UNIT 2: Transfer of Energy

Unit Summary: In this unit, students will provide evidence that energy can be transferred from place to place. Students will design a device that converts energy from one form to another.

It is recommended for students to have a science journal that will allow them to display their thoughts and ideas, to find vocabulary, and respond to discussions and writing prompts.

Concepts and Vocabulary:
Vocabulary

constraints	criteria	electric currents
transforming	conversion	hazardous
delimiting	proposals	proposed
electric circuits		

Stage 1 – Desired Results (Also see Disciplinary Core Ideas below)

Performance Expectations: (PE)

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

Enduring Understandings (1-3 max)
Students will understand that: (connects with EQ 1)

- Energy can be moved from place to place through sound, light, or electric currents
- Energy can be transferred in various ways and between objects.
- Light also transfers energy from place to place.

Students will understand that: (connects with EQ 2)

- Cause-and-effect relationships are routinely identified and used to explain change.

Essential Questions
Guiding Question: Where do we get the energy we need for modern life?

EQ 1:

- *"How does energy make your TV or other things work?"*

EQ 2:

- *"How much does matter where we get our energy from, and why?"*

• Knowledge of relevant scientific concepts and research findings is important in engineering. • Over time, people's needs and wants change, as do their demands for new and improved technologies. • Energy and fuels that humans use are derived from natural sources.	

Science & Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts

Obtaining, Evaluating, and Communicating Information ● Obtain and combine information from books and other reliable media to explain phenomena. (4-ESS3-1)	● Energy is present whenever there are moving objects, sound, light, or heat. When objects collide, energy can be transferred from one object to another, thereby changing their motion. In such collisions, some energy is typically also transferred to the surrounding air; as a result, the air gets heated and sound is produced. (4-PS3-2 ● Light also transfers energy from place to place. (4-PS3-2) ● Energy can also be transferred from place to place by electric currents, which can then be used locally to produce motion, sound, heat, or light. The currents may have been produced to begin with by transforming the energy of motion into electrical energy. (4-PS3-2) ● **ESS3.A: Natural Resources** Energy and fuels that humans use are derived from natural sources, and their use affects the environment in multiple ways. Some resources are renewable over time, and others are not. (4-ESS3-1)	● Cause and effect relationships are routinely identified and used to explain change. (4-ESS3-1) --- ***Connections to Engineering, Technology, and Applications of Science*** **Interdependence of Science, Engineering, and Technology** ● Knowledge of relevant scientific concepts and research findings is important in engineering. (4-ESS3-1) **Influence of Engineering, Technology, and Science on Society and the Natural World** ● Over time, people's needs and wants change, as do their demands for new and improved technologies. (4-ESS3-1)

Stage 2 – Assessment Evidence	
Summative Performance Task(s) **Writing Connection:** Choose an idea and write a story or essay about it. Use your imagination and your knowledge of energy. ● Black out! One evening, there's a blackout in your neighborhood. All the electric lights go out. The electric stove, the microwave oven, the TV, the computer — none of them are working. What will you do to get through the evening? What will you make for dinner? What will you do for amusement? ● Invent it! You used a rubber-band to make a motor that moved your rubber-band roller. What are some other machines you could make with a motor like that? (You can be serious or silly — your choice.) ● Snack power! If you could make a vehicle that uses food as fuel, what food would you use? What vehicle would you make? Why would you use that food and make that vehicle? ● No gas; no go? Suppose all gasoline-powered engines suddenly stopped working. Cars, trucks, buses, and motorcycles won't run. How would you get to school? Where would the energy come from to get you from one place to the other? ● Pancakes or Petroleum? How is a big breakfast like a tankful of gas? How are they different? ● The power of zap! Suppose you are a superhero named the Energizer. What is your superpower? How will you use it? **Audience:** ● Peers and teacher ● Rubric (Coming Soon)	**Formative Evidence for EQ 1:** *How does energy move?* ***Students who understand the concepts are able to:*** ● Identify cause-and-effect relationships in order to explain change. ● Obtain and combine information from books and other reliable media to explain phenomena. **Formative Evidence for EQ 2: How can energy be stored?** ● Identify cause-and-effect relationships in order to explain change. ● Obtain and combine information from books and other reliable media to explain phenomena. Navigating Nonfiction- Use the skills and mini-lessons taught in this unit to read informational texts presented in this unit. Students can showcase this knowledge in various outlets.

Stage 3 – Learning Plan / Road Map (Design to make as student centered as possible)
Suggested Resources for Planning: Mystery Science, NewsELA, Tower Garden Lessons, NJCTL.org, thewonderofscience.org, and other relevant resources.
Learning Activities: Learning Goal: Students will provide evidence that energy can be transferred from place to place.Students will design a device that converts energy from one form to another. **Mystery Science Resources** Mystery 1: How is your body similar to a car? Standard:4-PS3-1, 4-PS3-4 Target: ● I can provide evidence that energy can be transferred from place to place. ● I can design a device that converts energy from one form to another. ● Assessment: can be done in science journal Mystery 2: What makes roller coasters go fast? Standard:4-PS3-1, 4-PS3-3 Target: ● I can provide evidence that energy can be transferred from place to place. ● Assessment Question ● Anchor Chart NewsELA ● **What is Energy?** Mystery 3: Why is the first hill of a roller coaster always the highest? Standard:4-PS3-3 Target: ● I can provide evidence that energy can be transferred from place to place. **NewsELA** ● **Wind Energy** Mystery 4: Could you knock down a building using only dominoes? Standard:4-PS3-4, 3-5-ETS1-1

Target:

- I can provide evidence that energy can be transferred from place to place.
- I can design a device that converts energy from one form to another.
- Anchor Chart

NewsELA

- **Yellowstone**

Mystery 5: Can you build a chain reaction machine?
Standard:4-PS3-4, 3-5ETS1-1, 3-5ETS1-2, and 3-5ETS1-3
Target:

- I can provide evidence that energy can be transferred from place to place.
- I can design a device that converts energy from one form to another.
- Anchor Chart

NewsELA-
Sun Connection

Mystery 6: What if there was no electricity?
Standard:4-PS3-2, 4-PS3-4
Target:

- I can provide evidence that energy can be transferred from place to place.
- I can design a device that converts energy from one form to another.
- Anchor Chart

Additional Resources:
Science of Roller Coasters Understanding Energy

Suggested Methods: Could be tracked using science journals
Phenomena:
● What is the relationship between the speed of an object and the energy of that object?
● In what ways does energy change when objects collide?
● How can scientific ideas be applied to design, test, and refine a device that converts energy from one form to another?
● How can we use waves to gather and transmit information?
● Where do we get the energy we need for modern life?

Links to Phenomena:

- 4-PS3-1 Coupled Pendulum

• 4-PS3-1, 3-PS3-2, PS3-4 Solar Cars • 4-ESS3-1 Algae Fuel and Food • 4-PS3-1, 4-PS3-2, 4-PS3-3, 4-PS3-4 Amazing Rube Goldberg Machines