



# POWER IT UP

A GS NORCAL COUNCIL'S OWN BADGE PROGRAM

CADETTES, SENIORS & AMBASSADORS  
TO EXCITE AND ENCOURAGE GIRLS TO PURSUE  
CAREERS IN ELECTRICAL ENGINEERING



## PURPOSE

Learn what it takes to be electrifying. In this Badge, we'll encourage you to play with electricity (safely) and even learn new skills – like soldering, where you actually melt metal to use it like glue! After you complete this Badge, you'll have a working knowledge of electricity that will aide you for years to come.

## REQUIREMENTS

Choose two activities from the five in each category and one more from a category of your choosing to earn the award. Be sure to answer the reflection and evaluation questions at the end.

An asterisk at the end of the activity indicates when the activity can be completed through the Girls go Techbridge Power it Up Program Box available at your local council office. As of 2009, Girl Scouts of Northern California, Girls Scouts of Central Texas, Girl Scouts of Central Maryland, and Girl Scouts of West Central Florida have sets of these Girls Go Techbridge Program Boxes.

All members of Girl Scouts of the USA are eligible to earn the Power it Up Badge.

The Power it Up Badge is an official award and should be worn on the front of the vest or sash.

## ORDER INFORMATION

To order the Power it Up Badge please visit [www.girlscoutsnorcal.org](http://www.girlscoutsnorcal.org) and purchase the items online. Please note that shipping and handling will be added to all online orders.

Members of Girl Scouts of Northern California will not be charged for shipping and handling if they use the GS NorCal Council's Own Order Form and have badges shipped to the closest GS NorCal store in their area for members to pick up.

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# POWER IT UP BADGE FOR CADETTE, SENIOR & AMBASSADOR GIRL SCOUTS

## GSLE OUTCOMES AND INDICATORS

1. Gain practical life skills - Girls will be able to identify and discuss different components of a circuit
2. Develop critical thinking - Girls will be able to identify new objects as conductors or insulators
3. Seek challenges in the world - Girls will become comfortable with soldering
4. Feel connected to their communities, locally and globally - Girls will be able to identify local employment opportunities in electrical engineering
5. Are resourceful problem solvers - Girls will be able to problem solve a broken electrical appliance
6. Educate and inspire others to act - Girls will be able to identify and implement ways to save electricity in their family homes

## SET UP AND SUPPLIES (MOST SUPPLIES ARE IN THE POWER IT UP PROGRAM BOX AVAILABLE AT YOUR LOCAL GIRL SCOUT OFFICE)

### *Discover*

1. Battery, wire, and any other circuitry component you want. Glue, tissue paper, pipe cleaners and scissors to turn it into a craft
2. Flashlight w/ battery, aluminum foil, pennies, Styrofoam, thin pieces of wood, thin piece of rubber, paper clips, and other insulators and conductors
3. Solder, de-solder, soldering stand, soldering iron, safety goggles, moist sponges, soldering instructions, soldering kit (circuit board with components and instructions), battery, wire cutters
4. Internet
5. Group of friends

### *Connect*

1. Local science museum and younger girls
2. Computer with internet access or library, paper, markers, pens
3. A computer scientist or materials engineer
4. A buddy, internet
5. Local electrical engineering group, mode of transportation

### *Take Action*

1. Broken electrical appliance, screwdrivers, possibly screws or soldering tools
2. Paper and pen
3. Paper, pen, envelopes, stamps
4. Poster board, markers, construction paper, scissors, glue, and other display materials
5. Wire, LEDs, battery, electrical tape, and anything else needed for the display

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# POWER IT UP BADGE FOR CADETTE, SENIOR & AMBASSADOR GIRL SCOUTS

## DISCOVER

1. There are many different types of electrical components such as an LED, resistor, capacitor, battery, switch, wire, and circuit board. Learn about at least 10 different electrical components and what they do in a circuit. Use this knowledge to make your own working simple circuit. Then put the circuit to use in a craft project.  
\*Power It Up! LED Butterfly Activity.  
*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Discuss how the electricity is flowing from the power source and eventually back to it.*
2. Electricity often flows through wire. Explore what other types of materials electricity flows through by using a simple electric device such as a flashlight to test at least 10 different materials. Some materials that you can test to see if they conduct or insulate are: Glass, wood, rubber, aluminum foil, pennies, Styrofoam, and paper clips. Place each test material between the battery and the flashlight. Make sure to keep a chart of what materials were good conductors and insulators.  
\* Power It Up! Conductors vs. Insulators.  
*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Allow girls to suggest (and then test) things they think would be conductors or insulators. Discuss what qualities all the conductors have in common and what the insulators have in common.*
3. Electrical circuits can be connected using a technique called soldering. Learn how to solder by searching the internet for instructions. With an experienced adult, practice your own soldering skills by finding a soldering kit and making a working circuit.  
\*Power It Up! Blinky Robot Activity.  
*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Make sure girls are following all safety rules – soldering irons are hot!*
4. For additional exploration go online and research series and parallel circuits, polarized components, electrical and mechanical energy, and resistors  
\*Power it Up! Snap Circuits.  
*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Discuss how each of these things are used in the appliances and lights around them. Why is it important to know about these things?*
5. Get a circle of friends together and create a human circuit! Each person can be a different role like power source, motor, LED, wire, etc. See if you can get an electron (symbolized by a squeeze) all the way around the circle. Can you get it to do work (through a motor or LED)? What happens if all your hands are linked but you're not in a circle?  
*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Make sure that the squeezes are friendly and not painful. A squeeze will do work when a girl assigned to be a motor or LED or other such component receives that squeeze. She should then indicate that she is working by moving or vocalizing.*

POWER IT UP BADGE FOR CADETTE, SENIOR  
& AMBASSADOR GIRL SCOUTS CON'T.

CONNECT

1. Lead younger girls, friends, and family through a local science or technology museum that has an exhibit on electricity. Help them understand the exhibit.  
*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Girls should choose what museum to use on their own and be allowed to explain the exhibits in their own fashion as long as what they are saying is accurate.*
2. Learn about what it takes to be an electrical engineer by researching online or visiting your local library. Use this information to design your own “career card” as if you were an electrical engineer. Your card should include information on the type of education you will have completed and what you do on a day-to-day basis.  
*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Keep girls focused on the important things to include on their card. Discuss what resources (both research-wise and educationally) are available locally for girls who might want to be electrical engineers.*
3. Interview a computer scientist or materials engineer. Find out what factors led to choosing that career, what classes in high school and college prepared her for this work, and what types of activities or hobbies she does outside of her job.  
*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Use the internet or your local council office to find local computer scientists or material engineers. Work with girls to come up with interview questions. Discuss with the girls any surprising information they discover.*
4. Learn about three different types of engineering careers that work with electricity. Get with a partner and conduct mock interviews about the careers with one girl being the reporter and one playing the engineer. Switch roles so that both of you get a chance to be an engineer.  
\*Power it Up Mock Interview Activity  
*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Keep the girls focused on finding three careers; that’s more than enough. Then help them create the interview questions. The questions should be specific and on-topic.*
5. Research local electrical engineering clubs (such as the Society for Women Engineers). Find out when the next prospective member meeting will be and plan to attend. Did you learn anything new? Do you think you might eventually like to become a member?  
*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Make sure the girls are respectful when they visit. After the trip, discuss the pros and cons of clubs like this. What impressed them the most? What discouraged them the most?*

## POWER IT UP BADGE FOR CADETTE, SENIOR & AMBASSADOR GIRL SCOUTS CON'T.

### TAKE ACTION

1. With your family, identify 5 different electrical appliances in your home and discuss what role electricity might play in their operation. Teach your family or friends about different electrical components by taking apart a simple electrical appliance (i.e. hairdryer, toaster, coffee machine) that does not work anymore. Following the circuit to see how the appliance uses electricity to power itself, puzzle out what might have gone wrong with your appliance. If possible, fix the appliance with the help of an adult. For more information go to [www.howstuffworks.com](http://www.howstuffworks.com).

*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Make sure safety precautions are being observed when working with old appliances. Discuss the benefits and challenges of fixing things rather than buying new.*

2. Make a list of all the ways you use electricity on a given day. Have a family meeting to talk about ways your family can conserve energy. Make a plan to implement at least three of these ideas. Keep a journal for one month tracking your progress.

*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Encourage the girls to brainstorm as many possible ways they use electricity and could conserve it as possible. Discuss their impact not only on their household but on their friends and family.*

3. Find out from where your community's electricity comes. Does it include sustainable resources like wind or solar power? As a troop design a proposal for a more sustainable policy and send it to your local representative or government official.

*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Help the girls find the appropriate local contact for changing your community's electricity policies. Discuss what it felt like to write the proposal and what kind of a response they may have received.*

4. Create an electrical safety kit. Include outlet covers and breaker labels as well as flashlights and such. Give this kit to local child centers to child proof their electrical appliances.

*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Inspire the girls to be creative with their kits. Good ideas can be had on the internet at childcare websites and baby stores.*

5. Run an electricity safety event for Brownies. Using fun activities, stress the importance of being safe wherever and whenever there is electricity present. Be sure to include lightening as well!

*FACILITATION AND DISCUSSION POINTS FOR LEADERS—Have the girls rehearse before they lead the event. Make sure that everything the girls say is accurate and correct. Help them with creating fun, age-appropriate, informative activities. The Brownie handbook is a good source of ideas.*

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## Reflection and Evaluation Questions:

- ❖ How does energy flow through a circuit?
- ❖ Why is wire commonly used to make a circuit? Why do you think wire has a coating?
- ❖ How did you feel soldering a complete circuit?
- ❖ Did you learn about something new that you might later consider pursuing as a career?
- ❖ What surprised you about the use of electricity in your daily life?
- ❖ What is polarity and why does it matter?

## Field Trips

Best Buy Geek Squad service centers, Google, Sun Microsystems, or other software/hardware companies

## Related IPPs

Why in the World?

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