

THE SCIENCENTER EARTH HOUR EXPERIMENT GUIDEBOOK



On March 28, 2009, at 8:30 pm, one billion people in more than 930 cities around the world will come together to make a bold statement about their concern about climate change by doing something quite simple—turning off their lights for one hour.

INTRODUCTION

What is Earth Hour?

Earth Hour began in Sydney, Australia in 2007, when 2.2 million homes and businesses switched off their lights for one hour to raise awareness about the impact of power generation on global climate change. In 2008 the event grew into a global movement, with 50 million people switching off their lights. Global landmarks such as the Golden Gate Bridge in San Francisco, Rome's Coliseum, the Sydney Opera House and the Coca Cola billboard in Times Square all stood in darkness.

This year, "VOTE EARTH" is the theme for Earth Hour, which takes place on **Saturday, March 28, from 8:30 to 9:30 pm local time** around the world.

Every individual, every business and every community around the world is encouraged to switch off their lights for one hour to make a large collective statement of concern over global climate change and illustrate the need for solidarity in finding solutions.

Over 930 cities in more than 80 countries have pledged their support for Earth Hour 2009.

The Sciencenter joins hundreds of science museums worldwide in encouraging its members and friends to take part in Earth Hour 2009. The event as a coordinated effort of the Association of Science-Technology Centers, an organization based in Washington, DC that supports science museums worldwide through programming and professional development.

What is the Sciencenter Earth Hour Experiment?

The Sciencenter Earth Hour Experiment gives families in our local community the opportunity to join a global initiative on climate change while conducting a real at-home experiment on home energy use. This at-home project will help demystify -- for children and adults alike -- home energy use and its connection to global warming.

In this experiment, parents and grandparents can help others in their family in the process of scientific discovery so that children can learn more about science and how it is done.

No children? No problem! This experiment is fun for all ages.

BEFORE EARTH HOUR – Start by going room-by-room through your home to investigate home energy. Use a home energy meter if you have one, or simply read the labels on light bulbs and appliances. Then, predict how much energy you can save by "turning off the lights" and other items during Earth Hour 2009.

DURING EARTH HOUR – Turn off any items on your list that draw power and measure how much energy you saved.

AFTER EARTH HOUR – Calculate your energy savings and convert this into CO₂ emissions prevented. If you report your results to the Sciencenter, you'll get a certificate and be eligible for drawing for a \$50 gift card at Borders Books.

THE EXPERIMENT

MATERIALS - What you need

Scientists

This is the best part: YOU ARE THE SCIENTISTS!

This activity can be done by any number of people, of any age.

You can assign specific tasks according to ability. For example:

- preschoolers can help identify things in a room that “turn off and on with a switch”
- elementary-aged children can help record data
- older children can work on mathematical calculations, etc.

Please note: For safety reasons, please supervise young children closely around electrical outlets and do not let them plug or unplug items.

Estimated Time Required

This experiment is designed to be conducted in two parts, on two separate days.

Plan to spend one to two hours collecting data in your home in the days leading up to Earth Hour on March 28, 2009, and an additional two hours conducting the experiment for Earth Hour itself.

Materials

While you can do this experiment with nothing but a pencil, paper and the electric meter on your house, here is a complete list of supplies that will help you measure energy used by small household devices and sharpen your predictions of energy savings.

- This guidebook
- At least one room in your home with things powered by electricity (plugged in or hard-wired)
- Pencils
- Sciencenter Earth Hour Data Sheets or scrap paper
- A home energy meter
- A calculator
- Access to your electric meter
- Flashlights or headlamps (with working batteries)

Please see the glossary at the end of this guidebook for useful terms.

STEP ONE – PREPARING FOR EARTH HOUR

Note:

Do these steps well before Earth Hour on March 28!

1. Choose a group of items that require electricity and would normally be turned on (or left plugged in and powered) from 8:30 pm until 9:30 pm.

Examples include: lamps, clock radios, freezers, cell phone/iPod chargers, night lights, televisions, DVD players, radios, computers, printers, electric space heaters, aquarium lighting, video game units, baby monitors.

2. Take an inventory of these items and write them down on the **Sciencenter Earth Hour Data Sheet** (See next page). You may want to make additional copies of this data sheet.

Note: DON'T include items that you use only briefly, such as hair dryers, blenders or toasters.

3. For each item, make a prediction about how much power (in watts) you think it uses. You can read the label on light bulbs for clues on energy use. Using a home energy meter will help you sharpen your predictions, especially for items that do not list the wattage.
4. Add the energy used by all the items on your list to get your **Total Power** prediction.

Sciencenter Earth Hour Data Sheet

Room	Item Description	Power (Watts)

TOTAL POWER (Watts) _____
1000

= TOTAL POWER (Kilowatts) _____

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TOTAL POWER (Watts) _____
1000

= TOTAL POWER (Kilowatts) _____

STEP TWO – CONDUCTING YOUR EARTH HOUR EXPERIMENT

Note: Do these between 7:25 pm and 9:30 pm on March 28, 2009

1. Turn the listed items on your Data Sheet ON before 7:25 pm on Saturday, March 28.
2. **Go outside.** Using your flashlight (if needed) and **read your electric meter at exactly 7:25 pm.** This meter reading will help you establish your baseline energy use for the items you are testing.
IMPORTANT: ESTIMATE YOUR READING TO ONE-TENTH OF A KW-HR! (otherwise you may not see much of a difference)
3. Go back inside for one hour. (*Optional: Make fun snacks to enjoy during Earth Hour*)
4. **At exactly 8:25 pm, go outside and read your meter a second time,** making sure you estimate to one-tenth of a kW-hr.
5. Turn OFF all the items on your list that you powered on one hour ago.
6. **At exactly 8:30 pm** - quickly go outside with your flashlight and read your electric meter (to one-tenth kW-hr).
7. For the next hour - Take a walk outside, tell stories in the dark, take a nap (with an alarm set!) or play a board game by candlelight.
8. **At exactly 9:30 pm** – go outside with your flashlight and do a final meter reading.

STEP THREE - USING YOUR METER READINGS TO CALCULATE YOUR ENERGY USE AND SAVINGS

1. The first pair of readings tells you how much energy you used with everything ON (in kilowatt-hours).

$$\frac{\text{_____}}{8:25 \text{ pm reading}} - \frac{\text{_____}}{7:25 \text{ pm reading}} = \frac{\text{_____}}{\text{kW-hours ON}}$$

2. Earth Hour: The second pair of readings tells you how much energy you used after turning selected items OFF (in kilowatt-hours).

$$\frac{\text{_____}}{9:30 \text{ pm reading}} - \frac{\text{_____}}{8:30 \text{ pm reading}} = \frac{\text{_____}}{\text{kW-hours OFF}}$$

3. **How much energy did you save by turning off the power to lights and other items during Earth Hour?** By subtracting the energy used in Hour 2 from the energy used in Hour 1, you can see how much energy you saved by turning off the items on your list.

$$\frac{\text{_____}}{\text{kW-hours ON}} - \frac{\text{_____}}{\text{kW-hours OFF}} = \frac{\text{_____}}{\text{kW-hours saved}}$$

4. **Calculate your CO₂ emission savings.** Now you can calculate the CO₂ emissions you saved by switching off the items on your list (an average of about 0.6 kg of CO₂ are produced for each kilowatt-hour of electrical energy generated by fossil fuel):

$$\frac{\text{_____}}{\text{kW-hours saved}} \times 0.6 = \frac{\text{_____}}{\text{CO}_2 \text{ saved in kg}}$$

STEP FOUR - REPORT YOUR RESULTS BACK TO THE SCIENCENTER!

We'll send your family an official Sciencenter Earth Hour Experiment certificate AND you'll be entered into a drawing for a \$50 gift card from Borders Books.

Simply email the following to info@Sciencenter.org

- Your name
- Your predicted energy savings (kW-hr)
- Your actual energy saved (kW-hr)
- Your estimated CO₂ emissions saved (kg)

GLOSSARY OF TERMS

Watt

A watt is the basic unit of electrical *power* or rate of doing work, similar to gallons per minute of flow rate or miles per hour of driving rate. Technically, a watt is defined as the amount of work you do if you lift up a weight of 1 Newton ($\frac{1}{2}$ cup of coffee) a distance of 1 meter (just over a yard) per second. There are many other ways to define a watt.

Kilowatt

A kilowatt is 1000 watts. To determine kilowatts, divide watts by 1000.

Kilowatt-hour

A kilowatt-hour is the basic unit of electrical *energy*. Turn on one kilowatt of lights for one hour and you've used 1 kW-hr of energy. A kW-hr costs roughly 15 cents in our region.

VARIATIONS OF THE EXPERIMENT

Want to try some additional experiments? Here are some suggestions:

- Do you have a digital power meter instead of a dialed power meter? If so, you may want to extend both measurement periods by several hours to see the meter budge. ***What will this do to the accuracy of your measurements?***
- **ADVANCED:** Instead of predicting the amount of energy saved in one hour, try predicting how long it will take to save exactly one kW-hr of electricity. Start your experiment by reading your meter at 8:30 pm and read it again after your predicted time has passed. ***How close did you come?***

WE WANT TO HEAR FROM YOU!

What was the most enjoyable part of this experiment? Do you have suggestions on making this experiment better? Do you have ideas for future programs for parents and grandparents?

Please let us know by sending us an e-mail:
info@sciencenter.org