SOLAR STIK®

Enhancing Airfield Operational Capability

Hybrid Power Support to the Tactical Automatic Landing System (TALS)

Figure 1 - TALS with 3kW HPS on One End of the Runway

The Summary

Increased use of Unmanned Aerial Vehicles (UAV) to wage the War on Terrorism and fight insurgents added traffic to an already busy runway at Bagram Air Field (BAF), Afghanistan. The use of UAVs requires redundant landing capabilities to fulfill safety requirements. The U.S. Army uses the Tactical Automatic Landing System (TALS) in support of the MQ-1C Gray Eagle UAV to satisfy these safety requirements. The TALS is tailored specifically for land-based UAV operations in small areas. BAF had two TALS deployed, one on each end of the active airfield.

The TALS is normally powered by a 3 kW Tactical Quiet Generator (TQG). The 3 kW TQG operating full-time to enable the safe landing of weaponized UAVs at BAF required refueling and maintenance that significantly disrupted airfield operations due to its proximity alongside active runways. Scheduled maintenance and repairs that led to the 3kW TQG being shut off also puts limitations on the use of a critical weapon system such as the UAV.

The Gray Eagle UAVs cannot fly without the TALS being fully operational for safety reasons. However, flight operations at BAF mandated that refueling and maintenance operations required of the 3 kW TQG be reduced to a minimum.

The Challenge

The leadership of BAF requested the assistance of the U.S. Army Rapid Equipping Force (REF) to reduce generator runtime (the root problem) and maintenance by incorporating a hybrid power system (HPS) similar to one already used by the REF.

The 3 kW TQG is the smallest variant in the U.S. Army inventory. The TQGs at BAF ran constantly, producing 3 kW of energy to power the 240 W TALS load to support UAV operations. The TQG had to be refueled twice daily since it was running continuously. Roughly 90% of the TQG power output and of the fuel consumed was wasted in this system configuration.

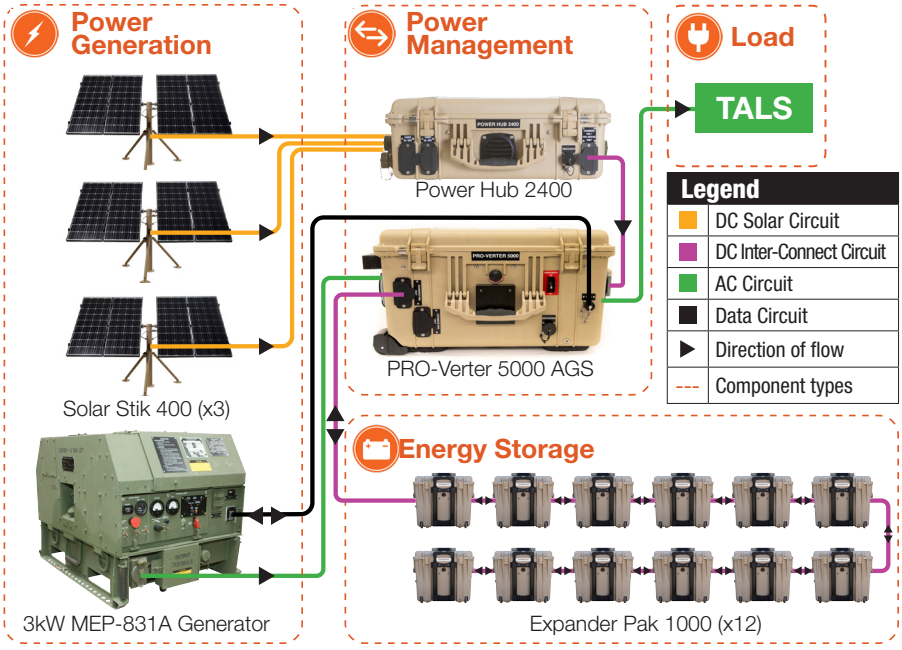
Figure 2 - TALS Installation at Bagram AFB

The TQG also required maintenance checks and services after 8 hours of constant use in accordance with the generator Technical Manual. The use of an auxiliary fuel tank to provide extended operation of the 3kW TQG without refueling was not feasible due to its location on the airfield. Grid and prime power also were not options available to the UAV operators.

The Solution

The REF's Operational Energy (OE) Advisors integrated a Solar Stik 3kW HPS into the TALS power system. The HPS is comprised of solar arrays, power management components, and energy storage (batteries) along with the 3 kW TQG. The highly efficient HPS configuration reduced generator runtime by powering the TALS from energy stored in the batteries rather than directly from the 3 kW TQG.

The autostart-modified generator runs only when the battery state of charge drops below a set level; all of the energy produced by the TQG is captured and stored in the batteries. Power from the solar arrays charges the batteries, further extending the support time for the TALS without the need to run the generator.



The Solar Stik 3kW HPS includes:

- **Solar Array**—generates up to 1200 W of power
- **Expander Paks**—provides 12 kWh of energy storage
- **PRO-Verter**—provides power management and distribution
- **Power Hub**—processes up to 300 A from all DC sources including solar, vehicles, wind, and fuel cells

The Results

Integrating the HPS into the TALS power system was successful in solving the root problem. Generator runtime was reduced significantly. On most days, the solar arrays provided all of the power required to support TALS (Figure 3 A). With the HPS integrated, the TQGs ran so infrequently that they required refueling only one time per month rather than two times per day (Figure 3 B). TQG maintenance intervals were also increased significantly due to the reduced runtime. Ninety percent of the energy required to support the operation was provided by solar power.

Powering TALS with the HPS rather than a stand-alone 3 kW TQG resulted in a reliable, hands-off power source that required very little effort for sustainment operations. The reduced logistical burden to support TALS translated into less disruption to airfield operations and improved continuity of operations for the UAV. There was also the added benefit of cost reduction from less fuel consumption and generator maintenance. It also resulted in the intangible benefit of a reallocation of manpower that allowed Warfighthers the opportunity to focus on other, more mission-critical activities.

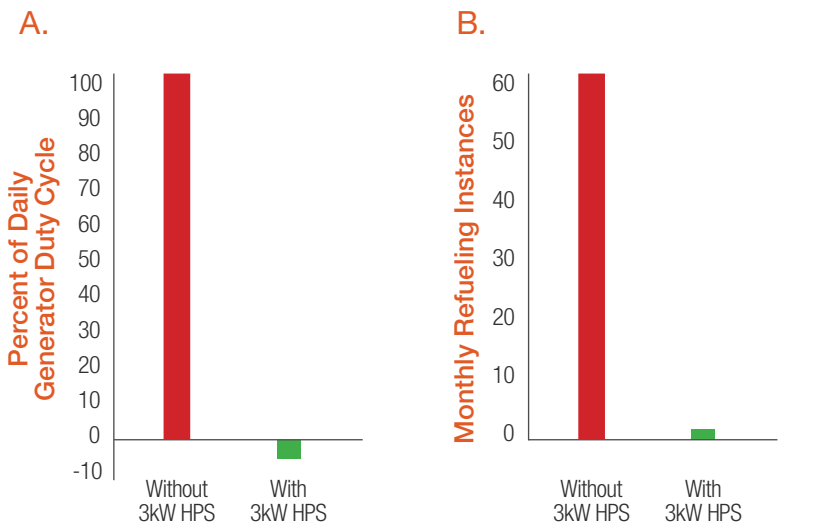


Figure 3 - Daily Generator Duty Cycle (A) and Monthly Refueling Instances (B) with and without the 3kW HPS

The Solar Stik 3kW HPS provides:

- Automated control of the TQG, start-stop, and load levels
- Reduced generator runtime
- Increased TQG PMCS intervals
- Improved continuity of operations for UAV and TALS
- Reduction in logistics burden for maintaining and operating TALS
- Small footprint (300-500 square feet)
- Field serviceability

Figure 4 - TALS with the 3kW HPS on the Other End of the Runway

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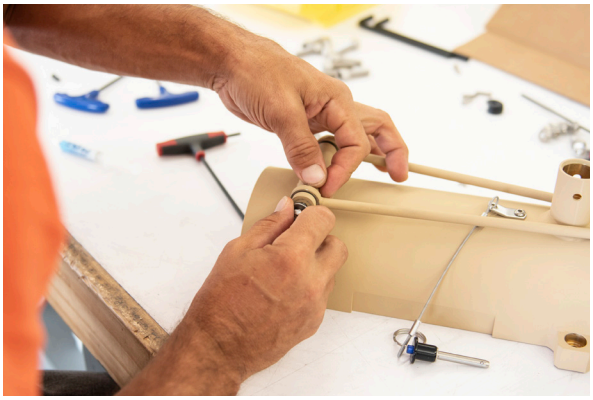

Why Solar Stik

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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