discussion Question

What challenges do you anticipate students having with these concepts?

Instant Challenge

Instant Challenge Rules (10pts)

- Unannounced until students arrive, so no preparation is necessary
    - Study Guides available by age division
- Set amount of time to complete
- Instructions and materials will be provided
- Adapted to each age division

Previous Instant Challenges:

- Wind Siting
- Gear Ratio
- Data analytics
- Circuits
- MacGyver Windmill

Instant Challenge

Dan Whisler from Trane

Dan.Whisler@trane.com

The story of energy in Kansas…told with LEGO's!

2010	R/N	rounded #	Renewables	Non-renewables
Solar	R	0	0	
Nuclear	N	100		10
Hydro	R	0	0	
Wind	R	30	3	
Geothermal	R	0	0	
Natural Gas	N	280		28
Coal	N	360		36
Biomass	R	20	2	
Petroleum	N	410		41
		Totals -	____5____	___115____

2021	R/N	rounded #	Renewables	Non-renewables
Solar	R	0	0	
Nuclear	N	90		9
Hydro	R	0	0	
Wind	R	230	23	
Geothermal	R	0	0	
Natural Gas	N	290		29
Coal	N	220		22
Biomass	R	20	2	
Petroleum	N	340		34
		Totals -	____25_____	____94_____

Instant Challenge

- Firefly
- Parts of the firefly

Goal: Design a set of blades that capture the wind to generate electricity to power an LED.

Discussion Question:

What ideas were sparked by this activity?

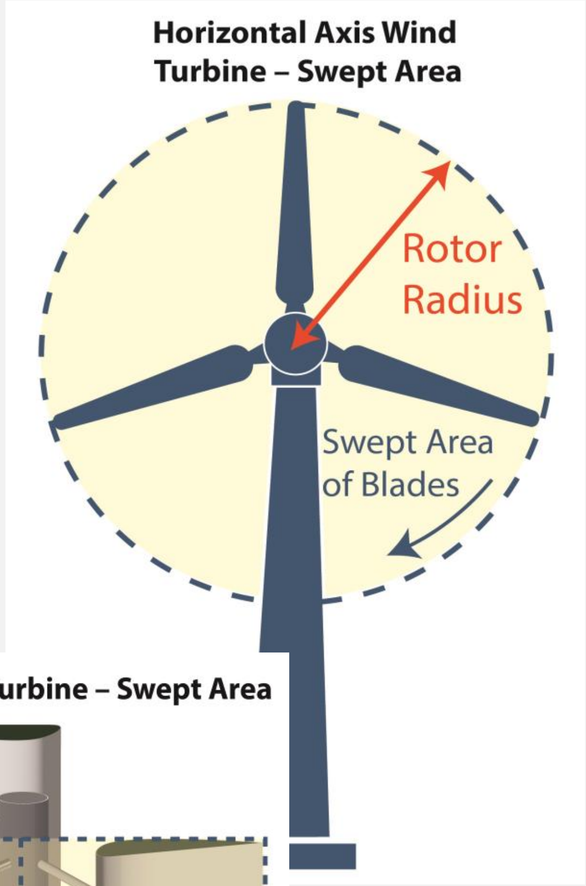
What would your first lesson or activity on wind energy look like?

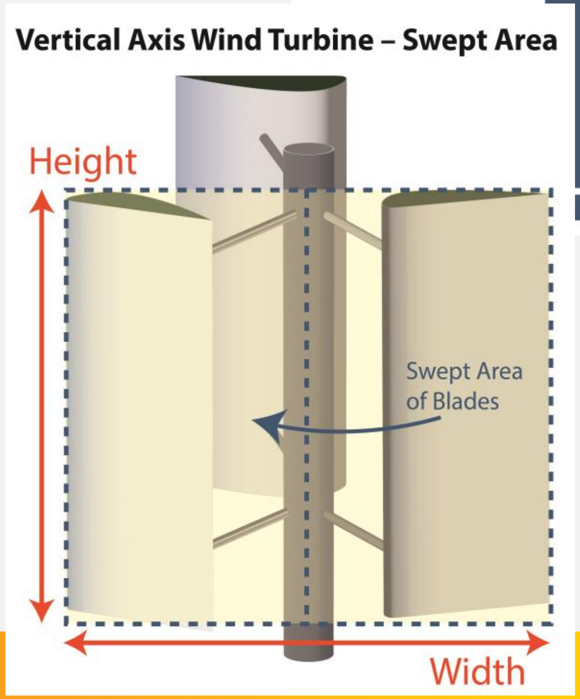
Add-On Activities

And ideas for upper-level students

Calculating wind power

- Power in the Wind = $\frac{1}{2}\rho AV^3$
  - Air density, ρ
  - Swept area, A
  - Wind speed, V
- Swept area (horizontal): $A = \pi R^2$
  - Area of the circle swept by the rotor
  - Doubling the length of a blade will result in 4x the power
- Betz limit (59%)
  - Theoretical maximum power that can be produced by a wind turbine





Activity: Calculating wind power *(Part 1)*

Your students want to know how blade length affects energy output. Use the Wind Power formula to evaluate two wind turbine designs:

Turbine A: 20-cm (0.2 meter) blade length *(radius: 0.2m)*
Turbine B: 40-cm (0.4 meter) blade length *(radius: 0.4m)*

First we'll need to calculate the Wind Swept Area:

$$Turbine\ 1\ wind\ swept\ area = \pi r^2 = \pi \times 0.2^2 = 0.126\ square\ meters$$

$$Turbine\ 2\ wind\ swept\ area = \pi r^2 = \pi \times 0.4^2 = 0.503\ square\ meters$$

Activity: Calculating wind power *(Part 2)*

Assumptions:

- Air density of 1 kg/m^3
- Wind speed of 3 meters/second

Wind swept area (from previous slide):

- Turbine 1: 0.123 square meters
- Turbine 2: 0.503 square meters

Next we can calculate Available Power:

$$Turbine\ 1\ available\ power = \frac{1}{2}\rho A V^3 = \frac{1}{2} \times 1\frac{kg}{meter^3} \times 0.123\ sq.meters \times 3\frac{meters}{second}^3 = 1.66\ Watts$$

$$Turbine\ 2\ available\ power = \frac{1}{2}\rho A V^3 = \frac{1}{2} \times 1\frac{kg}{meter^3} \times 0.503\ sq.meters \times 3\frac{meters}{second}^3 = 6.79\ Watts$$

Results: By doubling the blade length, available wind power was increased 4x!

Remember to take the Betz limit into account – meaning the theoretical maximum power will be about 59% of these values (but most likely quite a bit less than that).

Wind Speed

- It’s the most important factor when generating power from wind
- Power is a cubic function of wind speed
  - V × V × V
- 20% increase in wind speed means 73% more power
  - 1.0 m/s wind speed: 1 × 1 × 1 = 1
  - 1.2 m/s wind speed: 1.2 × 1.2 × 1.2 = 1.73
- Doubling wind speed means 8 times more power
  - 2.0 m/s wind speed: 2 × 2 × 2 = 8

Activity Idea: How many homes can a wind turbine power?

Assumptions: 2-MW turbine; 40% capacity factor; average home uses 11,000 kWh electricity per year

$$2\ Megawatts\ x\ \frac{40}{100}\ x\ \frac{24\ hours}{day}\ x\ \frac{365\ days}{year} \times \frac{1{,}000{,}000\ Watts}{1\ Megawatt}\ x\ \frac{1\ kilowatt}{1{,}000\ Watts} = 7{,}008{,}000\ kWh/year$$

$$\frac{7{,}008{,}000\ kWh}{year}\ x\ \frac{year/home}{11{,}000\ kWh} = 637\ \text{homes}$$

Follow-up Activity

Based on information in the previous slide, how many hours would it take one wind turbine to power a single home for one year?

One option:

$$\frac{7{,}008{,}000\ kWh}{year}\ x\ \frac{1\ year}{365\ days}\ x\ \frac{1\ day}{24\ hours} = 800\ \frac{kWh}{hour}$$

$$\frac{11{,}000\ kWh}{home}\ x\ \frac{1\ hour}{800\ kWh} = 13.75\ \frac{hours}{home}$$

A simpler option:

$$\frac{365\ days}{year}\ x\ \frac{24\ hours}{1\ day}\ x\ \frac{1\ year}{637\ homes} = 13.75\ \frac{hours}{home}$$

How many turns/revolutions does it take to power a home for one day?

Assumptions: 15-Megawatt (MW) off-shore wind turbine is operating at full (optimum) speed for one hour (10 revolutions per minute). The average U.S. home uses 11,000 kWh electricity per year (30 kWh per home per day).

Step 1: $15\ MW\ x\ 1\ hour = 15\ MWh$

Step 2: $\frac{10\ revolutions}{minute}\ x\ \frac{60\ minutes}{1\ hour} = \frac{600\ revolutions}{hour}$

Step 3: $\frac{15\ MWh}{600\ revolutions}\ x\ \frac{1{,}000{,}000\ Watts}{1\ MW}\ x\ \frac{1\ kW}{1{,}000\ Watts} = 25\ \frac{kWh}{revolution}$

Step 4: $\frac{\frac{30\ kWh/home}{day}}{\frac{25\ kWh}{revolution}} =$ 1.2 revolutions per home per day

KANSAS ENERGY PROGRAM

Overwhelmed?

- You do NOT need to know everything to get started. Tell your students you're learning alongside them and they may advance beyond you. That's exciting!
- Rather than trying to explain everything, first let students explore and play. Subjects like gears and aerodynamics will come up more naturally.
- We are available to help you adapt and incorporate what we're sharing today.

Resources to help Understand Electricity and Energy

An example of what the Kansas Energy Program has to offer

Light Box

By the Numbers
Light bulb in a typical Kansas home: 50
Your Electric Bill
Lighting accounts for 10% to 12%
Westar Energy
INCANDESCENT
BULB LIFE 1,000 HOURS
CAUTION HOT
DO NOT TOUCH LIGHT BULBS
CFL
BULB LIFE 6,000 TO 8,000 HOURS
LED
BULB LIFE 25,000 TO 50,000 HOURS
WATT METER

Light Box – Many Add-ons

- Don't limit students to just testing light bulbs.
- Calculate how much coal is consumed.
- Use EPA tools to calculate emissions and pollutants associated with electricity use.
- Life cycle cost
- How the US energy grid is used. Discuss the Southwest Power Pool and its generation mix.

Handcrank Generators

Students get to feel how much energy it takes to power an incandescent vs. LED light bulb. This is a great follow-up to the light box!

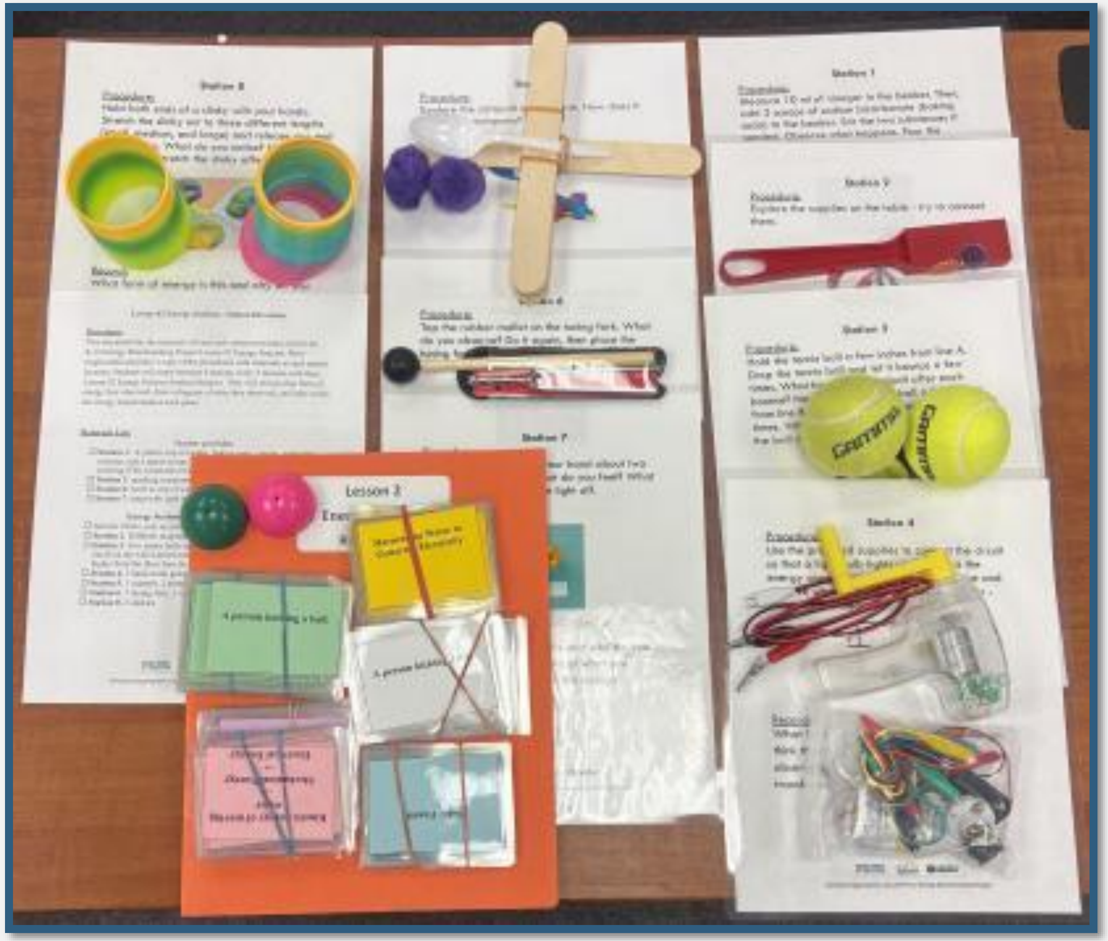
Breakout Rooms

- Energy Auditing
- Energy Efficiency
- More in development!

Energy Stations

Students move from one energy station to another to learn about different forms of energy and energy transformations.

https://kansasenergyprogram.org/educators/kansas-energy-programs-equipment-library/inventory/energy-stations-kit



National Energy Education Development (NEED)

- Many types of energy-related curricula are available (beyond wind energy)
- No cost, but you do need to add lessons to your cart

https://www.need.org/shop/

NEED
National Energy Education Development

Turbine Design

Let's Draw a Turbine

And label each part

Turbine Design

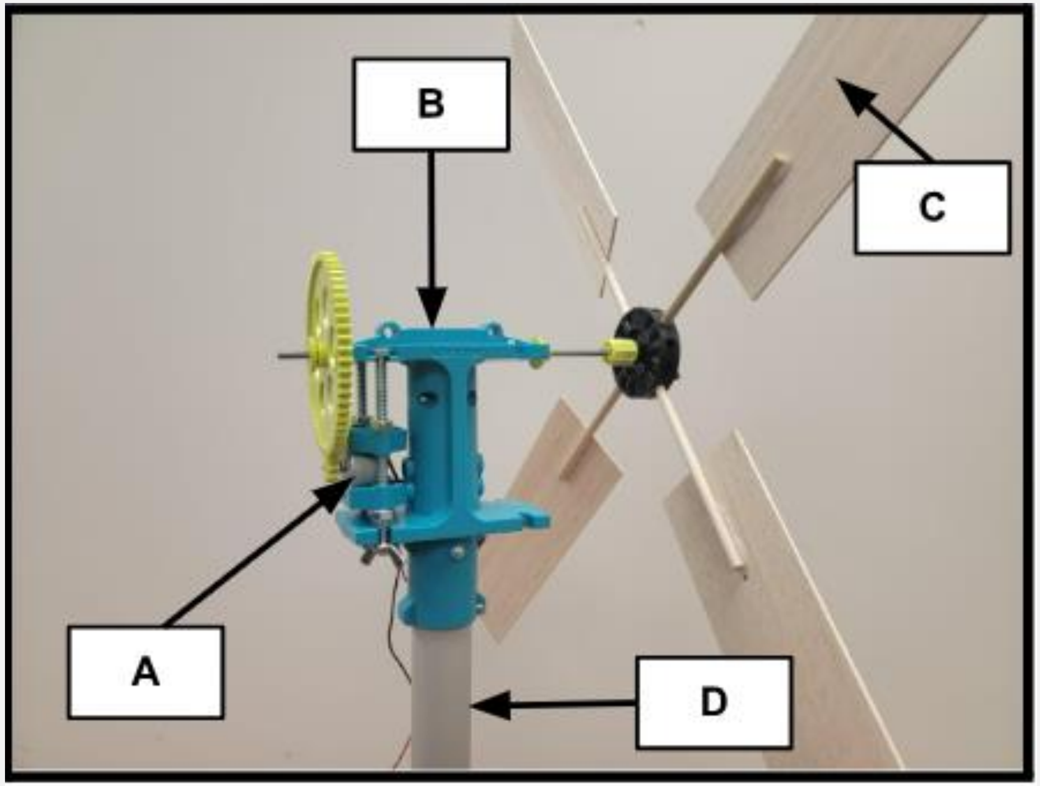
Check your answers:

(A) Generator: spins and converts mechanical energy into electrical energy.

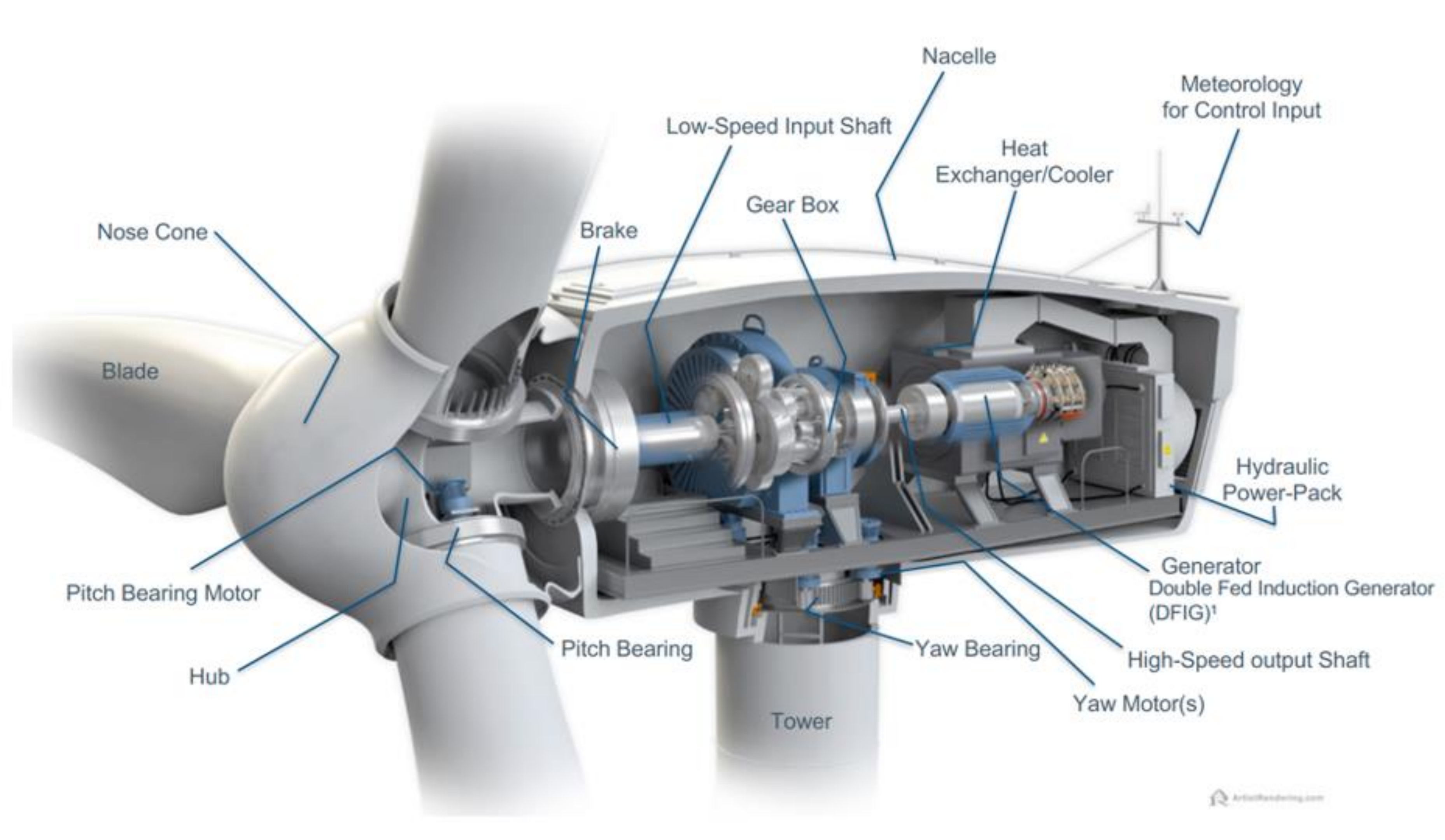
(B) Nacelle: houses the generating components.

(C) Blades: Capture wind and cause rotor to turn.

(D) Tower: supports structure of turbine.



A More Thorough View

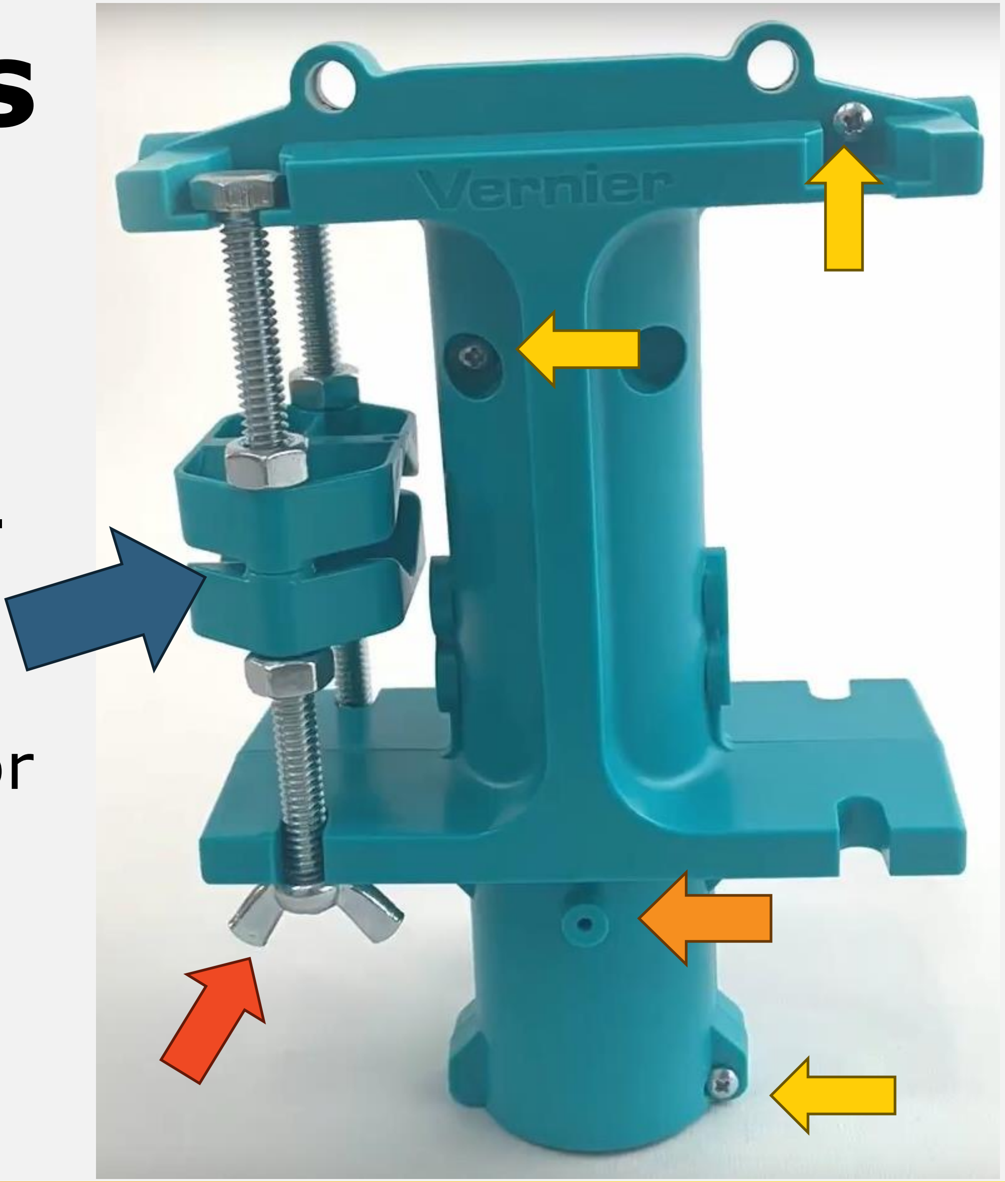


Learning the Lingo

We do have vocab sheets for you if needed!

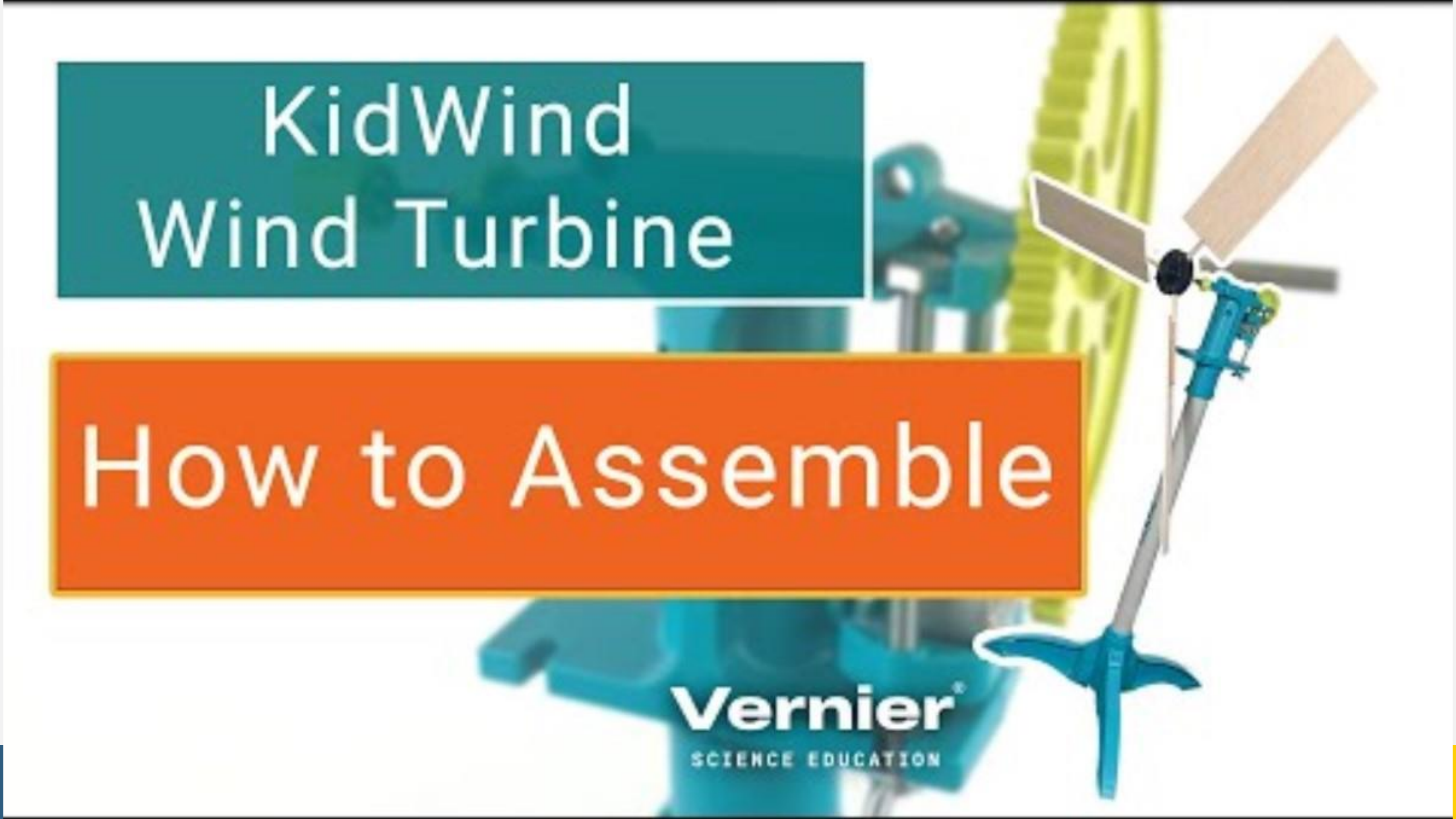
Nacelle-Building Tips

- Screwing the two halves of nacelle together only needs completed once *(yellow arrows)*.
- Don't overtighten wing nuts *(red arrow)*.
- Use optional set screw to keep nacelle from rotating on tower *(orange arrow)*.
- Why do you think height of the generator holder is adjustable? *(blue arrow)*

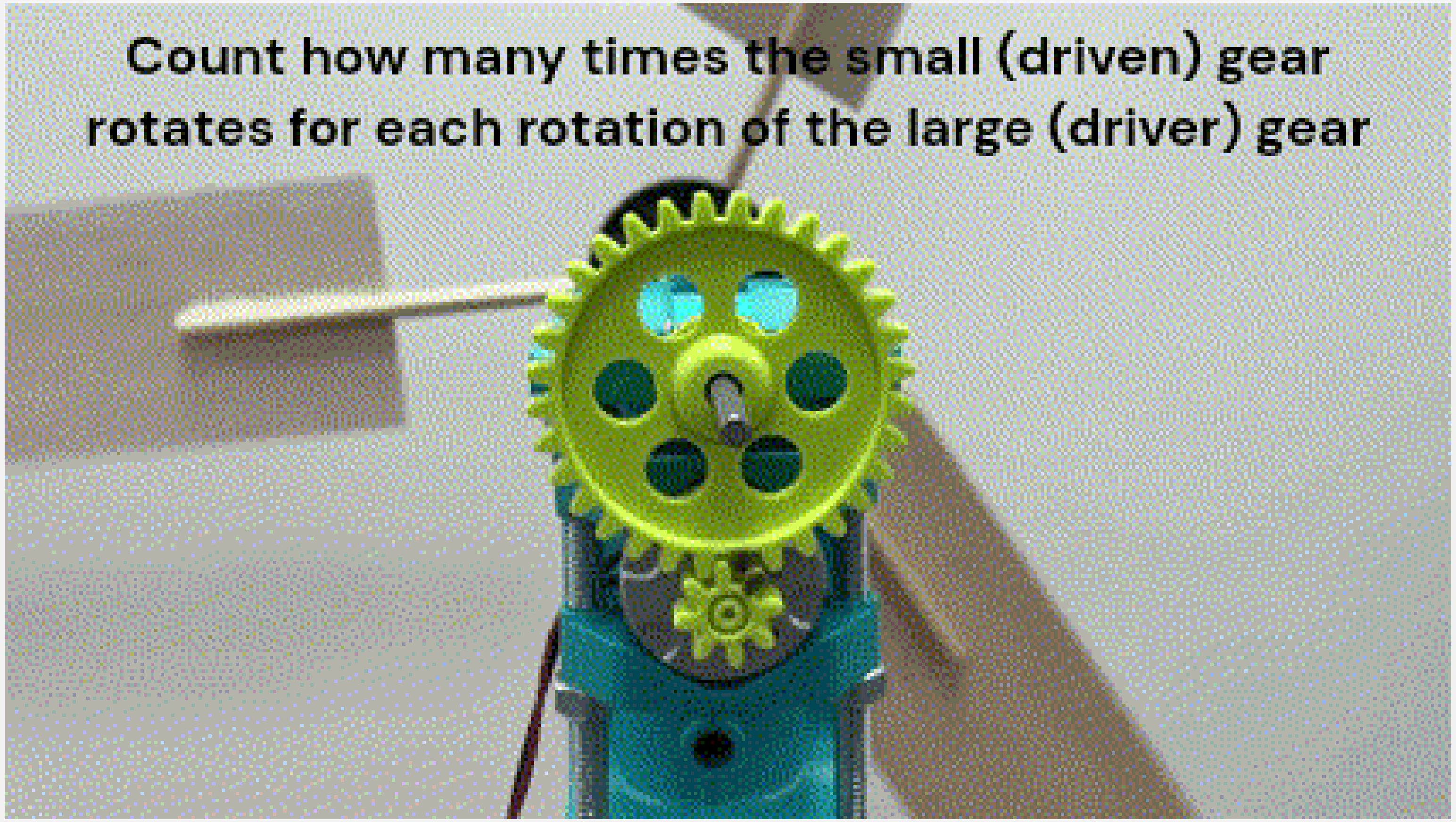


Turbine Design

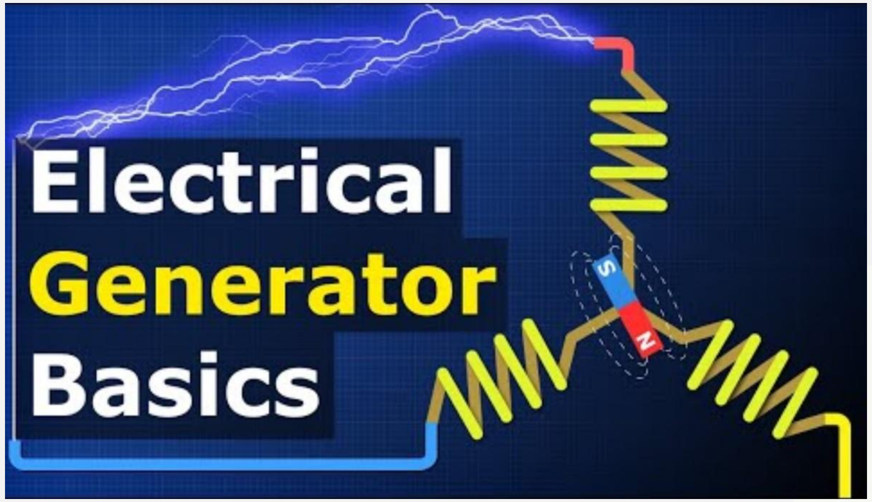
- Now it is your turn to build your turbine!
- Everyone can build their turbine, or just one per team.
- Each team will choose one turbine to use for testing in the afternoon.

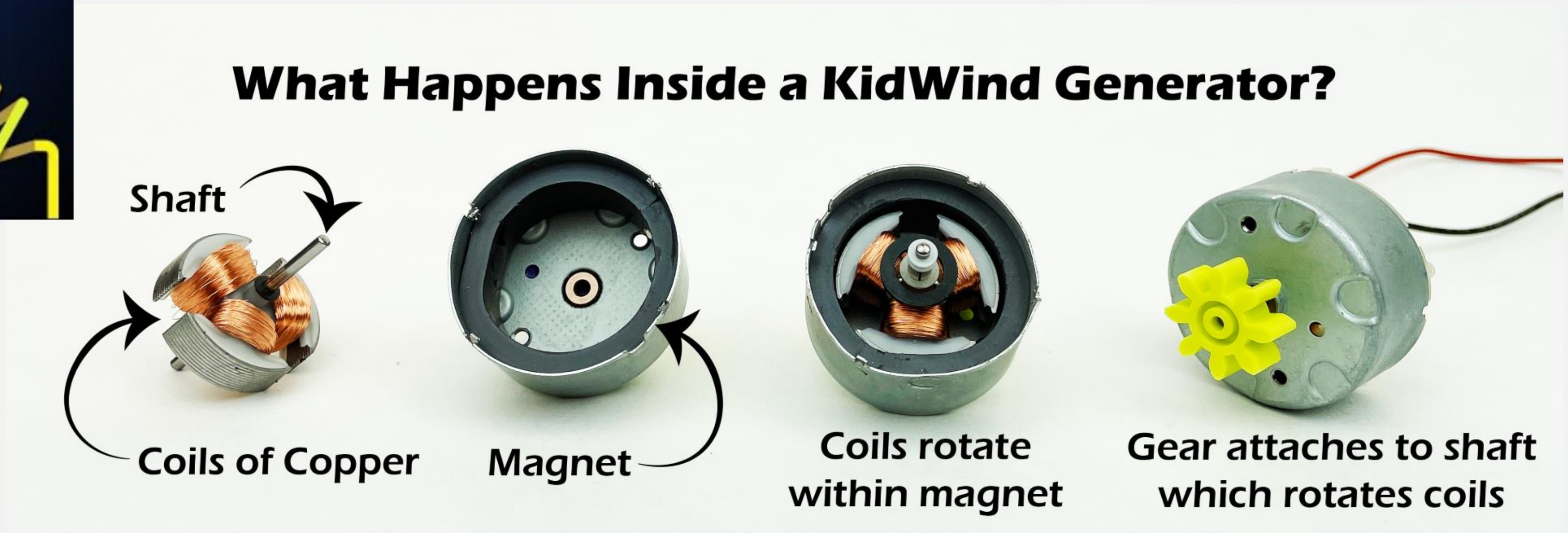

KidWind
Wind Turbine
How to Assemble
Vernier
SCIENCE EDUCATION

What Gear Did Your Team Choose?



What Does the Inside of a Generator Look Like?





Pitch Perfect

Use the pitch tool to ensure turbine blades are all at a consistent angle (or pitch).

Discussion Question

Now that you've built a wind turbine, what aspects do you think your students would excel at?

Where would they need more guidance?

Discussion Question

Which wind energy vocabulary terms might be tricky for your students — or even for you to explain clearly?

What vocabulary would you intentionally front-load before beginning a wind unit?

LUNCH

Knowledge Quiz

Knowledge Quiz Rules (10 points)

- Time: typically 10 minutes
- No electronic devices.
- Teams work together to answer multiple choice, true/false, & fill in the blank questions.
- Need accommodations? Please inform the event organizers.
- Review Games available.
- Adapted for each age division
- Use the study guide!

Knowledge Quiz

Now it is your turn – Complete the quiz with your team.

We will review as a group.

Winners get a prize!

Discussion Question

How can you make sure your students go beyond building and truly grasp the science of wind energy?

Turbine Performance Testing

Basic Turbine Performance Rules

- Each team must have its own turbine and base
- Turbines must fit inside wind tunnel (4’x4’, but leave some space)
- Each turbine must use the KidWind generator

Basic Turbine Performance Rules *(cont)*

- The turbine must be free-standing (has its own base and tower).
  - We will provide weights to help hold turbine in place.
- Power must be generated solely by wind (you cannot "help" get it started).
- You are allowed to use purchased parts (other than pre-made airfoils), but judges may award points for creativity and economical use of resources.
- Blades must be made of safe materials (avoid metal, plexiglass, or anything with sharp edges).

Basic Turbine Performance Rules *(cont)*

- When measuring power output from the turbine during the KidWind Challenge, it will be hooked up to a 30-ohm resistor to create a load, so don't forget to test it that way.
- Approximate wind speed in the tunnel is 3.5 meters/second (7.8 mph), so make sure to test your device for high winds.

Basic Turbine Performance Rules *(cont)*

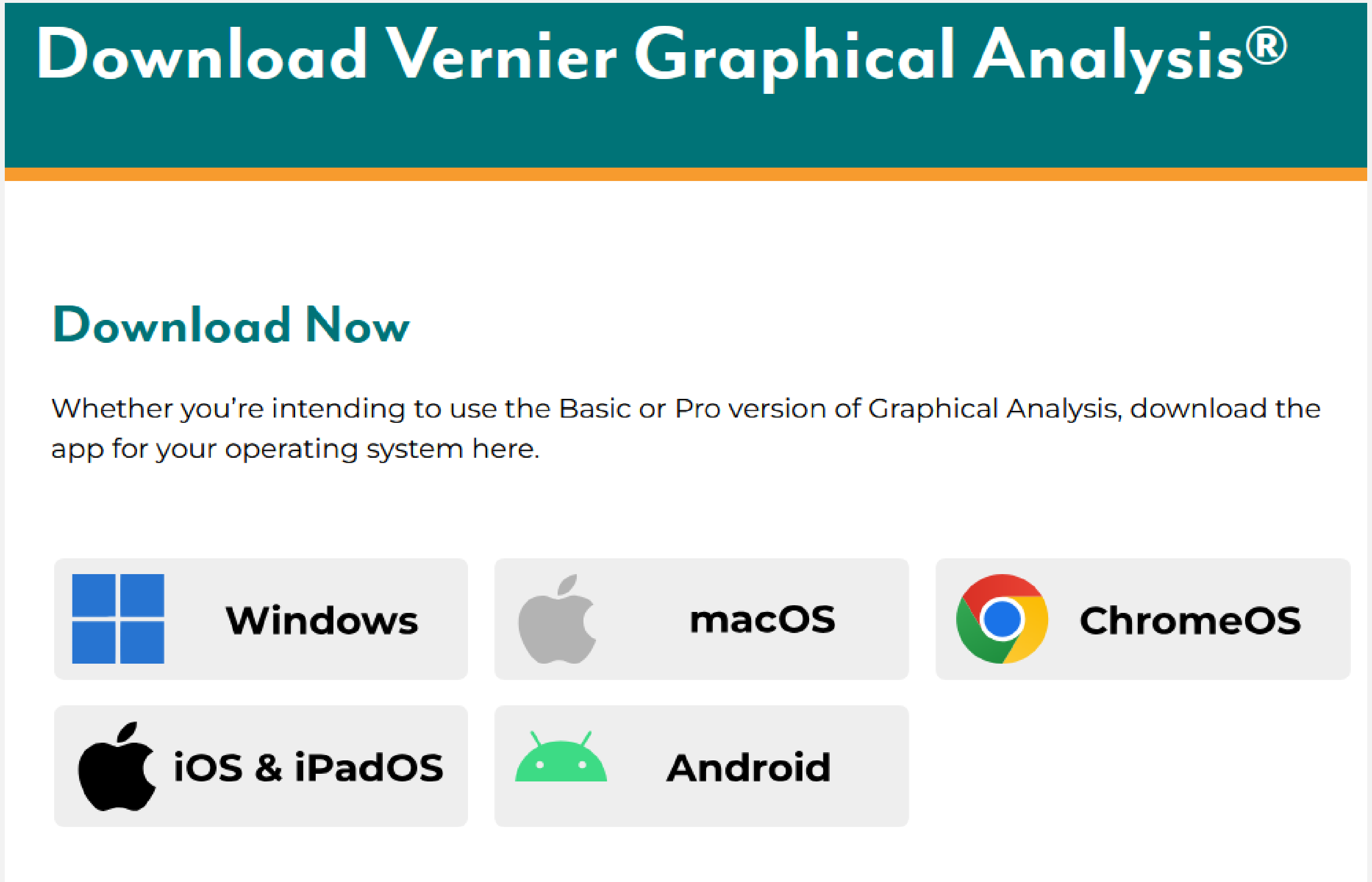
- Scored based on amount of energy produced (in units of Joules) in a 30-second period
- The best 30-second run will be used for scoring; there is no penalty for a bad run.
- Read all the rules

Basic Terminology

- **Joule –** measure of energy (very small: Watt-second)
- **Watt** – instantaneous measure of power (Joule/second)
- **Kilowatt (kW)** = 1,000 watts
- **Kilowatt-hour (kWh)** – seen on electricity bills; measures energy use/production over time; 1 turbine producing 1 kW electricity for 1 hour produced 1 kWh
- **Megawatt (MW)** = 1 million watts (often used in reference to power generation plants)

Vernier Graphical Analysis

https://www.vernier.com/downloads/graphical-analysis/



Turbine Performance

Now it is your turn to test your turbine!

- Use the Data Collection Handout
- Try different variables (blades, gear ratio, etc.)
- Repair Kit available
- Winner gets a prize!

Discussion Question

How could you scaffold students in interpreting inconclusive or messy data?

Presentation
(Judges Panel)

Judges Panel (40 points)

- No spectators, teachers, and parents are allowed
- Panel of 3-5 judges
- Total score is an average of each judge's score.
- 10 minutes total
  - Teams present (3-4 min)
  - Judges ask questions (4-5 min)

Presentation/Judges Panel *(cont)*

- Students bring turbine and documentation
  - Examples: short report, PowerPoint presentation, notebooks, booklets, poster boards, etc.
- The presentation should be about the students' design and build process and *not* be about wind energy in general.
- Be prepared if technology fails!

Now it's Your Turn

Make a quick presentation about what you learned today. Take a look at the Judges Panel Scoresheet that was handed out.

Discussion Question

What strategies or classroom activities do you use to help students build presentation confidence?

How do you coach students to explain their design and data clearly — not just show the finished product?

Upcoming KidWind Webinar

- November 13, 2025 at 4pm
- https://kansasenergyprogram.org/events/2026-kansas-kidwind-informational-webinar

Wrap Up

- Workshop Survey ->
- PD Hours Form
- Travel/Substitute Reimbursement Form
- W-9 Form

KidWind Challenge Logistics

KidWind T-Shirt Design Contest

https://kansasenergyprogram.org/events/2026-kidwind-challenge-t-shirt-design-contest

Who can participate?

- Any student in the 4th-12th grade.
- There is no restriction on team size, but 3 to 5 students per team is recommended.
- Teams can come from public schools, home schools, after-school clubs, etc.
- Teams need to have an adult (coach) with them at the event (one adult per 10 students).

What does it cost?

- No cost! *(only supplies to build the turbine)*
- Only required part is a KidWind Generator from Vernier
  - 3-pack is $20 or 10-pack is $60
  - We can provide one generator/team
- Mileage reimbursement and stipends for teacher substitutes are available.
- Lunch is provided at each event.

How to Incorporate KidWind?

- Some teachers kick off lessons after winter break and spend a couple weeks on the project; others start in the fall and then come back to it in January/February.
- Some teachers will use the KidWind Challenge as a capstone project for students.
- Teachers can host an internal competition to decide who will attend a regional Challenge *(more on this later).*
- Many resources available *(more on this later)*

What does the day look like?

2025 NC Regional Kansas KidWind Challenge - 02/25

Location: Manhattan Area Technical College

Begin	End	Judging Room	Knowledge Quiz	Performance Tunnel	Instant Challenge
8:00 AM	8:40 AM	Registration, practice tunnel available			
8:40 AM	9:00 AM	Opening Remarks			
9:00 AM	9:10 AM	-	H (6-8)	-	-
9:10 AM	9:20 AM	C (6-8)	-	A (4-5)	F (6-8) G (6-8)
9:20 AM	9:30 AM	D (6-8)	I (6-8)	B (4-5)	
9:30 AM	9:40 AM	E (6-8)	-	-	-
9:40 AM	9:50 AM	-	J (6-8)	C (6-8)	M (9-12)
9:50 AM	10:00 AM	H (6-8)	-	D (6-8)	
10:00 AM	10:10 AM	I (6-8)	K (9-12)	E (6-8)	-
10:10 AM	10:20 AM	J (6-8)	-	F (6-8)	-
10:20 AM	10:30 AM	-	L (9-12)	G (6-8)	A (4-5) B (4-5)
10:30 AM	10:40 AM	-	-	H (6-8)	
10:40 AM	10:50 AM	F (6-8)	M (9-12)	I (6-8)	-
10:50 AM	11:00 AM	G (6-8)	-	J (6-8)	C (6-8) D (6-8)
11:00 AM	11:10 AM	-	-	-	
11:10 AM	11:20 AM	-	-	K (9-12)	-
11:20 AM	11:30 AM	A (4-5)	F (6-8)	L (9-12)	E (6-8) H (6-8)
11:30 AM	11:40 AM	B (4-5)	-	M (9-12)	
11:40 AM	11:50 AM	-	G (6-8)	-	-
11:50 AM	12:30 PM	Lunch			
12:30 PM	12:35 PM	-	D (6-8)	-	-
12:35 PM	12:40 PM	K (9-12)		A (4-5)	I (6-8) J (6-8)
12:40 PM	12:45 PM		E (6-8)	B (4-5)	
12:45 PM	12:50 PM	L (9-12)		-	
12:50 PM	12:55 PM			C (6-8)	
12:55 PM	1:00 PM	M (9-12)	A (4-5)	D (6-8)	-
1:00 PM	1:05 PM			E (6-8)	K (9-12) L (9-12)
1:05 PM	1:10 PM	-	B (4-5)	F (6-8)	
1:10 PM	1:15 PM	-		G (6-8)	
1:15 PM	1:20 PM	-	C (6-8)	H (6-8)	
1:20 PM	1:25 PM	-		I (6-8)	-
1:25 PM	1:30 PM	-	-	J (6-8)	-
1:30 PM	1:35 PM	-	-	-	-
1:35 PM	1:40 PM	-	-	K (9-12)	-
1:40 PM	1:45 PM	-	-	L (9-12)	-
1:45 PM	1:50 PM	-	-	M (9-12)	-
1:50 PM	1:55 PM	-	-	-	-
1:55 PM	2:00 PM	-	-	-	-
2:00 PM	2:20 PM	Competition ends and results tallied; Presentation by Sponsors			
2:20 PM	2:40 PM	Awards			

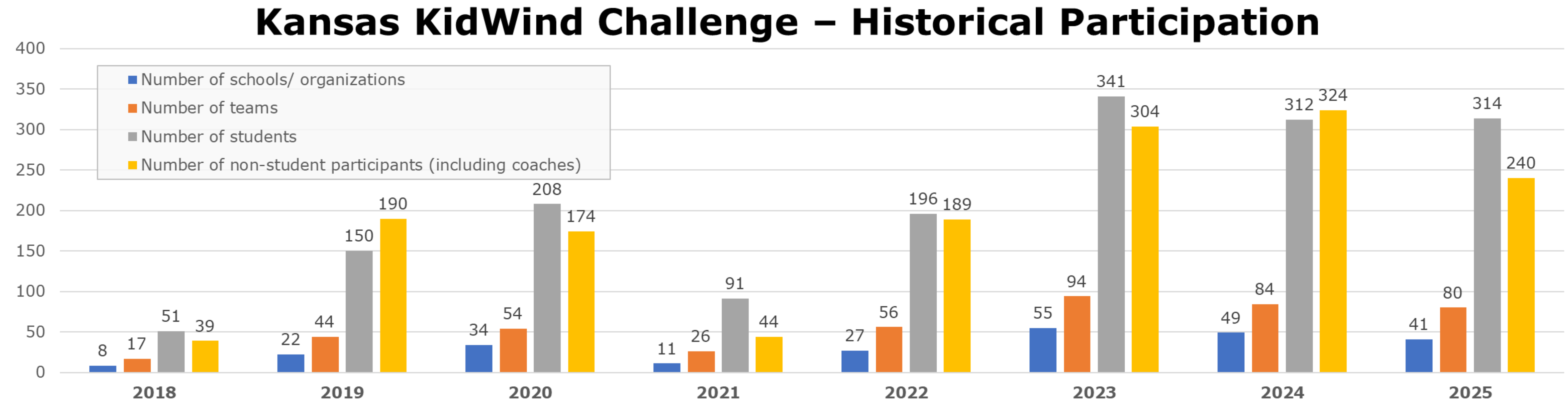
Staging Area

Practice Wind Tunnel

Internal Challenges

- If you want to involve an entire class or grade level, we recommend holding an internal challenge to decide the winning teams to attend regionals.
- We can provide resources and limited assistance (including sending 1-2 volunteers)

KidWind Over the Years



2018: KEP/KCC began hosting program; One Challenge in Manhattan

2019: Four regional Challenges + Statewide Challenge

2020: Five regional Challenges (Statewide canceled due to pandemic)

2021: Due to pandemic, hosted three regional Challenges & Statewide (all virtual)

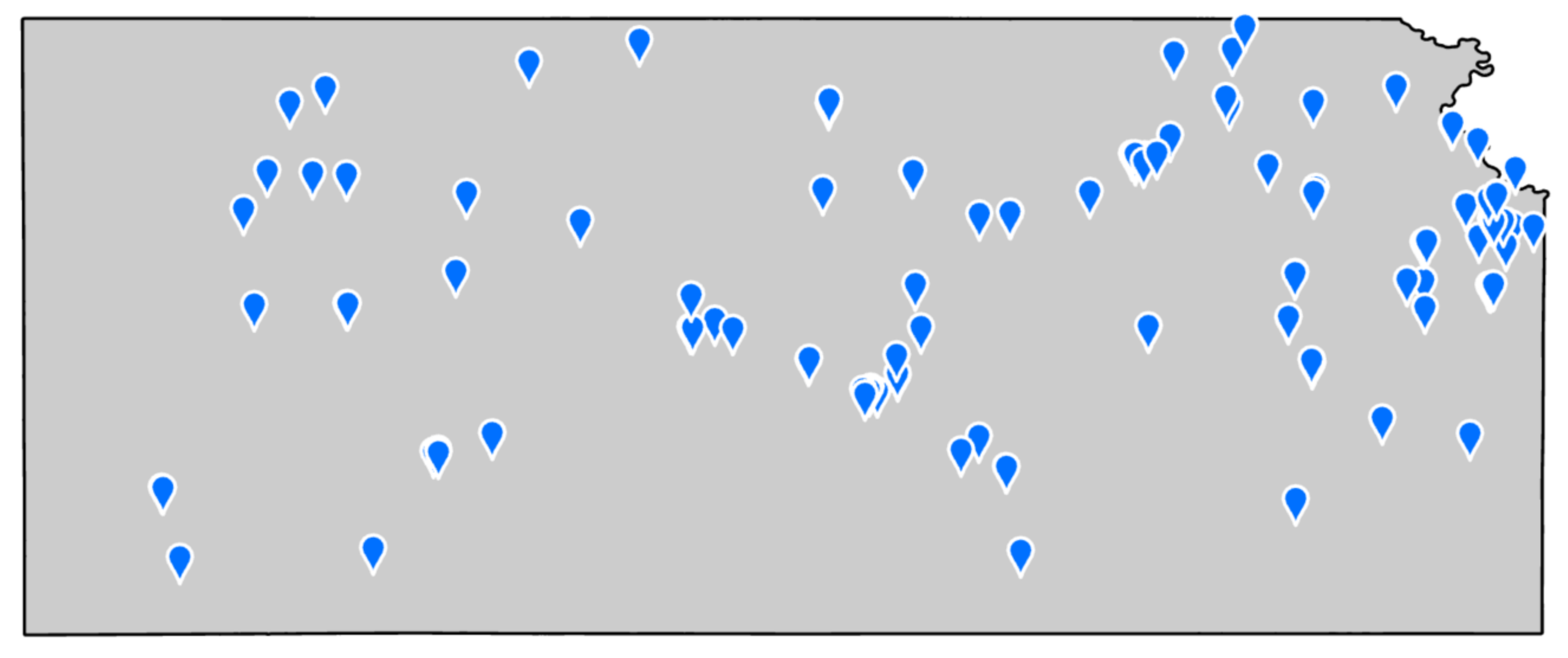
2022: Five regionals (Pandemic prevented some participation; one regional cancelled) + Statewide

2023: Six regional challenges + Statewide

2024: Six regional challenges + Statewide (23 team cancellations – many due to # of snow days)

2025: Five regionals + Statewide (NE cancelled; many cancellations due to # of snow days)

Who Participates?



More than 850 students participated in the KidWind Process in 2025 and >1,100 in 2024.

Regionals, State, Worlds - OH MY!

How to Register for Regionals *(2-part process)*

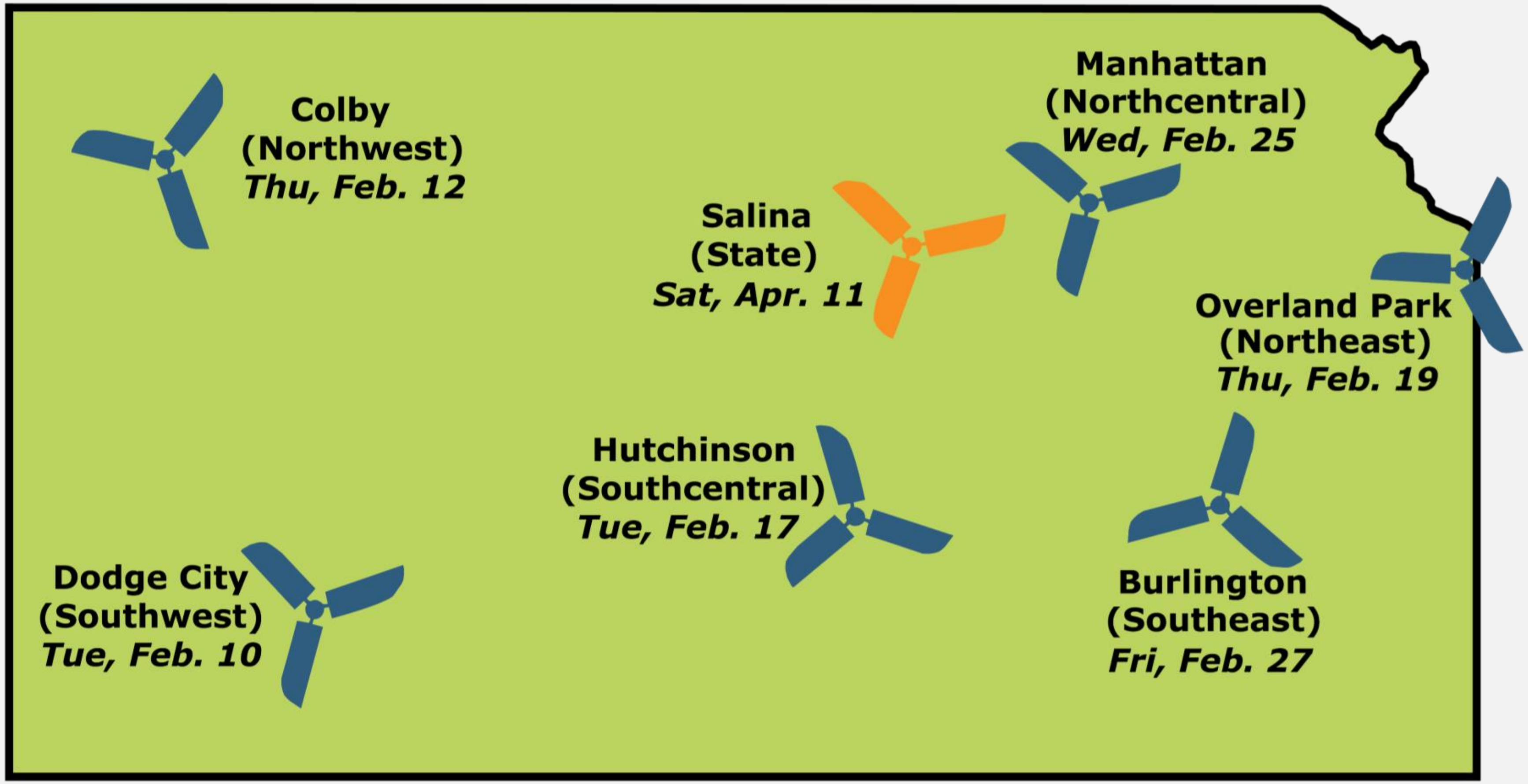
- **Initial registration (by December 19 or full):**
  - Contact info
  - Number and age division of teams (*NO details*)
  - Which Challenge you want to attend
  - *The third team in age division is automatically waitlisted*

- **Follow-up registration (December-January)**
  - Names of students and teams
  - Dietary restrictions
  - Photo release forms

KidWind Timeline

Register	• Oct. 1 to December 19: Register basic info and # teams • Waitlisted teams announced 12/16/25
Prepare	• Throughout the fall and/or early spring semester, teams explore, design/build, and prepare (borrow a wind tunnel!)
Attend Regional	• February 2026: Regional events (map with locations and dates coming up). Top two teams in each age division advance.
Attend State	• April 11, 2026 (Sat) in Salina *(teams can totally redesign turbines if desired)*
Attend Worlds	• Typically held in early to mid-May. Details to come.

2026 KidWind Locations



You choose which to attend based on date and location.

NOTE: Each school is limited to 3 teams per age division maximum. You cannot send more than 3 teams by splitting between multiple challenges.

A Few Other Things

- Register as soon as you can
- Scoresheets – emailed approx. one week after
- Changes can be made from regionals – State – World
- Shark Tunnel at State!

Discussion Question:

What is your single biggest takeaway from today?

Turbine Orientation

Vertical

Horizontal

Vertical Axis Wind Turbines (VAWT)

Advantages

- Omnidirectional
- Accepts wind from any angle
- Components can be mounted at ground level
- Ease of service
- Lighter weight towers
- Can theoretically use less materials to capture the same amount of wind

Disadvantages

- Shorter turbines capture poorer wind
- Centrifugal force stresses blades
- Poor self-starting capabilities
- Requires entire rotor to be removed to replace bearings
- Overall poor performance and reliability
- Have never been commercially successful (large scale)

Horizontal Axis Wind Turbines (HAWT)

Advantages

- High power output
- High efficiency
- High reliability
- High operating wind speed

Disadvantages

- Logistics to transport, install, and maintain
- Environmental impacts
  - Noise, drop shadow, wildlife
- Strict regulations

Blades

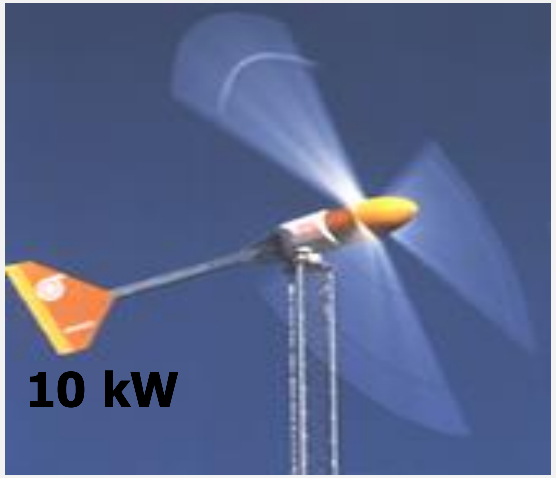
- Blade designs are continuously being extended
- Currently the most important driver for increasing capacity factor
  - Capacity factor = avg power output / max power capability
- Swept area is directly dependent on blade length
  - Swept area = πR^2
- Greater swept area leads to lower Levelized Cost of Energy (LCOE)
  - LCOE = Costs / Annual Energy Produced

KidWind-related activities

- Wind turbines – have students list the different independent variables (number, length, and shape of blades; gear ratio; wind speed; etc.) to determine their impact on performance
- Generator – construct your own generator instead of using a pre-made Vernier generator
- Based on energy produced by turbine, determine what it could power, how long it would need to spin to produce enough energy to power a lightbulb, etc.

Modern Small Wind Turbines

- High tech
- Reliable
- Low maintenance
- 2-3 moving parts
- ~5,000 On-Grid



KANSAS ENERGY PROGRAM

Large Wind turbines In Kansas

- More cost-effective
- 4,415 turbines in Kansas
- Rated 0.05 – 4.8 MW
- Tallest: 182.6 m (599’) base to blade tip
- Largest rotor diameter: 149 m (489’)
- GE 1.5 MW turbine weighs 163 tons
- Foundation 20+ feet deep

Yawing – Facing the Wind

- Passive Yaw (small turbines)
  - Wind force directs the rotor
  - Tail vane
- Active Yaw (medium & large turbines)
  - Anemometer on nacelle tells the controller which way to point
  - Yaw drive turns gears to pivot the rotor into the wind

Capacity of Generation Units

- **Capacity** – Maximum output of electricity that a generator can produce under ideal conditions (typically measured in megawatts)