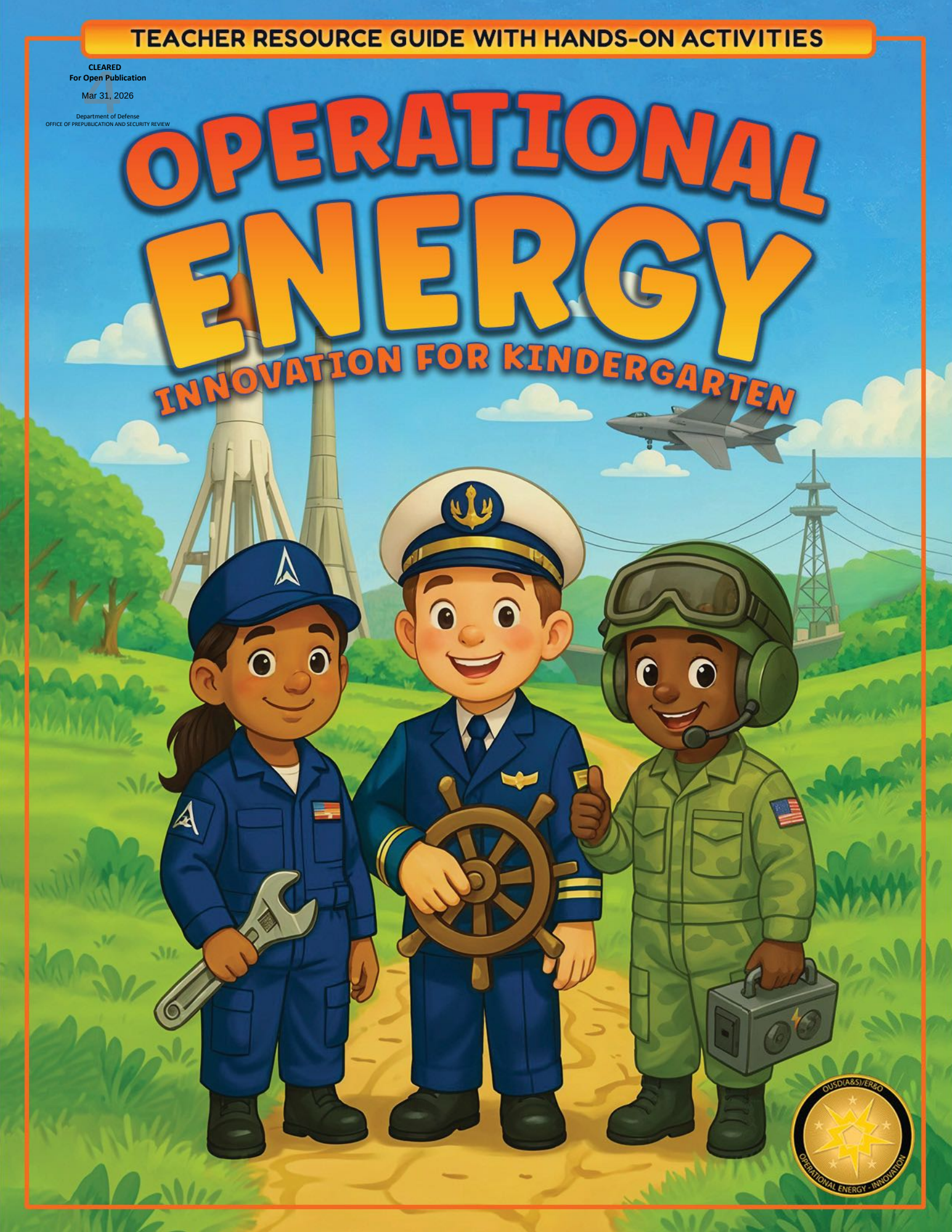
TEACHER RESOURCE GUIDE WITH HANDS-ON ACTIVITIES

OPERATIONAL ENERGY

INNOVATION FOR KINDERGARTEN



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Introduction

Welcome to the **Operational Energy Initiative (OE-I) Teacher's Guide**. This resource was developed to support educators in teaching students about energy - how it is generated, transformed, conserved, and applied in real-world contexts. By connecting directly to Next Generation Science Standards disciplinary core ideas including Energy (PS3) and Earth and Human Activity (ESS3), this guide helps students explore how energy systems work and how human choices influence technology.

The **OE-I Kids Demo App** extends learning through interactive exploration. Students can test ideas, model systems, and see the impact of different energy choices - reinforcing Science and Engineering Practices like developing models, analyzing data, and designing solutions. The app also highlights crosscutting concepts such as cause and effect, systems and system models, and energy and matter, giving students a deeper understanding of how energy connects across science disciplines.

Together, the Teacher's Guide and Demo App provide a well-rounded learning package that supports:

- **Scientific Inquiry:** Asking questions and making evidence-based claims.
- **Problem-Solving:** Using engineering design to test and improve ideas.
- **Systems Thinking:** Understanding the relationships between energy, technology, and the environment.

These resources are designed to spark curiosity, strengthen **STEM** skills, and inspire students to see energy not just as a topic of study, but as a powerful force shaping their world and future opportunities.

Objectives

Teacher Guide Objectives
Operational Energy - Innovation for Kindergarten

By the end of this guide, students will be able to:

1. **Understand Energy**
   Explain what energy is and why it is important for people, machines, and military heroes.

2. **Identify Energy Sources**
   Recognize different types of energy, including fuel, solar, battery, nuclear, and water.

3. **Explore How Energy Works**
   Learn how energy is produced, stored, and used through hands-on activities and games.

4. **Solve Energy Challenges**
   Understand the importance of planning, teamwork, and protecting energy in everyday life and for the military.

5. **Innovate as Energy Explorers**
   Experiment, create, and test ideas to improve how energy is used, fostering curiosity and problem-solving skills.

6. **Practice Energy Conservation**
   Apply lessons about using energy wisely and saving it for the things that matter most.

Chapter 1

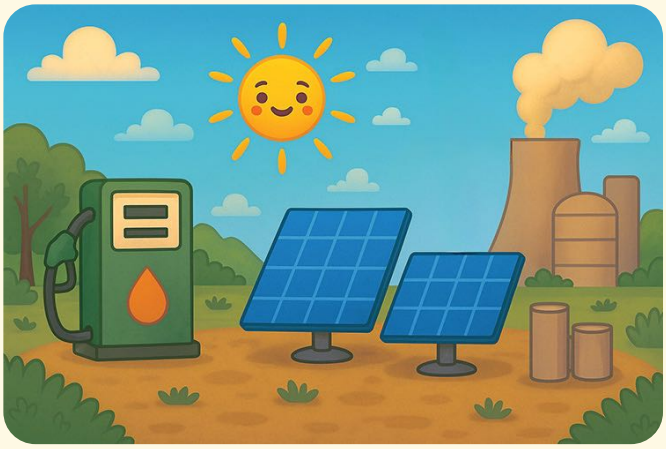
Energy for Our Heroes

What is Energy?

Energy is what makes things go! Just like how we eat food to run and play, our heroes in the military need energy to do their important jobs.

How Do Our Heroes Use Energy?

Our soldiers, pilots, and sailors need energy to power their trucks, planes, and ships. They use energy to talk to each other on radio, keep their computers working, and even to stay warm or cool in different weather.



Different Kinds of Energy

There are many ways to get energy! Some energy comes from fuel, like gas for cars. Some energy comes from the sun, batteries, or even big power plants. The military is always looking for smart new ways to use energy to keep our heroes safe.

Why Operational Energy is Important?

If our heroes run out of energy, their planes wouldn't fly, their trucks wouldn't drive, and their radios wouldn't work! That's why the military must make sure there is always enough energy for everything they do.

Using Operational Energy Wisely

The military is trying to use energy in the smartest way possible. They build better engines that don't waste energy, and they use new kinds of power that last longer. That way, they can go farther and do more without running out of energy.

Keeping Our Heroes Ready

The military works hard to make sure they always have the energy they need, even if they are far from home. This helps them protect people and do their important missions.

The Future of Operational Energy

The military are finding even cooler ways to use energy! In the future, the military might use space energy or special power from the sun to help our heroes do their jobs even better.

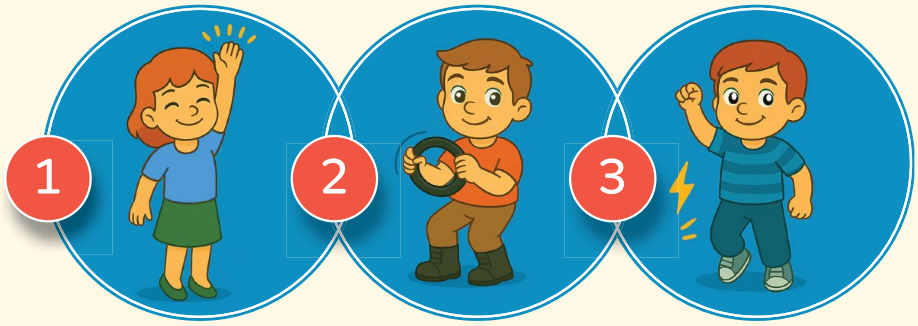
Chapter 1 – Activity

"Move Like Energy" Game

Objective: Help kids understand that energy makes things move.

Activity: Have the kids act out different forms of energy by moving their bodies!

1. Solar energy: Slowly stretch and "grow" like a sunflower.
2. Fuel energy: Pretend driving a car, flying a plane, or steering a ship.
3. Battery energy: Hop in place until their "battery" runs out, then "recharge" by resting.



"What Happens Without Energy?" Freeze Game

Objective: Show why energy is important.

Activity:

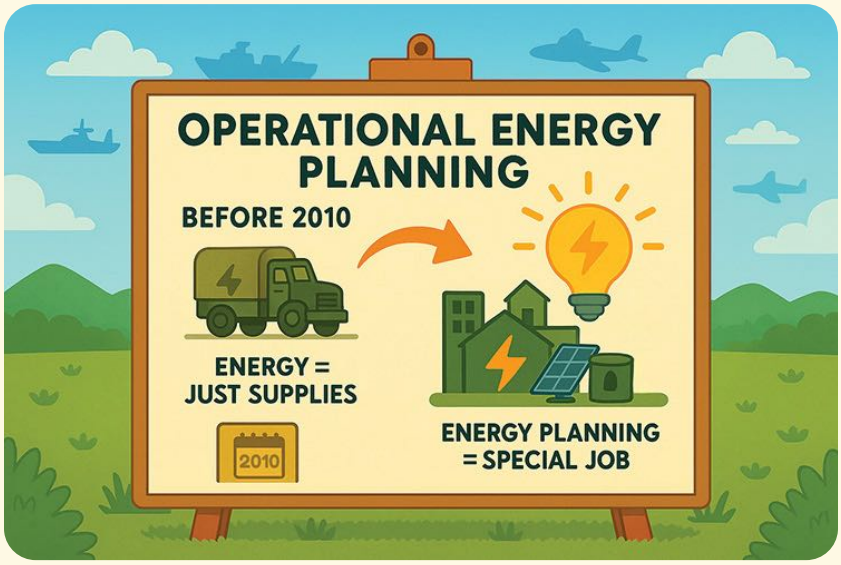
1. Have kids pretend to be military trucks, planes, or ships moving around.
2. When you call out "**NO ENERGY!**" they must freeze in place.
3. Ask them what happens when the military runs out of energy and how they can fix it.

Chapter 2

Operational Energy Planning for Our Heroes

How Do Our Heroes Plan for Operational Energy?

A long time ago, armies always thought about how to get enough energy for their missions. But in 2010, the U.S. military made a big change! They decided that energy planning should be its own special job, not just part of moving supplies. This helped them make sure they always have the power they need.



Military Operational Energy vs. Everyday Energy

People at home can sometimes lose power for a little while, like during a storm. But for the military, running out of energy can be dangerous! Soldiers need energy all the time to keep their planes flying, ships sailing, and computers working. That's why they always make sure they have extra energy, just in case.

Operational Energy for the Military!

New technology is changing how the military uses energy. Some special technologies, like laser beams and microwaves, need a lot of power to work. These energy tools are becoming more important, just like regular tools such as tanks and planes. If the military runs out of energy, they can't use these powerful new tools!

Planning for Now and the Future

The military thinks about energy in two ways:

- **Long-term planning:** Leaders think about how to get energy for the future. They look for better fuel and new ways to power the military.
- **Short-term planning:** Commanders on the ground make sure their teams have enough energy right now, so they can complete their missions.

Why This Matters

By thinking ahead and planning well, the military makes sure they always have the energy they need. Whether it's today or in the future, they want to be ready to keep everyone safe and complete their important jobs!

Chapter 2 – Activity

"Energy Art" Craft Station

Objective: Let kids explore energy creatively.

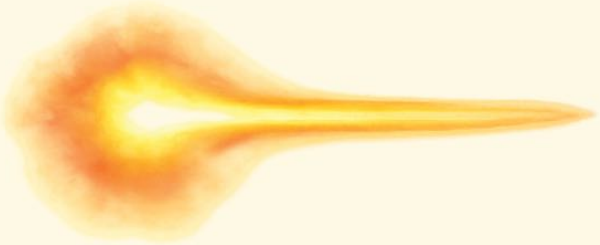
Activity:

1. Provide coloring sheets or cut-out pictures of planes, ships, tanks, and solar panels.
2. Have kids glue “energy” (colored paper rays for sun power, small cotton balls for fuel smoke, etc.) to show how each one gets its energy.

Types of Energy

Fossil Fuel

Nuclear



Laser

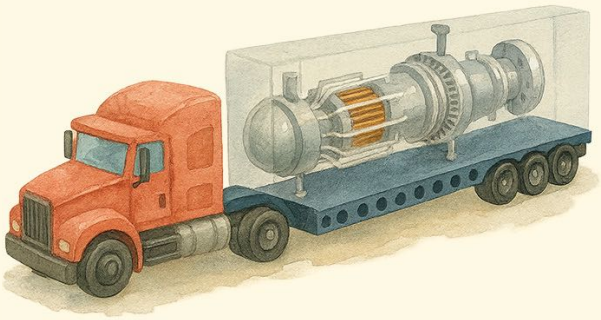
Solar

Water

Electric

Steam

Energy Generation



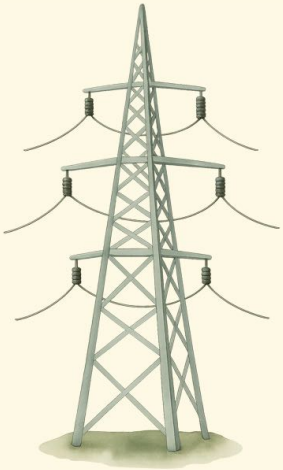
Mobile Micro Nuclear Reactor

Nuclear

Solar Panel

Hydroelectric

Power Station

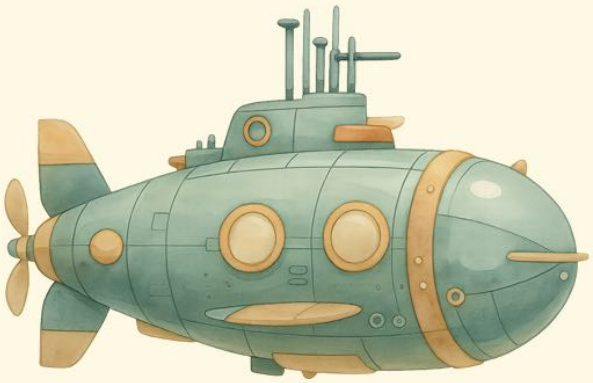


Electrical Grid Tower

Solar Farm

Portable
Power Station

Vehicles that use Energy



Chapter 3

Energy Challenges for Our Heroes

Why Is Operational Energy Sometimes Hard to Get?

A long time ago, soldiers didn't have to worry much about getting enough energy. But today, the military goes to many different places, like faraway islands and cold, icy lands. Some of these places don't have enough fuel or electricity, which makes it harder for soldiers to do their jobs. Plus, other countries might try to stop the military from getting the energy they need!

Why Do We Protect Our Energy?

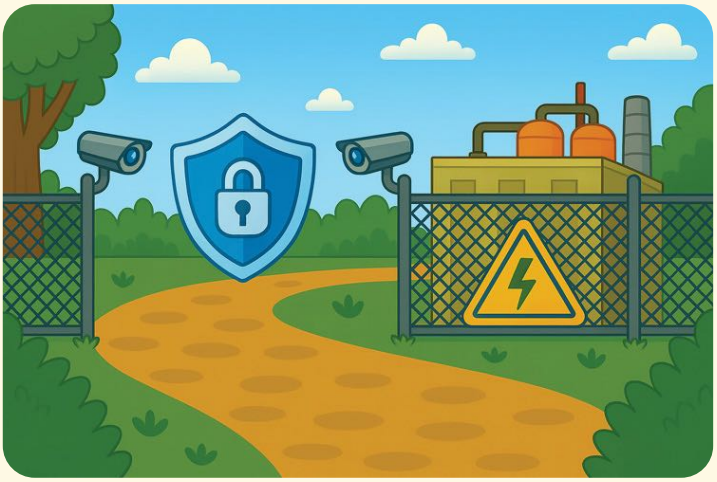
Soldiers need energy to do their important jobs, such as flying planes, driving trucks, and using computers. Sometimes, problems can happen. Roads might be blocked, equipment might break, or the power might stop working. That is why military teams work together to solve problems and make sure energy is safe and ready when it is needed. When everyone helps and works as a team, the mission can keep going strong.

Why Fuel Trucks Can Be Dangerous

Big trucks carrying fuel move slowly and can catch fire easily. This makes them easy targets in battles. That's why the military looks for safer and smarter ways to get energy, so fewer heroes get hurt.

Keeping Energy Safe

Some of the energy the military uses comes from places like gas stations and power plants. These spots are not as protected as military bases. Storms, accidents, or other problems can make it hard to get energy. That is why the military works with the community to keep energy sources safe and ensure there is always enough power.



Learning from the Past

A few years ago, a big fuel pipeline had a problem that made it hard for people and soldiers to get fuel. This taught everyone how important it is to protect energy, not just for homes, but for the military too. When regular people and the military work together, they can help keep energy safe for everyone.

How Do Soldiers Plan for Operational Energy?

The military has special tools and smart plans to make sure they always have energy. Soldiers help by making new ways to store and use power better. If one part of the energy plan changes, it can help or hurt many other parts. That's why it's important to think ahead and plan carefully!

What's Next?

The military keeps working on new ways to use energy so they can stay strong and ready for anything. By planning smartly and working together, they can keep everyone safe while using energy in the best way possible!

Chapter 3 – Activity

"Energy Art" Craft Station

Objective: Teach kids about different energy sources in everyday life.

Activity:

1. Hide pictures or toy objects representing energy sources (solar panels, gas cans, batteries, etc.) around the classroom.
2. Give kids clues to find them and discuss how each one powers something.

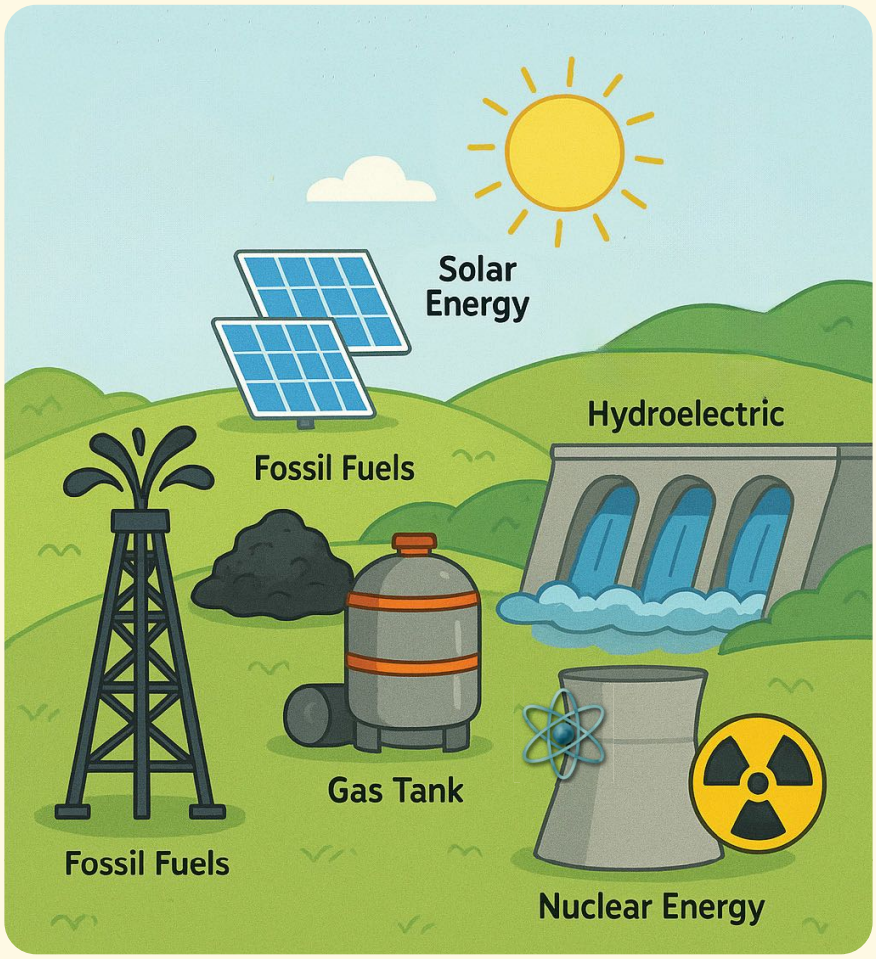
Chapter 4

How the Military Uses Energy

Where Operational Energy Comes From

Some energy comes from things like oil, coal, and gas, which we take from the ground. Other types of energy come from nature, like sunlight and water, which are free and renewable. There is also nuclear energy, which comes from tiny particles called atoms.

The military needs energy to make airplanes fly, power ships, and move tanks. Right now, they mostly use fuel from oil because it gives a lot of power and can be stored for a long time.



How the Military Controls Energy

Just like you must be careful with your toys and snacks, the military must be careful with energy. They have a big plan to make sure they don't run out and use it the best way possible.

Big leaders decide how much energy to send to different places, like making sure soldiers in faraway lands have enough fuel for their vehicles. Special computers help them see how much energy is left and if they need to send more.

Because these computers are important, bad people might try to hack them and cause trouble. That's why the military protects them, just like locking a door to keep a treasure safe!

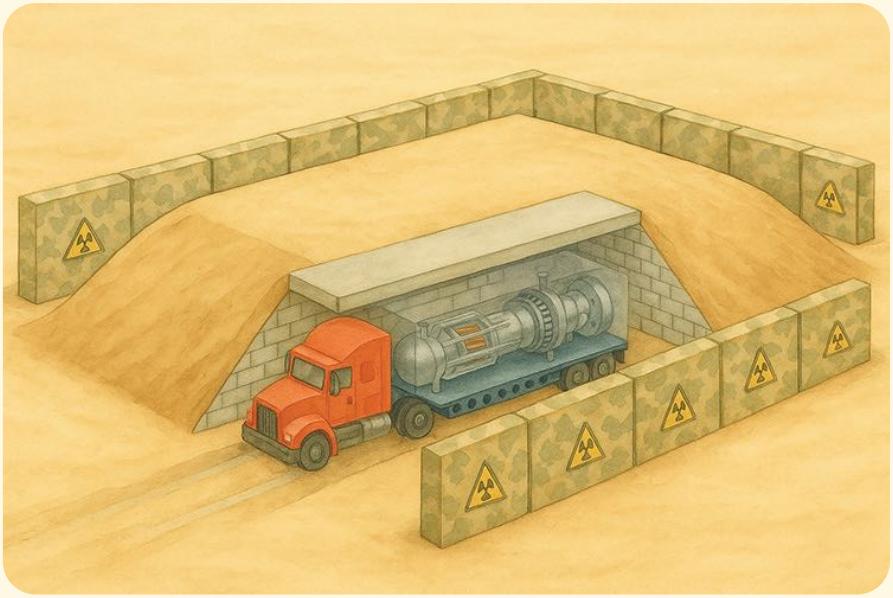
How the Military Makes Energy

The military gets power in different ways:

- **Burning Fuel:** This is the most common way. Cars, tanks, and planes burn fuel to go.
- **Hybrid Vehicles:** These use both fuel and batteries, like some cars you see on the road.
- **Electric Vehicles:** Some military machines use only batteries and no fuel at all!
- **Other Fuels:** Some use special fuels like hydrogen, which works differently from regular gas.

For big bases where soldiers live and work, power plants or small generators make electricity. Most power still comes from coal, gas, or nuclear energy, but the military is trying to use more sun.

Some bases are even thinking about using tiny nuclear plants to get power without needing fuel trucks!



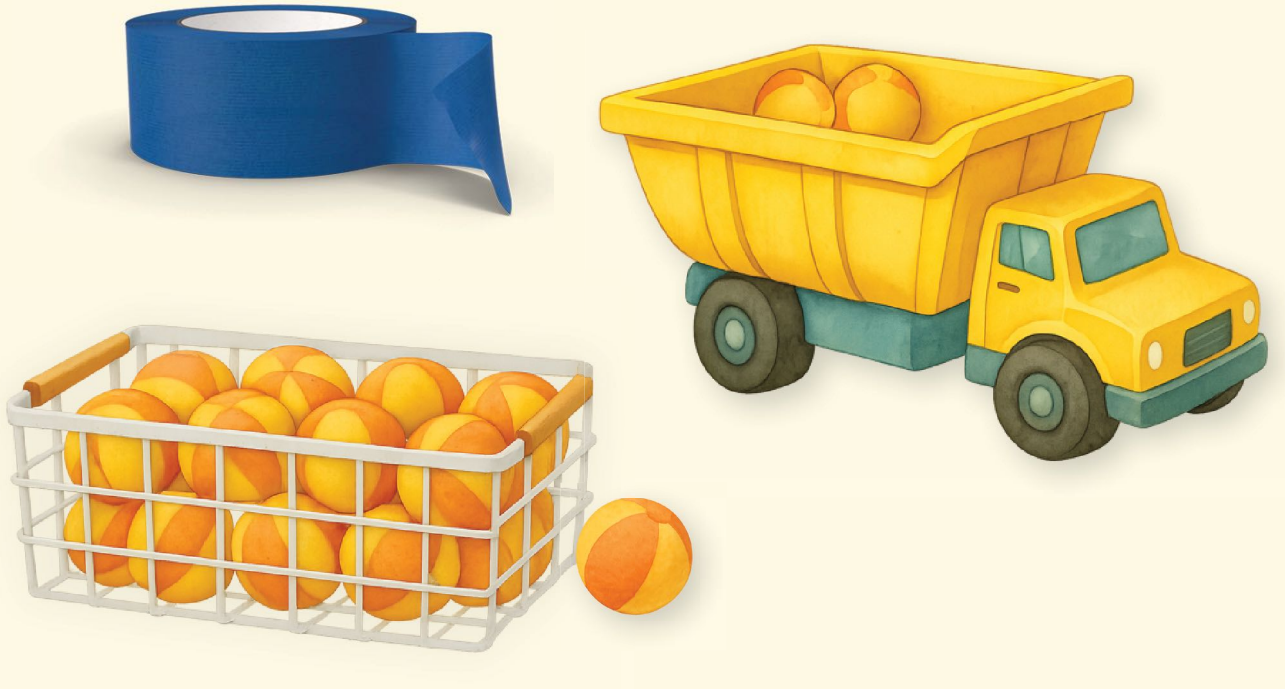
Chapter 4 – Activity

"Power the Military" Relay Race

Objective: Show how energy is needed to keep military vehicles moving.

Activity:

1. Set up stations for different military vehicles (trucks, planes, ships).
2. Kids run to each station carrying "fuel" (bean bags or small balls).
3. They "refuel" the vehicle by dropping in the bean bag, then running back to refill and keep going!
4. Talk about why the military needs to always have energy to complete missions.



Chapter 5

How Energy Gets to Where It's Needed

Sending Energy

Electricity moves through long metal wires called power lines. Some energy is lost as it travels, but the closer it is, the less it is lost! Big power grids connect many places, but small power grids, called microgrids, can work alone or with big grids.

Soldiers are trying to find new ways to send electricity without wires, like magic, but they aren't ready yet.

Small Power Grids (Microgrids)

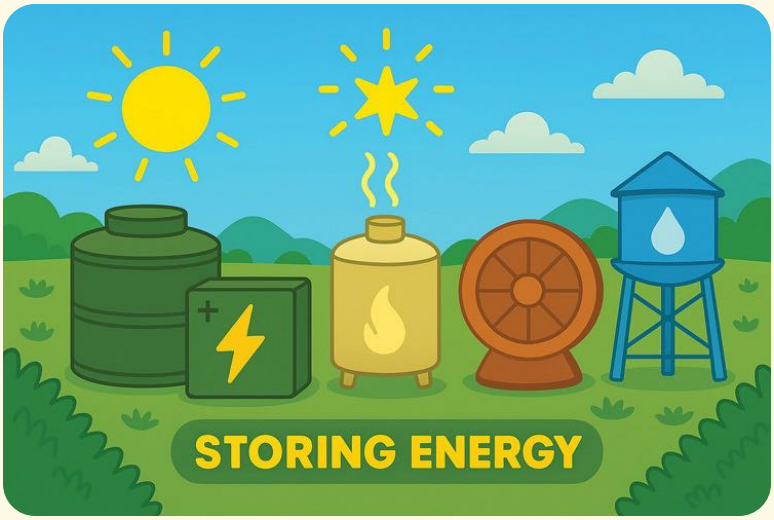
A microgrid is like a little power station that can work by itself. The military uses these to give power to bases far away. They can use fuel, tiny nuclear plants, solar, and more!

If the big power grid has a problem, microgrids can disconnect and keep working on their own just like an island of energy!

Storing Energy

Keeping energy for later can be tricky.

- **Gas & Oil:** These fuels are stored in big tanks but can take up lots of space.
- **Batteries:** Soldiers and ships carry lots of batteries to keep things running. Some batteries can be used once, and others can be recharged!
- **Other Cool Ways:** Some energy is saved using hot liquids, spinning wheels, or water in high places.



Soldiers are working on new ways to store energy, like using air or magnets!

Tools & Learning About Energy

The military uses special tools to watch how much energy is used. These tools help them make sure nothing is wasted!

Learning about energy is important, too! Soldiers and workers are trained to use and save energy the best way possible. They also keep learning about new ways to make and store power.

The better they use energy, the safer and stronger they can be!

Chapter 5 – Activities

Light It Up! Solar Power Experiment

Objective: Demonstrate how solar energy works.

Activity:

1. Give each child a small solar-powered toy or a flashlight with a solar-charged battery.
2. Take them outside and let them see how the sun makes it work.
3. Discuss how the military can use solar energy for power in different places.

Energy for Our Bodies Snack Time

Objective: Connect food energy to fuel energy.

Activity:

1. Give kids small snacks (like fruit or crackers) and explain that food gives us energy like fuel gives cars energy.
2. Ask them to act out being "recharged" after eating their snack.

Chapter 6

How to Be an Energy Explorer!

Have you ever built something really cool? Maybe a tower of blocks, a fast paper airplane, or even a super fun obstacle course? When we create new things to make life better, we are being innovators! Today, we're going to learn how people called Energy Explorers help make new ideas real, just like how you turn your ideas into awesome creations!

What is an Energy Explorer?

An Energy Explorer is someone who finds new ways to make energy work better. Imagine if you had a flashlight, but it ran out of batteries super-fast. Wouldn't it be great if you could invent a way to make the batteries last longer? That's what Energy Explorers do! They create new ways to power important machines, like the ones that help keep people safe and strong.

From Idea to Reality!

Let's pretend you want to build the best toy car ever. First, you have an idea, maybe a car that goes super-fast or one that jumps over ramps! But before you can play with it, you need to test your idea to make sure it works. Energy Explorers do the same thing!

1. **Think of an Idea** – Energy Explorers come up with ways to make energy work better and last longer.
2. **Build a Small Version** – They create tiny test models to see if their ideas work.
3. **Make It Even Better** – If something doesn't work, they try again and again until it's just right.
4. **Test It in the Real World** – Once it works, they let others try it out to make sure it helps people.

Why Do We Need Energy Explorers?

Imagine if your toys stopped working in the middle of a game. Boring, right? Now think about big machines like airplanes or rescue vehicles. They need energy to keep moving, just like your toys need batteries. Energy Explorers help make sure that energy is always ready to go and that it works in the best way possible.

Teamwork Makes Ideas Even Better!

Energy Explorers don't work alone. Just like how playing with friends makes games more fun, working together helps make energy ideas even smarter. They share ideas, test each other's work, and help make the world better together!

Be an Energy Explorer!

You can be an innovator too! Next time you build something cool, think about how you can make it even better. Ask questions, test your ideas, and never stop exploring because the best ideas start with someone just like you!

Chapter 6 – Activities

#1 – Build a Better Toy Car!

Materials: Demonstrate how solar energy works.

1. Toy car or small box
2. Straws, paper, tape, and markers
3. Balloons (optional for extra fun!)

Instructions:

1. Have the kids decorate their "energy car."
2. Challenge them to make it go faster or farther using different materials.
3. Let them test and improve their designs, just like real innovators!

#2 – Energy Explorer Scavenger Hunt

Materials: A list of things that use energy (lamp, TV, fridge, computer, toy with batteries, the sun, etc.).

Instructions:

1. Kids walk around and find things that use energy in their home or classroom.
2. Discuss which ones need electricity, batteries, or even sunlight!

#3 – Idea Factory!

Materials:

1. Paper and crayons
2. A big piece of paper labeled "New Inventions"

Instructions:

1. Ask kids: “What’s a problem you want to solve?”
2. Have them draw their invention idea (a robot that picks up toys, a flying backpack, etc.).
3. Let them explain their invention to the class!

Conclusion

What kind of Energy Explorer do you want to be?

1 Solar Energy Explorer – Army Engineer

Example: Army engineers use solar panels to help power equipment in the field so soldiers can stay safe and connected

Activity Idea: Have kids place a toy under a lamp and in the shade. Ask: "Which place gives it more light? How can we use sunlight to make power?"

2 Battery Energy Explorer – Air Force Pilot

Example: Air Force pilots need strong batteries to power their planes and keep their gear working during missions!

Activity Idea: Show two toy planes, one with a battery-powered light and one without. Ask: "Why is it important for pilots to have power that lasts?"

3 Nuclear Energy Explorer – Navy Ship Captain

Example: Many Navy ships use nuclear energy to power their engines, letting them travel the oceans for a long time without needing to refuel!

Activity Idea: Show kids a glow stick and explain that it has special stored energy inside. Ask: “How do you think energy hidden inside something can power a giant ship?”

4 Light & Optics Explorer – Marine Corps Night Vision Scout

Example: Marines use special goggles to see in the dark with the help of light, even when it's almost invisible!

Activity Idea: Dim the lights and shine a flashlight through colored plastic or tissue. Ask: "What colors can we see in the dark? How do night vision goggles help Marines on nighttime missions?"

5 Motion Energy Explorer – Army Tank Operator

Example: Soldiers who drive tanks need powerful engines to move across rough ground!

Activity Idea: Let kids roll toy cars on different surfaces (carpet vs. smooth floor). Ask: "Which one moves easier? Why?"

6 Water Energy Explorer – Coast Guard Rescuer

Example: The Coast Guard uses energy from water to power boats that save people during storms!

Activity Idea: Pour water over a toy wheel or paddle. Ask: "How does water help boats and machines move?"

7 Space Energy Explorer – Space Force Engineer

Example: Space Force engineers help design solar panels for satellites so they can stay powered in space!

Activity Idea: Show kids pictures of the International Space Station with its big solar panels. Ask: "How does the sun give power to things in space?" Let them build a “solar satellite” using paper, foil, and craft sticks!

What kind of Energy Explorer do you want to be?


4
USMC


5


6


7
SPACE FORCE

Extra Activities

How Much Energy Do We Have? Battery Level Stickers & Coloring Fun!

Objective: To help children understand the importance of energy for both themselves and the military by using battery levels as a fun, visual way to show how energy works, why it matters, and how to use it wisely.

Activity: Color in the batteries to show different energy levels!

1. A full green battery means plenty of energy—our heroes are ready to go!
2. A yellow battery means we're using up energy—time to be careful!
3. Orange: Low energy—almost empty!
4. A red battery means almost no energy—things might stop working!

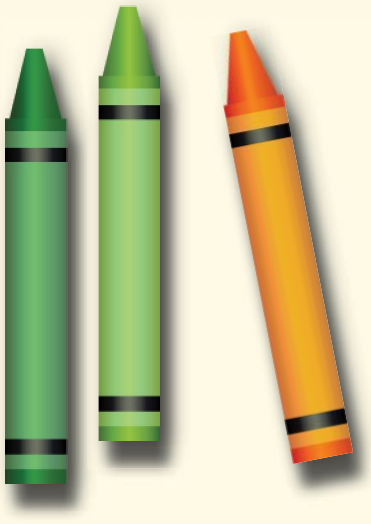
You can also draw your own faces or symbols on the blank batteries to show how you feel when you have lots of energy or when you're tired!

Teacher's Learning Tip:
Explain to the children that just like we need energy to run, play, and learn, the military needs energy to keep important machines like trucks, planes, and ships working.

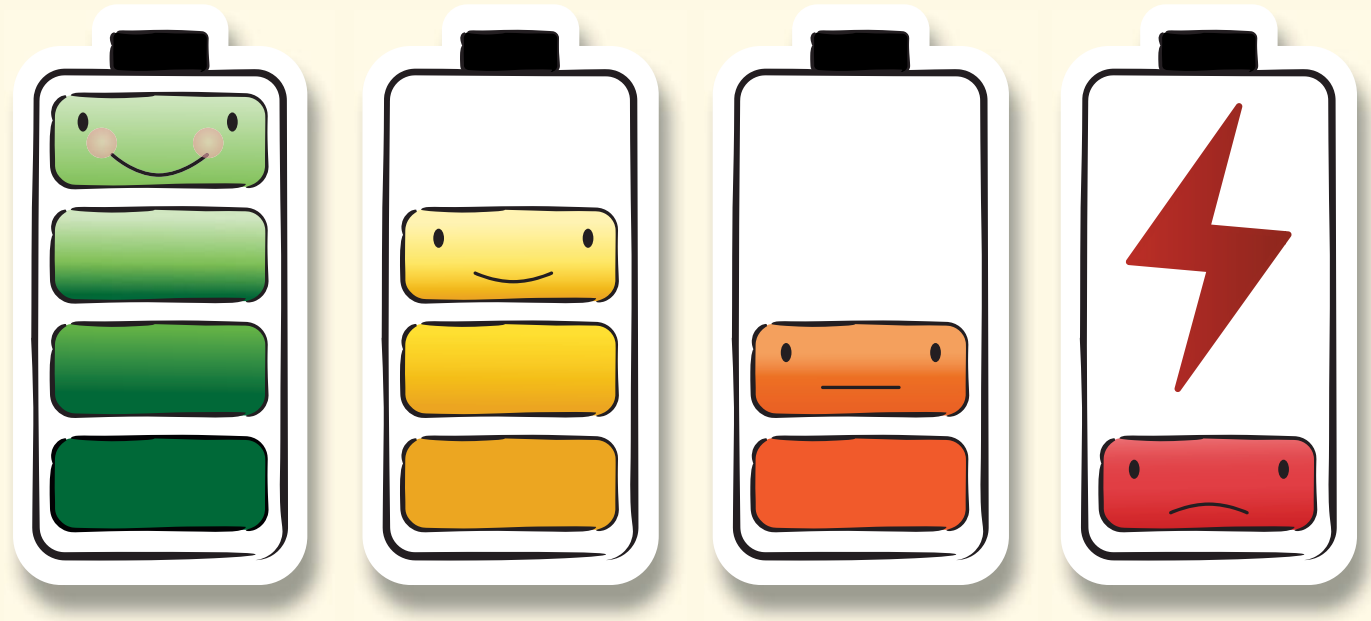
Use the battery levels to talk about saving energy and using it wisely—just like the military does with Operational Energy.

Encourage kids to think of ways they can "save energy" in their own lives (like turning off lights or walking instead of using a car).

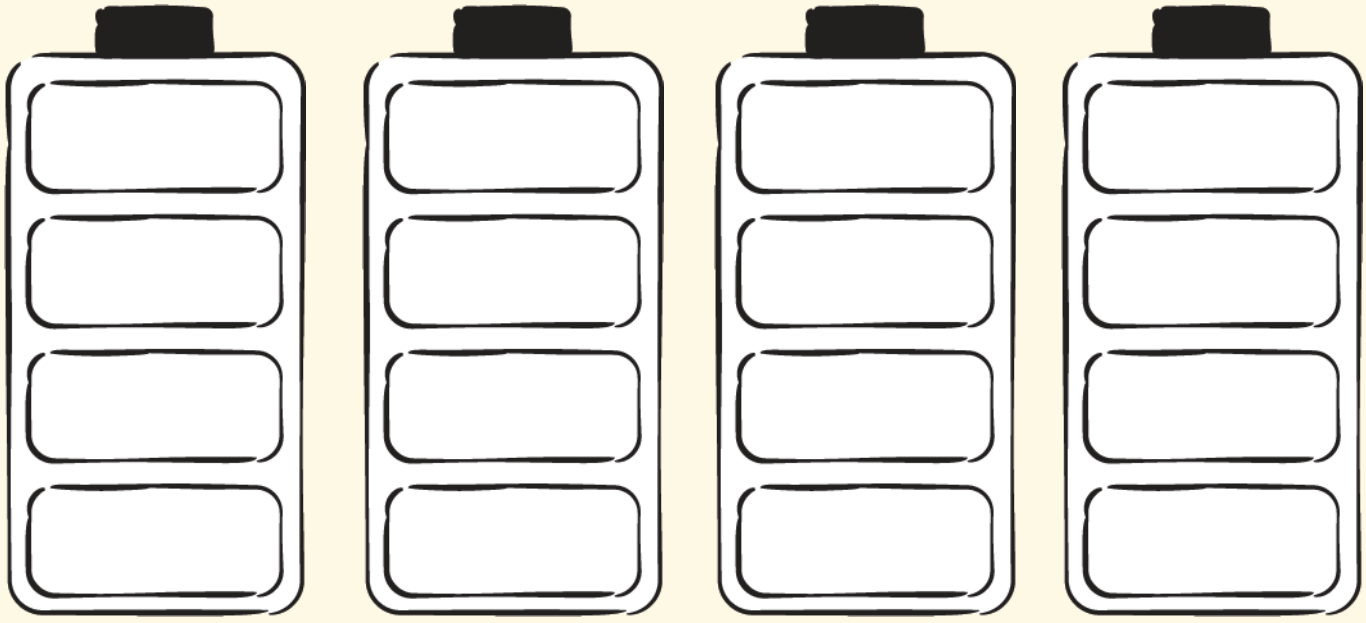
Reinforce the idea that when energy runs out (as shown in the red battery), important missions can't happen—so it's everyone's job to help conserve energy.



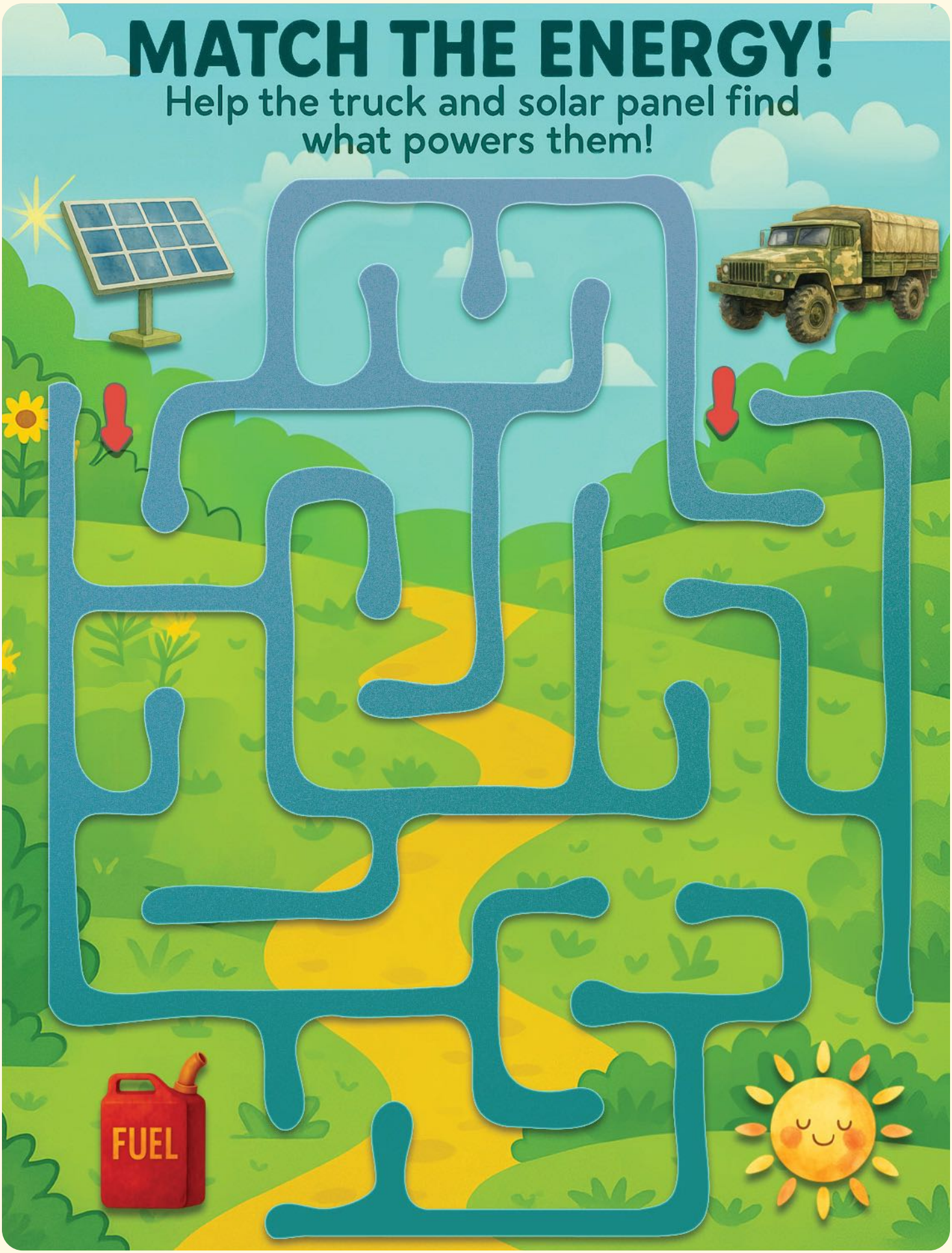
Stickers

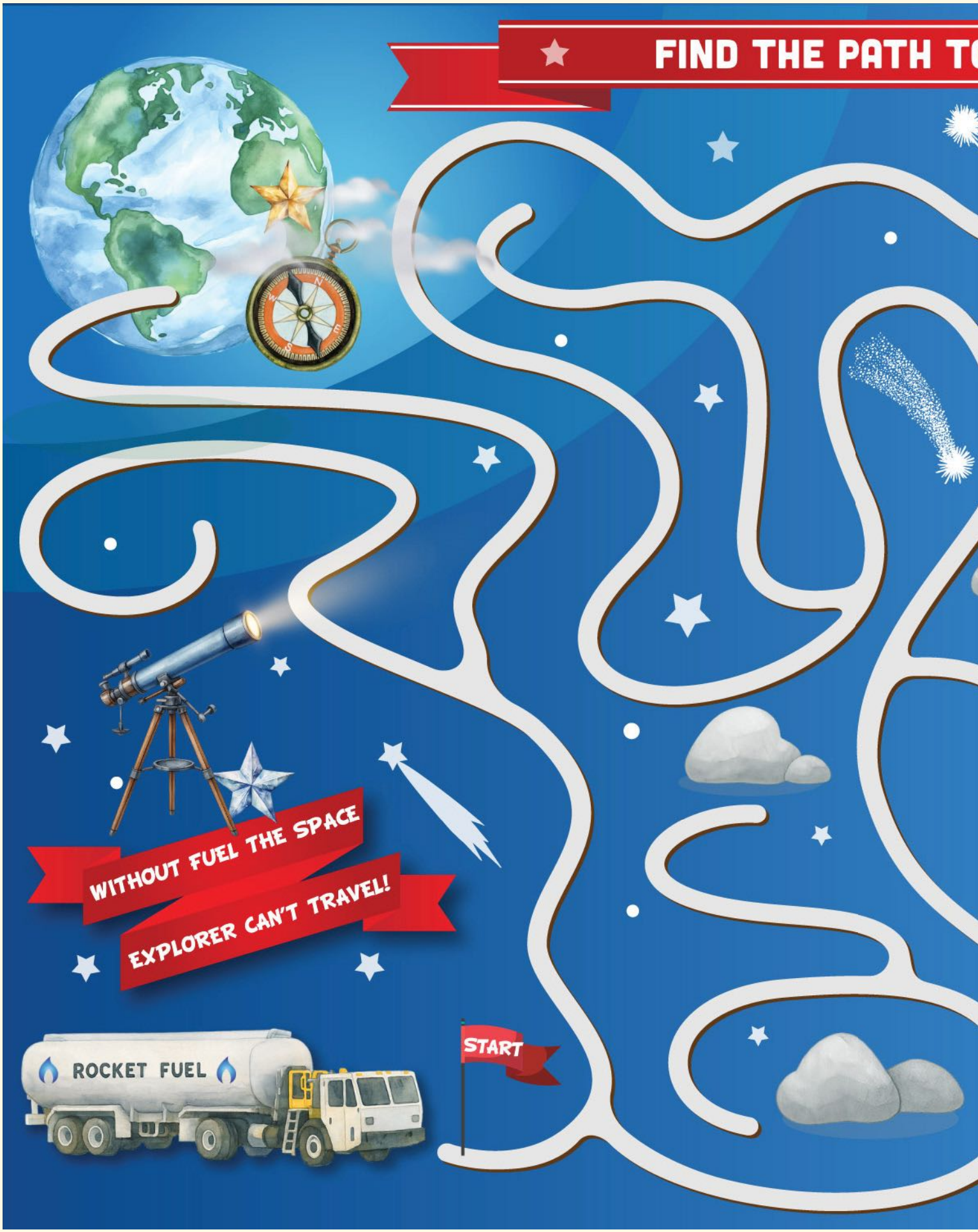


Coloring Template



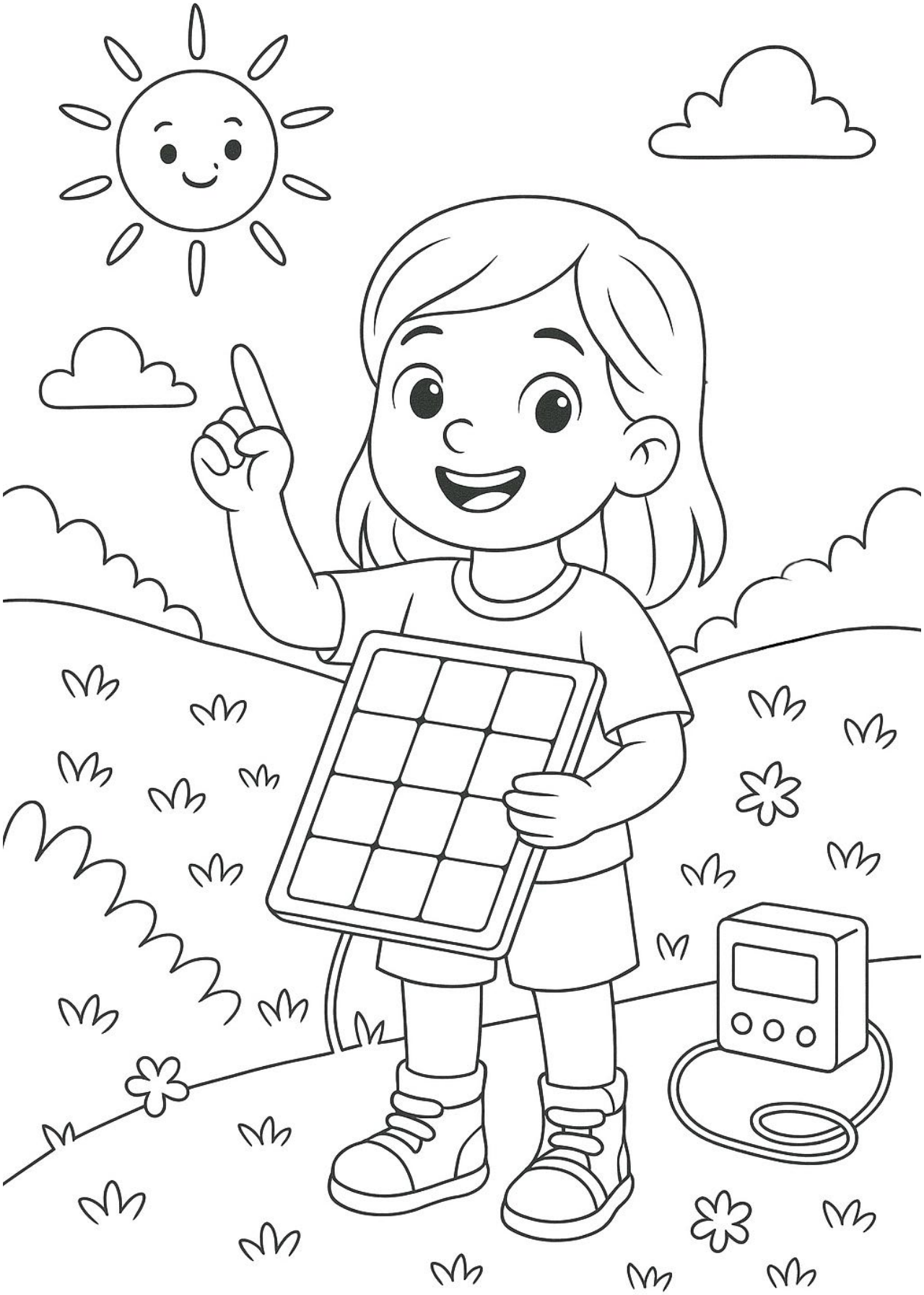

Use your crayon or your finger to trace the path through the maze.
Try to find the way to the yellow fuel truck at the END!
START
END
FUEL


MATCH THE ENERGY!
Help the truck and solar panel find what powers them!
FUEL


FIND THE PATH TO
WITHOUT FUEL THE SPACE
EXPLORER CAN'T TRAVEL!
ROCKET FUEL
START


O FUEL THE ROCKET
FINISH

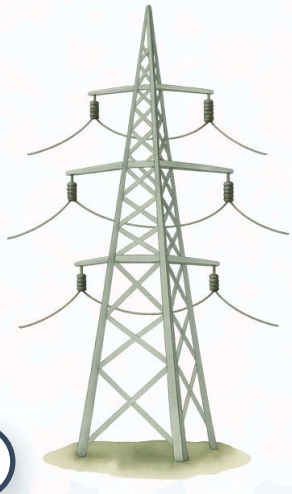
Use your creativity to color the Solar Energy Explorer!

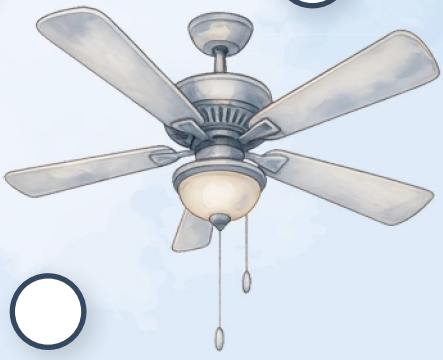


Use your creativity to color the Battery Energy Explorer!

Going on an
ENERGY SCAVENGER HUNT

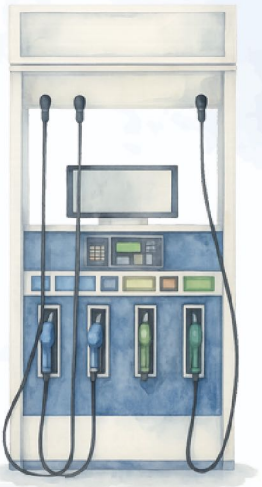
Check each off as you find it!

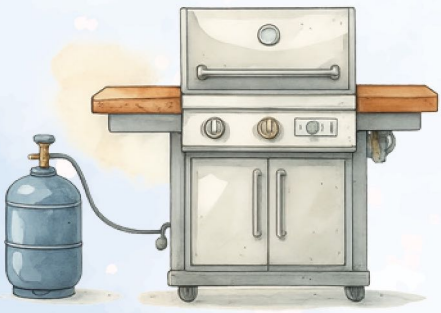


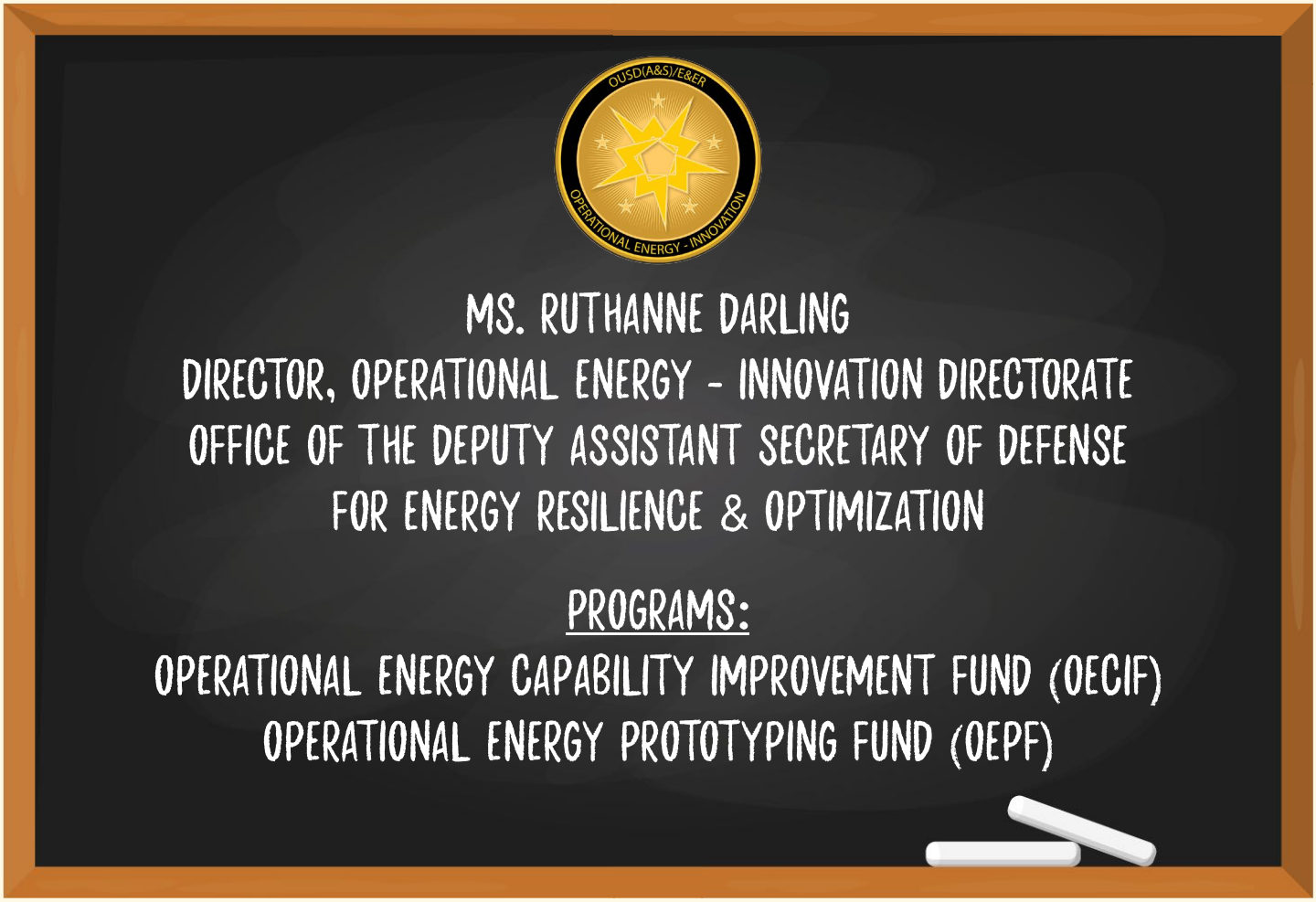


Going on an
ENERGY SCAVENGER HUNT

Check each off as you find it!



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OPERATIONAL ENERGY - INNOVATION
MS. RUTHANNE DARLING
DIRECTOR, OPERATIONAL ENERGY - INNOVATION DIRECTORATE
OFFICE OF THE DEPUTY ASSISTANT SECRETARY OF DEFENSE
FOR ENERGY RESILIENCE & OPTIMIZATION
PROGRAMS:
OPERATIONAL ENERGY CAPABILITY IMPROVEMENT FUND (OECIF)
OPERATIONAL ENERGY PROTOTYPING FUND (OEPF)