



2024 REcharge Academy Resources Guide



Fairbanks, Alaska
June 9 - June 14, 2024

Thanks to our Partners!

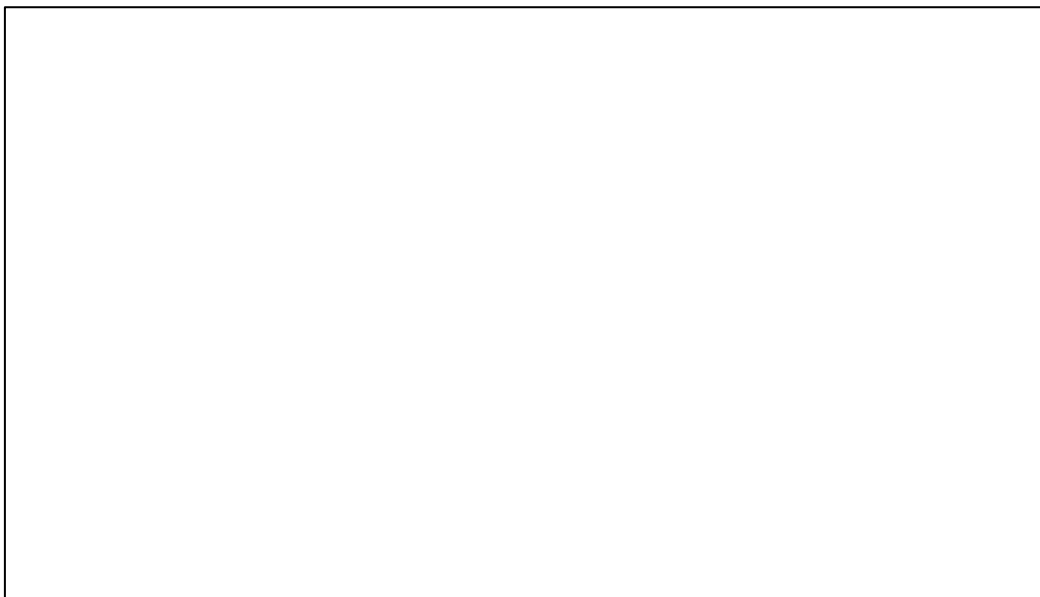


Renewable Energy
Alaska Project



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2024 REcharge Academy Sponsors



MIXING ACTIVITY! - MACGYVER WIND POWER *(Mike & KW Team)*

Let's get to know our friends and colleagues from all over the U.S.. This session covers how a windmill captures the energy of the wind and transforms it into usable mechanical energy. This is the basis for understanding modern wind turbines.

Macgyver Wind Energy

- [MacGyver Wind Power](#)

Amazing Old Windmills

- [Dutch Windmills](#)
- [Dutch Sawmill](#)
- [Detailed Tour about Living in a Dutch Windmill](#)

The Boy Who Harnessed The Wind

- [Book](#)
- [Info](#), [Ted Talk](#), [Netflix Movie](#)

INTRO TO ALASKA ENERGY *(Tyler Katzmar)*

This session will introduce the history of energy extraction and use in Alaska, the energy "ecosystems," and discuss some energy justice considerations in the state. This will set the stage for thinking about microgrids in Alaska and around the world.

- [Presentation](#)
- Look up your state's info at [EIA.gov](#) and your state Energy Office

ENERGY EFFICIENCY *(Colleen Fisk)*

This session will introduce you to the [AK EnergySmart](#) curriculum with hands-on activities focused on electricity and heat. Energy efficiency is the first fuel. The cheapest and lowest carbon energy is the energy you don't use.

- [Presentation](#)
- [Ponie electricity monitor](#)
- [Electricity Calculator](#)

THE COLD CLIMATE HOUSING RESEARCH CENTER (CCHRC)

CCHRC is a nonprofit corporation created to facilitate the development, use, and testing of energy-efficient, durable, healthy, and cost-effective building technologies for people living in circumpolar regions around the globe.

[FIND MORE DETAILS ON THE CCHRC HERE.](#)

ELECTRIC GRID OVERVIEW (*Daisy Huang - Associate Professor of Energy*)

Introduction to electric grids and microgrids, with an Alaska focus. What is the Power Grid? What is a Microgrid? What makes AK different and challenging?

[Presentation](#)

EXPLORING POWER GRID CLASSROOM PROJECTS (*KidWind Team*)

How can we help students understand and explore the complexities of the power grid? We will explore innovative hands-on projects you can use with your students to explore the power grid.

Draft Power Grid Activity Shared By Mike

[RESOURCE FOLDER](#)

This folder contains a draft of lessons that relates to the microgrid activity you started on Monday. There is A LOT here. Some details on the coding of the folders.

Folder Coding D1.1 = Day 1 / Activity 1

We assume each day is about a 2-hour block. That may not be right for your situation. There may be more than one activity on each day – but our timings are a bit of a guess!

Documents you may find in each folder include:

TG – Teacher Guide

SG – Student Guide or Handout

PPT – PPT to help guide you and/or to use with your students

These are some guides on the Power Grid Pilot Project – A bit dated

- [Teacher Padlet - Empowered Design](#)
- [Student Padlet - Empowered Design](#)

[Videos on how to do this project](#)

CONTINUE POWER GRID PROJECTS CLASSROOM ACTIVITIES

We will keep working to build our mini power grids and explore some power grid lessons, simulations and other tools.

What is the Power Grid?

There are like 100s of basic videos on the power grid -- I am not sure it is exciting for any kids....but here are a few that are OK.

- [Electrical Grid 101 : All you need to know!](#)
- [How does the Power Grid work?](#)
- [How does the Electrical Grid Work?](#)
- [The Great East Coast Blackout!](#)

Power Grid Websites

Good for background data on power generation and and real time grid data!

- [Map of Power Plants](#)
- [US Dept of Energy Local Energy Data](#)
- [Map of US Wind Turbines](#)
- [Real time Power Grid Data from BPA](#)
- Understanding - [Power Grid Inertia](#)

Real Time Data Websites

US EIA WEBSITE -- TOTAL US GRID DATA

- [Cal ISO](#)
- [NY ISO](#)
- [NE ISO](#)
- [MidWest ISO](#)
- [PJM ISO](#)

Power Grid & Other Simulators

- [PhET - DC Circuit Sim](#)
- [Power Grid Balance Sim](#)
- [Power Grid Flow Sim](#)
- [PBS Power Grid Lab](#)
- [Smart Grid for All Simulator](#)
- [Marine Energy Sim](#)
- [Power the Grid Game](#)

DARKSKY!

A fictional city has experienced a widespread blackout. You are an investigator charged with determining which factor(s) caused the blackout and what are immediate fixes and long term prevention measures.

<https://darksy.mste.illinois.edu>

TOUR THE ALASKA CENTER FOR ENERGY AND POWER

ACEP works with Alaskan communities and industries as leaders establishing the energy systems of the future. Alaska's remote off-grid systems present unique problems to generation, distribution and resource integration that have spurred microgrid innovations for decades.

Power Systems Integration Lab

- [Check out what they do at this lab here.](#)

GROUP 1: UAF POWER PLANT TOUR

This new \$255 million dollar combined heat and power plant began supplying all electricity and heat for the UAF campus in February 2020. It has been designed to handle at least 25 years of projected growth on campus. This example of a local microgrid was built with efficiency in mind.

[Combined Heat & Power Plant website](#)

GROUP 2: ACTIVITY BREAK-OUT

Explore a wind-focused project that best fits your student population. Options will include Sail Cars (elementary), Fireflies (elementary) and Homebuild Generators (middle/high). Lesson & generator links below!

- [Firefly Lesson](#)
- [Sail Car Lesson](#)
- [Homebuild Generator \(simpleGEN\) from Vernier](#)
- [Simple Generator Manual](#)

EXPLORING SOLAR ENERGY IN YOUR CLASSROOM

We will take some time to better understand solar energy and then do a solar Scavenger Hunt, build some solar fountains and then explore what it takes to site a solar array. Please find KidWind's solar activities linked below!

- [Solar Scavenger Hunt Activity](#)
- [Solar Fountains Activity](#)
- [Solar Town Activity](#)
- [Solar Cork Activity](#)

CLASSROOM WIND TURBINES & MINI KIDWIND CHALLENGE (MIKE & KW TEAM)

Teachers will construct and explore a variety of different classroom wind turbines and do activities that explore basic turbine functionality.

We will also hold a condensed version of a KidWind Challenge here with all of you!

Classroom Wind Turbines

Some kits we showed are below!

- [Advanced Wind Energy Kit](#)
- [KidWind Mini](#)
- [Firefly](#)

Our fearless REcharge Instructor Dick Anderson from WI has made some nice videos around some basic classroom wind turbines.

- [Beginner Wind Power to Mechanical](#)
- [Intermediate Wind Power to Mechanical](#)
- [Beginner Wind Power to Electrical](#)
- [Intermediate Wind Power to Electrical](#)
- [Advanced Wind Power to Electrical](#)

Other Resources

- [Some Blade Making & Testing Tips](#) (PNG Image)
- [Measuring Voltage Using a Meter](#) (PNG Image) [VIDEO](#) // [KW VIDEO LIBRARY](#)
- [Learn Wind \(PDF\)](#) - Dated but Good
- [Science Fair Wind Power \(PDF\)](#) - Dated but Good!
- [Measuring your Blade Pitch Video](#)

WindWise Lessons

- [Lesson #10 - Which blades are best?](#)
- [Lesson #11 - How can I design better blades?](#)

KidWind Challenge

Learn about KidWind's flagship competition, the KidWind Challenge - our hands-on design celebration that engages students through the lens of wind and solar energy. Student teams design, construct, and test small scale wind turbines and solar structures at events all over the world.

Some videos to give you an idea of what happens at a Challenge:

- [2022 KidWind Challenge San Antonio](#) & related [Article](#)
- [The KidWind® Challenge \(2018, Vernier\)](#)
- [2019 Kansas KidWind Challenge \(ENEL\)](#)
- [2019 Penn State KidWind Challenge](#)
- [2017 UNC Coastal Studies KidWind Challenge](#)

[KidWind Online Wind Challenge](#)

[KidWind Simulation Challenge](#) - [DETAILED WEBINAR](#)

Thursday, June 13

Food Energy Nexus & Geothermal

FOOD ENERGY NEXUS (*Colleen Fisk*)

95 percent of Alaska's food is imported. Biomass and geothermal are already used in a few places in Alaska for low-cost energy for heating greenhouses, but there is opportunity for more combinations of clean energy and food growing to improve food security. This session will also include discussion about carbon credits and a hands-on activity from AK EnergySmart.

- AKES Activity - [Value of a Tree](#)
- [Presentation](#)

CHENA HOT SPRINGS & GEOTHERMAL TOUR

[Check out the Chena Hot Springs website here.](#)

Other Resources:

- [Folder for files on USB](#)