

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?

Not pictured: Brie and Brendan



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.



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 – Registration
- 9:30-10:30 – Intro to KEP and the KidWind Challenge
- 10:30-11:10 – **Instant Challenge**
- 11:10-12:20 – Wind Turbine Design and Wind 101
- 12:20-12:50 – Lunch
- 12:50-1:10 – **Knowledge Quiz**
- 1:10-2:40 – **Wind Turbine Testing** (wind tunnel) and more Wind 101
- 2:40-3:00 – **Judges Panel**
- 3:00-3:15 – Regionals, State, Worlds - Oh my!
- 3:15-3:30 – Wrap Up



New this year: KidWind
Challenge Padlet!
(QR above)

Introductions and Teams

- Name
- School
- Subject and grade level you teach

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



Newsletter Announcements

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



@KansasEnergyProgram



@kansasenergyprogram



@kansasenergyprogram



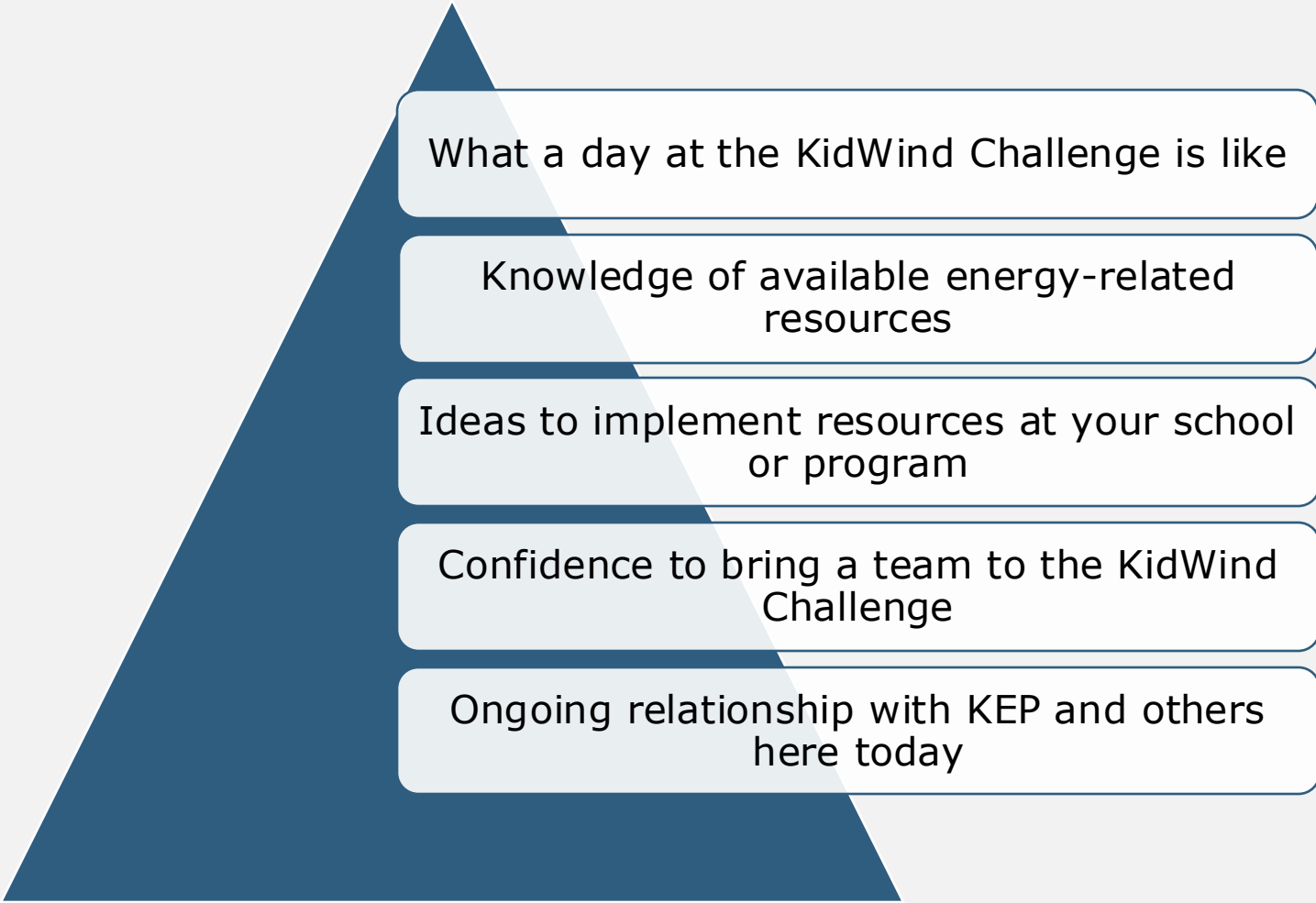
<https://kansasenergyprogram.org>



What is KidWind?

A STEM competition for 4th-12th graders where student teams design and build a working wind turbine. Teams bring their turbine to a regional KidWind Challenge to test their turbine's performance and present their work to judges, along with completing a quiz and instant challenge. Winning teams advance to State and World competitions.

What we hope you will gain today



What a day at the KidWind Challenge is like

Knowledge of available energy-related resources

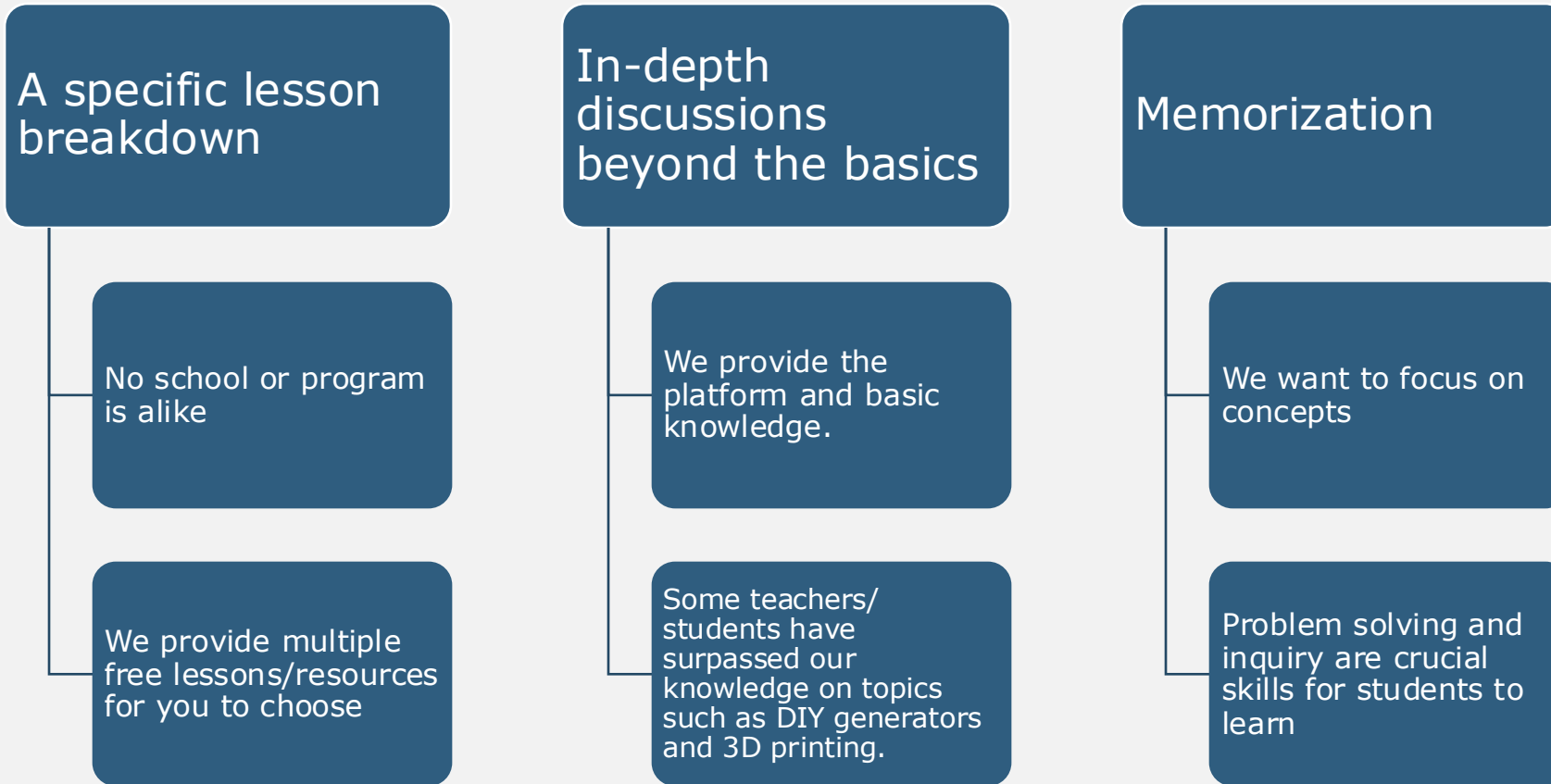
Ideas to implement resources at your school or program

Confidence to bring a team to the KidWind Challenge

Ongoing relationship with KEP and others here today

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

What won't be covered today



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)

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*)

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.

Basic Competition Overview

Form teams
(typically 3-5
students) in three
divisions
(*4th-5th, 6th-8th, or
9th-12th grade*)

Students design
and build a wind
turbine, learn about
energy, and
prepare a
presentation

Attend a 1-day
regional KidWind
Challenge (four
competition areas)

Winners advance to
State and World
Challenges

Four Parts to the Challenge

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)

Four Parts in Photos *(more details later)*



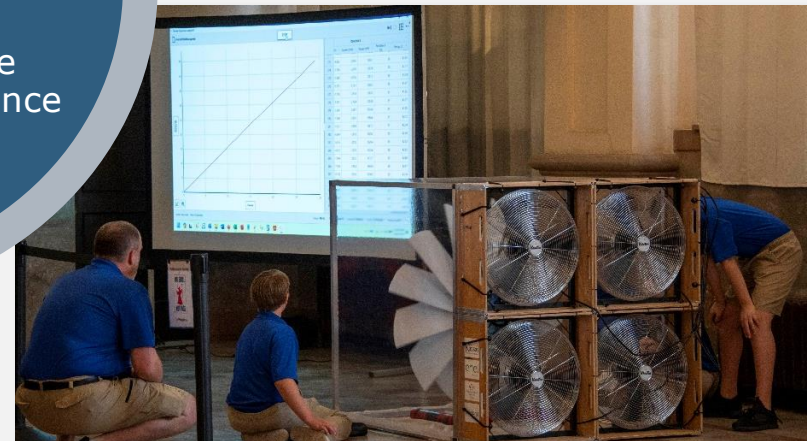
Judges Panel



Instant Challenge



Knowledge Quiz



Turbine Performance

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)
9:20 AM	9:30 AM	D (6-8)	I (6-8)	B (4-5)	G (6-8)
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)
10:30 AM	10:40 AM	-	-	H (6-8)	B (4-5)
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)
11:00 AM	11:10 AM	-	-	-	D (6-8)
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)
11:30 AM	11:40 AM	B (4-5)	-	M (9-12)	H (6-8)
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)	-
12:40 PM	12:45 PM	-	E (6-8)	B (4-5)	I (6-8)
12:45 PM	12:50 PM	L (9-12)	-	-	J (6-8)
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)	-
1:05 PM	1:10 PM	-	B (4-5)	F (6-8)	K (9-12)
1:10 PM	1:15 PM	-	-	G (6-8)	L (9-12)
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			

- Arrive between 8am and 9am.
- Rotate through competition areas
- Presentation by a KidWind Challenge sponsor while scores are tallied (approximately 3pm).
- Winners announced ~3:30pm, so teams can be on the road ~4pm.
- Times shift based on number of teams.

Team Names (School Names and Division)		
A - Country Wind (Onaga Grade School 4-5)	G - Powering Towards a Cure (Abilene MS 6-8)	M - Beloit HS (9-12)
B - Airvacados (Oliver Brown Ele 4-5)	H - 6th Grade Team (Abilene MS 6-8)	
C - Girl Energy (Beloit Jr Sr High 6-8)	I - Wind Benders (Onaga Grade School 6-8)	
D - Sandy's Squad (Beloit Jr Sr High 6-8)	J - Manhattan Catholic MS 6-8	
E - WInders (Nemaha Central 6-8)	K - Freshman Team (Abilene HS 9-12)	
F - Roosters (Frankfort MS 6-8)	L - Juniors Team (Abilene HS 9-12)	

Staging Area



Practice Wind Tunnel

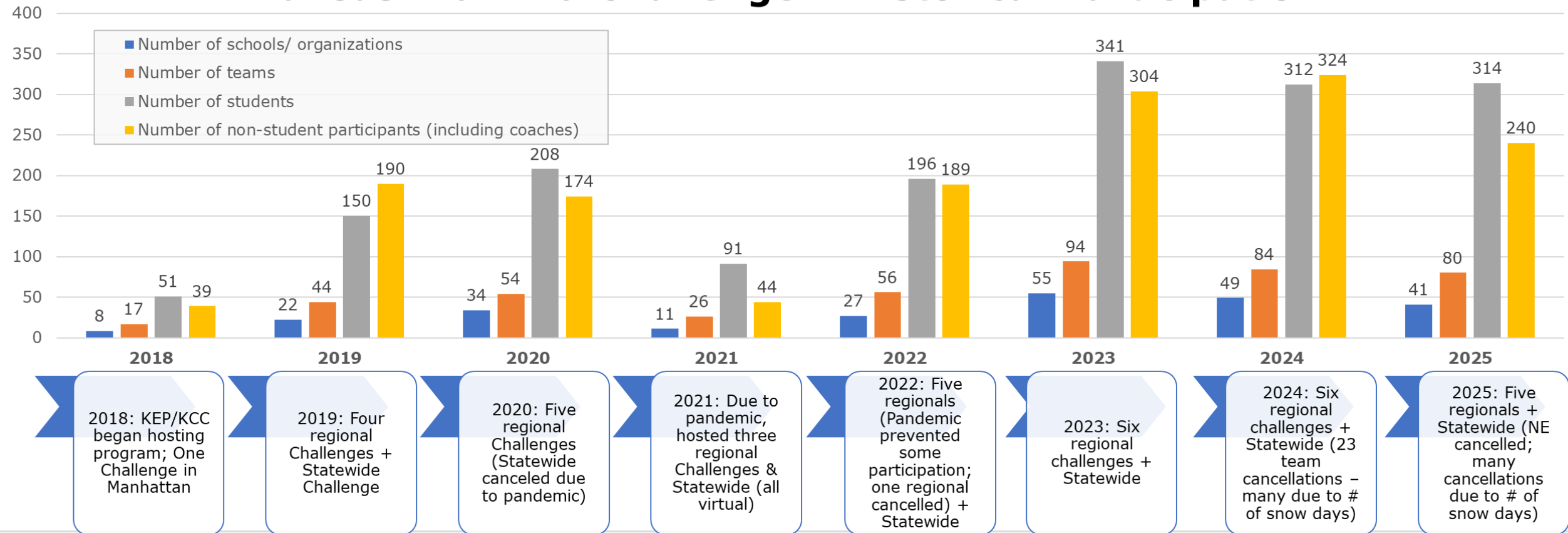


Internal Challenges

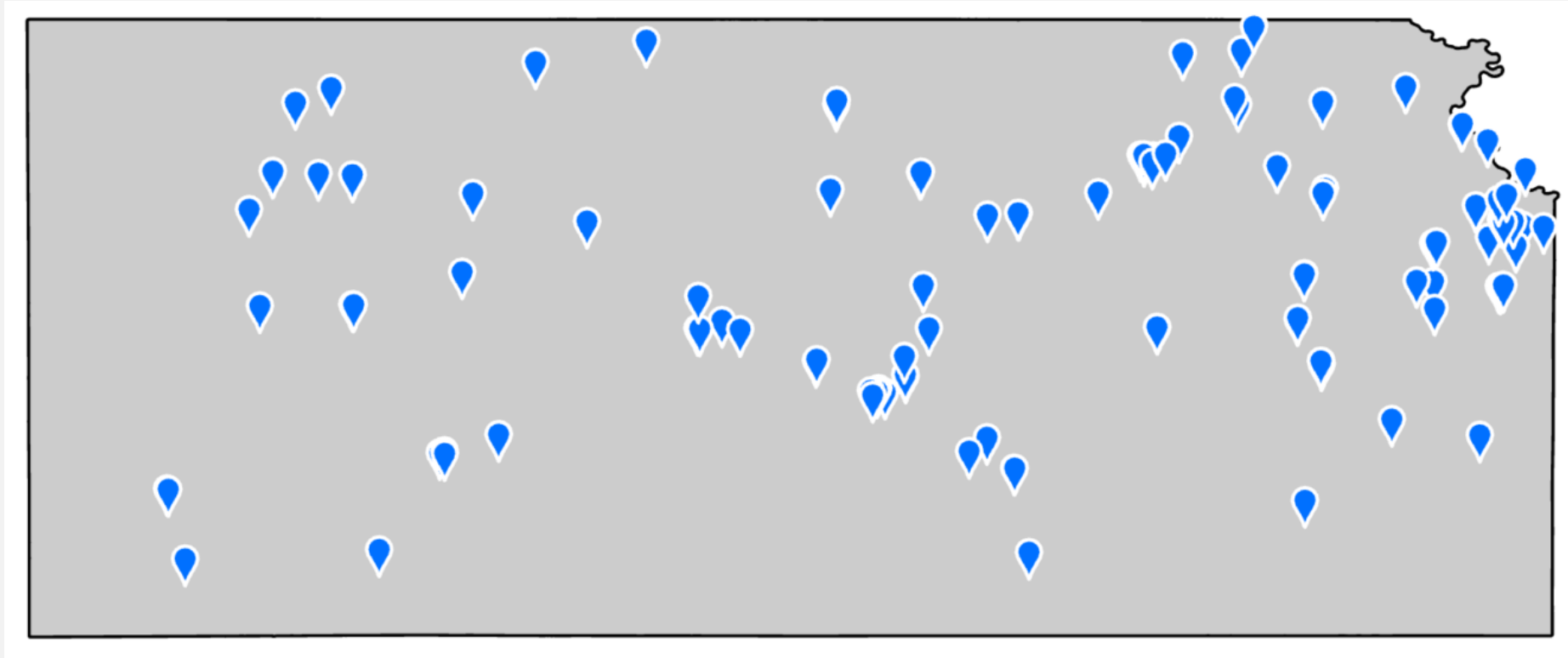
- If you want to involve an entire class or grade level, we recommend holding an internal challenge to decide the winning teams to attend regionals.
- We can provide resources and limited assistance (including sending 1-2 volunteers)

KidWind Over the Years

Kansas KidWind Challenge – Historical Participation



Who Participates?



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

Feeling overwhelmed?

- Remember: you're learning along with your students and they may advance beyond you. That's exciting!
- Rather than try explaining everything, let students explore and play first. Subjects like pitch, gears, aerodynamics, etc. will come up more naturally.
- Students of different ages and abilities can all compete.
- We provide many links/resources. These are just ideas for you – no need to try them all.
- Questions at any time? Just reach out and ask.

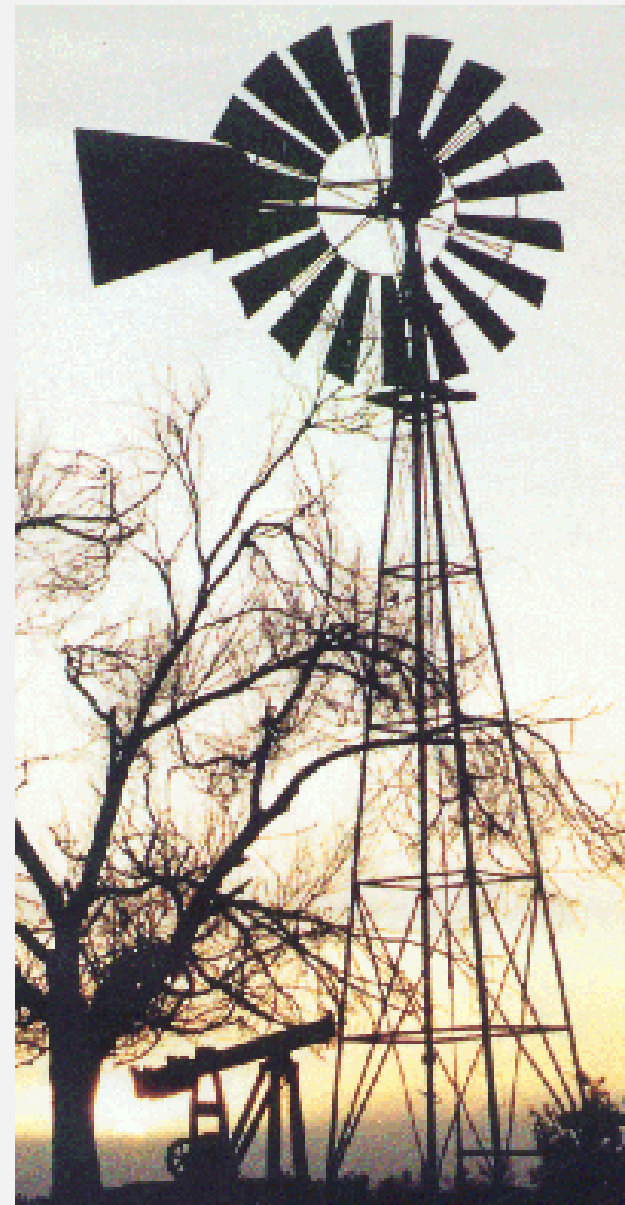
KidWind Fellow

Brendan Devening



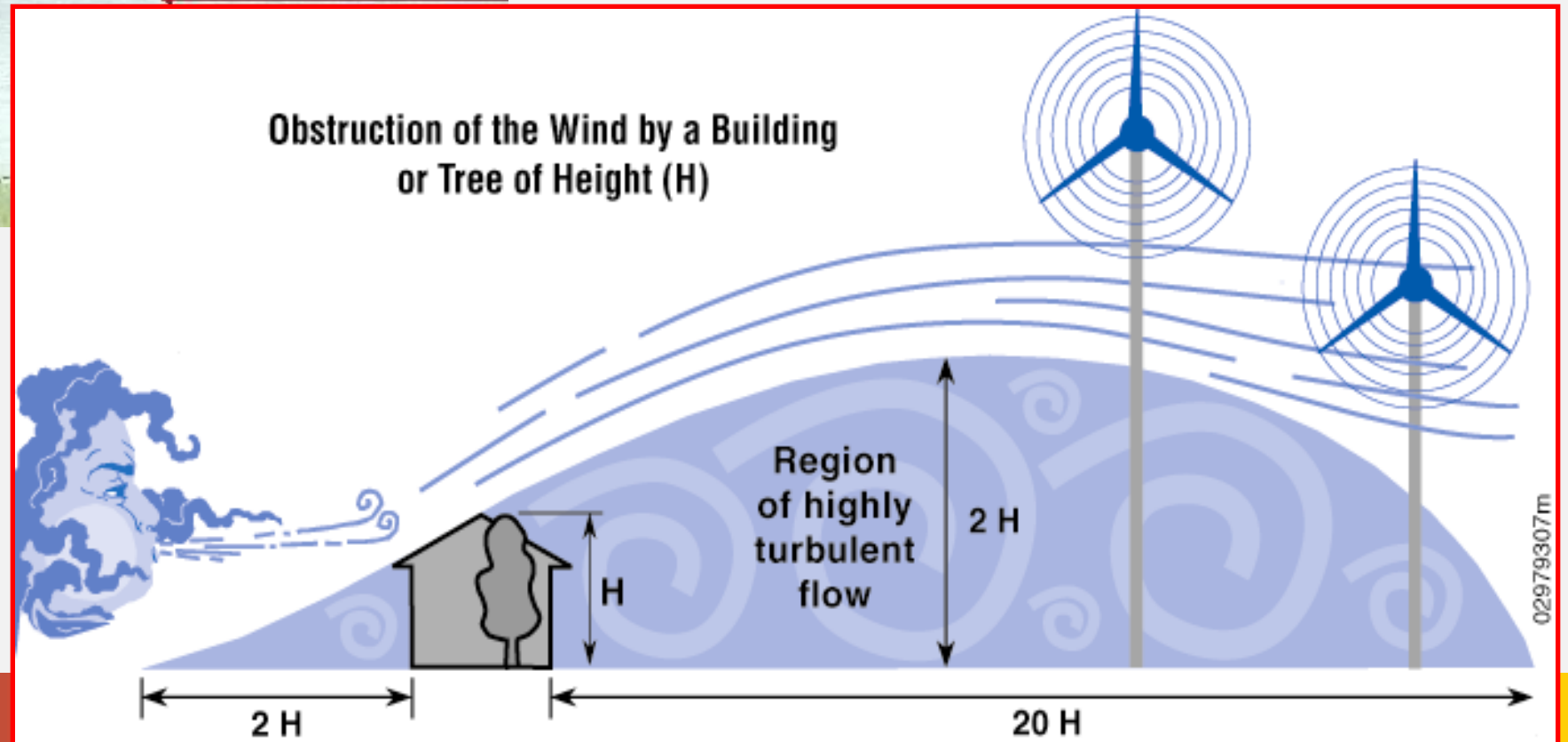
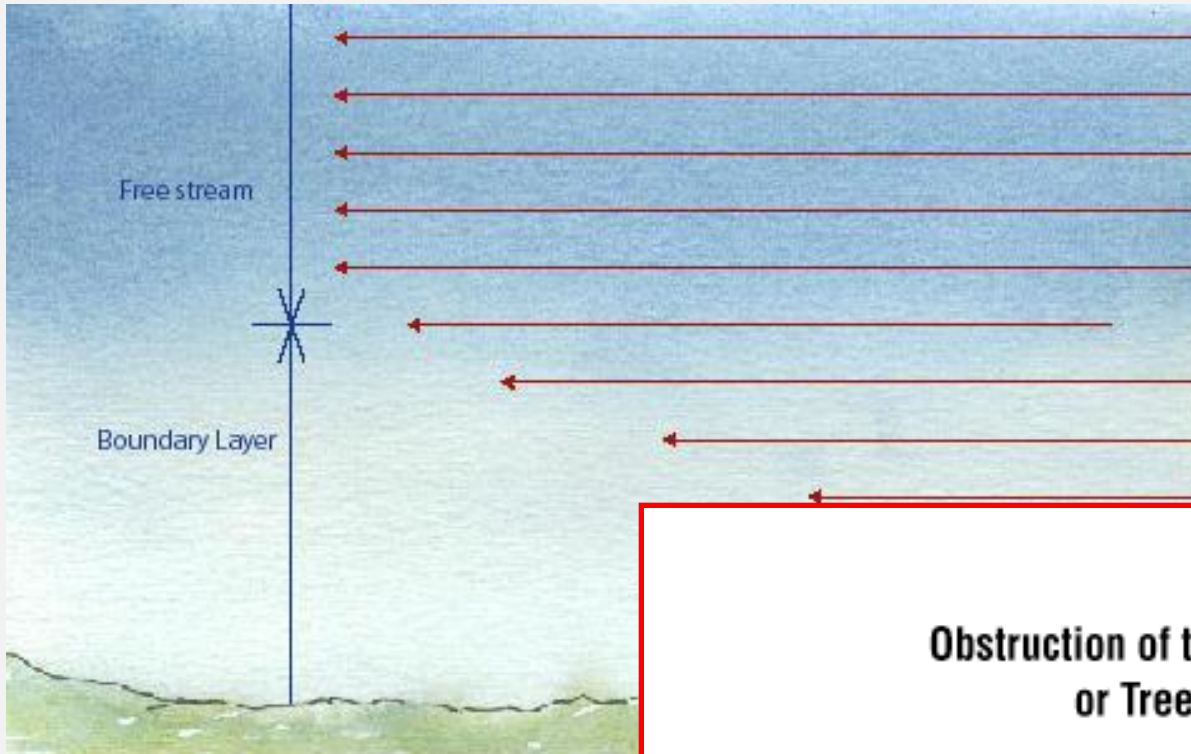
Wind 101

Introduction to Wind Energy



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

Wind as a Resource



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

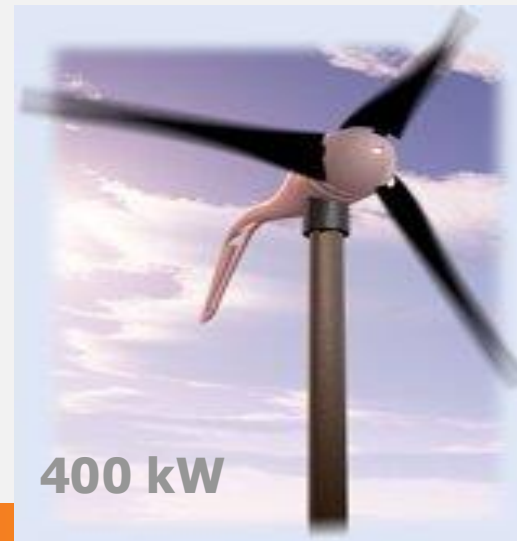
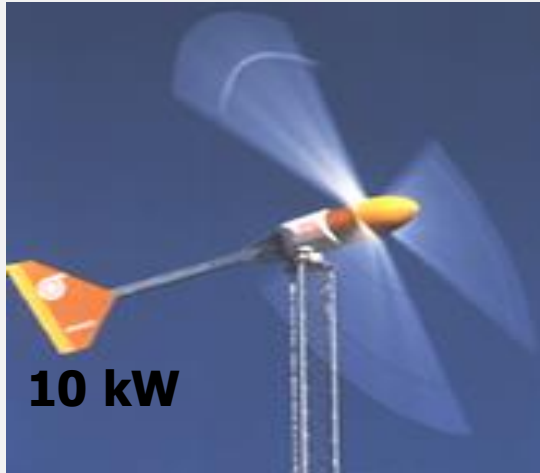
- Logistics to transport, install, and maintain
- Environmental impacts
 - Noise, drop shadow, wildlife
- Strict regulations

Basic Terminology

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

Modern Small Wind Turbines

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



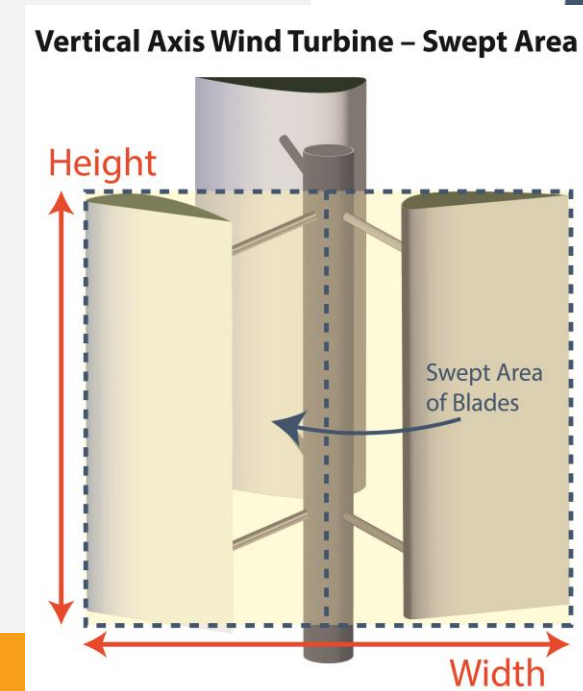
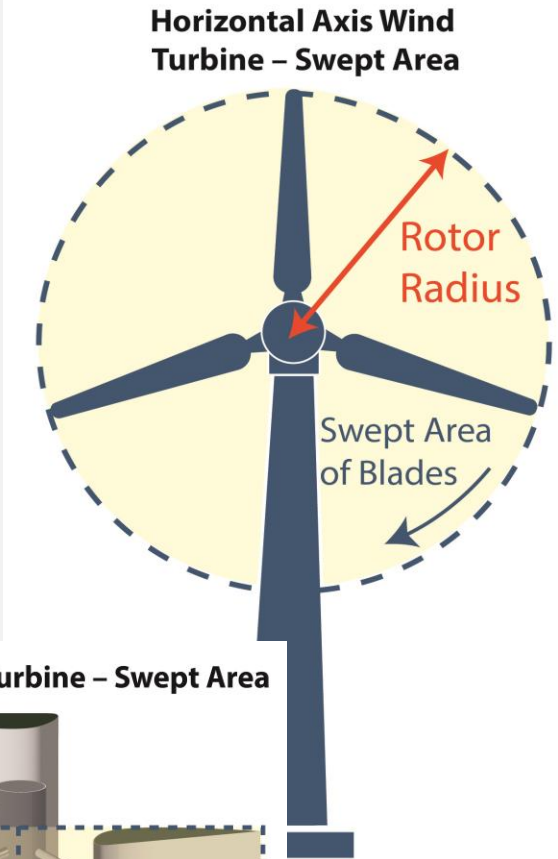
Large Wind turbines In Kansas

- 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



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: 40-cm (0.4 meter) blade length (*radius: 0.2m*)

Turbine B: 80-cm (0.8 meter) blade length (*radius: 0.4m*)

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

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

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

Activity: Calculating wind power (Part 2)

Assumptions:

- Air density of 1 kg/m³
- 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:

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

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

Results: By doubling the blade length, wind power output 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
 - $V \times V \times V$
- 20% increase in wind speed means 73% more power
 - 1.0 m/s wind speed: $1 \times 1 \times 1 = 1$
 - 1.2 m/s wind speed: $1.2 \times 1.2 \times 1.2 = 1.73$
- Doubling wind speed means 8 times more power
 - 2.0 m/s wind speed: $2 \times 2 \times 2 = 8$

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

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

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

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

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

A simpler option:
$$\frac{365 \text{ days}}{\text{year}} \times \frac{24 \text{ hours}}{1 \text{ day}} \times \frac{1 \text{ year}}{637 \text{ homes}} = 13.75 \frac{\text{hours}}{\text{home}}$$

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: $15 \text{ MW} \times 1 \text{ hour} = 15 \text{ MWh}$

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

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

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

Activity idea: calculate wind tip speed

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

Distance traveled (circumference) in one revolution = $\pi \times \text{diameter}$ OR $2\pi \times \text{radius}$

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

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

Panel Question:

What inspired you to make KidWind part of your teaching?

Instant Challenge

Instant Challenge Rules (10pts)

- Unannounced until the day of, no preparation is necessary (Study Guides available by age division)
- Set amount of time to complete the challenge. Instructions and materials will be provided.
- After event, avoid discussing anything within hearing distance of other teams.
- Penalty points if students use a phone during an instant challenge.



Previous Instant Challenges:

- Wind Siting
- Gear Ratio
- Circuits
- Energy Efficiency
- MacGyver Windmill

Today's Instant Challenge

Welcome Dan Whisler from Trane

Now it is your turn to complete an instant challenge.

Winners get a prize!



Panel Question:

Do you have an internal challenge? Do you include an instant challenge?

Turbine Design

Turbine Design

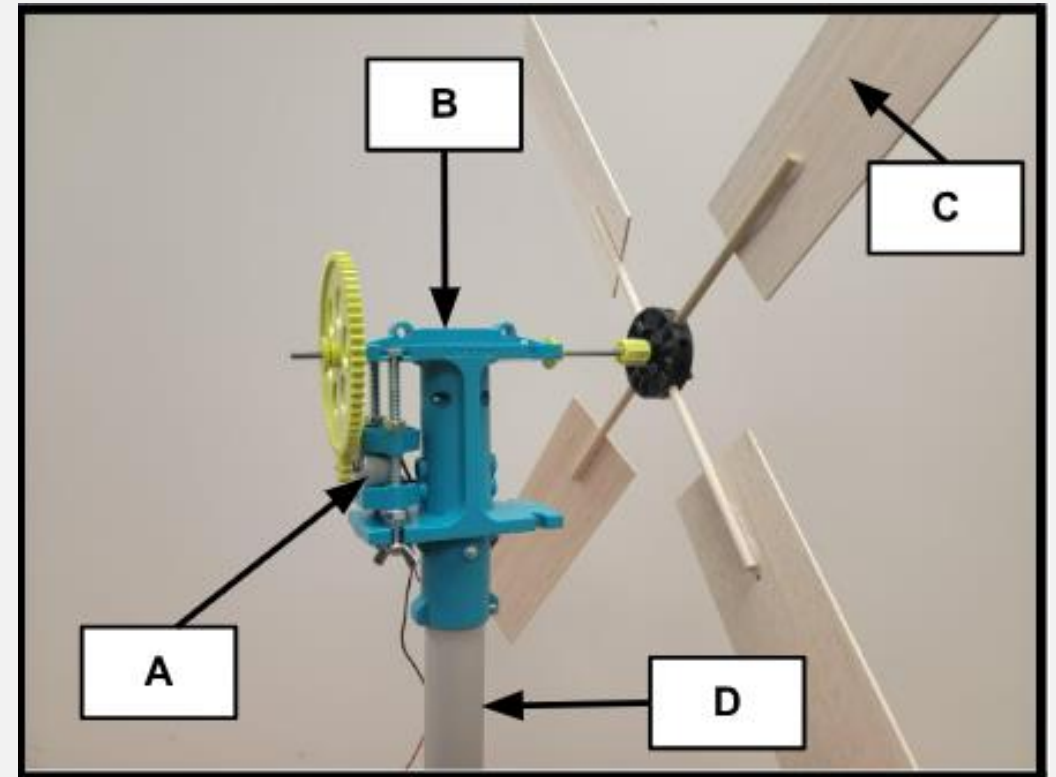
With your team, write down the parts of the turbine:

A

B

C

D



Turbine Design

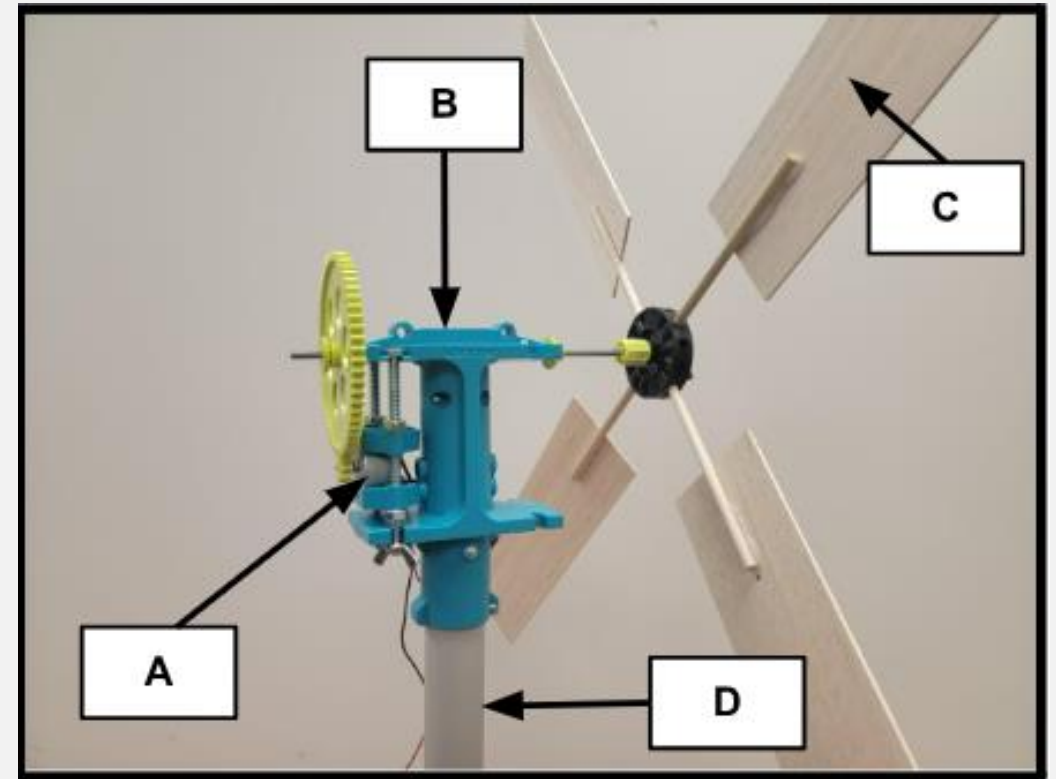
Check your answers:

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

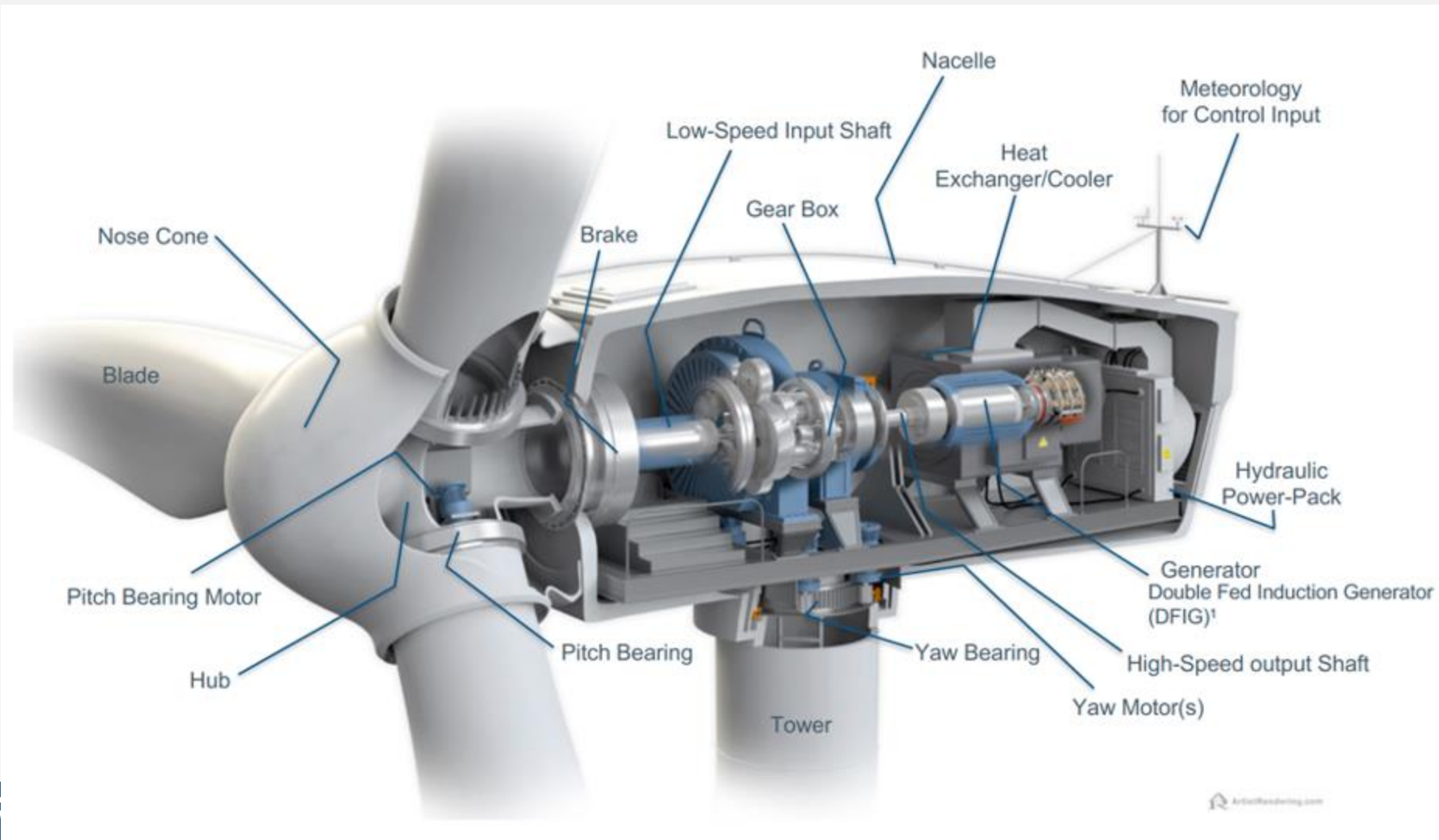
(B) Nacelle: houses the generating components.

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

(D) Tower: supports structure of turbine.



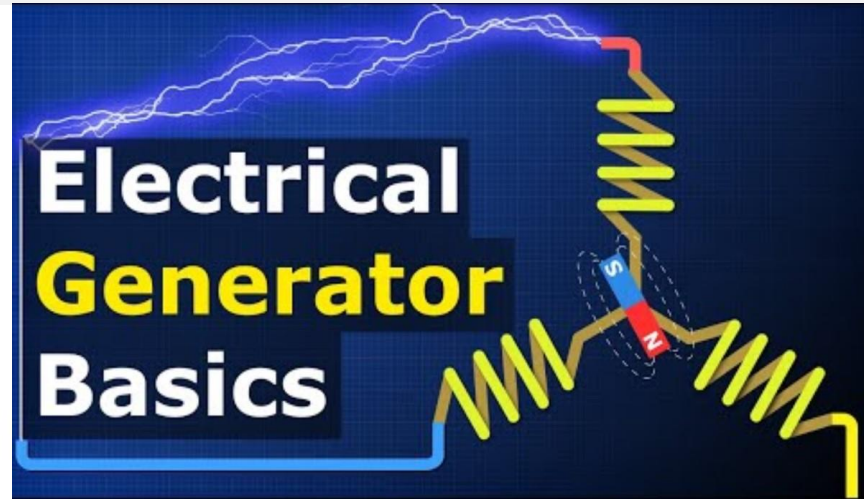
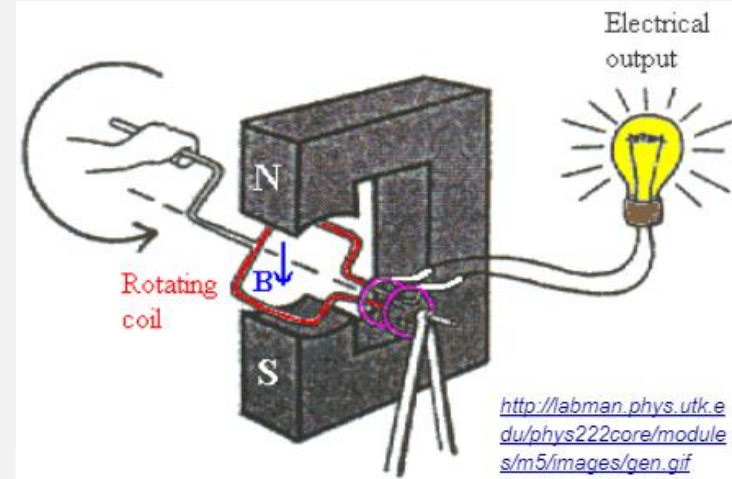
A More Thorough View



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

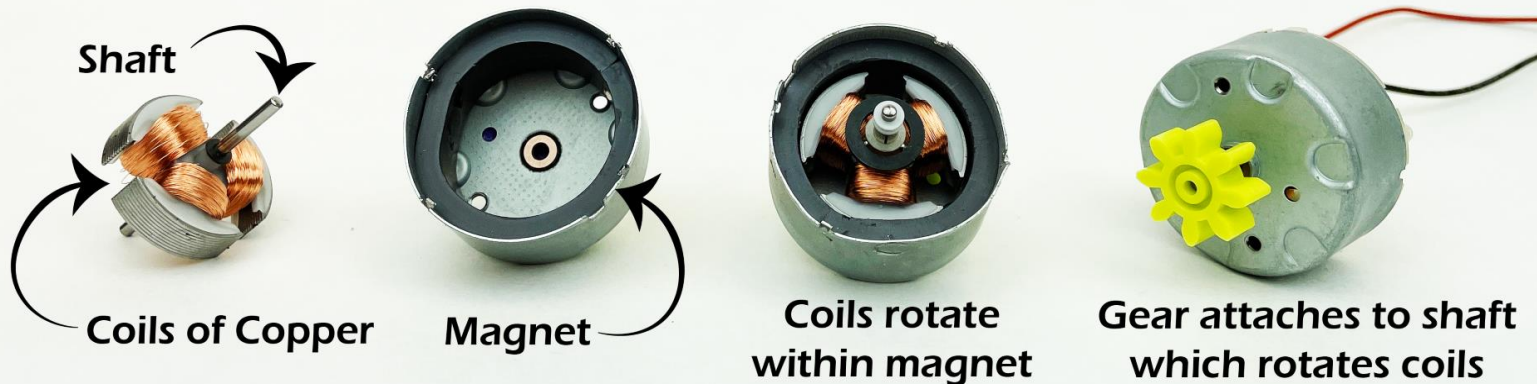
Turbine Design - Generator



[This video](#) does a nice job of explaining how a generator works. Basically, a generator produces (or generates) electricity by moving a magnet near a wire to create a flow of electrons. In the case of our wind turbines, if you open up the generator, you will see that we're using energy from the wind to make our coil of wires spin inside a magnetic field!

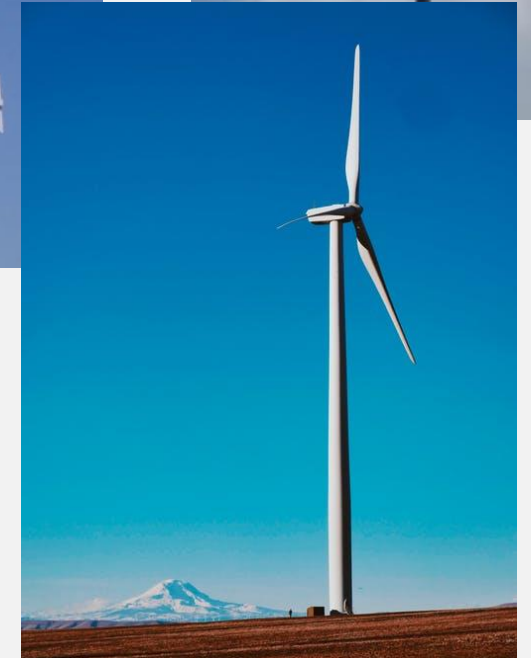
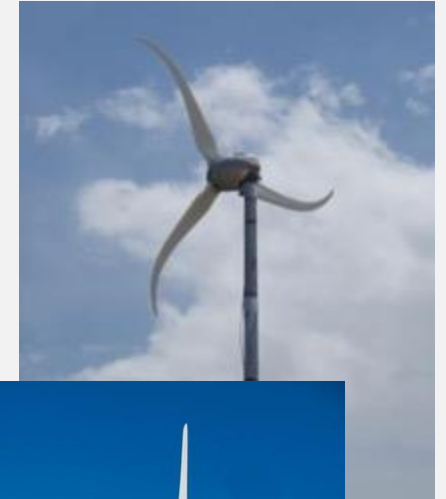
Check out the inside of a KidWind generator on the left!

What Happens Inside a KidWind Generator?



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



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.

Panel Question:

Looking back on your first KidWind Challenge, what's one thing you'd do differently?

LUNCH

Knowledge Quiz

Knowledge Quiz Rules (10 points)

- Time: Typically 10 minutes
- No phones or other electronic devices.
- Students will collaborate to answer 10 questions including multiple choice, true/false, & fill in the blank.
- Need accommodations, please inform the event organizers.
- Review Games available.
- The study guide used for the quiz questions is available online at <https://kansasenergyprogram.org/educators/kidwind-challenge/kidwind-resources>.



Knowledge Quiz

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

We will review as a group.

Winners get a prize!

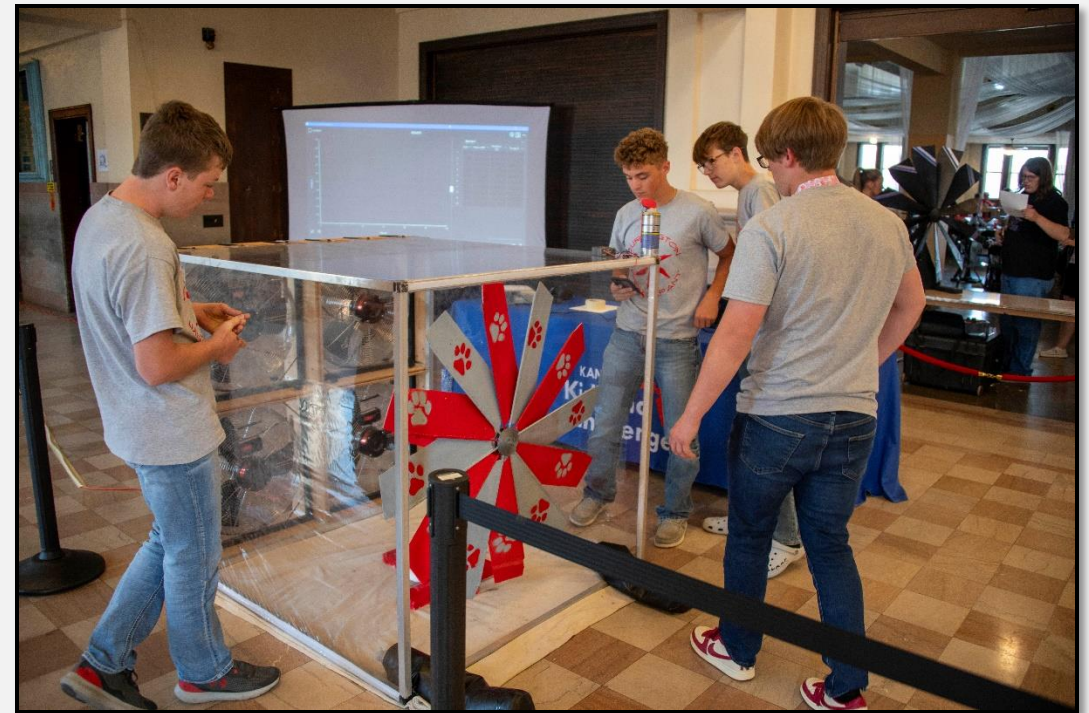
Panel Question:

Do you prep teams for KidWind in your general classroom, gifted classes, after school club, etc.?

Turbine Performance Testing

Turbine Performance (40 points)

- Practice tunnel available
- Turbine must be able to start producing power (turning) on its own without external assistance
- 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.
 - The first testing period: 10 minutes with six minutes of official testing time. Four minutes for set up/take out.
 - The second testing period: 5 minutes with three minutes of official testing time. Two minutes for set up/take out.
- Organizers and judges have the final say on rulings and disputes.
- Only student team members are allowed to adjust the turbine. Parents and coaches are asked to stand back and not assist; they can provide verbal recommendations, but the team will decide whether or not it wants to implement those recommendations. Penalty points may be assigned if coaches fix or handle the turbine or enter the wind tunnel space.
- A score of zero points will be awarded if the turbine fails to spin. Two separate testing periods; organizers do not plan to allow for catastrophic failures.
- Points ranking and spread are TBD for 2026 season.



Basic 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](#)
- A coach/teacher must [register](#) each team ahead of the Challenge and make sure students are prepared
- [More detailed rules](#)

Basic Rules (*continued*)

- 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 Rules (*continued*)

- 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.



Turbine Performance

- Energy Sensor
- Graphical Analysis
- Wind Power Formula

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!

Panel Question:

How much guidance do you provide your teams in the design, build, and testing process?

Judges Panel

Judges Panel (40 points)

- Spectators, teachers, and parents are not allowed in the room during judging.
- A panel of 3-5 judges will meet with each team for up to 10 minutes:
 - Students present their turbine design-and-build process (3-4 min.)
 - Bring turbine and documentation that reflects engineering design process.
 - Documentation examples: short report, PowerPoint presentation, notebooks, booklets, poster boards, etc. The presentation should *not* be about wind energy in general.
 - Be prepared with a backup plan if no wifi
 - Judges ask questions (4-5 min)
 - Be prepared to discuss/explain the choices incorporated into the design.
- The score for the judging portion of the competition is an average of each judge's score.



Judges Panel

Now it is your turn! Make a quick presentation about what you learned today.

- Judges Panel Scoresheet

Panel Question:

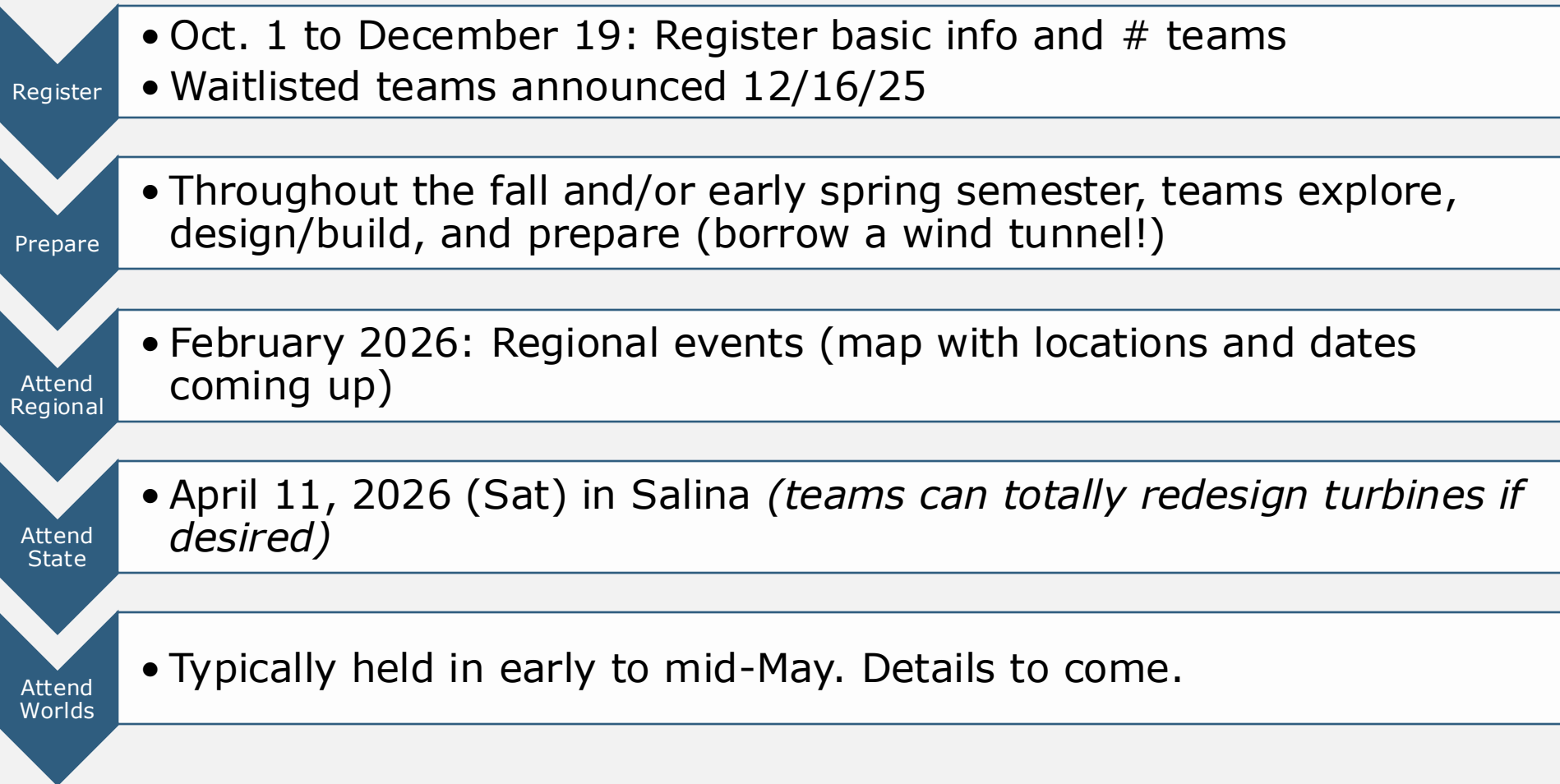
- *What aspects of the presentation have your students found most challenging?*
- *What strategies or ideas have you seen from other teams at past competitions that you adopted for your own teams?*

Regionals, State, Worlds - OH MY!

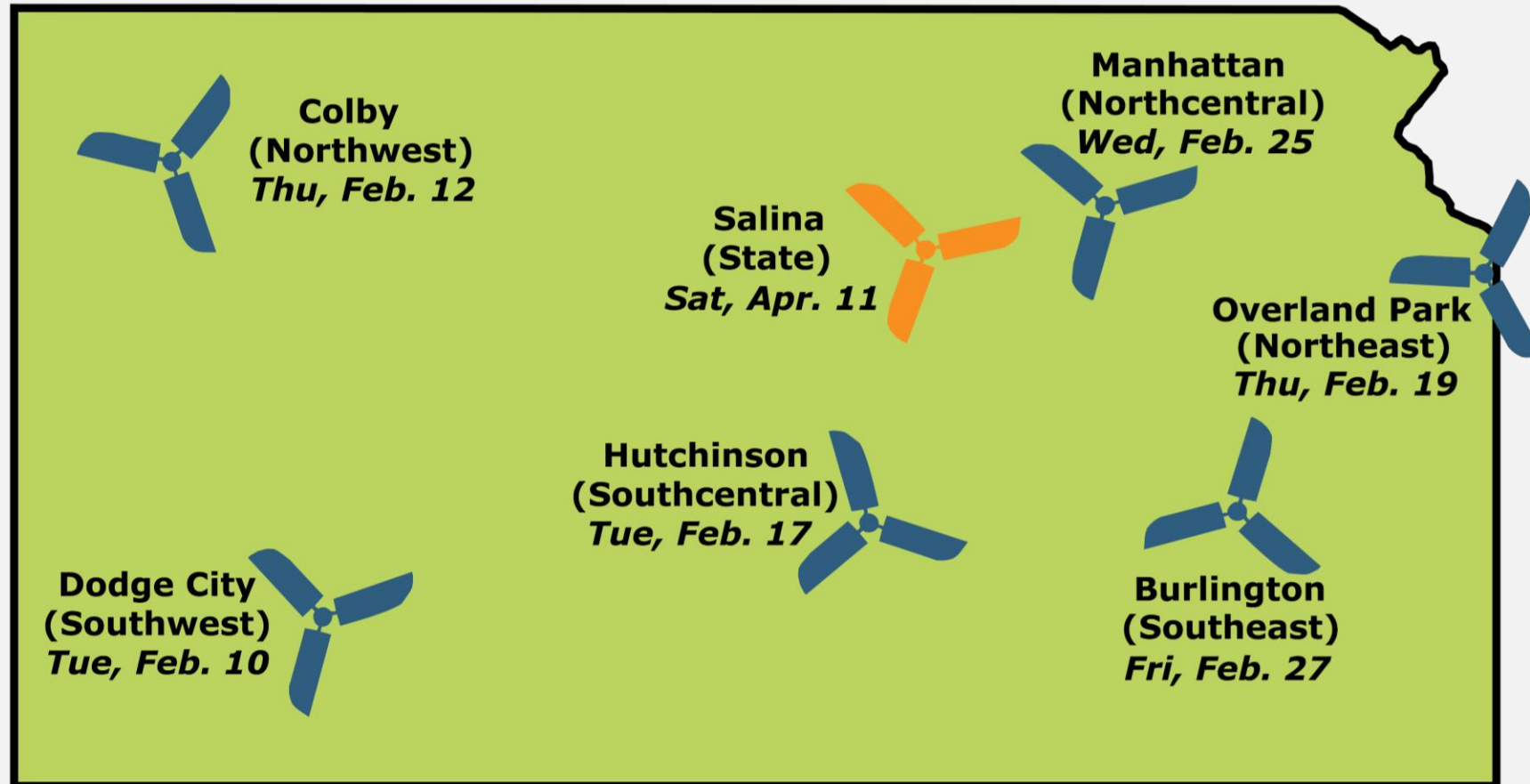
How to Register for Regionals (*2-part process*)

- **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



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.

Regionals, State, Worlds OH MY!

- Registration
- Scoresheets – emailed within 1 week
- Regionals – State – World (changes can be made)
- Shark Tunnel at State
- T-Shirt Design Contest this fall!



Panel Question:

How much did your students change or improve their turbine design between regionals, state, and worlds?

Resources and Activities

Focused on Wind Energy

KidWind-Specific Resources

All resources are available on the KEP website at
<https://kansasenergyprogram.org/educators/kidwind-challenge/kidwind-resources>

Wind Sailcar Activity

- Great introduction 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 from REcharge Labs at
www.kidwind.org/activities/recharge-labs
- Supplies and support available



MacGyver Challenge

- Great introduction 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 from REcharge Labs at
www.kidwind.org/activities/recharge-labs
- Supplies and support available



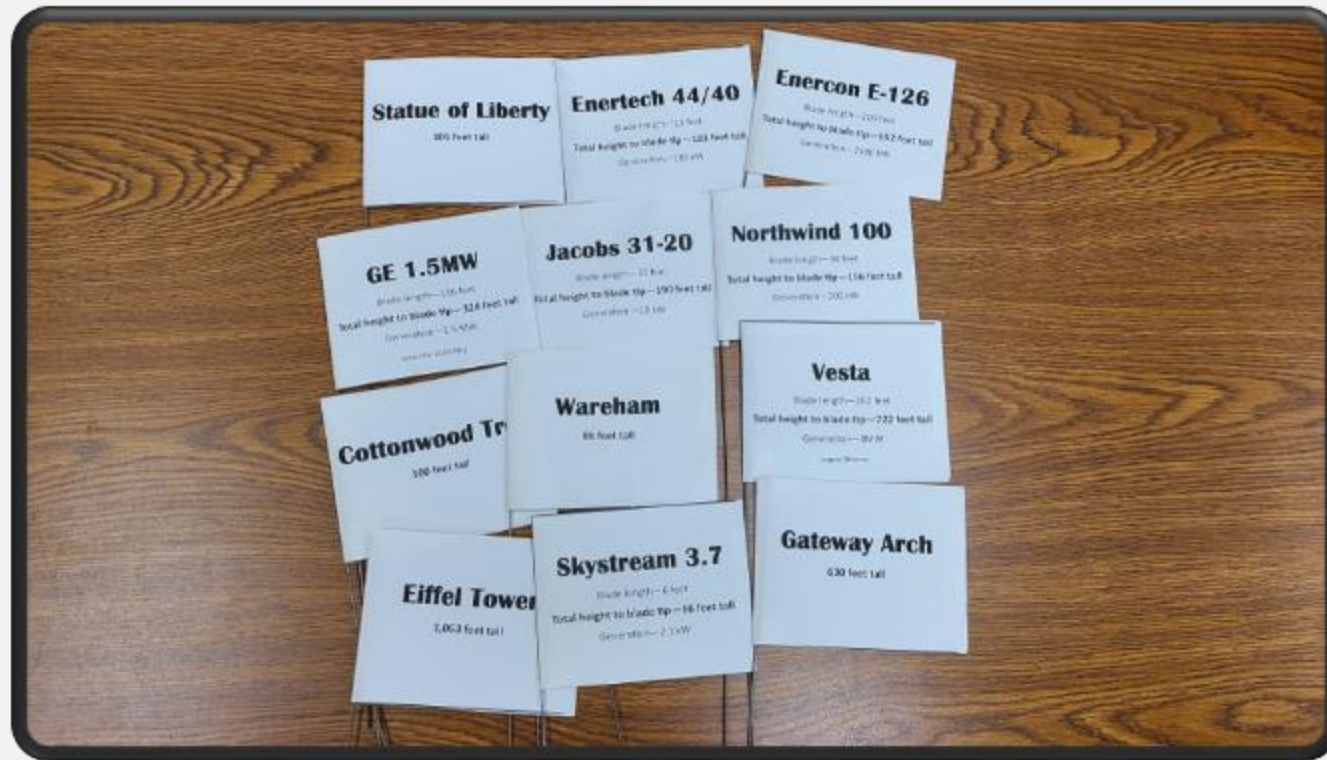
KidWind-related activities

- 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.

Be the Blade



Measure the Distances



Other Energy-Related Resources

An example of what the Kansas Energy Program has to offer

Light Box



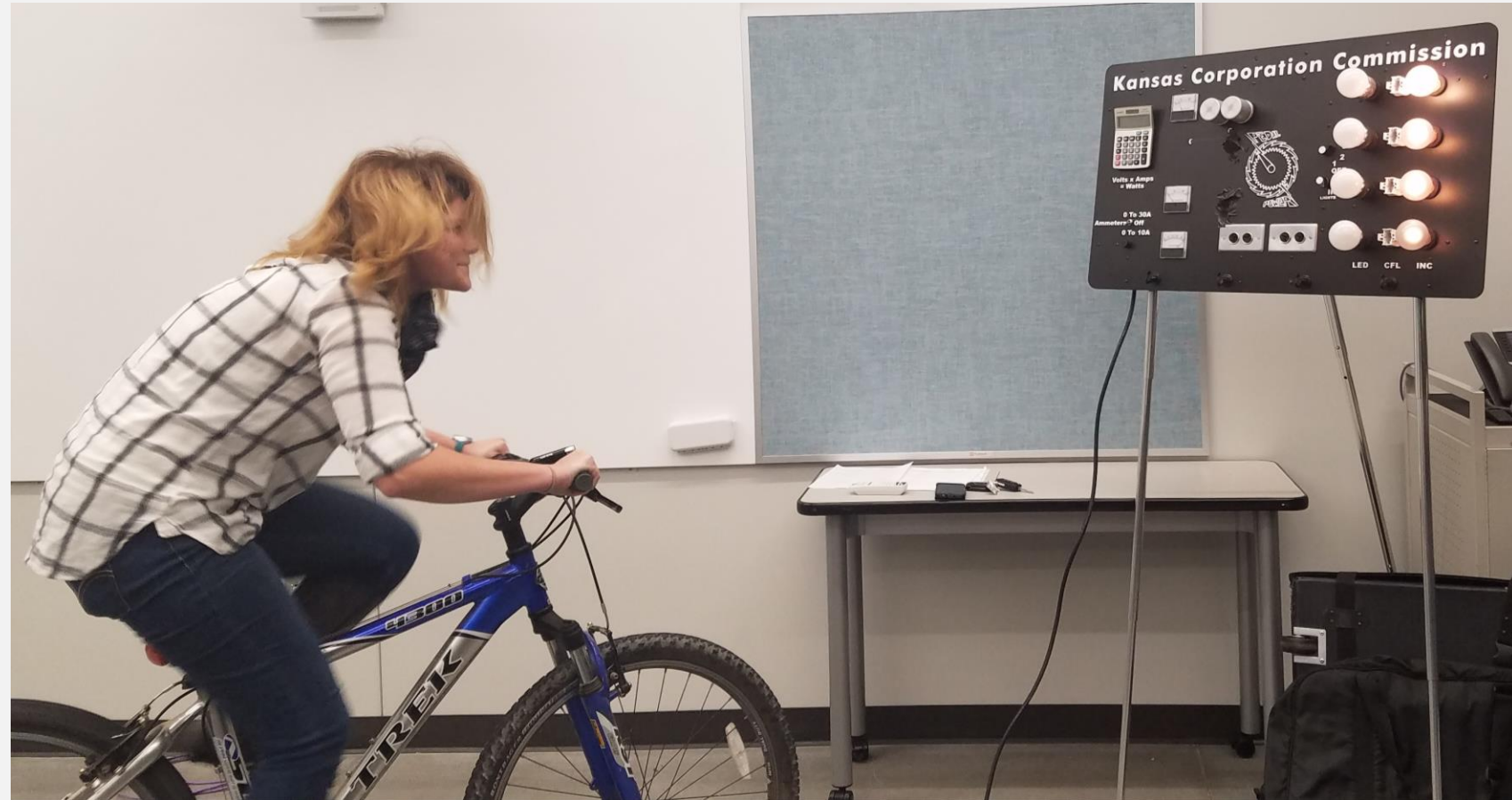
Light box - Explore more!

- Experiment with different electrical items to see how much power they draw and cost to use them; calculate the amount of coal that would have to be consumed based on an estimate of how long the equipment is used.
- Use the [EPA Emission and Generation Resource Integrated Database \(eGRID\)](#) to calculate the pollutants associated with each item.
- Use the [Pollution Prevention Greenhouse Gas Calculator](#) to calculate greenhouse gas emissions from each item.

Light box - Explore more!

- Use [EPA's Greenhouse Gas Equivalencies Calculator](#) to calculate greenhouse gas equivalencies for each item.
- Tie the P2 GHG calculator to the eGRID columns
- Discuss baseload vs. non-baseload energy and how different types of fuel sources can impact those.
- Using the very relevant Texas energy crisis, discuss how the US energy grid is used.
- Discuss the [Southwest Power Pool](#) and its [generation mix](#).

Bikes and Handcranks



Breakout Rooms

- Intro Video for Teachers: https://youtu.be/UoUq_NR3E1Y
- Trailer for Students: www.youtube.com/watch?v=do86F9NXz24&feature=emb_logo



Other Resources

- SPP generation mix - <https://portal.spp.org/pages/integrated-marketplace-generation-mix>
- Wind farm locations - <https://eerscmap.usgs.gov/uswtdb/viewer/#7.18/38.514/-98.32>
- 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/>

Wrap Up

- [Workshop Survey](#) ->
- PD Hours Form
- Travel/Substitute Reimbursement Form
- W-9 Form

