

# *Power is Knowledge*

## Report of Informal Pilot Test of Small-Scale Phone Charging Systems in Kenya

Laura Murphy, PhD, International Health & Development, Tulane University [lmurphy2@tulane.edu](mailto:lmurphy2@tulane.edu)

### 1. Overview

Can solar effectively charge mobile phones in places “where there is no electricity?”, i.e., much of rural Africa?

The aim of this pilot study was to refine the parameters of appropriate small-scale phone-charging systems for rural Kenyans. Beyond the obvious factor of price, long term economic, technical and socio-cultural features shape the practical potential of charging systems.

Different qualities and criteria matter, in combination: i.e.,

- initial price and long term costs (in relation to local alternatives),
- features/functions,
- perceived complexity,
- whether principally solar, or not solar
- Power/wattage.

These characteristics will attract or deter consumers. I propose different classes of users, i.e., individuals, households, and small community groups. As well, there are shopkeepers, retail phone/electronics businesses, and repair. Different “charging systems” will be affordable and truly useful to different users.



Overall, the target audience are low-income rural and peri-urban residents: places where grid electricity either does not exist (most villages), is unreliable.

I use the word ‘system’ rather than product to emphasize that the device is connected to other systems, i.e., repair, replacement tips, cables, storage systems, security systems and technical know-how; as well as weather systems, transport and livelihoods.

The pilot took place in January, 2009. It was the dry season: it was sunny (and hot) every day. The systems tested out are listed in Table 1. They were first tested out in Nairobi (to get to know the devices and choose which ones for further research). They were then simply demonstrated to a range of users in Bungoma (Western Kenya).

Findings are summarized in Table 1 and discussed below in relation to technical features (complexity, functions, solar/non-solar) and socio-cultural dimensions of these small-scale charging systems.

The pilot is intended to guide formal, structured social-technical and consumer-oriented research. Findings in this report do not constitute product endorsements. Based on this pilot, a detailed plan for formal academic research is being drawn up.

## 2. Description of Charging Systems (Products)

Now, many small solar chargers are on sale in the US, marketed to the boating community, sport enthusiast, back-country traveler, and “green” gadget-rich consumer. Meanwhile, in Kenyan shops, small and cheap solar devices are imported but with no regularity and of obviously inferior quality of fabrication to the US and European consumer goods. Several such products were identified for this pilot reflecting personal and larger small group systems, as well as non-solar devices. These retail products also reflect a range of features, power/wattages, durability, and initial price. They are described in detail in Table 1. The three classes of product are summarized here:

- “Small & Cheap” The Personal Chargers: Several pocket-size hand-held chargers for mobile phones, iPods, Pads, etc. using conventional solar (hard mono- or polycrystalline) cells are on the market in the US and Europe (and in Asia, but to a much less extent in East Africa).
  - Prices range from US\$50 to 90 in the US, and Ksh 2000 to 6000 in Nairobi and Kisumu markets. Prices vary depending on features, efficiency and quality of the cell and the overall design, and standards of fabrication. (An assumption behind this project is that solar consumer prices will drop as demand increases and products are produced at a larger scale: but which features matter?)
  - Typically they are powered at 1-2 Watts, but vary in their solar cell efficiency, overall robustness, user-friendliness of design, and presence of added features (lights, radio, variable voltage, different adaptor tips for different phones).
  - Built-in batteries allow charging at night or to run a LED light (of varying strength).
  - Some (>1) use regular rechargeables and function as AAA battery-chargers.
  - They often come with (you pay for) A/C adaptors and/or car-charger input to charge the internal batteries by grid or car-based electrical source.
  - Several types of small personal chargers were selected for this pilot, with and without batteries, and with a few other variations representing what the US & Kenyan market offered (with/without lights, hinges, quality, etc.). This type of product was envisioned as being used by a single owner—as they were designed-- or a small family/household with 1-2 phones.
- “Joint Purchase” the larger personal or small-group chargers: More watts is a good thing, but more expensive, and thus might require pooling/investment. This type of system was envisioned for a larger household, a small community group, NGO team, or as (part of a) for-profit venture.
  - Systems would be less portable, more expensive, and possibly more complicated: but could charge several handsets a day. Extra watts would be helpful and often necessary.
  - Larger thin-film type solar systems have been on the retail market in the US for several years, and offer a highly-portable higher-wattage system (5 to 12 watts) as an alternative to bulky conventional solar cells available in Kenya. These are rugged, portable, and more powerful, and cost is dropping to around \$100 (5 watt) to \$200 (12+ watts).
  - SolaPak of Nairobi supplied a small, locally made 5 Watt charger (selling for Ksh 5000, or about US \$ 67) that was explored in less detail than the others (I did not receive it in time for 3 of the group demonstrations & interviews in Bungoma). It could serve as a bulkier personal or small-group charger.
- “The Professional Charger”. Many rural residents carry reports, questionnaires, proposals for OVC projects, health forms, certificates, letters and agendas -they move around for work. A Solar-Powered bag would seem to suit their needs.
  - The (US Based) Voltaic Company manufactures a 4 Watt solar-powered messenger and backpack bags with built-in batteries and a small light and car charger as well as direct adaptor. (Recently, they produced a larger watt laptop-charger bag for US\$400).
  - There are other companies but this product was more relevant product for a rural site: i.e., a simple sturdy black messenger with well-designed battery pack for storage.

- This product was envisioned as being useful for a user who moves around the village and town, uses his/her phone every day for work, has a little cash income, and might find it helpful to meet not only his/her individual needs but for his/her team members, clients, patients, colleagues, etc.
- “Non-Solar Charger”. The FreePlay Companion offers a (\$30-\$35) hand-crank dynamo phone charger (that works for ONLY a Nokia handset). It is primarily a solar-powered or hand-crank torch/flashlight and AM/FM radio. (Etón Corp. offers a similar product that I am now testing—it has not worked for the Kenyan Nokia or local handsets for other reasons, and merits field trials.)
  - This device was included (almost at the last minute) as an alternative to the main “solar” devices that are designed as primary phone-charging systems.
  - Freeplay also makes a dedicated phone charger lacking a radio or light, and there are other non-solar hand, foot- and motion-powered charging systems—for future tests.

### 3. Overview of Activities

**Nairobi Field Trials.** I systematically tried out each product myself over several days to identify issues in everyday use and prepare for tests with other potential users. I aimed to understand

- Can I use this device myself with ease?
- Can other experienced (computer-savvy) people use the product?
- Can I fit various phones using the supplied adaptor?
- Can I actually charge my handsets more or less within the suggested/advertised time?
- How relevant are the additional aspects of the product design (portability, weather-proofing, light, bag, radio, etc.)?

All the adaptor kits were tried out for fit with the new ultra-low-cost-handset) Nokia 1200 and Motorola c113a, as well as a Samsung. In Bungoma, users supplied their own handsets to try out the fit. All the devices and their assorted cables, adaptors and other bits and pieces were labeled.

**Bungoma District Pilot.** I demonstrated the product set to different audiences in this order over 3 days in January:

1) Staff of a Kenyan NGO based in Bungoma town, serving rural communities in the district with training, field outreach, and research. They have access to electricity in the office, but it goes out often, they often have multiple handsets, higher-end phones and are computer-savvy. Almost all have access to or at least can use comfortably, a PC.

(2) Community-based groups dealing with agriculture, HIV/AIDS, orphan - support in Kabuchai area and Kimukungi/Kakichuma. They are rarely computer literate, lack electricity except along the road in the market, and have low-end handsets (ULCH Nokia being most common, plus the Moto C113 and various used handsets)



(3) One village householder who tested a solar product in 2007 during the Hybrid Technologies field work (see Ilmurphy.net for reports). That was a cheaper product: she compared it with the newer solar devices and the Freeplay;

(4) Informal conversations with 2 shop-keepers, retailers of mobile phone accessories and phone repair, in Bungoma town (both people new to me).

In each case, I displayed and briefly demonstrated all the products in person. (I provided a summary handout with prices blacked out so they can refer to it later).

- I invited their verbal questions and reactions to the obvious qualities and distinctions between systems (this was in English, Swahili, and/or Bukusu):
- I invited their active participation, i.e., asked them to try to fit their own handset and then to attempt to charge it.
- I observed and listened to them as they encountered each product: What problems did they face fitting their handset, understanding how the system worked, etc.
- With a translator (my assistant) we asked a few specific questions: “What would be a reasonable price for this, if you were to see it in the market here in Mayanja?” and “If it were to break: Where would you go to fix this?”

#### 4. Findings

Results of my personal field trials and these informal conversations are summarized in Table 2: Findings. Pertinent examples and an overview of findings are given here. Images are shown in the attached “Slide Show” .

##### Demand/Economics

Installed Solar is known far and wide in rural Kenya, but “small-scale solar” is not. Wherever the products were shown (in Bungoma urban and rural settings): most informants had never seen anything like the products. Even the NGO staff had not encountered the SunLinq; none had seen the Freeplay; they had heard of small personal chargers but had not seen one yet. When probed, one shop keeper had seen a hand crank charger before, but remarked “it was not well-made” .

The most obviously popular devices—in terms of enthusiasm, interest, and time spent on studying and trying them out, were the Freeplay Companion, the Voltaic Bag, and the SunLinq 12 Watt ThinFilm foldable charger. These are also all effective products that work (more or less) as intended - at least in the short run, over a few weeks. They fit different needs and respond to different concerns and income levels found in different users. (The last two only support the Moto C113 only via the car charger.)

- The Voltaic Bag was popular among NGO staff, who asked “can it charge my laptop?” as well as community group members. (See separate slide show for images). The mobility and ease of dealing with the need to expose panels to the sun --without having to think about, while moving about village and town to bus stop, meeting, etc.
- The SunLinq (both 5 W and 12 W systems) was admired for its flex, obviously sturdy design, and portability in relation to what they know as the alternatives (the bulky, glass and metal-framed locally available cells). That it can charge 12V is valuable to village residents.
- The Freeplay Companion was unexpectedly popular for the non-solar, anytime charge accompanied by radio. See below for more discussion, and attached photos.

None of the small consumer-oriented, “personal” “solar phone chargers” fared as well. Across the board among the community groups: they are perceived as “too personal” for the investment. As well, the products were attractive, but appear fragile, luxury goods.

- The EcoSolutions product was admired for the sleek look and sturdy construction. It was also feared—it appears too complex and the many charger tips are confusing. None of the community group informants would spend money on it. NGO staff could learn to use it, but were put off by the buttons, cables, and tips. Even in Nairobi, it proved confusing. (However, it does work well technically: these are aspects of user-friendliness.)
- One exception emerged: the very small generic charger (purchased in Kisumu -see separate Slide Show for images). This device seemed to be popular with men (in Nairobi and Bungoma town).

##### Price and cost

This was really a minor topic given the focus on technical and usability parameters, but initial price and long term cost are obviously huge barriers to getting access to these products/systems. I can supply some general reactions to the economic aspects of phone-charging systems.

Among community informants: When asked 'What would you think is a reasonable price': the answers were surprisingly close to (but below) the US retail price, i.e.,

Freeplay: from Ksh 1000 to Ksh 2000 (\$30)

Voltaic: from Ksh 8000 to Ksh 15000 (\$200)

For various products, i.e., most of the personal solar-handset chargers, no figures were given. The lack of response indicates that they did not value the functions supported by the product enough to envision what they might spend. (Note: this was not a formal willingness to pay survey, but does provide an indication of what these low-income rural residents thought would be a reasonable price for such a product in their local markets. Also, their responses indicated their reasoning processes, i.e., The FreePlay was verbally valued against the joint purchase price of charging in a kiosk, buying a small radio, buying a torch, plus the AA batteries.

Initial price is an issue, but long term costs matter. Informants can do the math and appreciate that a larger investment up front can look favorable against the amount they spend on kiosks (travel time and the Ksh 20 per charge). Thus, an important consideration is the quality of the product and trust in its ability to last.

Jan N, upon learning about how the Voltaic works as a charger, started toting up revenues from 'renting out' such a bag to charge village handsets. She sees it as a way to earn some cash. This might lead to unrealistic expectations, but also reveals an entrepreneurial side of the informant, and the very small-scale of income-earning that could be valued.

These are among rural users who do not have any grid electricity in their homes. Some have a small installed solar (i.e., 35 Watt panel on the roof + local car battery) or just a car battery that they take to town to charge. Most simply walk to town to charge phone handsets as needed. Thus they clearly value their time and want to avoid the inconvenience and distress involved in getting handsets charged.

Community groups viewed the portable SunLinq (if additionally equipped with 12 V car-type or closed cell battery) as a possible revenue-earner comparable to the Posho Mill (maize/grain mill) that one group operates. They spontaneously suggested setting up a solar charging kiosk or portable charging station that could move around to events: trainings, "OVC Fun Days", Barazas, and the like. (Again, this might not actually be a feasible income-earning strategy, but gives an indication of their concerns, activities and reasoning processes as they face new types of solar products and learn more about the potential.)

#### The "Solar" Question

There is plenty of sun, especially in much of Kenya. Solar chargers were not necessarily the obvious nor most popular solution. Why? Weather, sun and the limits of solar. In general, there is plenty of sun in equatorial Kenya. In practise, the long rainy seasons figured in the minds of Kabuchai and Kimukungi respondents—even when discussions were being held under the blazing January sun. In all, solar is valued and understood as an electrical power source, but has its limits. Not only does the sun not always come out, but the user must remember to put out the panel even when there is sun. See the slide show for pictures of the solar lantern that was donated to the Kabuchai Health Clinic that was found (discharged) in a store room. The nurses were concerned about theft and had gotten too busy to put it outside for recharging.

Other forms of energy can and should be tapped, while the specific design features of any solar-product can better adapt to concerns for theft in public spaces, such as clinics and villages. Retrofitting a cage, container, frame, etc. with a cable and lock.

#### Usability & Fit

Not to have to think about it is a feature that would be helpful. Solar charging requires planning—put it out in the sun-- which in part leads to preference for the Freeplay. As well, a reverse blocking diode is a useful design feature that most would not know about but will readily appreciate. (Cheaper models

found in Nairobi in 2007 did not have those, and my informants tell me how they learned about the hazards of leaving their phone attached all day.) Secure ways to leave a charger out all day, esp if it were attached to a phone are needed. A homestead is a public space; many users are moving around during the day and can't leave the system sitting out wherever they are.

Make it easy to "share with others": Other family and friends will want to use the device, but they could break it, get the tips mixed up, run down the charge, etc. The less functions (cables, attachments, buttons), the less that can get lost or broken. The Moto C113 is a common low-cost handset which was only supported by the car-charger adaptors. None of the supplied tips fit (even that from Eton Corp for their hand crank charger which was not part of the field test)

Minimize Maintenance: The Freeplay was popular in part because it seems simple and durable and thus not to require maintenance. Things break—that is expected. Hinged systems broke already. Systems also seem to need a degree of work to keep up, put outside to charge, store different tips and cables, and put away.

Complexity: Are additional elements worth it, especially when crammed into a small space for portability and cheaper design via circuitry vs. physical buttons? Sometimes, much simpler systems that just do one thing well (for years) are best. Assuming it is well made: additional functions are not always desirable. More is not always good as many consumer electronics and MP manufacturers find. For example:

- The variable voltage function on the EcoSolutions product was irrelevant as well as too confusing. Variable voltages is probably not relevant for the 'mobile phone' charging purpose, except in Nairobi where one sees smartphones, blackberries, Ipods, and PDAs.
- A small flashlight is a useful device, especially for the rural areas, and in poorly lit towns and cities (which is most of them). From the point of view of users: they need to be aware that using the device as a flashlight would also run down batteries.
- The Radio was a hugely popular product in the villages—is the receiver and speakers etc worth it? It could be envisioned as an element of other (i.e., principally solar) charger systems. The Freeplay and Eton are the only products that provide radios (they are radio companies, vs phone charging or solar companies).
- A small LED light is useful - but it should be clear whether/how much it also draws down the battery. (At the risk of adding complexity, having two batteries (one for lighting, one for charging) could protect the 'phone-charging' quality of a modular system)

### Markets, Barriers & Consumer Advocacy

(Note, during this pilot, I am not looking specifically at market-level or industry barriers, such as import tariffs, component supply, etc. --although those issues are important and some aspects emerged here. I.e., what is on sale in phone and electronic shops is what happens to be imported into the country. Even when there are affordable and functional 'solar' consumer goods (ie., from China, Taiwan, Korea), there is room to work with wholesalers need to be informed which products, manufacturers, criteria, and specifications will sell and to whom/where.)

The two mobile phone shopkeepers in Bungoma were shown 4 main products (Voltaic, FreePlay, SunLinq, and SolaPak). Neither had seen any of them before—and they are well-traveled men from Central Kenya.

- One retailer ("JM" in downtown Bungoma) said he could sell all of them. He sees a large market even for Bungoma town. The power goes out often, and in case is not always convenient for many urban residents whose work takes them out and about day and night. More affluent rural-based customers (affluent farmers, vets, officials) are also his customers.

There is little information for consumers. Practical education about good design, different types of solar, what to look for, etc. would help low-income users make better investments and demand better quality and more appropriate products.

Industry wide/Consumer advocacy issue: Many of the manufacturers products vary in ways that do not matter to the end-user: i.e., different cable, adaptor tips, battery packs, and connections. This in fact adds complexity, as one individual or group investment might not be compatible with another—it is harder to share. Diversity is desirable along relevant traits, instead: i.e., wattage, portability, battery. Standardization around a “car charger” receptacle might be the way. Alternatively/in addition, plan for for the next generation of mobile phones to use mini-USB and common chargers.

### Some conclusions

Personal vs. group/shared use: This distinction matters to purchasers. A bachelor trader/shopkeeper buying for himself is one user (and market); a group leader and family member buying for many is another market.

Solar is not always best for all users. It does have an (ill-informed, low-income) market, i.e.,

- An effective, powerful (efficient cell), straightforward, “single-use” personal solar charger will sell, but not to everyone.
- Higher end rugged, well-designed multi-use/multi-user products will have a market—if there are ways to avoid theft (This refers to SunLinq thinfilm, the Voltaic efficient bag-system) A low-cost non-solar, anytime charge (plus radio and light) will probably sell well

Security/Theft. Perceptions of high cost includes anxiety about theft and the needs of maintenance, so attention should be given in design, sale and use to ways to secure a device or reduce risk of theft (i.e., the bag you take with you, wearable solar).

Simple vs complex, one-function vs. multi-function: Both design-approaches yield products that might work for different users/markets, as long as the product itself—and the supply system for repairs and replacement cables and tips -actually works and the product is seen to last. The product must be “complex” in ways that make sense and are valued.

- ++Solar/crank “Flashlight+ Radio+ Phone Charger” is one combination that is valued, whereas:
- ++ Modular systems that the end-user can add to over time might work: i.e., a phone charger that can support an LED torch or run a radio (all to be purchased separately).
- -- “LED plus Variable Voltage plus A/C charger” (i.e., some personal chargers) is less relevant
- -- Small “personal” solar charger with money-detector and A/C and car charger fittings. (Why pay for cables, attachments and functions you cannot use?)

## 5. What’s Next?

**Immediate next steps:** We need to study the products/systems over a span of several months of wear-and tear and regular use, through the rainy and dry seasons. I am working to arrange for formal, longer term feasibility and useability field trials of products/systems on the market already. Based on these findings, these types of charging systems appear most relevant for low-income rural and peri-urban users:

- “Freeplay”-type (Companion) dynamo “anytime” with solarradio & torch (for Nokia, and with retrofitted adaptor for other handsets);
- “Voltaic” Solar Messenger/backpack (mobile phone charger system);
- Foldable 5 or 12W “SunLinq” type system: weatherproofed ThinFilm + car-charger receptacle + car battery charger + car battery for storage);
- 1-2 W “personal” and portable, simple, reliable solar charger (note: none of the products tested so far actually seem suitable)

To this end: I’ll develop a detailed field research plan and relevant data collection instruments and guidelines for different end-users, around a range of different charging systems. The analytical aspects would cover the balance of economic/financial, technical/design, and sociocultural feasibility for low-income rural users, and generate recommendations for different audiences.

For the longer term, I will look at different technical designs to find better alternatives for small scale “off-the-grid” charging systems. The popularity of non-solar devices suggest that there will be interest in and (niche?) markets for non-solar charging systems. Alternatives I’d like to test include several for sale and several not yet on the market:

- the FreePlay crank mobile phone charger: Will it sell without the torch and radio?
- the Potenco pull charger: why has it not spread further?
- the “Bionic Power” knee brace that captures human walking motion: will it work?
- the “GreenErg” rolling generator: will it work for rough, sandy, muddy trails?
- bicycle dynamos for the Boda-Boda market, and the bicycle commuter -why are they not already more common?
- The Weza bicycle-crank (fixed) foot/treadle-powered dynamo (made by Freeplay): will this work for a kiosk, school, or group?

I would like to investigate the possibility of solar-systems and market aspects, to make use of products that exist. One option is “Matumba Solar”: It works for the used clothing trade and old handsets: why not for cast off solar charging systems? What can we find used and cheap on Ebay, etc. to be shipped out, repaired, modified (with appropriate adaptor or car-charger fitting), and sold in Kenyan markets? Given the large numbers of consumer-oriented solar gadgets out there, can we find the capacity and institutional support in Kenya (and other places) to make such a globalized recycling system work? A system of trade, repair, resale and recycling US and European (and possibly Asian) consumer products. Another angle is “Secure Solar” : Perceptions of high cost includes anxiety about theft and the needs of maintenance: Retrofitting a cage, container, frame, etc. for various small handheld chargers with a cable and lock. Can we identify modules/security systems that allow solar-plus cables and batteries to be strapped down, sewn into the users clothes and bags to keep on/about his/her person, and thus exposed (to the sun) yet secure.

(Note: inclusion of a product in this trial does not constitute a product endorsement)

## Attachments

Table 1. Findings from the field (by product/system)

“Slide Show” from Bungoma trial. Posted separately on [www.ilmurphy.net](http://www.ilmurphy.net)

**Table 1. Summary of Findings from Western Kenya Pilot Test**  
(Note: inclusion of a product in this trial does not constitute a product endorsement)

Product & Description	Summary from Nairobi Trials	Summary of Bungoma Trials	Overall Rating & Comments (+ or -)
<p><b>“SunLinq” Brand</b> (Retail US\$170)</p> <p>12 Watt foldable charger, with (male) standard car charger, battery clips</p> <p>No battery (full sun only—unless the user supplies external 12 V and related paraphenalia)</p>	<p>Excellent results during Nairobi field trials in full sun</p> <p>Well-made product</p> <p>Needing full sun is a constraint—want a battery</p> <p>Perceived as expensive but likely market among many professionals, travelers (ie., there is a latent demand—but not proven. SolaPak have trouble selling the cheaper 5 W variant? What is the issue?)</p>	<p>Much interest in this system for personal, household and group use</p> <p>Perceived as simple to use with car-charger—not confusing, easy to use, nothing to go wrong</p> <p>Everyone (NGO, Rural User, C-B groups, Shopkeepers) valued the evident ruggedness, lightweight, portability. Major concern: lack of battery..can’t charge at night</p> <p>However: see that it can charge a regular 12V battery—they already use that for TV, radio, home use. Won’t have to lug the battery to the shop.</p>	<p>+++</p> <p>This product should be tested further at 12 W and 5 W for (high-market) personal, and household/group use.</p> <p>Features valued: portability, fast charger, rugged, outdoor use</p> <p>Seen as addition to an existing home 12 V battery system</p> <p>Concerns to overcome:</p> <ul style="list-style-type: none"> <li>• Pay extra for battery for storage</li> <li>• If use 12 V car battery .. No longer so portable...change use</li> <li>• high initial cost—can it come down?</li> <li>• Is it really rugged ... i.e., with donkeys, cows, goats?</li> </ul>
<p><b>“Voltaic” Brand</b></p> <p>4 Watt messenger bag (retail US\$180)</p> <p>Adaptor-tips (Nokia, Samsung, S-E, Moto Razr, Mini USB), car charger battery pack, built-in small LED light</p>	<p>Excellent results during Nairobi field trials. Worked well as everyday bag for one person (me) and as a go-everywhere phone charger. Users less likely to forget to put it in the sun for recharging. The battery pack is easy to use and the light works well as a back-up torch.</p> <p>Failed to charge Nokia after return from bungoma. Most likely the Voltaic-supplied tip was ruined --possibly I switched it to another charger and burnt it out.</p>	<p>NGO staff valued the bag for teams of fieldworkers, health workers, teachers, etc. Community health workers appreciate that you can take it with you, carry your papers (i.e., forms, records), i.e., while going to matatu, walking about village/town</p> <p>“J-“ began calculating the revenues from renting out cellphone charge time. She envisioned running a mobile/moble--phone-charging business. Valued: It won’t get stolen.</p> <p>What would you think is a reasonable price? “Ksh 15000”, Ksh “8000”, Ksh 12000”</p> <p>Concerns: The cables and adaptors are confusing to use. Labels help.</p> <p>The Moto C113a could only be charged via</p>	<p>+++</p> <p>Worth trying out on a longer term and larger scale with different ‘group’ end-users</p> <p>Can we get a cheaper modular system to fit onto existing bags, i.e., reduce the cost to the efficient panels and battery pack and charging interface?</p> <p>Concerns:</p> <p>Personal vs group use—it is made to fit so many devices and can charge 2 at once, but it is a ‘personal’ product (a bag).</p> <p>How well does it work in practise for charging handsets for &gt;1 person</p> <p>Proprietary battery pack—expensive and</p>

		the car charger (i.e., in full sun) and not on battery (the system lacks the appropriate tip)	difficult to replace.
<p><b>“Ecosolutions” Brand SunCell</b> (retail US\$80-90)</p> <p>1.5 Watt, multiple adaptor tips, built in battery</p>	<p>I charged first from the wall with the A/C charger: Will they do this in the village?</p> <p>Instructions needed to turn it on, start charging, change variable voltage</p>	<p>Not popular, too complex, too many buttons (i.e., 4-9 V variable voltage), too many adaptor tips.</p> <p>Did not fit the Moto c113 a. Did not fit many other phones (i.e., used phones in the village)</p> <p>Seen as a “personal charger”</p> <p>Appreciated the built-in battery—charging at night would be useful.</p>	<p>–</p> <p>This model would not sell widely. At a lower price with simpler interface would probably find a market among certain (higher-end, savvy) individual users.</p>
<p><b>“MySoldius” Brand</b></p> <p>1.5 Watt phone and Ipod charger (\$70)</p> <p>No battery</p> <p>Attractive, effective, lightweight</p> <p>Simple is good: “Charger – only” (no added features)</p>	<p>Nairobi experience: Easy to use (one cable, no on/off buttons) charged Ipod and Nokia rapidly (1-2 hour) in full sun, watching it all the time (against theft). Lack of battery or light a problem. Not enough tips.</p>	<p>In Kabuchai:</p> <p>Perceived at first as similar to the Ecosolutions brand—informants did not appreciate the distinction between systems with- and without battery</p> <p>Did not like the fact that it could not work at night.</p> <p>Valued: elegant aesthetics and portability.</p> <p>Concern: could break, could get stolen</p> <p>“What would be a reasonable price?” Very little interest</p>	<p>--</p> <p>Chosen to represent the type of personal charger with NO battery (i.e., simpler, cheaper)</p> <p>There is not much market among these users—esp as they learn more about solar—for a system with NO battery.</p>
<p><b>Micro-Solar</b></p> <p>“3-in-1 Power Supply” (Retail US\$29)</p> <p>Supplied with tips and car and A/C cables, Charges handse via rechargeable (NiCd or NiLi) AAA batteries (which can be used for something else). Small LED light. Also charged via car charger</p>	<p>Nairobi experience:</p> <p>Worked well as AAA battery charger—fast and effective. I used the batteries in other products.</p> <p>It is relatively easy to use. It seems fragile and cheap, with plastic casing and tiny switches.</p> <p>It is portable—could attach to bag, hang around neck, to catch</p>	<p>Comments in Kabuchai: “Too personal”</p> <p>Seen as way too small to be useful to a household—something for a single user.</p> <p>Seen as somewhat fragile, breakable, but not as much as the ‘fancier’ hinged devices.</p> <p>Recognized as useful in that it charges AAA batteries (for a radio or small torch), but these rechargeables are expensive in Bungoma.</p>	<p>-?</p> <p>This type of small, inexpensive, multi-purpose battery charger (i.e. phone and AAA batteries) might find a market in urban areas for individual users who use batteries (rather than as a phone charger).</p> <p>Prices of AAA rechargeables an additional constraint on this system.</p>

or AC.	the sun.		
<p><b>Generic Personal Mobile Phone Charger</b></p> <p>Retail: Ksh 2000 in Kisumu (solar shop) Small, Korean-made (?), built-in battery, several adaptor tips (incl. mini USB), car and AC charger</p>	<p>Bungoma tests by me:</p> <p>I found the size attractive—could hitch it to a mobile phone itself Seems fast and effective Probably burnt out my Voltaic Nokia tip (I used it since it fit--) Reverse diode?</p>	<p>Kabuchai and Kakichuma: “too personal” (based on its size) NGOs: did not attract much attention compared to Freeplay and Voltaic. Shopkeepers: would be willing to carry. Like the look and size of it.</p>	<p>+</p> <p>Popular among men as dedicated personal device Clever small size, efficient cell. Unnecessary additional feature (money-checker light)</p>
<p><b>“Freeplay” Companion</b> (Retail ~\$30)</p> <p>Solar and crank-charged AM/FM radio and decent flashlight Built-in batteries only for operating flashlight &amp; radio</p> <p>Hand-crank dynamo phone charger (Nokia only)</p> <p>Inconvenient crank -- Charger adaptor tip fits only older Nokia</p>	<p><u>Nairobi experience</u></p> <p>Difficult to crank, cumbersome and slow to get up a charge. The Freeplay Version only works for Nokia older handsets (larger tip). I found a Ksh 300 adaptor cable in Nakumatt Phone shop to fit the newer thin-pin Nokia). No place to store/keep/attach the phone charger cable, so it is easily misplaced</p> <p>The Eton Corp model of the same product (radio, torch, and charger) offers more adaptor tips. I am currently trying it out. It also does NOT work for the Motorola c113a.</p>	<p>NGOs: I want that ...for my mother, myself when the power goes out... Kabuchai test audience: I want that for myself, my kids! One respondent had her 6 children cranking it for a few minutes at a time to fully charge her Nokia. (Many had the Nokia 1200--the FreePlay worked fine.) Kimukungi test audience: “What a wonderful product! Good during the rainy season and at night and if you forget to put out the solar charger...” “What would you think is a reasonable price if you saw this for sale in Mayanja?” Ksh 1000 -- 2000 ... Retailers in Bungoma: “We used to have a crank charger...not good quality and we don’t carry it now” Asked of Nakumatt in Nairobi (official Freeplay dealer in East Africa): “Why don’t you stock the Companion?” (No answer yet...we’re in communication)</p>	<p>+++</p> <p>Very popular in Bungoma Valued <b>immediate</b> charge for a phone <b>anytime</b> –i.e., at night. Don’t have to plan ahead. The radio is a plus. The torch is valued-but probably less than the radio. The current US retail price is in the ballpark (but needs to come down for rural Kenya.)</p> <p>Concerns: Only works for Nokia (In communication with FreePlay: They “have no plan to come out with more tips” .)</p> <p>Will the device work day-in and day-out when used by everyone in the family for phones, radio and torch? Will it be lost, stolen? Where do you keep the cable when not attached? What happens when the handle gets broken off—what sort of jua kali repair is possible?</p>