

IPRO 335 One Laptop Per Child–Haiti

Problem

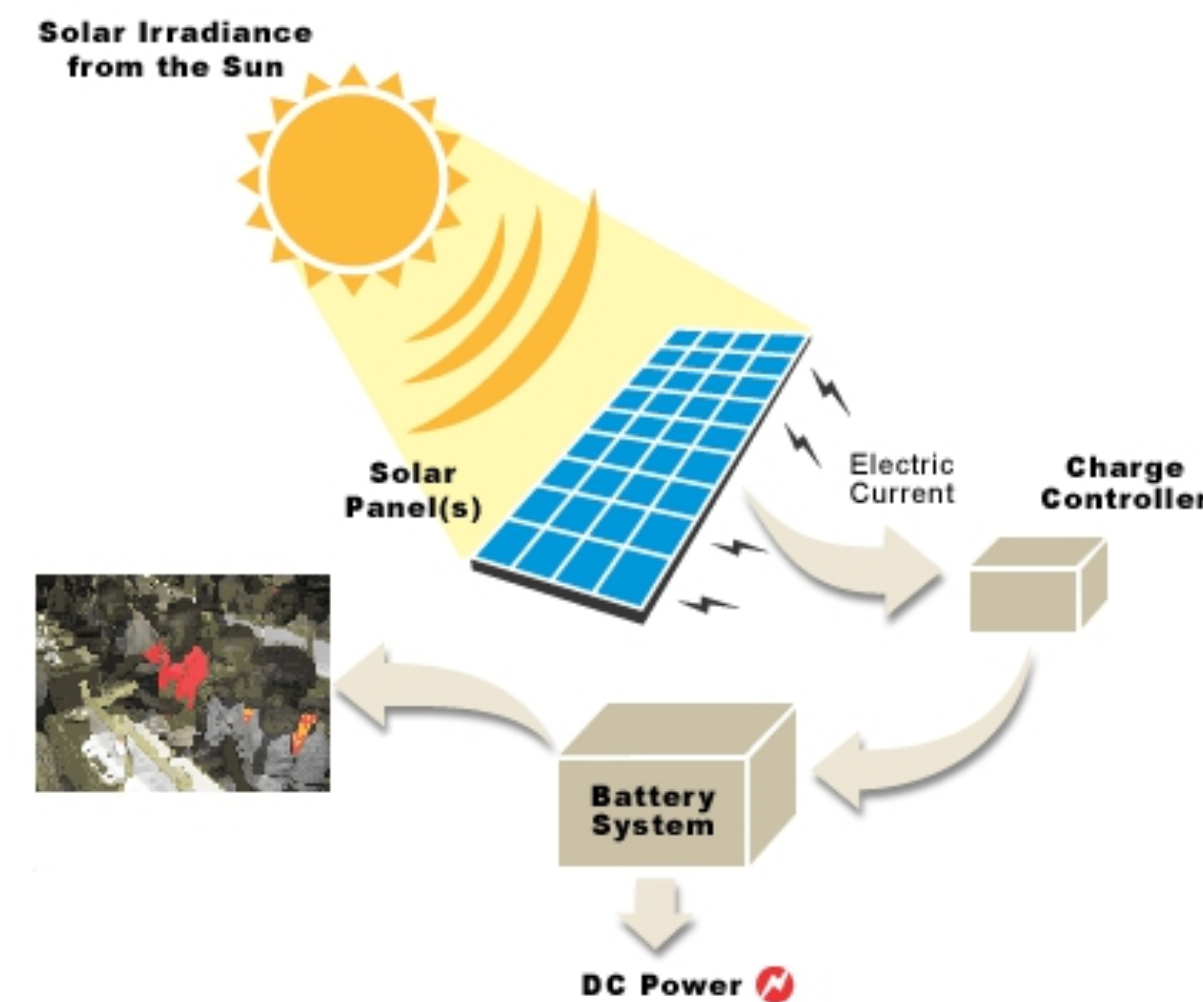
- The Haitian Board of Education has approximately 11,000 XO laptops from the One Laptop Per Child organization that it will distribute to primary schools across the country, but 95% of these schools lack sufficient electrical resources to power the laptops.

Objectives

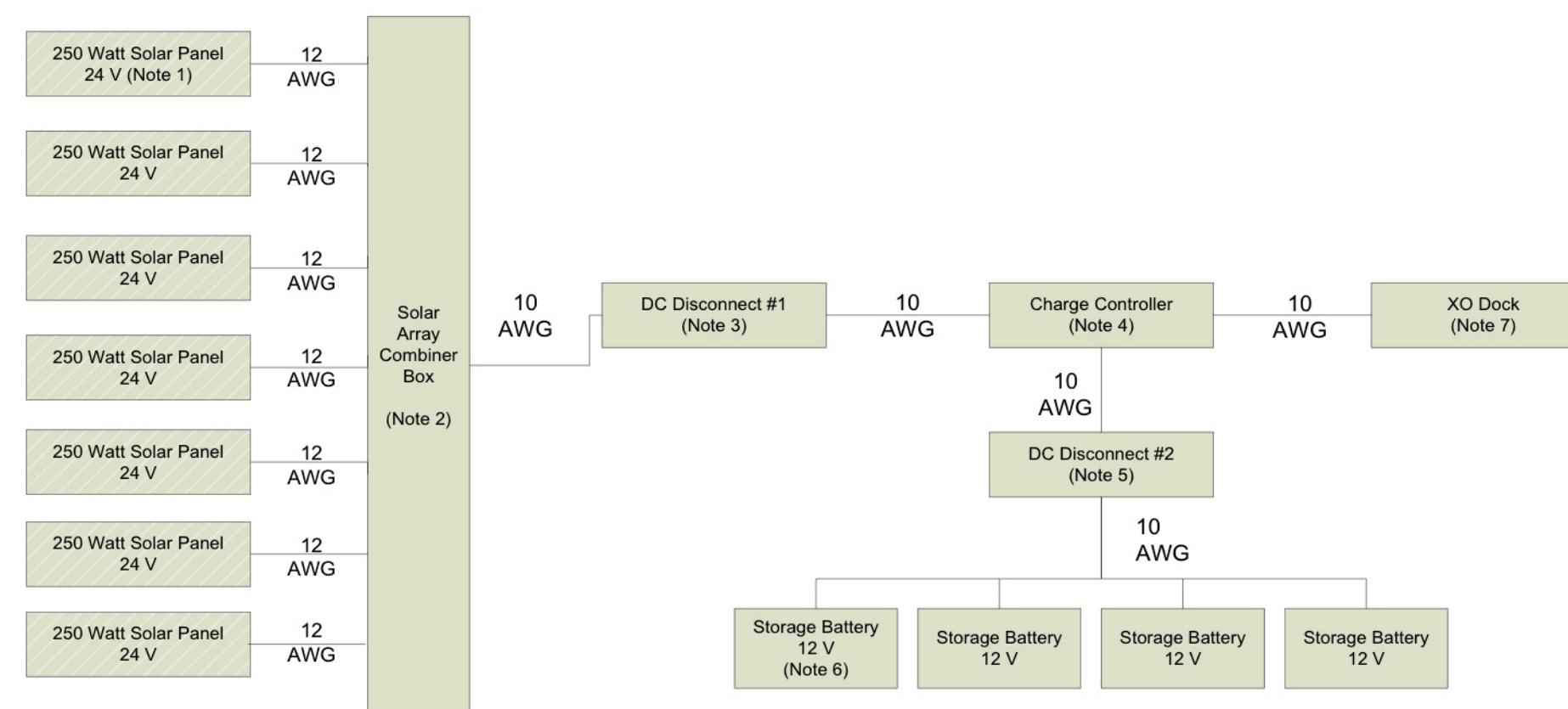
- Design an affordable, replicable, solar charging solution that can be built in country.
- Develop a method of regular communication between partners in the US and Haiti to foster collaboration.



Solution



Solar energy is gathered by the solar panel and the electric current is transferred into the charge controller where it is then transferred to the battery. The charge controller also distributes the battery power to the laptops. Our DC-only solution permits us to obtain maximum output from the panels, keeps costs down by avoiding the use of an inverter, and ensures that only the laptops will be charged through our solution. Solar is our preferred electrical energy solution as it is renewable, low maintenance, and the least expensive. It is also the source requested by the Haitian Ministry of Education.



Our Full-Scale Model Specifications (First Draft)

The system's specifications are as follows:

Reminder: 1 XO laptop needs **17 watts (1) (at 12 volts)** of electricity to charge for **1.5 hours** in order to fully charge a dead XO

THEREFORE

17 watts x 1.5 hours = **25.5 watt hours per OLPC XO**
For **350 XO laptops...**

350 XO's x 25.5 watt hrs = **8,925 watt hrs**

Assuming an average of **5.295 hours** of direct sunlight (2), the size of the solar panel would be...

8,925 watt hr / 5.295 hrs = 1,685 watts from solar panel = **round up to 1,750 watts**

The battery required to charge the 12 volt XO laptops would be...

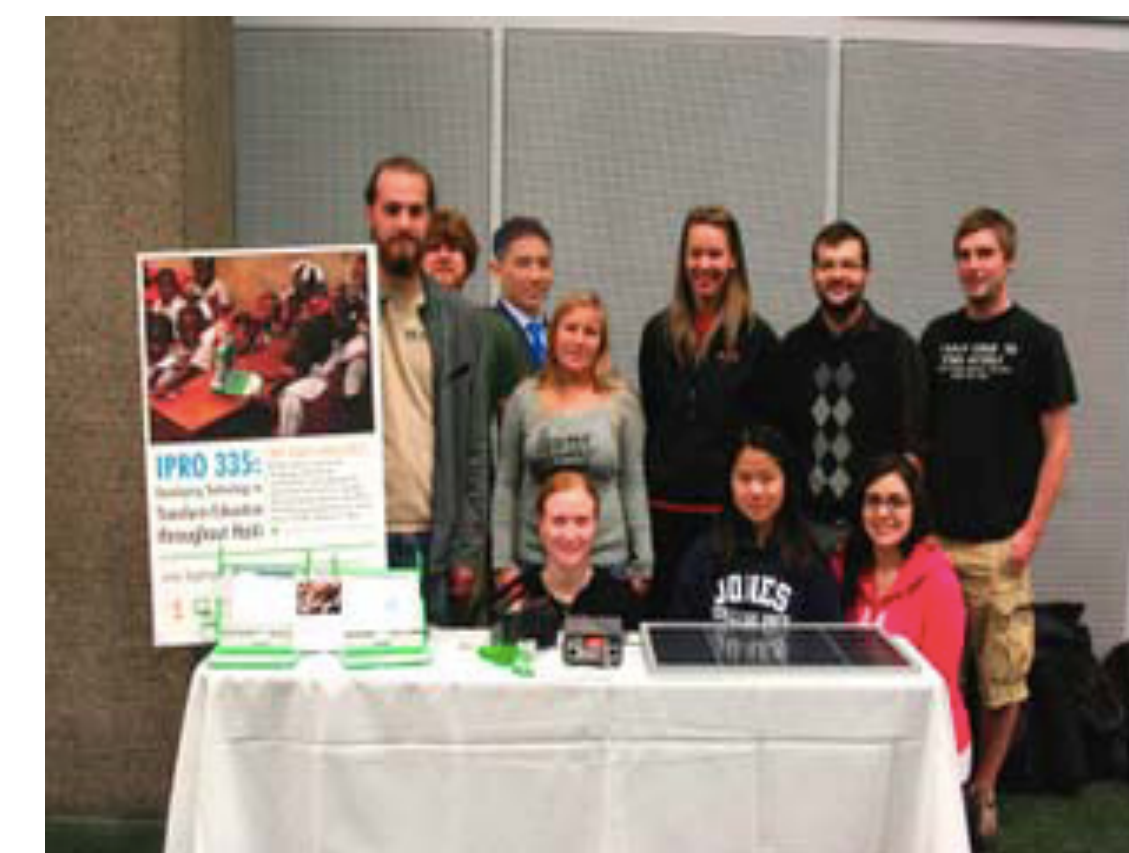
8,925 watt hr / 12 volts = 743 amp hr = 30% overhead factor = **966.875 amp hr**

References: 1. Test results of an in class experiment performed on September 16, 2010 at the Illinois Institute of Technology. 2. Data obtained from the NASA Langley Research Center Atmospheric Science Data Center, New et al. 2002. (<http://www.gaisma.com/en/location/mirebalais.html>)

The total estimated cost for our proposed solar solution for our pilot schools in Lascahobas, Haiti is as follows:

Description	Unit	Qty	Est. Cost	Extended
Sealed Gel Battery 12 volt, 225 amp/hr	Each	4	\$651	\$2,604
Solar Panel Module	Each	7	\$570	\$3,990
Charge Controller	Each	1	\$700	\$700
Electrical Wiring	Feet	100	\$2.50	\$250
Battery Interconnect Cable	Each	8	\$18	\$144
XO Charge Cables	Each	324	\$1	\$324
Solar Panel Mounting Materials	Misc.	6	\$75	\$450
Fuse and Safety Equipment	Misc.	1	\$25	\$25

Estimated Total Expense: \$7,917



Background

- The non-profit organization, One Laptop Per Child (OLPC), provides durable, low-cost laptop computers to schools in developing nations to enrich children's education by connecting them to the world at large.
- In 2009 Haiti received a donation of 11,000 XO laptops from OLPC.
- To date the use of the laptops is limited due to an inability by most school to charge them.

Going Forward

In future IPRO, we would like to perform the following tasks:

- Develop a curriculum for the XO laptops
- Develop a method of communication between XO communities
- Teach local students how to maintain and create other solutions
- Develop a method of sizing various solutions for other XO communities



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Acknowledgements:

- One Laptop Per Child
- Haitian Ministry of Education