WORKSHOP

PRESENT + FUTURE POWER NEEDS

1.9 billion people around the world live without electricity. This doesn't capture the number of facilities operating without power such as health clinics, schools, and businesses. Solar, wind, biogas, and hydro-power are all types of off-grid power solutions presently being applied to rural facilities around the world in need of power. When considering off-grid power solutions, start by calculating the current power needs of the facility, community, or home as well as their anticipated future needs. The information you collect will help define which power solution is appropriate for the community's needs.

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The following pages outline Catapult's step-by-step process for conducting a basic energy assessment. For this workshop, we focus on photovoltaic (PV) solar systems.

UNDERSTANDING POWER DISTRIBUTION:
Developed nations and urban areas are on the grid. Sketch a map of how electrical power gets to your home. Compare the grid system to a PV off-grid system (illustrated below). Note the differences in power transmission, AC to DC, etc.

THE BASIC EQUATION

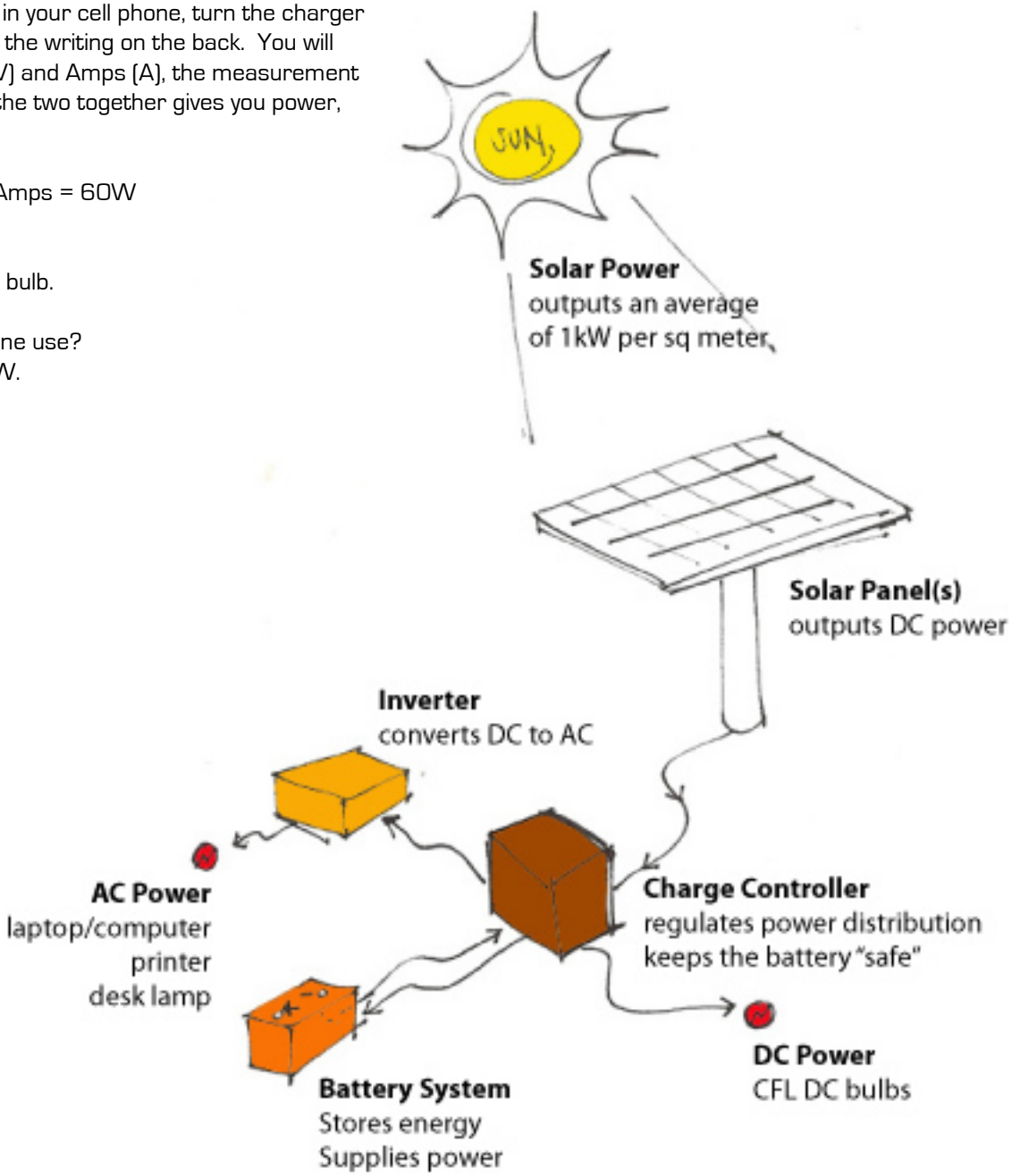
Power = Voltage x Current

The next time you plug in your cell phone, turn the charger over and take a look at the writing on the back. You will find a listing for Volts (V) and Amps (A), the measurement of current. Muliplying the two together gives you power, or Watts.

For example: 12V x 5Amps = 60W

What uses 60W?
One incandescent light bulb.

What's does a cell phone use?
Typically, between 3-6W.



CONDUCTING AN ENERGY ASSESSMENT

Step 1
Establish your on-the-ground contact who has access to and uses the facility you are accessing. Ideally this contact also knows what equipment needs power and has a basic understanding of energy generation. Have them fill out the "User Worksheet". Review the document with them in-the-field. Note that there's often a disconnect in how much energy we think we use versus how much we actually use.

Step 2
Sketch out the layout of the facility. Capture the current location of items requiring power: light bulbs, laptops, or an area for charging cell phones, as well as the location of any existing electrical systems. Also note the location of equipment with unusual power needs such as large equipment requiring a different voltage or foreign plugs.

Step 3
Fill in the "PV Sizing Summary" excel sheet with the equipment and usage information you've collected. Double check the auto-filled values for accuracy. You'll also need to input:
- Average temperature at the site (celsius)
- Peak solar hours at the site (available on-line)
- The number of days of autonomy

Step 4
The "PV Sizing Summary" worksheet will auto-calculate the PV panel and battery sizing (row 59) for the equipment needs specified by your point-of-contact. However, these final numbers do not anticipate future power needs.

Once a facility is electrified, it's highly probable that:
- community members will tap into its electrical wires
- the facility will aquire more equipment
- the system and loads will be misused as users learn to use the system

To combat this, the Solar Electric Light Fund has developed a "future needs" estimate, similar to an engineering safety factor, based on their extensive experience with PV installations.

Step 5
Plug your data into the "Future Power Needs" section of the worksheet (section 7). It will auto-calculate and bump up your system size. To understand the factors used to calculate your system size, read the "Definition of Terms" in section 7.

Step 6
Now you know what size solar system the facility needs. The next step is to find the appropriate vendors to: 1) purchase the system from, 2) install the system, 3) train staff to use and maintain the system, and 4) monitor system usage. These may all be separate vendors, each are critical., and check with your local partner for their preferences.

There are postivites and negatives to using local vendors. If poossible, local vendors should be used for all four, but this in not always financially viable. If this is the case, a local vendor to monitor system usage is the most critical.

when looking for vendors of components:
- shop quotes from a variety of sources to check that costs are appropriate.
- request that the brand names for components be included on their quotes and check for quality.
- ask for referrals from other electrification orgs.
- make sure replacement components are readily available.
- do they also offer installation? A training program?
- does your point-of-contact trust the vendor?

when looking for installation vendors:
- do they engage users in the installation?
- do they also offer training programs and/or monitoring programs?
- have they done other installation nearby that you can check for quality?
- does your point-of-contact trust the vendor?
- look for installers that also train or monitor

when looking for monitoring vendors:
- how do they monitor the system?
- what is their response time if the system needs to be fixed?
- what does the load usage feedback loop look like?
- do they have a formal conservation plan that they use to educate users?

GETTING EQUIPMENT DONATED

In many communities, the cost of solar equipment is much higher than US prices due to tarriffs and taxes. This makes the idea of donated equipment appealing.

While many solar vendors donate equipment to communities in need, this typically does not cover the cost of shipping. Research the costs associated with shipping components in to the community, the lead times, and the import requirements. In many countries, going through customs in a port city is a lengthy, unreliable process. Anticipate several months for your equipment to get shipped and transported.

There are program that provide free shipping of PV equipment to developing countries, but only to non-profit recipients.

Above all, make sure your point-of-contact agrees to the timeline for component acquisition and installation, especially if the timeline is long.

WHAT ELSE YOU SHOULD KNOW:

PV systems use “deep cycle” lead acid batteries that look similar to car batteries, but are designed for slow charge and discharge and longer lifespan.

Batteries should be stored in a wooden, or other insulated container, and lifted off the ground.

A good charge controller has a clean digital display that visualizes and/or data logs information such as the state of charge of the batteries. A real-time feedback system is essential!

CREDITS + RESOURCES:

Green Empowerment, www.greenempowerment.org
Solar Electric Light Fund, www.self.org

Request for Quotation Checklist

Region/Country:

Person To complete:

	Quantity	Dimensions	Amp*Hrs
Existing Energy Generation Systems			

Equipment name and brand	Quantity	Watts (each)	Hours Used Per Day	Days Per Week
Existing Appliances				
Anticipated Future Appliances and Usage				

Environment and Weather
Latitude
Longitude
Frequency of brown outs?