Where Does the Energy Come From? Cards

What's this Activity About?

Objective: Lead participants to discover that the Sun is the ultimate source of energy for almost everything that we do in our daily lives.

Presenters: A minimum of one person.

Visitors: Most activities are appropriate for families with older children, the general public, and school groups in as young as kindergarten. Between 10 and 30 visitors may participate.

Duration: Between fifteen minutes and a half hour, depending on the number of topics covered.

Materials: Set of Energy Cards, one card per participant. There are 30 Energy Cards included here.

Note:
If you have fewer than 30 participants, be sure that the subset you choose consists of complete energy chains, ideally with a variety of types of chains – both technology and life. We recommend that you sort the cards yourself ahead of time to become familiar with which chains might be formed. Each chain has several options, with no single "right answer". Here are some examples of sets of cards for different sized groups:

- 10 participants – Sun, Corn, Ancient Plants, Solar Power Plant, Cow, Burger, Human, Coal, Thermal Power Plant, Light Bulb
- 15 participants – All of the cards for 10 participants, plus: Cereal, Cheese, Petroleum, Automobile, Refrigerator
- 20 participants – All the cards for 15 participants, plus: Oak Tree, Squirrel, Hawk, Computer, Light Bulb (CFL) (Note: more than 15 participants will require that you print the additional cards found in the manual.)
- 25 participants – All the cards for 20 participants, plus: Wind, Windmill, Soy, Tofu, Human (Vegetarian)

This activity is based on the Energy Flows curriculum guide from the National Energy Education Development Project (NEED): http://www.need.org/needpdf/Energy%20Flows.pdf

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Activity Script

Leader's Role ***Participants' Role (Anticipated)***

To say:
Who's got a lot of energy today? Who's feeling low energy? Today we are going to talk about energy. Energy is part of everything we do. What have you done today that used energy?

Share activities that took energy, such as getting out of bed, brushing teeth, walking, turning on light, heating water, driving car.

And where did the energy to do those things come from?

Share a variety of fuel sources, such as the food we eat, the gasoline in our cars, etc.

Let's find out. Energy is stored in many different forms. Energy cannot be created or destroyed. It is transferred or transformed from one form to another. We are going to play a game that explores how energy is transferred in order to provide energy for those things we do in our everyday lives (mention some of the activities that came up). In this game, you will each represent something that uses, transfers, and/or stores energy.

To do:
Hand the "Human" card to one of the participants. If possible, note that person's name.

To say:
For example, [NAME] will be a human being – that should be easy. Your task is to read the back of your card to find out where you get your energy, and then put your hand on the back of the person who represents that source of energy. Your energy source is written in bold letters on the back of your card. [NAME], please read the back of your card aloud and tell us: where does your energy come from?

Reads back of card: "I get my energy from the food I eat. My food can be both plant- and animal-based."

So, you would be looking for someone with a card that has something you can eat to give you energy. You would then put your hand on that person's back. Then you might have to walk around with that person to find his or her source of energy. You might also end up linking with more than one person.

To do:
Pass out a card to each participant.

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To say:
Everyone have your cards? Any questions? Okay, let's see how quickly we can have everyone link up to their energy sources. Be sure to hold your cards up high so everyone can see them. Ready, set, go!

Look around for energy sources and form chains by placing hands on the back of the person representing the energy source.

To do:
As participants look for their energy sources, make sure that they are holding their cards high enough for everyone to see them, and assist any participants who seem lost. You may also want to help make sure that there is a somewhat even distribution. For example, if all of the electric devices (refrigerator, light bulb, computer) are linking to a particular power plant (solar, wind, thermal), you might want to suggest that some of them go to a different energy source for variety.

To say:
Good, that was fast. Stay standing in place, but go ahead and drop your arms. Now let's see what we have. I am first going to rearrange you slightly.

To do:
The chains will likely be arranged in a half circle fan shape. Rearrange the chains into a complete circle around the Sun, as in the picture here.

To say:
Look around at what we have here. What do you notice?

We formed chains. The Sun is the center.

Right, the Sun is in the center, and each of these energy chains traces back to the Sun.

Let's take a closer look. I am going to ask each of you to read the back of your card and then place it on the floor/ground at your feet. There is an arrow on each of your cards. When you place your card on the ground, make sure that arrow is pointing to your energy source, that is in the direction of the person whose back your hand was on. Then step out to the edge of our circle.

To do:
Ask each person to read his/her card and follow the instructions you just gave. Start with the Sun in the center, and then work your way out along each chain.

Read cards, place them on the ground, step to edge of circle.

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To say:
Now we can see all of our energy chains. What do you notice?

Share observations.

The energy chains might look something like this picture

Possible discussion points:

- You noticed that all of the energy chains trace back to the Sun in the center. What does this mean? (Wait for some answers.) The vast majority of the energy we use for all of those things we do in our everyday lives comes from the Sun.
- These chains have different lengths. Let's look at the first step in each chain, so the first card next to the Sun in each chain. What do you notice about those first steps? (Wait for some answers.) The first step from the Sun for most of the chains is green plants (the other is a solar power plant). Plants convert energy directly from the Sun to energy stored in their cells. Plants are necessary for the rest of life to access the Sun's energy.
- Did you notice that some chains are shorter than others? This is a simplified model, but these shorter chains tend to be more efficient uses of energy. Solar power converts energy from the Sun to useable energy without any extra steps in between, and a vegetarian diet provides energy converted directly from the Sun by plants without the extra steps of other animals in between.
- What else do we know about these energy sources and their impact on the environment? Some sources of energy are renewable (solar, wind), meaning that we won't ever use them all up. Others are non-renewable (petroleum, coal), meaning that we have limited supplies and once they are depleted, we can no longer use them as sources of energy. Some sources of energy have negative impacts (pollution).
- Are there sources of energy that do not trace back to the Sun? Nuclear plants generate power through nuclear fission. Non-rechargeable batteries generate electricity through a chemical reaction. But the vast majority of energy sources and life forms trace back to the Sun as the ultimate energy source. We could even argue that we would not have the energy to build nuclear power plants or batteries if we did not have the Sun.
    - Another example that might come up here is the tubeworm that lives at the bottom of the ocean where sunlight does not reach, but while it is a very interesting life form, even this creature is not totally independent of the Sun. It does not use sunlight as a direct source of energy, instead using a process known as chemosynthesis to convert oxygen, hydrogen sulfide, carbon dioxide, and other available molecules into organic molecules to provide nutrition. But the Sun is still necessary for the tubeworm to feed, since it relies on free oxygen in the water, which was released through the photosynthesis of organisms closer to the surface of the water.

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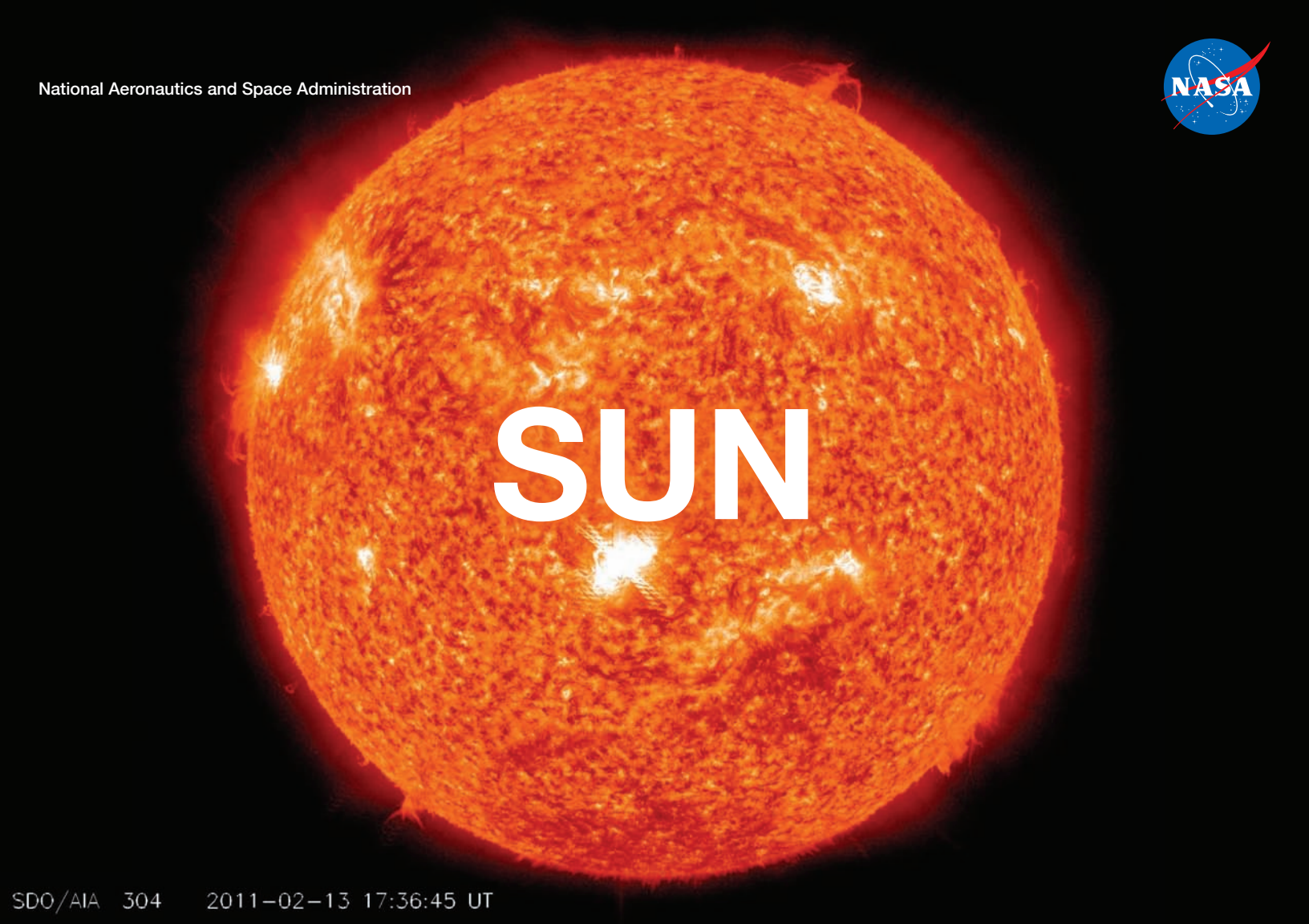

SUN

I convert hydrogen to helium through the process of **FUSION**, which releases energy. This energy eventually reaches the Earth as heat and light.

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HUMAN

HUMAN

I get my energy from the **FOOD** I eat. My food can be both *plant*- and *animal*-based.

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CORN

CORN

Through the process of photosynthesis, I convert energy from the **SUN** into energy stored in my cells.

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COW

I get my energy from the **FOOD** I eat. My food is *plant*-based.

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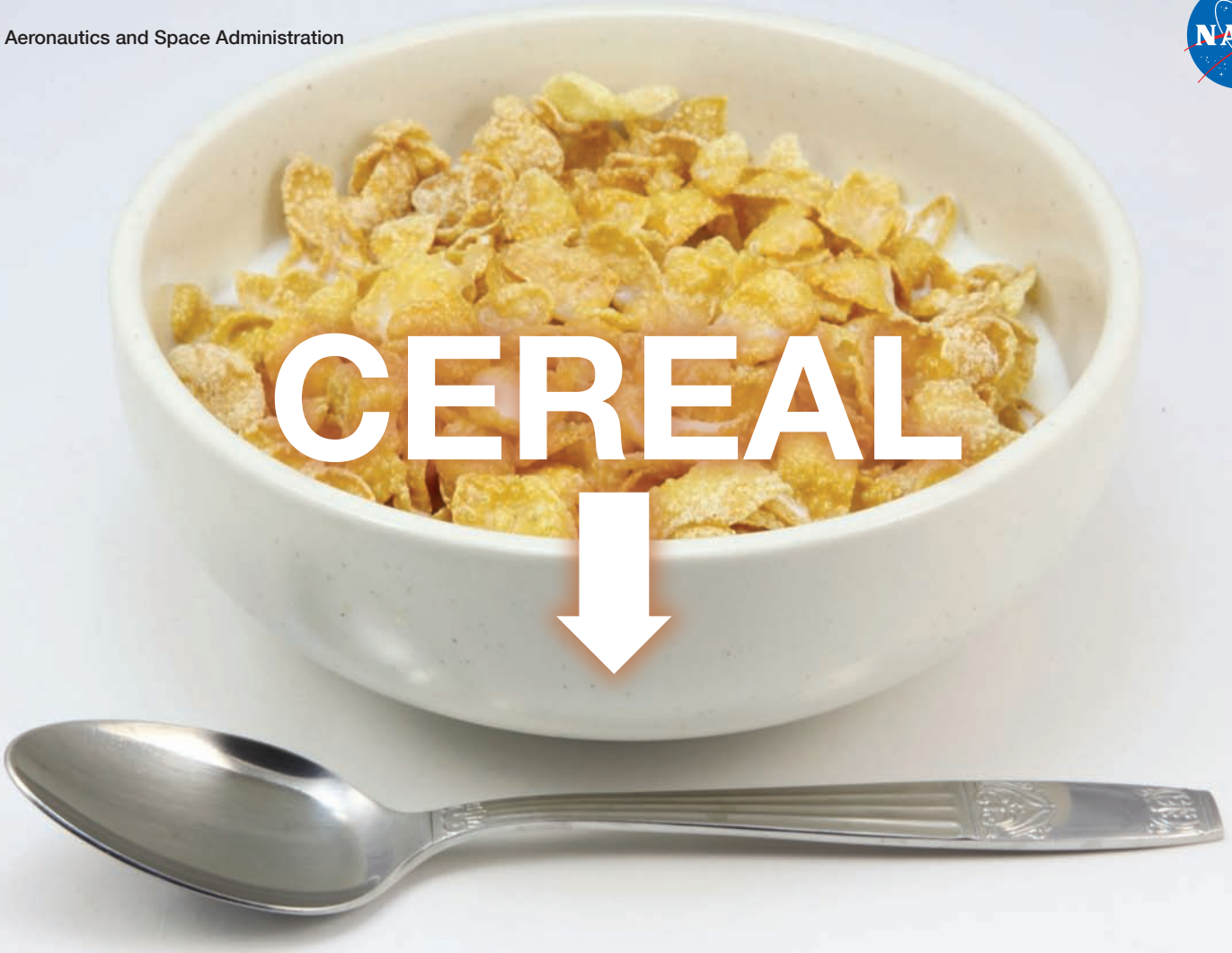

CEREAL

I am a plant-based food. I have stored energy from the **PLANTS** (**CORN**) used to make me.

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BURGER

I am an animal-based food. I have stored energy from the **ANIMALS** (**COW**) used to make me.

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COAL

COAL

The chemical energy stored in me came from the remains of **ANCIENT PLANTS**.

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PETROLEUM

The chemical energy stored in me came from the remains of **ANCIENT PLANTS** and animals.

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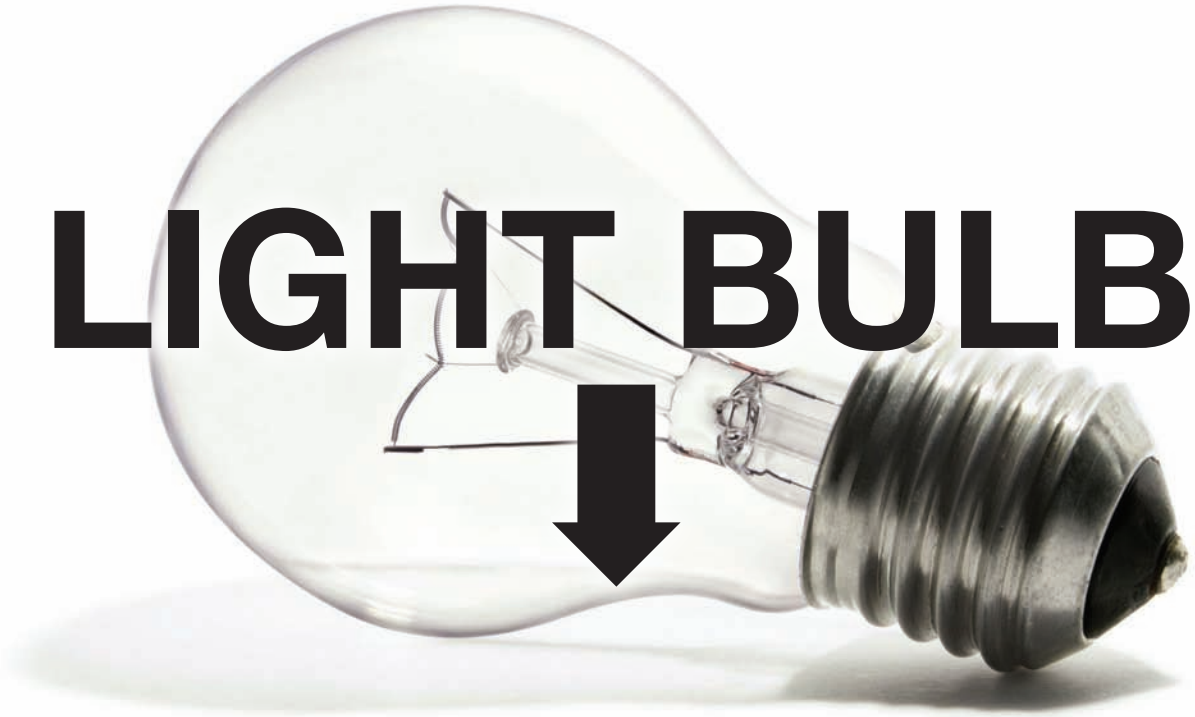
LIGHT BULB



LIGHT BULB

To produce light, I use electrical energy generated in a **POWER PLANT**.

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THERMAL POWER PLANT

THERMAL POWER PLANT

I burn fuels such as **COAL** to produce electrical energy.

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AUTOMOBILE

AUTOMOBILE

My energy to move comes from burning the fuel **PETROLEUM**.

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NASA
ANCIENT
PLANTS

ANCIENT PLANTS

Through the process of photosynthesis, I converted energy from the **SUN** into energy stored in my cells.

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SOLAR POWER PLANT

SOLAR POWER PLANT

I convert energy from the **SUN** into electrical energy.

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REFRIGERATOR

REFRIGERATOR

I run on electrical energy generated in a **POWER PLANT**.

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CHEESE

I am an animal-based food. I have stored energy from the **ANIMALS** (**COW**) used to make me.