Tablets

The Tablet Corner

August 2016

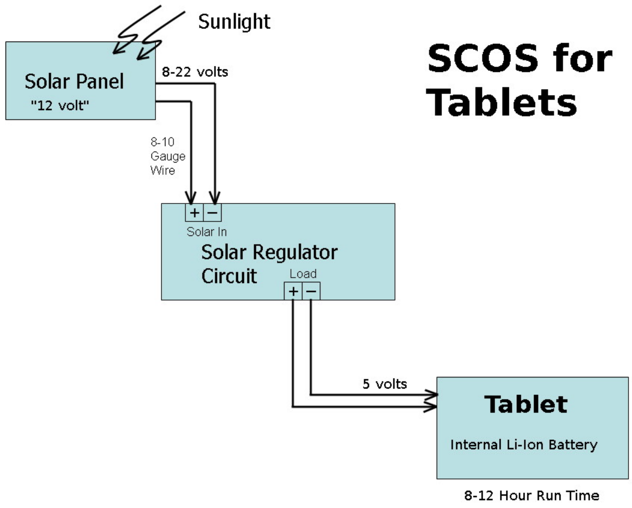
Someday computing in the field will look like this:

Tablets, whether Android OS or Windows OS are clearly the future of Bible Translation and Language Development, at least if the intent is to mobilize the local indigenous church to share in the work. What other strategy will ultimately win the world in our lifetime? Already we are seeing the results of Scripture App Builder (SIL software) producing electronic readable versions of vernacular text with spoken audio, on both mobile phones and tablets. In PNG Reading App Builder (SIL Software) and "Education for Life" systems are preparing the way to teach vernacular and English language skills. This alone addresses a major vernacular distribution problem that before was limited by paper and mitigates the logistics of getting paper printed and transported. Especially if the tools are on popular and readily available mobile smart phones. More and more software will be available on tablets. As of this writing there is even a movement to have a Paratext (SIL/UBS software) like functionality present in the tablet space.

It is true that not all regions of the world have enough mobile phone penetration... but that is progressing forward over time. Even in PNG there are remote regions without mobile phone coverage, but even in these area people might purchase a mobile phone as an inexpensive "reader" of materials, and people do purchase for this reason.

So, in light of tablets and mobile phones getting stronger and stronger use, and more usable software is becoming available the ultimate question is: "How to do sustain power to these devices?" Most of PNG, as an example does not have mains power available. Up to 90% of the country and the population. They want to recharge their devices, and inexpensively. Enter solar power (renewable energy) as the solution.

The Tablet Power Block Diagram:



Tablets are "5 volt" devices, whereas the typical notebook is a 19 volt device. This has a profound technical bearing on a 12 volt solar system. I only have to really supply reliable regulated 5 volt power to a tablet and keyboard combo, instead of a "step up" in voltage for the typical notebook/ laptop. It is much easier in low-light situations to "turn on" my charging system when I am trying for 5 volts systems than reach high for a 19 volt system. That is primarily why we need those external battery packs. The external batteries act as a buffer or conditioner for power, that helps in the controller/ charger process. And of course they store extra energy. But extra energy is not really necessary for tablets which often have longish run times even with the diminutive batteries inside the tablet.

This means we have a change to eliminate the external battery/ solar controller combo and head to a more simple 5 volt regulator in our circuit. See this diagram.

Data Entry? Tablet Keyboards Included

(Click for Zoom; Click again for Ultra-Zoom)

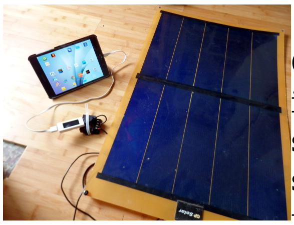
When we talk about data entry software, like Paratext (SIL/UBS) or basic email or Word Processing tasks then we must include "tablet keyboards" in the discussion. For some, this is an automatic "given" but for others this has to be further explained when one talks about "tablets" in general use and work. Bluetooth and wired keyboards of all shapes and sizes can be purchased for around $30 to $100 depending upon other features. Some from Logitech have tiny solar cells embedded and can run forever under office lighting. For these, you would never have to replace the AAA batteries, because they don't exist. Even those with replaceable AAA batteries run for months at a time before replacement is necessary. Shown here is a Samsung Android tablet with Logitech keyboard, with stand.

But Why Not Just Use a Notebook Instead?

Cost. Sustainability. The cost of the computer and the cost of the sustaining solar system to run the computer, is greatly reduced. **The Goal:** Affordable systems that the local level churches and communities can afford themselves, and create a "sustainable" environment. In some countries this level of hardware is already for sale in the cities within that country. In terms of longevity and "buy in" for the language project this "sustainability" argument is not to be ignored, at least for our work in the next 1000 langauges. We should not be embracing strategies that perpetuate a dependence upon Western aid and support structures. (End of sermon,) The biggest thing we lack is great software and royalty free resources in this space.... but people are working on that even now.

So What Does This Really Look Like?

(Click for Zoom; Click again for Ultra-Zoom)



Picture: A 20 watt flexible, thin-film GP-Solar, solar panel powers a Samsung Galaxy Tab 4, 8 inch Android tablet. This tablet could draw 5 watts when its battery is discharged, and by the standard "4 x rule" one would normally want a 20 watt solar panel if you want this all to work in rainy, and overcast conditions. In bright sunlight you could easily get by with 10 watts of panel, but that's not a guaranteed reality in the Highlands of PNG.

Voltage Regulators (central block in diagram above) come in all shapes and sizes. This one is nice because he had solid screw terminals to attach wires, but the basic principle is often built-in already with various fold-out solar panels with USB charge ports as found all over Amazon.com stores. Here is a lab design in PNG:

Note the Tobsun sealed potted module here that can handle an enormous 10A if necessary, which is over-kill in this application. Look for the three parts in this photo that correspond to the block diagram above. $11 on Amazon.com. The 5A unit is $1 less.

See: Amazon Store   If you need such a thing, there is also a 12 volt variant on Amazon.com instead of a 5 volt regulator.

So what are the problems with this setup? It has been reported by others (GTIS: *Charging Directly from a Solar Panel*), that strange things can happen when we mix and match parts in this environment. Different things happen, with different regulators, solar panels, and tablets and phones when you connect the parts together. Problem scenarios include: The system starts to charge (indicated on the tablet screen) in full sunlight, but then a cumulus cloud rolls by placing one in the shade. When the sunlight returns later, the charge circuit within the tablet refuses to re-engage and start a charging cycle again. It just gives up and the user has to coax the system back into charge mode, usually by plugging and un-plugging the USB cable. Not a good solution if you have something else you would rather be doing for two hours.

But if you substitute a different panel (usually a slightly bigger one) or you substitute a different tablet, you will get a different result. Some tablets and their internal chargers are just plain different... **they are not all designed the same way**.

So for the rest of us, this means we still have to experiment a bit to get that optimum "universal" set of parts that will be the least troublesome for all users and all tablets out there in life. This could be a tall order. The biggest lesson, as of this writing, is "Try before you Buy" as you complete a setup for others. You need to do some testing, but in this space we will try to list all the latest news on what works and what doesn't.

The next experiment, yet to be tried as of this writing, is to substitute the GTIS 15 watt, Solartec panel instead of the 20 watt GP Solar panel above. These GTIS panels are in aluminum frames and heavier to transport, but at $18 each (SIL Member Price) there are amazingly inexpensive. See: GTIS PowerMon Store

The other experiment to try is various fold-out 15 watt solar panels (see below), where the advantage is extreme portability and lower weight over the Solartec conventional panel. However, the canvass/nylon fold-out panels are considerably more expensive to purchase, relatively speaking, and the Solartec panels might be more durable in settings where they don't move around a lot and are mounted on roofs for years at a time.

Highly Portable, 15-20 watt, **Tablet** Solar Chargers

There is big interest in Tablets over Mobile Phones for language work, because most of our software will look similar in the larger screen format offered by the 8 to 10 inch tablets. Android is in focus now, but soon Windows OS based tablets will be affordable and our most popular language software applications are going to be there. One would expect a Bluetooth keyboard added for serious data entry.

Recent tests of the Anker "PowerPort Solar Lite" product (Model A2422) in the field produced some pretty nice results sustaining a Samsung 8 inch Android tablet, model "Galaxy 8 Tab 4" (~$250). The Anker fold out screen has two major panels and a rugged polyester canvas construction material. It is reasonably weather-proof, but not "water proof". Don't leave this one in the rain while out in the garden. It has recently dropped price on Amazon.com to **$42** versus around $65 before. Of the making of fold-out panels there is no end, but Anker is a good, solid name with a good reputation on their product line. Sure enough in the lab, this panels performed well in high and medium sunlight, using its 15 watts max output to good advantage.

Tests included covering and uncovering the panel and seeing whether the Samsung Tablet would "restart" its charging process. It did. However, the threshold for charging at 15 watts of panel for a 4.5 watt (while charging) 8 inch tablet was at 1/2 Sol, or 1/2 the normal brightness of full sunlight, at least as found in the Highlands of PNG. So, this means that **certain rainy weather conditions will not allow the Samsung Tablet to recharge**. My suspicion is that when we move to a 20 watt folding panel, we will get the desired performance of re-charging the tablets at 1/3 Sol which would cover most every day in PNG. We will be testing such panels in the future.

Unlike with the small, low-power consuming notebooks (see that section) where you must have an external battery pack involved (so far), the charging circuit of the typical tablet, simply does not "turn on" well in low-light conditions. It means that a larger panel is required if one has the goal of charging the tablet on rainy days, as well as fair weather days, and everything in between. The modern solar controller plus external battery in the other notebook solar system designs, allows for charging to start at much lower sunlight times, like early dawn and dusk times. That's simply not going to happen with the typical tablet arrangement.

Note that the Anker A2422 panel has dual USB ports, a charge activity light, and claims an top output of 2.1 Amps at 5 volts for the USB ports. Many other panels are going to limit their performance to a mere 1.2 Amps or worse to 0.5 Amps like the old USB 2.0 computer ports of olden days. So, these are the kinds of specs to look for if you are looking for a subsitute panel to this Anker panel. The normal charge rate for the 8" Samsung table is 0.9 amps while screen on, and recharging the internal battery, or approximately 4.5 watts.

Highly Portable, 7 watt, **Mobile Phone** Solar Chargers


Mobile Phones are even easier to charge up in the field on solar. Here is a typical 7 watt fold out panels and it is recharging a 2.5 watt Asus Zenfone 4 with dual SIM cards. The screen here was "full bright" for the picture and note that the charge LED is glowing. The boxed area is the place on this fold-out panel were the 5 volt regulator is included. Simple plug in your USD cable and go. Note that this is inside my house, and the outside sunshine is overcast at the time of the picture. That is the recharge performance we seek. Time to recharge a "flat" mobile smart-phone battery would be 2.5 hours and at 3 watts.

Note that 7 watts to charge a 3 watt phone is pretty amazing. This says something about the on-board regulator here, the superior "low-light" performance of thin-film solar panels, and the overall brightness of my "overcast" condition. Shade performance actually matches full-sunlight performance, indicating a true current regulation at a measured 550 ma. In other words, it doesn't matter if I am in the sun or in the shade, if I am charging, I'm cranking out .55 A to the phone and it takes an appropriate but longer time to recharge. However, back in the lab, with a 2 amp USB port to play with, the bench charger delivers what the phone wants which is more like 990 ma. (1 Amp) Therefore on the bench, the mobile phone will recharge that much faster, as in less than an hour. But for field settings, taking 2.5 hours to recharge in the shade is actually pretty nice.

All this sort of defies the normal "4x rule" for panels powering devices. More like "2x" here. Basically if the sunlight is cut down by this factor of full sunshine, we are still in business for today's work. We don't have to stop our routines to keep going.

Picture: This 7 watt fold-out panel, is similar to the **PowerAdd** panel which we have tested as well. This panel is of an unknown make and was purchased direct from China, sent to PNG. The only mark on it says: "Witi". The PowerAdd panel is very similar in size and performance. $20 7 watt See: Amazon Store The highlighted box is the housing for the on-board regulator, and USB port on the side.

During a recent trip to a tropical climate town, in PNG, the PowerAdd panel failed a few significant tests. It is not recommended at this time for purchase. 1) In bright sunlight, the regulator strangely "clamped down" to a mere 50 mA at 5 volts, while charging a mobile smart-phone. 2) Stranger still, the mobile app ***Ampere*** indicated a nice positive charge of 350 mA (@ 200 mA consumption; total: 550 mA) while the panel was placed in the shade, but failed to actually recharge the phone. 3) In contrast, a portable USB battery bank, with 1000 mA high-current USB port, allowed the moble phone to recharge at 950 mA, under the same conditions. Conclusions: Be sure to test any USB charging panels in a variety of real-life conditions, and look for panels with regulators that allow delivery of currents beyond 500 mA output.

There are no good recommendations on the best 7 watt fold-out panels at this this time. The SCOS Handbook welcomes additional reports by users in the field at this time (Aug-16)

For more folding panel ideas just search "7 watt fold out solar panel" in Amazon.com search. See $20 7 watt **MQB** See: Amazon Store and see: $25 8 watt **Eco-Worthy** Amazon Store but really there are a dozen other companies out there.

Note: The construction varies quite a bit on this panels in terms of their canvas, or nylon shells and whether they will handle scratches well, flex forever without breaking internal wires, and hold up under abuse (front face of active solar elements). It would be great if readers could add any experiences they may have had, good or bad in this space, to help others on purchasing decisions. Also all the 7 watt Amazon.com panels say they are for various mobile phone models. They do not say they can power common tablets. This is not surprising at the 7 watt level. And the lab agrees. We are moving to 15 watt or more, fold-out panels to test for normal 8-10 inch, Android Tablets.

Battery Banks with Small Integrated Solar Panels

These are great as energy storage devices, and yes, many will recharge a mobile phone quickly and maybe two times with a full charge. Fine, except their solar panels are **way, way too small** to recharge the battery bank and then continue to charge mobile phones **each and every day, even in full sunshine**. Worse on rainy day weeks. So, if you re-charge a phone, and deplete the capacity of the battery by half, expect four full charge days, before you regain the energy you used to re-charge the phone. It's not the storage that is wanting; it's the capacity of the tiny solar panel that let you down. Note the relative size of the 7 watt solar panels above for a mobile phone for comparison purposes.

However, straight "battery banks" are quite useful devices and many can be connected directly to a USB solar panel for charging. These will work well and recharge once a day in normal use, if the solar panel is comparable to the work involved by the devices in use during the day. So, small Lithium battery based battery banks do have their place, just not the fancy ones with tiny integrated solar panels on one back-side. That feature is a waste of money. Purchase a larger external solar panel instead.

Summary:

Hopefully we have shown here some viable solutions to powering and working well with a tablet computer. A small solar panel, without the need for an external battery and fancy solar contorller, with the comensurate reduction in expenses, can be deployed. A bluetooth keyboard should be added for data entry purposes, and that might even include a mobile phone setup, but obviously an 8 inch tablet is nicer. All of this equipment is within the reach of local level language communities to purchase and to use their **own equipment.** This same equipment should be introduced with adequate training and can easily be incorporated in our present National Training courses (PNG Context). Training costs are reduced in this scenario as well, since everyone already knows pretty much how to re-charge mobile phones and tablets in a town environment where power is available. On the brighter days, the user can help relatives and friends recharge their phones, and perform a community service, while working on a language project and doesn't have to worry about having enough power to do everything (a problem with higher power laptops, where the person with the resources might be considered "stingy" in not sharing those same resources).