Solar Device **Rules**

Building Guidelines

1. Size

Your solar device and all accessories must fit in a 1-meter cube. Simply having a bigger device will not boost your score. You will want to make sure you leave some space (maybe 10 to 20 cm) around the edges of your device.

2. Materials

You can use anything to construct your device. We are especially fond of repurposing found items like old dollhouses, model cars, and recycled materials. Remember that resourceful and responsible use of materials is considered during the judging process.

Pre-manufactured circuits or circuitry kits are allowed (little bits, snap circuits, etc), but will be noted in the judging process.

3. Solar Panels

You can use solar panels from any company and you can use any number of solar panels, but only use solar panels that are 6V or below and produce less than 1.1A. If you combine solar panels in parallel or series, please make sure that you are not producing more than 12V at 2.2 amps in any configuration.

- Not sure how combining solar panels affects voltage and current? A solar panel is basically a DC power source. If you combine panels in series, you will increase the voltage they can provide. If you combine them in parallel, you increase the available current they can provide.

4. Accessory Loads & Power Storage

You can use any load to make your device interesting. These can include LEDs, incandescent bulbs, motors, and capacitors. These do not have to be new items; you can dissect and scrounge things from all sorts of places. We love cutting up old holiday bulb strings and finding parts in old electronic devices. The key to using items that you find is to be sure they can be powered by the solar panels that you are using.

Pre-manufactured circuits or circuitry kits are allowed (little bits, snap circuits, etc), but will be noted in the judging process.

Safety First!!!

- Yes, you're dealing with electricity...so be careful.
- Learn a thing or two about circuitry before diving into building your solar device!
- Watch out for short circuits!
- Carefully check that each of your loads are properly connected to the power source before turning your device on.
- Use the proper solar panels for your solar device.
- High voltage alone is not going to make a light bulb brighter, it will, in fact, more likely blow it up.

We may disqualify your solar device if it is judged to be potentially dangerous. Send us a photo of your circuit if you're unsure if it is safe.

Extension Activities

High school students might consider constructing a solar panel to learn the chemistry and physics of how a solar panel works. Learn more about these challenging projects here:

- **Build a Solar Panel Kit**
- **Build a Solar Panel Kit #2**
- **UW Build a Solar Panel Info**
- **Video Solar Cell Construction**

Local judges have the final call for safety. If you're not sure about something, send a photo to **info@kidwind.org**

Important:

Bigger does not mean better! You do not get more points for more solar panels or more power output. It is all about design, creativity and the functionality of what you have constructed.

Resources

Some resources to learn about energy:

- PHET Electricity Simulations -- The simple DC circuit ones are great.
- Combining Solar Panels
- NeoK12 Solar Engergy
- Go SEEK: Solar Energy Eco Knowledge

5. Microcontrollers

We think integrating a microcontroller into your solar device is awesome - but it is not easy!

Microcontrollers are small computers that you can program to make things happen in your solar device, like turning a light when it gets dark or making an elevator go up and down when you press a button. Some examples of microcontrollers include Makey-Makey, the microbit, Hummingbird Robotics, Arduinos and the lilypad.

The microcontrollers can be externally powered using a battery or plug — or for super serious bonus points, it can be powered by the sun, too.

NOTE: This could be very difficult!

6. Budget

There are no budgetary restrictions for the Solar Device Challenge, but keep in mind that resourceful and responsible use of materials is considered during the judging process. As we said before, we love to see materials that have been reclaimed.

7. Wiring Diagram

As a part of the judging and reporting process, we ask all teams to provide a wiring diagram. This will help the judges understand what you were trying to do with your solar device.

Use the Wiring Diagram template located in the appendix to detail all the electrical parts of your solar device such as solar panels, loads, switches, etc. You may either bring this form to the judges, or use it as a starter to create a more formal and detailed wiring diagram.

8. Solar Panel Placement

You can attach your solar panels directly to whatever solar device you have created or get a little more creative and flexible with your panels. You could create a solar panel bank that is not attached to your device but can power it with an attached wire or a solar panel bank that is movable so that it can pivot and capture the most direct sunlight.

Please note that all of your components should still fit within the 1 meter cube. You should also be careful that any elevated solar panels are far enough away from the overhead light bank that they will not overheat or become damaged.

While this challenge is focused around solar photovoltaic energy (PV - converting sunlight to electricity) you are more than welcome to integrate solar thermal and other solar construction concepts into your design that you can show off to your judges. This could definitely show the judges you know your stuff when it comes to solar power!

Solar Testing **Guidelines**

We hope to provide a similar solar testing experience for all teams. If we have access to natural sunshine we will use that!

If it is a cloudy or rainy day, we will use an artificial lighting bank to test your solar array. Typically, this array will utilize a bank of 80-100W incandescent, halogen or xenon light bulbs that we can shine on your solar panels. This light array will be positioned 1 meter directly above the table.

At some testing sites we may rotate the lighting bank 180 degrees to simulate sunrise to sunset to see how your solar device performs. At some locations we may also test to see if you have any storage embedded in your solar device. For this test the judges may turn the lights off and see if your device still functions.

Please check with your event organizer for specifics about your event's solar device testing protocol.