



SOLAR STIK®

# Emergency Communications in Puerto Rico

Portable Solar Generators for Hurricane Relief



Figure 1 - Solar Stik System Powering Satellite Data Terminal on Puerto Rican Rooftop

## The Summary

In late September of 2017, Hurricane Maria, one of the largest hurricanes ever recorded, barreled through the Caribbean. Among the worst affected islands was Puerto Rico, which, after the initial storm impact, experienced complete infrastructure failure. This failure led to lack of essential resources such as food, water, and electricity. After the hurricane dissipated in early October, many organizations, ranging from private companies to government agencies and nonprofits, launched relief efforts to assist those in need. Focused Mission, an organization specializing in hurricane relief, was one of these organizations.

Upon seeing the projected impacts of Maria, Focused Mission anticipated the future need for functioning communications before Maria hit land. Recognizing the hurricane would likely destroy the power grid, Focused Mission reached out to Solar Stik, Inc., a company specializing in portable power, to organize a partnership.

Solar Stik had some scalable, portable power systems on hand that could be adapted for Focused Mission's requirements. These were made available by October 2, 2017. Focused Mission employed the Solar Stik systems to power communications systems with or without grid support while assisting in Puerto Rico, and the organization was able to arrive with the now autonomous communications devices on October 6, 2017. The communications systems were immediately deployed to various locations throughout the island and were used to provide wireless connectivity in Puerto Rico through the end of December 2017.



Figure 2 - Solar Stik System 2 in Cases

## The Challenge

Lack of available communications led to major gaps in hurricane relief efforts following Hurricane Maria. Because infrastructure failure eliminated many traditional communications systems and reliable power from various places in Puerto Rico, even functioning communications devices quickly became useless without charging ability. The combination of destroyed communications systems and lack of available power substantially slowed down or completely halted relief efforts such as search and rescue or other aid that traditionally relies on communications functionality.

Working with the Puerto Rican government, Focused Mission identified public communications restoration as crucial to hurricane recovery. Bringing public communications back up to speed required a solution that did not rely on grid power, and this solution was requested by the Puerto Rican government to assist in resuming hurricane recovery operations as soon as possible.

## The Solution

Focused Mission worked with Solar Stik to employ two autonomous power solutions for public communications in Puerto Rico. System 1 powered a radio recovery site that included a radio repeater and a satellite data terminal. System 2 powered satellite phones, radios, and laptops.

Figure 3 depicts the solutions the two companies selected to power the different communications support systems. Although neither power system was originally designed to work with communications equipment, the adaptability and open architecture inherent to the Solar Stik design allowed both solutions to effectively power Focused Mission's devices.

Both of the selected Solar Stik systems consisted of ruggedized components built and designed to MIL-STD-810G, and each system generated solar power, processed unregulated DC solar power, distributed AC and DC power to the communications devices systems, and stored excess energy. Both systems generated up to 2.160 kWh of solar energy per day, and System 1 provided 1.8 kWh of energy storage while System 2 provided 1 kWh.

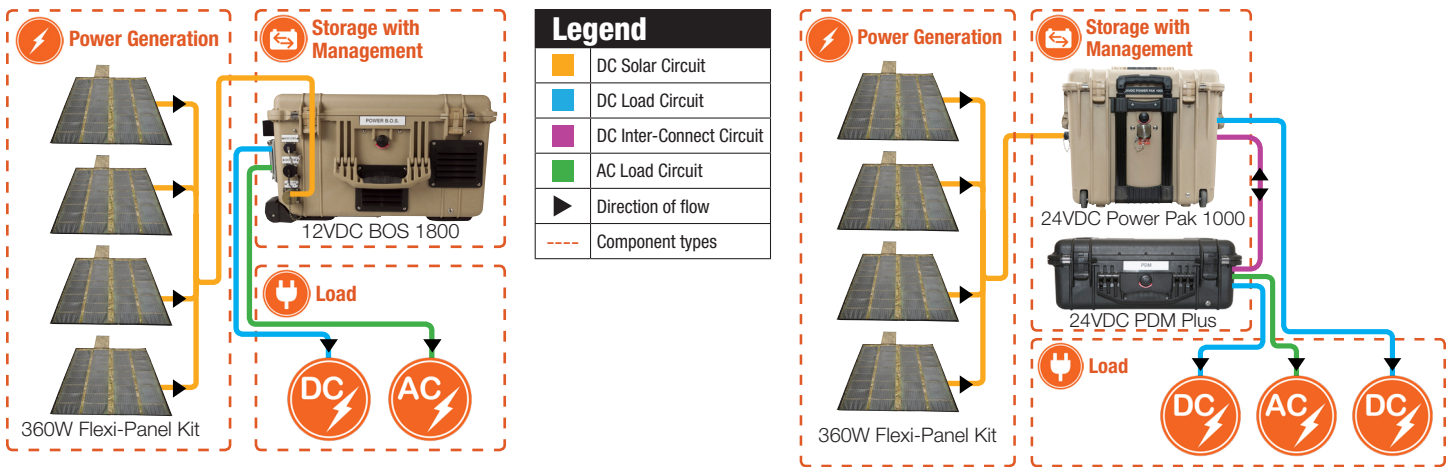


Figure 3 - Solar Stik Systems Solutions

### System 1

- **12VDC 360W Flexi-Panel Kit** – Generates up to 360 W of Power or 2.160 kWh of daily solar energy generation (assuming 6 hours of solar irradiance)
- **12VDC BOS 1800** – Processes unregulated DC power from the Flexi Panel to allow for 12 VDC and 5 VDC outputs, inverts DC power to 120 VAC power output, and contains 1.8 kWh of energy storage

### System 2

- **24VDC 360W Flexi-Panel Kit** – Generates up to 360 W of Power or 2.160 kWh of daily solar energy generation (assuming 6 hours of solar irradiance)
- **24VDC Power Pak 1000** – Processes unregulated DC power from the Flexi Panel and contains 1.0 kWh of energy storage
- **24VDC PDM Plus** – Provides 5 VDC, 12 VDC, 24 VDC outputs and contains a built-in, pure sine wave inverter to supply two 120 VAC outputs

## The Result

System 1, as employed by Focused Mission, powered the radio repeater and the satellite data terminal. This communications system had a continuous load of 200 W with a surge of 500 W. System 2 powered satellite phones, radios, and laptops. This communications system had a varying continuous load that oscillated under 200 W.

Figures 4 and 5 demonstrate how the solar power systems from Solar Stik enabled autonomous operation of the two communications systems.

With solar recharging, figures 4 and 5 show the 24VDC Flexi-Panel Kit 360s in both systems were able to generate enough power to keep the loads running 8-10 hours per day for an indefinite number of days. During ideal conditions, the battery state of charge (SOC) in System 1 never dropped below 71% and in System 2 never dropped below 60%, ensuring both systems had power. Even without solar recharging or days without sun, both systems would operate for over five hours purely off energy storage.

Focused Mission and Solar Stik's communications solution, although rapidly put together with components that were not tailored for the task at hand, demonstrated communications systems could be powered by a fully autonomous solar power system. Harnessing alternative energy alleviated the need for grid or generator connectivity, and power requirements were met purely using solar power generation and energy storage. These communications systems gave many people in Puerto Rico the ability to send and receive messages critical to restoring operations after Hurricane Maria.

Without the communications systems brought to Puerto Rico by Focused Mission and powered by Solar Stik, communications ability in Puerto Rico would have been further limited. Focused Mission received feedback from many people in Puerto Rico stating the autonomous communications systems were critical to their hurricane recovery efforts.

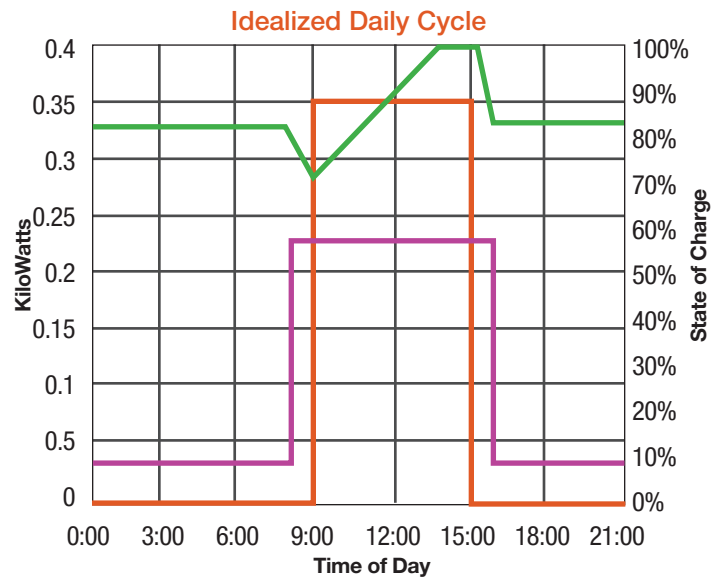


Figure 4 - System 1 Idealized Daily Cycle

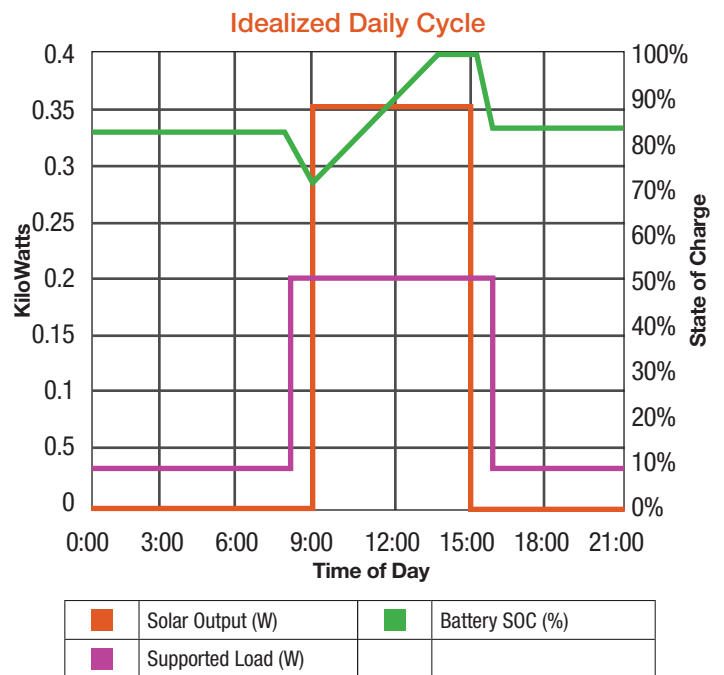


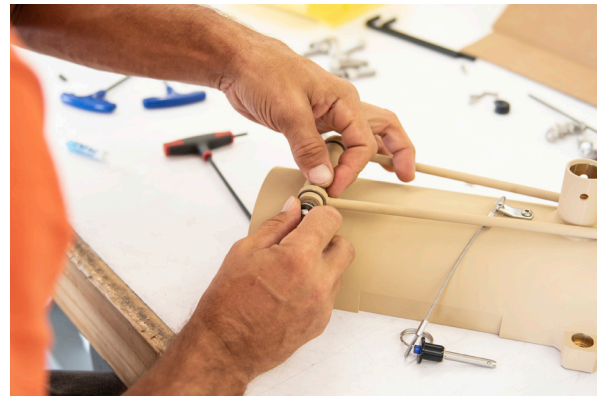
Figure 5 - System 2 Idealized Daily Cycle



Figure 6 - Solar Stik System Deployed



SOLAR STIK®



### Why Solar Stik

Solar Stik is the premier manufacturer of portable hybrid power systems for military applications in the 1 to 15 kW power spectrum. It pioneered the design and manufacturing of scalable, modular system architectures used to alleviate the logistical burdens of providing power in remote, off-grid locations.

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