



Renewable Energy for Telecommunications



SkyBuilt's SkyStation®

SkyBuilt Power, Inc.
2425 Wilson Blvd., Suite #230 • Arlington, VA 22201 • Phone: (703) 276-7592
E-mail: szulkosky@skybuilt.com
www.skybuilt.com

Introduction

SkyBuilt Power (“SkyBuilt”) is the leader in shelter-based, trailer-based, and portable hybrid, renewable energy power systems designed to power telecommunications. SkyBuilt’s SkyStation®, a shelter-based system option, increases power reliability and power quality and lowers overall operating costs in a rugged, secure, and rapidly-deployable package. This system is similar to the rugged, field-proven power stations that SkyBuilt provides to the U.S. Military, Department of Homeland Security, and other customers.



Figure 1: An example of a SkyBuilt SkyStation powering a remote communication site. NOTE: This figure is shown for illustrative purposes only; actual installed equipment and system configuration may vary.

SkyBuilt Understands Telecom Providers’ Challenges

SkyBuilt works with top wireless and emergency communications providers and understands the technical and power issues. These include:

- **Energy Costs.** For on-grid sites, power bills and backup power generation costs, including maintenance and fail-over testing, continue to rise. For off-grid locations, fuel costs can escalate while diesel and propane generators require frequent maintenance, spare parts, continuous fuel supply, and high personnel and supply-chain costs.
- **Reliability.** Power failures caused by unreliable or incomplete power distribution can cause cellular, pager and emergency notification disruptions. This severely handicaps subscribers, public safety, and law enforcement communications. Remote locations with limited access require more reliability and less maintenance.
- **Coverage and Upgrades.** Ever increasing coverage area and data capacity upgrades are needed.
- **Underdeveloped Markets.** In many locations, grid power is sporadic or completely unavailable, generator fuel supply capability is not always reliable, and generators and fuel storage tanks are targets for theft or vandalism.
- **Regulatory Restrictions on Generators.** Government environmental agencies are increasingly restricting the use of fossil fuel generators as a primary source because of noise and air pollution.

SkyBuilt's Advantages

Through years of experience with systems in the field, from deserts to icy mountain tops with hurricane force winds, SkyBuilt provides its customers the optimal solution for each project.

- **Unique Experience and Understanding Telecom Needs.** SkyBuilt is the leader in hybrid renewable energy systems. We have installed systems to provide reliable and sustainable power to telecom systems in remote locations with uninterrupted service. SkyBuilt has close relationships with the top wireless providers in the United States as well as leading telecom shelter providers.
- **Proven Energy Savings.** SkyBuilt's customers have data-logged results of proven fuel cost savings of our units of up to 97% in the field over many months. SkyBuilt's products have been cited in the DoD's Defense Science Board report, "More Fight – Less Fuel" (Feb. 2008) for their rapid return on investment for the US military.

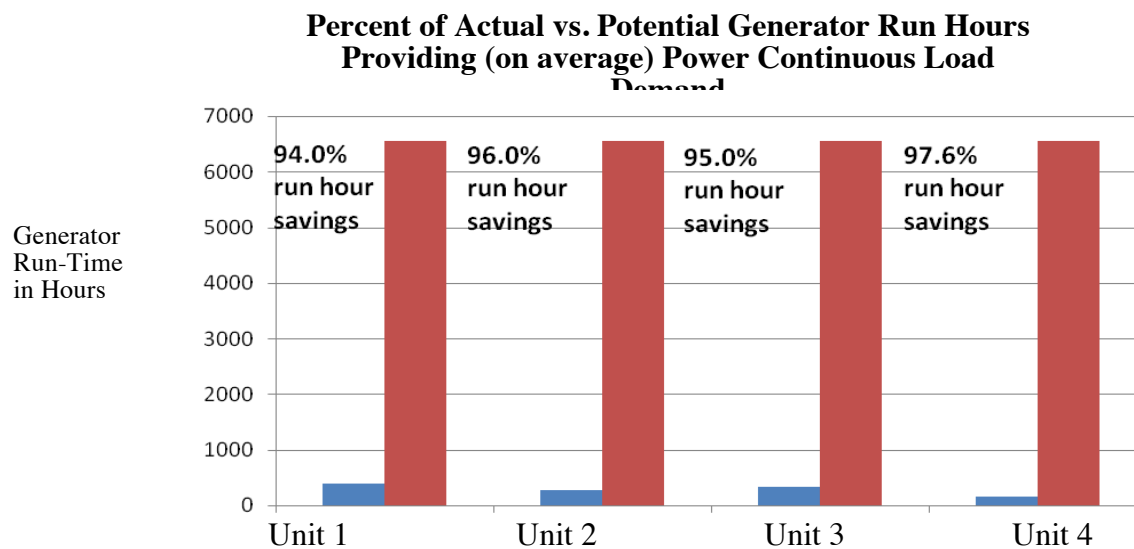


Figure 2: A table from a U.S. military report showing fuel savings of four SkyBuilt hybrid power systems versus a typical field generator.

- **Best Value for the Telecom Industry.** SkyBuilt has years of experience in determining best-of-breed components and has established relationships with product providers, leading to volume discounts that are passed along to customers. With its manufacturing partners, SkyBuilt has full assembly line capabilities, supply chains in place, operating manuals, and engineering and production drawings in order to rapidly accommodate quantity production and reduce overhead.
- **More Rugged and Sustainable.** SkyBuilt's systems work reliably under the harshest conditions in the field, withstanding extreme winds, humidity, and high altitude. Similar systems have been through Aberdeen Proving Grounds with over six months of testing, passed every one of the 300 tests, and have been certified by the military for safety and performance.
- **Low Maintenance.** Due to increased reliability, systems require less maintenance and fewer replacement parts. This translates to less work in the field and more focus on quality service.

Technical specifications provided below are flexible and may be adjusted in order to meet different application needs and requirements (e.g., more/less of particular options, budgetary constraints, etc.).

The SkyBuilt Solution: Product Description.

SkyBuilt's SkyStation is composed of extremely rugged, commercial-off-the-shelf (COTS) components. It is a simple, user-friendly, plug-and-play hybrid power system plus a shelter, designed to provide reliable power in harsh environments. The design provides a durable, climate-controlled shelter for the customer's equipment (optional), and also provides shelter for the electrical system components of the power plant (battery bank, charge controllers, etc.).

To provide the most cost effective solution, systems are designed to provide power with an extremely reliable hybrid renewable power system, utilizing input power provided by solar, wind turbines (if applicable), a battery bank, and a back-up generator to maximize the value and efficiency of each



Figure 3: The rigged abilities of the SkyBuilt SkyStation to power a communication site in extreme environmental conditions. NOTE: This figure is shown for illustrative purposes only; actual installed equipment and system configuration may vary.

The SkyStation includes the following major components:

The SkyStation includes: a pre-fabricated shelter, solar array and necessary mounting racks/hardware, wind turbines and necessary tower mounts/hardware, and a battery bank and fossil fuel generator to provide back-up power to the load. Specifically:

- **SkyBuilt Shelter.** SkyBuilt's pre-fabricated communications shelter is available in multiple sizes and constructions, such as concrete, lightweight metal, and ISO container-based. The shelter is extremely rugged and easily transportable.
 - **Climate Control.** The floor, ceiling, and walls of the shelter include high R-value insulation. The shelter includes a high-efficiency heating system and air conditioning and/or ventilation system, thermostatically controlled, to control the temperature and humidity inside the shelter and help protect the power plant system components from temperature fluctuations.
 - **Finished Interior.** The floor, walls, and ceiling of the shelter are finished with industrial-grade materials for durability. Also, all interior electrical wiring is in conduit and/or raceways for safety and increased performance. The interior also includes a high-efficiency lighting system to assist the user during operation.
 - **Safety Features.** The SkyStation meets all telecom standards and includes sophisticated safety features to protect the user and components. These features include, but are not limited to, alarm systems, hazard labeling of components, first aid kit, fire extinguisher, smoke detectors, and lightning protection.



Figure 4: An example interior of a SkyStation powering a communication site. NOTE: This figure is shown for illustrative purposes only; actual installed equipment and system configuration may vary.

- **SkyStation Power System.**
 - **Solar Array.** The system will include a solar array, conservatively sized to power the load during the expected worst-case weather conditions for the deployment location in question.
 - A portion of the solar array may be mounted on the roof of the shelter (see Figure 5 for an example), or may be mounted on a dedicated ground-mount solar racking system.
 - The array is supported by a highly efficient battery charge management system that maximizes the efficiency of the solar array.
 - **Wind Turbines.** The system may include wind turbines that may be mounted on separate towers away from the main structure. The wind turbines may also be mounted directly on the shelter or on the communications tower.
 - **Battery Back-up.** The SkyStation includes a battery bank sized to provide back-up power to the load. These batteries are sealed, maintenance-free, and are designed for deep-cycle, back-up power applications.
 - **Power Management Controllers.** A fully integrated system of charge controllers, inverters, and other power management components are included to provide quality power to the user in any voltage, amperage, or frequency.
 - **Generator.** An automatic start/stop propane generator can be included to provide back-up power to the load.

Figure 5 below illustrates one SkyStation configuration used to power a communication site on a remote mountaintop.

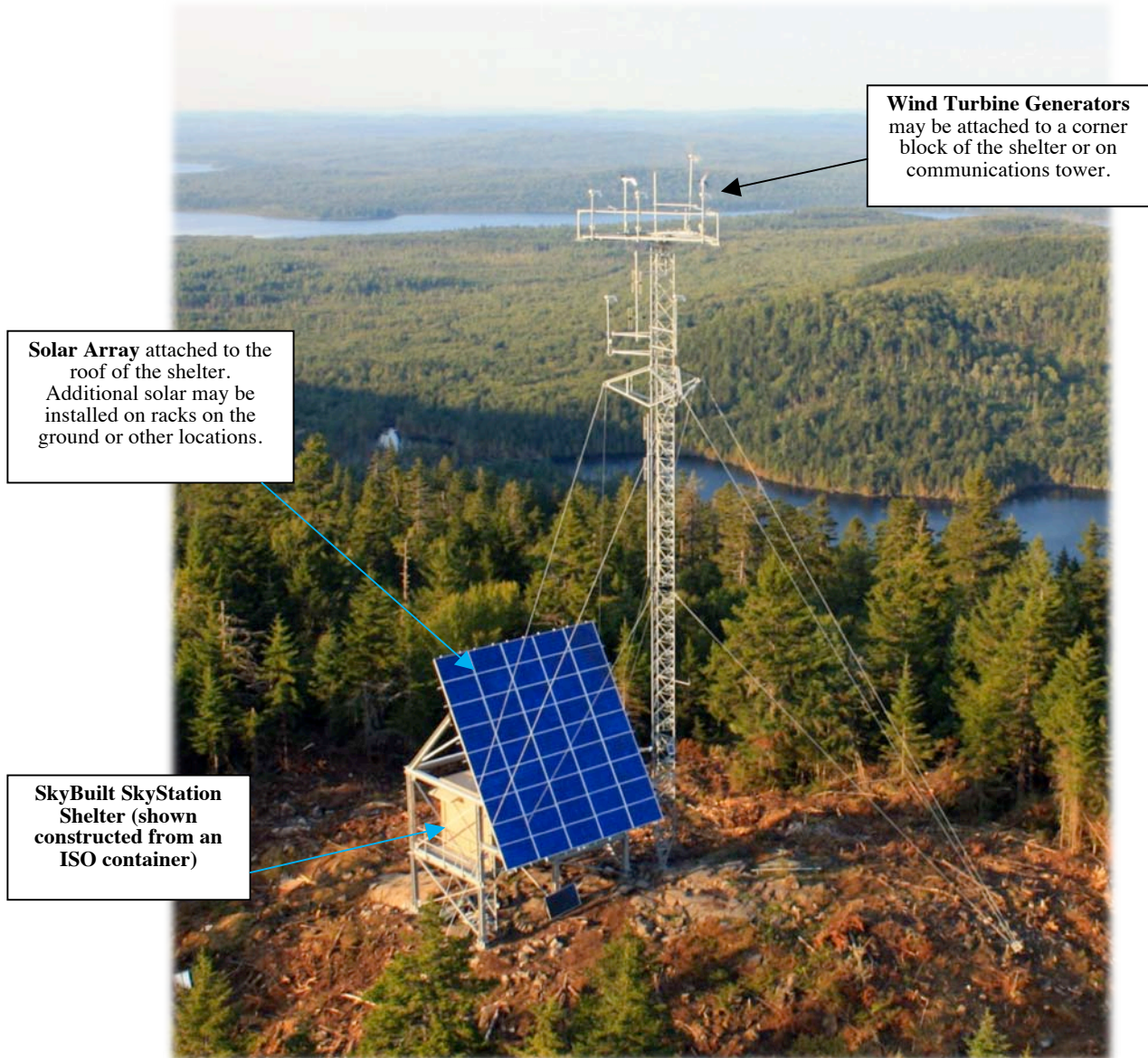


Figure 5: An example of a SkyBuilt SkyStation configuration, shown powering a communication site. NOTE: This figure is shown for illustrative purposes only; actual installed equipment and system configuration may vary.

SkyBuilt Systems Save Money

SkyBuilt systems will save money over a given period when compared to known system configurations at telecom sites. With information gathered from previous experience, SkyBuilt has run multiple simulations using varying system configurations for expected costs of powering a telecom site over thirty years.

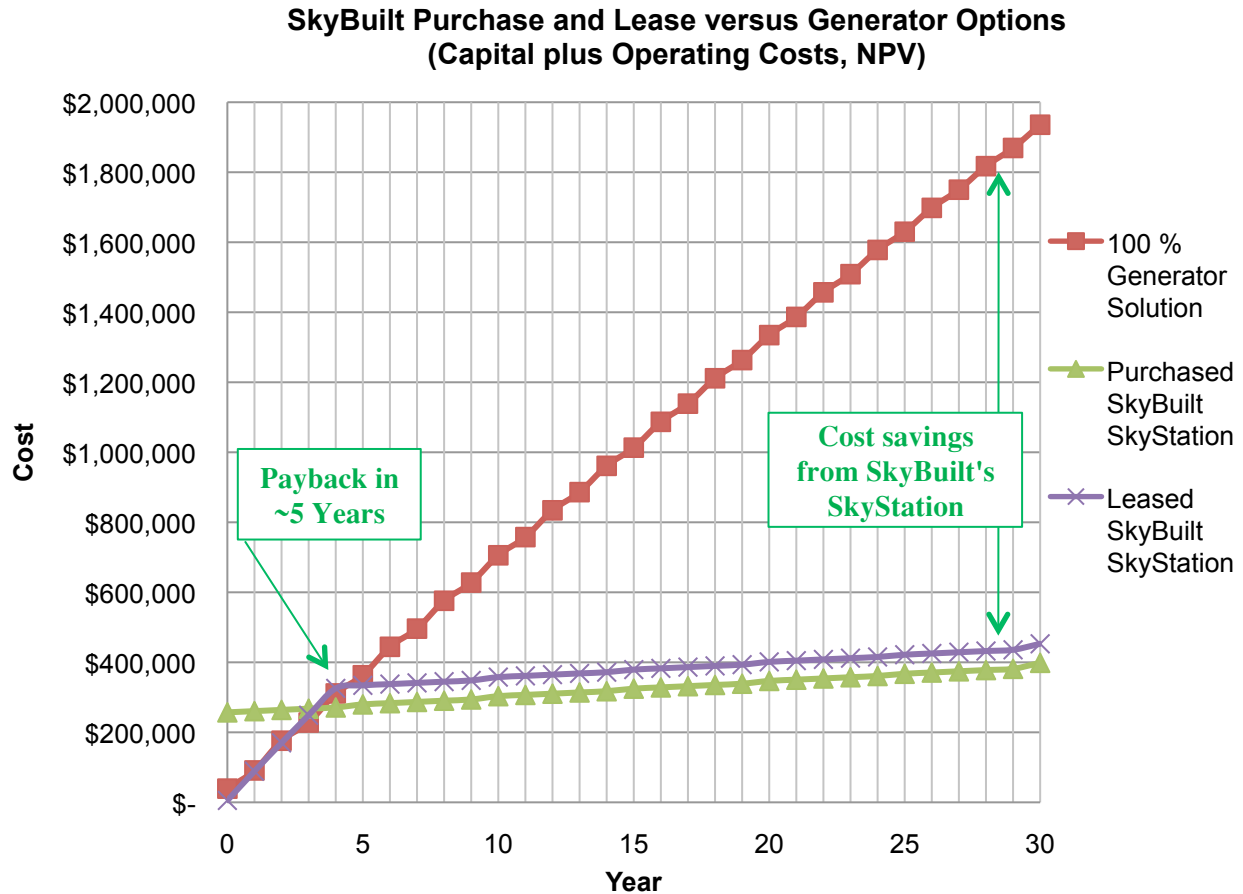


Figure 6: Expected total net present cost of SkyBuilt and generator based power systems for telecom site, 30 years. Please note that this example is provided for illustrative purposes only; cost savings may vary depending on SkyBuilt system size/power output, deployment location, baseline case used for comparison, as well as other factors.

As seen in Figure 6, an outright purchase of the SkyStation breaks even against the yearly operating costs around the fifth year of ownership and will net a savings of approximately \$1.5 million over thirty years of use.

This comparison incorporates a life cycle analysis of both the generator and SkyBuilt options. This includes initial capital costs as well as the cost of energy produced, maintenance and service trips to the site, replacement parts, refueling, and replacement costs of the respective systems.

Other Optional System Features

The SkyStation may include additional, optional features that will increase the performance and flexibility of the system. We can provide further details on them if you wish. Some of these optional features include:

Data Logging System and Weather Station. The SkyStation may include a high performance data logging and monitoring system to provide the customer the capability of monitoring the health and performance of the system. SkyBuilt regularly works with data logging companies to incorporate comprehensive systems that monitor key system components such as power, voltage, fuel levels, temperature, wind speed, solar insolation, etc. A complete solution may include:

- A data logging base system to store and process incoming information,
- Energy meters to monitor energy generation, net energy, and the system load,
- Performance sensors for each critical system component,
- Environmental sensors to supply actual weather data that will provide comparison information, and
- Monitors that can aid to increase power efficiency.

Maintenance and Services Package. A Maintenance and Services Package is available and recommended to maintain the system during operation and protect the longevity of the system. When combined with the data logging system, a Maintenance and Services Package is particularly attractive; when using the data logger to monitor system performance, SkyBuilt personnel (or others) would be immediately notified of a system issue on-site and could deploy the appropriate team to the installation location as needed. Similarly, SkyBuilt personnel could forecast the need for preventative maintenance using the data logging system, and plan on-site visits accordingly.

Expandability and Flexibility. The system can be easily expanded with SkyBuilt's patented, plug-and-play system to meet any future power needs in the field – additional solar, wind turbines and battery storage can be added to the system as needed.

Alternative Energy Components. The system may also incorporate alternative energy components such as fuel cells, micro-hydro systems, etc., as appropriate for the application and deployment location.

Grid/Micro-grid Connectivity. The systems can include the appropriate hardware to interface with the existing utility grid and/or other micro-grid systems available on site.

Remote Monitoring and System Access. The status of many system components may be monitored and controlled from a remote location by the customer or, if desired, by SkyBuilt.

Installation. System installation support is available if desired.

SkyBuilt Power[®]
RENEWABLE ENERGY SOLUTIONS