REcharge Trainings and National Standards

Inquiry and Science Process

Students set up experiments and collect data on how well their wind turbine or solar systems perform as they make design changes. They use simple and sophisticated tools as they travel through the design, test, and evaluation processes. Wind turbines and solar systems use many different parts that all function together in the wind or solar environment. To build a successful device, students will need to be analytical as they determine the major drivers of performance and understand how they influence one another.

Energy and Energy Transfer

Students build and refine an energy transformation device: moving air or sunlight is transformed into mechanical energy, which in turn transforms into electrons to be converted into light, sound, or motion. During each step of this process, students focus on the forces acting upon the turbine or solar panel, and must understand how energy works in order to optimize the transformation process.

Physical Science

From understanding how a generator works to the analyzing the action and reaction forces acting on a spinning blade or solar panel, there are a number of physical science concepts that can be explored while building a turbine.

Earth Science

Comprehending where our energy comes from is key in creating a responsible energy future. We cannot talk about how renewable energy sources operate without thinking about the fundamentals of where wind, solar, water, etc. come from. Understanding the flow of these natural systems and what cause them is vital to realizing and comparing their potential.

Human Impacts of Natural Resource Use

The understanding that humans contribute to environmental issues like climate change has required us to start thinking more holistically about where our energy comes from and where it goes. One of the major reasons society is looking to generate more energy from the wind and sun is that these resources are renewable, so they have the potential to reduce carbon emissions once infrastructure is in place. Students engage in lessons that illuminate the challenges of relying on conventional energy sources, and cover the materials necessary to have informed discussions about other energy sources like wind and solar.

Engineering Design

REcharge Training lessons revolve around hands-on engineering skills that students develop in the classroom. Students think critically to define the problem to be solved, design and evaluate proper solutions, and optimize their design. To succeed they must apply the science concepts they have learned and also tinker, craft, and experiment. This makes the process – and the lessons extracted from it – memorable.

REcharge Trainings and Next Generation Science Standards

4th Grade Energy

4-PS3-1. Use evidence to construct an explanation relating the speed of an object to the energy of that object.

4-PS3-2. Make observations to provide evidence that energy can be transferred from place to place by sound, light, heat, and electric currents.

4-PS3-4. Apply scientific ideas to design, test, and refine a device that converts energy from one form to another.

4th Grade Earth Systems

4-ESS2-2. Analyze and interpret data from maps to describe patterns of Earth's features.

4th Grade Earth And Human Activity

4-ESS3-1. Obtain and combine information to describe that energy and fuels are derived from natural resources and their uses affect the environment.

5th Grade Earth And Human Systems

5-ESS3-1. Obtain and combine information about ways individual communities use science ideas to protect the Earth's resources and environment.

Middle School Motion/Stability: Forces and Interactions

MS-PS2-2. Plan an investigation to provide evidence that the change in an object's motion depends on the sum of the forces on the object and the mass of the object.

MS-PS2-5. Conduct an investigation and evaluate the experimental design to provide evidence that fields exist between objects exerting forces on each other although the objects aren't in contact.

Middle School Earth Systems

MS-ESS2-5. Collect data to provide evidence for how the motions and complex interactions of air masses results in changes in weather conditions.

MS-ESS2-6. Develop and use a model to describe how unequal heating and rotation of the Earth cause patterns of atmospheric and oceanic circulation that determine regional climates.

Middle School Earth and Human Systems

MS-ESS3-3. Apply scientific principles to design a method for monitoring and minimizing a human impact on the environment.

MS-ESS3-4. Construct an argument supported by evidence for how increases in human population and per-capital consumption of natural resources impact Earth's systems.

MS-ESS3-5. Ask questions to clarify evidence of the factors that have caused the rise in global temperatures over the past century.

Middle School Engineering Design

MS-ETS1-1. Define the criteria and constraints of a design problem with sufficient precision to ensure a successful solution, taking into account relevant scientific principles and potential impacts on people and the natural environment that may limit possible solutions.

MS-ETS1-2. Evaluate competing design solutions using a systematic process to determine how well they meet the criteria and constraints of problem.

MS-ETS1-3. Analyze data from tests to determine similarities and differences among several design solutions to identify the best characteristics of each that can be combined into a new solution to better meet the criteria for success.

MS-ETS1-4. Develop a model to generate data for iterative testing and modification of a proposed object, tool, or process such that an optimal design can be achieved.

High School Energy

HS-PS3-3. Design, build, and refine a device that works within given constraints to convert one form of energy into another form of energy.

HS-PS3-1. Create a computational model to calculate the change in the energy of one component in a system when the change in energy of the other component(s) and energy flows in and out of the system are known.

High School Motion and Stability

HS-PS2-5. Plan and conduct an investigation to provide evidence that an electric current can produce a magnetic field and that a changing magnetic field can produce an electric current.

High School Earth and Human Systems

HS-ESS3-4. Evaluate or refine a technological solution that reduces impacts of human activities on natural systems.

High School Engineering Design

HS-ETS1-1. Analyze a major global challenge to specify qualitative and quantitative criteria and constraints for solutions that account for societal needs and wants.

HS-ETS1-2. Design a solution to a complex real-world problem by breaking it down into smaller, more manageable problems that can be solved through engineering.

HS-ETS1-3. Evaluate a solution to a complex real-world problem based on prioritized criteria and trade-offs that account for a range of constraints, including cost, safety, reliability, and aesthetics as well as possible social, cultural, and environmental impacts.