

# POWER-IN-A-BOX™

Princeton Power-in-a-Box™ is a portable hybrid wind-solar power system developed by Princeton students to deliver renewable energy to recovering and off-the-grid communities

# 2012 Winner



PRINCETON UNIVERSITY, SCHOOL OF ENGINEERING

**Team:** Ryan Fauber, David Fisher, Brandon Frank, Ben Hummel, Aaron Katz, Patrick Kontinen, Mike Kosk, Jacqueline Li, Lynn Nehme, Kate Smith, Uyanga Tamir, Ethan Vasquez, Fred Vystavel, Christian Wawrzonek

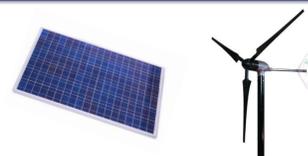
**Project Supervisors:** Elie Bou-Zeid, Hossein Hezaveh, Catherine Peters

## Background and Overview

- ❖ The project began following the devastating earthquake in Haiti in January of 2010. Princeton students and professors were determined to find sustainable technologies to provide readily deployable electric power generators in a disaster recovery scenario.
- ❖ In the spring of 2012, the students brought the Power-in-a-Box™ prototype to Washington, D.C. to compete in the EPA P3 National Sustainable Design EXPO, winning a grant of \$90,000 to continue the work.
- ❖ The project has moved forward with efforts for enhanced power production, as well as field testing of structural stability, power performance, and ease of use.
- ❖ P3 impact has been achieved through educational outreach at local schools and a spin-off project in Oshiyie, Ghana.

## What makes Power-in-a-Box™ different

1. Hybrid Nature: solar/wind energy system



2. 100% Renewable energy



4. Ease of Use: simple/easy to set up, take down, and maintain



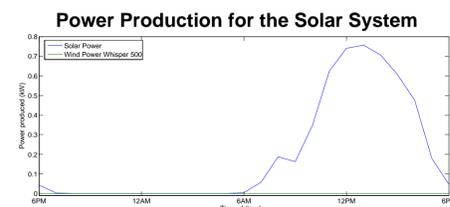
3. Portable



## Data/Findings: Power Production

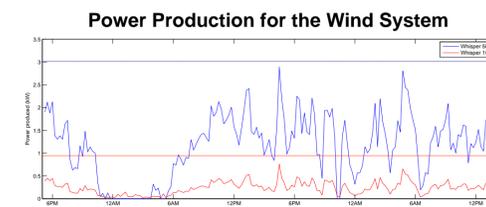
### Solar Power Production

- ❖ The 6-solar panel array can produce up to just over 1 kW.
- ❖ Average power production is around 0.6 kW



### Wind Power Production

- ❖ The Whisper 100 can produce up to 0.8 kW while the Whisper 500 can produce up to 3 kW.
- ❖ Average power production is 0.4 kW and 1.5 kW



### Total Power Production

Power-in-a-Box™ can produce up to 4 kW at peak capacity.

- ❖ Under variable weather conditions and times of day, Power-in-a-Box averages 1-2 kW.
- ❖ In terms of utility, 0.9 kW of energy can supply the amenities for a basic health clinic: a light bulb, computer, refrigerator, clock, radio telephone, TV, fan, satellite dish, and a phone charger.



## P3: People, Planet, Prosperity

### People

- ❖ Brings disadvantaged communities together around Power-in-a-Box™ and educates them about the advantages of renewable energy.



### Prosperity

- ❖ In the developing world, allows businesses to operate after dark, schools to have a reliable power source, and communities to see increased productivity.
- ❖ Opportunity for micro-enterprise (cell-phone services)

### Planet

- ❖ Environmentally sustainable by displacing the carbon footprint of diesel generator, including the enormous portion contributed by fuel transport.

## After the Expo

- ❖ Scale-up Power-in-a-Box™ with the more powerful Whisper 500 wind turbine and alternative mast design.
- ❖ Continue use as an educational tool at schools, museums, etc. around the U.S and internationally.
- ❖ Donate Power-in-a-Box™ to a school in Africa.

