Mid-Term Progress Report

We have been working hard to make sure this project is ready to deliver to Tanzania in early December. Despite the difficulties we have run into we are confident that we will provide a working, reliable and safe prototype within the time frame specified. Following is a report discussing our progress, difficulties and obstacles that we must overcome.

We have made much progress with our microprocessor controlled battery management system. Currently we have a working prototype that can read voltages and currents and display this information onto a small LCD screen. Some work must be done on the data crunching and algorithms needed to provide a percent and time remaining readout to the LCD display, but we are confident that this will be accomplished. We must wait until our final architecture is decided to that we can perform the tests necessary to provide this data.

Soon we plan to begin designing the PCB board layout for our final prototype. We believe that the microprocessor and its associated circuitry will be located close to the LCD display and will communicate with our LEM current sensors via i^2c data busses. The sensors will be mounted near the fuse boxes and will each have a small microprocessor to convert our analog voltage readings into digital signals which can be sent to the main unit without any fear of signal attenuation.

Our architecture decision has been narrowed down to either using small laptops with a server or using a single computer in a multi-seat configuration. We have ordered and are waiting for a new server that can be used for both of these architectures. Once we receive and configure the server we can optimize it for low power usage and for reliability. We don't foresee any problems with this step. Also we can begin to investigate the multi-seat option better because we will have hardware that is recommended for multi-seat systems, where as before we could not say for sure that this approach would work given our unique needs.

Also we have found software that should fit our needs better than Userful our best option before. As mentioned before, Userful allows us to expand one computer into multiple stations for minimal hardware cost. A new option, MDM, multiseat display manager, has been
discovered. MDM is made by C3SL, the Center for Scientific Computing and Free Software. This program was initially released in late September. Based on the initial assessment, it seems that this program duplicates the core functionality of Userful for free. We anticipate a final decision on which software to use upon the arrival of the server. The initial option of modifying the Xorg configuration files has been rejected, as this is automatically taken care of by the MDM software.

If we decide that the multi-seat option is not appropriate for deployment in December we are confident that we can acquire and quickly set up laptops to communicate with our already configured server. Laptops have the unique ability to be simple to set up and have the lowest power usage except for the multi-seat approach. The downside is that laptops have small viewing screens and students who are visually impaired may find them harder to use efficiently. Also laptops are more exposed to the elements and may have a shorter lifespan than other methods.

We recently decided that we are going to build a system at Michigan State and concurrently have the same equipment ordered to the University of Dar es Salaam. Because of the need to buy new hardware we have re-thought our current battery, solar panel, and charge controller. The new charge controller chosen is the Outback Flexmax 60. This is a ‘Maximum Power Point Tracking’ (MPPT) controller which is more efficient than the current setup and allows for a wide variety of battery/solar panel configurations. The extra efficiency and flexibility in configuration makes this the charge controller of choice.

We have a lot of hard work ahead of us. However, we have made many final and important decisions that allow the rest of the process from here to go much smoother. We are excited about this project and are very happy that we are getting the opportunity to make a real difference in people’s lives. This is something that not many people can say about their senior projects.