

Sustainable Solutions to Disposal of Solar Batteries in Kakamega, Kenya



BOISE STATE UNIVERSITY

Alex Dey, Britt Gable, and Travis Spring
Department: Environmental Studies

I. Introduction

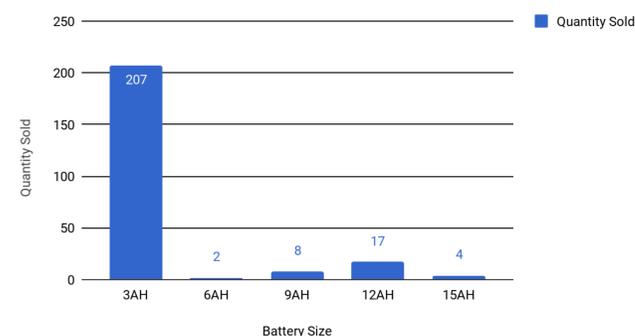
The county of Kakamega is located in Western Kenya with a population of 1.7 million people. The people in the area live in extreme poverty, with roughly one percent of the population having access to electricity. In recent years, Kenya has become a large developing market for solar power technology.

Solibrium is bringing inexpensive solar power to this area but is worried of the future improper disposal of the expired products from the solar equipment. Solar panels and batteries contain toxic chemicals and materials that can cause contamination of water and land.

Our objective is to find a responsible method to dispose of the hazardous materials found in solar panels and batteries once they have exceeded the lifespan of 5-7 years. The project's goal is to promote responsible disposal and recycling of solar panels and batteries, while also attempting to implement refurbishing and maintenance practices. This will ultimately help improve the longevity and efficiency of the solar project by Sollibrium.

In addition, funding efforts for recycling or disposing of the batteries are being explored. This will be accomplished by incentivizing local people to bring the expired battery to a central location for pick up and transportation to a recycling center. The incentives to bring the expired battery to a central location will include a 5% discount on a new battery or choice of cookware. We are also exploring the possibility of implementing an insurance program that would help fund the costly efforts of shipping used batteries to be recycled or refurbished. All of these potential improvements will help in the quest to bring electricity to Kakamega Kenya.

Quantity Sold vs. Battery Size



II. Methods

- Collaborate with Eco2librium and Solibrium about the types of solar kits and batteries in Kakamega, Kenya.
- Identify the problem with the solar kits battery life and begin to brainstorm solutions.
- Contact battery recycling centers near Kakamega, Kenya.
- Contact other similar companies to Solibrium (ie. Barefoot Power Uganda) and identify what they are doing for the safe disposal of batteries.
- Construct two possible sustainable plans to fund the recycling and transportation of expired batteries to the recycling center.



SOLIBRIUM SOLAR BATTERIES SOLD

Battery Size	Quantity Sold	Approximate Weight of the battery in kgs
3 AH	207	0.50
6AH	2	0.75
9AH	8	1.00
12AH	17	1.50
15AH	4	2.00
Total	238	

III. Results

Data: Solar kit Insurance

- Cost of recycling batteries: \$0.50USD per Kilogram
- Insurance cost per month: \$0.05USD
- Current kits sold: 238 kits in Kakamega, Kenya
- Money raised from insurance per kits per year: \$0.60USD
- Money raised from insurance for all current 238 kits sold for 5 years: \$714USD
- Solar kit battery life: 5-7 years
- Money raised per kit after 5 years: \$3.00USD
- Assuming all 238 kits needed recycling the same year that would cost \$149.25USD and high end of transportation per trip would cost \$167.00USD. Calculated by route and assuming gas is \$4.00USD per gallon and truck gets 12MPG.

IV. Conclusions

Option 1: Implement an insurance program. The insurance program will charge the consumer \$0.05USD per month. The insurance will cover faulty batteries that are not damaged intentionally or by water damage. The money collected for the insurance will cover the cost of recycling and transportation of the battery to WEEE recycling in Nairobi Kenya and cover the unforeseen cost of possibly replacing a faulty battery. WEEE Recycling charges \$0.50 USD per Kilogram of the batteries weight. The insurance cost will be calculated by the rate of \$0.05 USD per month per kit and this total will be covering the cost of transportation and recycling of the solar batteries.

Option 2: The second option is to implement an incentive program to attract the sustainable and responsible disposal of the batteries from the local customer base. If the customer brings the old battery to a central location for pick up and transportation to the WEEE Recycling center, they will be rewarded with a choice of a 5% discount on a new replacement battery or a choice of new cookware. The cost of a new battery with the discount is substantially cheaper than buying a whole new kit.

Overall, the objective of the incentive program is to influence decision making for the customers and allow them to continue to capitalize on their solar kits at a substantially lower continued cost. The insurance program in addition to this will help cover costs that Solibrium will incur to ensure that the old batteries get to the WEEE recycling center to be properly disposed of.