

SUSTAINABLE
ENERGY SERVICES
AFGHANISTAN

خدمات انرژی افغانستان



Sustainable Energy Services Afghanistan (SESA) is Afghanistan's largest renewable energy company with a track record of successful projects.



WHO WE ARE

SESA is an Afghan-registered company that embodies our long-term commitment to Afghanistan and our understanding that service and support must extend throughout the lifetime of the project. This means decades, not months.

With 23 full-time staff of international and Afghan professionals, SESA offers a range of services that have not been present in Afghanistan before. In particular, SESA is focused on reducing the dependence of Afghanistan on diesel generators for base load power and on increasing the use of electricity for productive use in rural areas.

SESA is proud to have on its staff professionally trained Afghan men and women who provide state-of-the-art renewable energy solutions.

Built by Afghans, for Afghans.



WHAT WE DO

SESA's core business is the design and implementation of turnkey renewable energy systems. We offer off-grid wind, hydro-electric, solar electric, geothermal, and biogas energy systems for businesses, communities and government-owned facilities.

Our approach to rural electrification is to engage communities in forming isolated grids managed by local utilities within the communities. Typically, these grids are powered by renewable energy systems, using diesel only as a backup power source. This translates to low operational costs that the communities are able to support from their own resources.

SESA focuses on creating energy systems that will meet the current and future energy needs of rural communities, while helping individuals, businesses and governments to create secure and cost-effective energy solutions.

- Create distributed or grid-connected energy systems for communities, homes and businesses.
- Design, cost and build renewable energy-based systems to reduce or replace diesel reliance.
- Audit energy usage to reduce waste and improve efficiency.
- Train community staff in both the maintenance and operation of the installed system.



SESA provides renewable energy systems that adhere to international standards; services that extend beyond construction and installation; and technologies that respond to the needs of rural communities.

CONTAINERIZED RENEWABLE ENERGY SYSTEM

SESA's Containerized Renewable Energy System (CRES) is a portable, customizable powerhouse that uses solar, wind or micro-hydro systems, and diesel back-up or city power to provide electricity to remote villages.

SESA uses a 20-foot shipping container—which brings into Afghanistan all the materials needed to build a complete power system—as the powerhouse. After unpacking, it is first insulated and improved to create a secure, compact and weather-proof environment for the equipment to run the system and distribute electricity.

The container can be outfitted in days as opposed to weeks as it is constructed in SESA's compound in Kabul, allowing multiple containers to be outfitted at once at a much greater speed. This also allows our engineers to work in a safe environment and have immediate access to tools, components and basic construction materials.

PREPAID METERING—A FIRST FOR AFGHANISTAN

One of the many firsts SESA introduced in Afghanistan is the prepaid electricity metering system. Prepaid meters allow individual households full control of their expenditure and avoid monthly bills that can be too large to handle. More importantly, the system gives the community management group the ability to control the project finances. Without this, the project is unable to succeed no matter how good the engineering.

Prepaid cards are topped up at stalls within the community and revenues are transparent and tracked. Cash earnings from the sale of the prepaid cards are banked into an account managed by the community-based organization (CBO) set up by SESA to run the electrification project in the community.

REMOTE COMMUNICATIONS AND SUPPORT

SESA can build a GSM data link into every CRES. Our technicians in Kabul can then dial up the unit and adjust or troubleshoot it.

Additional support is provided to system operators over telephone where SESA technicians can guide operators through a step-by-step process.

CAPACITY BUILDING

SESA believes that a community must be able to run and monitor their power systems in order to ensure the success of the project. SESA trains and provides support to community-based operators and teaches the community to build and maintain the transmission systems themselves.

The CBO is responsible for managing and operating the power system after it is completed. The CBO is typically formed within the community, and often draws from the existing power or management structure, but is set up with its own bank account and its own rules on how the funds and equipment are to be managed.





COLD STORAGE

capable of producing immediate and sustainable economic benefits.

Cold storage units give farmers the flexibility to sell their produce immediately or at a later time when market prices are more favorable to them. The return-on-investment is high and other benefits include improved food quality and security.

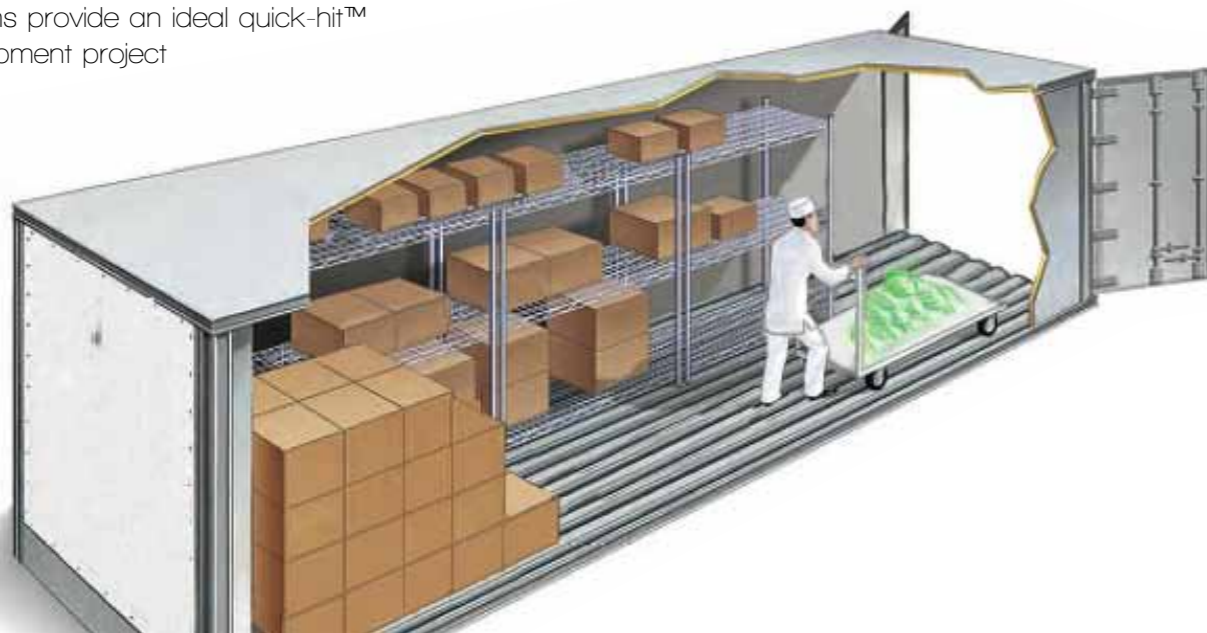
Each cold storage unit uses a regulation 20-ft or 40-ft insulated reefer container, with the standard diesel or electric chiller unit removed. SESA replaces this with a high chiller and compressor unit designed specifically for solar power applications. The compressor operates all day, starting at sunrise, and stopping only when the sun goes down or when the thermostat reaches its required temperature. At night, the unit does not function and uses the insulation and the large body of chilled material in the container to stay cold. The components and parts of the cold storage units are all of US, German or Japanese manufacture and carry a two-year warranty.

The economic structure of the project is designed to be community-owned, operated by an agricultural cooperative within the community. Profits made from these units go towards the maintenance and future expansion of storage capacity. This model can also become a viable income source for private individuals and entrepreneurs.

SESA is not just an energy services company. We believe in the totality of a development initiative in which we provide off-grid energy systems as well as facilities that will enhance the economic potential of the communities we serve.

Much of the developing world's agricultural sector is locked into a cycle of low prices and oversupplied markets due to the lack of cold storage facilities close to points of production. Many farmers produce the same crops in the same locations and compete for markets after harvest. The oversupply drives prices down and unsold produce rapidly spoils. For many farmers, the only option is to sell their produce at rock bottom prices or to middlemen who have the capability to cool-store the produce and then sell it back to the farmers at much higher prices. This negatively impacts on local trade and annual incomes.

In line with our long-term commitment to community-based rural electrification, SESA created off-grid cold storage units to build on and support the existing economic activities in the communities. Using insulated shipping containers equipped with solar PV panels and high-efficiency compressors, the units are easily assembled off-site—in a safe environment, close to materials and equipment—and transported to the communities, ready for use. The systems provide an ideal quick-hit™ development project



PREPAID POWER METERS

The electricity sector is a critical plank in the development aspirations of Afghanistan. Agriculture, industry, and multiple civil society functions are severely constrained in the absence of a reliable and affordable electricity network. To date, much of the power produced in the country is generated by diesel generators.

Whichever way power is generated, cost recovery is crucial for its sustained and reliable supply.

There have been numerous small community power systems built in rural Afghanistan, but they were built without metering systems in place. Meanwhile, in urban areas, the collection of domestic power charges is inconsistent and often only a fraction of the actual consumption.

In both urban and rural situations, adopting the model used by the telecommunications industry and widely accepted by the Afghan population has considerable merit. By applying this mechanism to the power sector in Afghanistan, through the use of off-the-shelf prepaid power meters that use a rechargeable debit card, both power generators and consumers can regain control of budgets, costs, and availment of services.

SESA introduced prepaid electricity metering into Afghanistan and has the first successful installations now operating. The meters have proven to be superior from both technical and social management perspectives.

- The technology can be retrofitted to existing installations.
- Communities and households are receptive to the use of prepaid metering, once an education and awareness program is undertaken.
- The commercial process of using rechargeable debit cards to 'top up' credit on meters is viable and realistic.
- The proper chain of accountability and audit is possible and workable.



SESA installs two types of prepaid meters. One that uses standard Smart Cards that are topped up from a credit access point and then transfer power credits onto the meter. When the credit balance is used up, the meter automatically disconnects the service. The second type is an SMS-based meter that can transfer credit onto the meter through a cellphone with the use of a 'numerical token' from the power company. The consumer pays the power company the credit he wants on his meter and the numerical token is sent to the consumer's cellphone and entered into the meter via a keypad.





SOLAR STREETLIGHTS

LED technology has improved dramatically in the last five years. SESA utilizes the latest and up-to-date white LED technology that has exceptionally low demand for power. This reduces the size and capacity of all the other system components while, at the same time, extending system life and reducing service and maintenance costs. The LED has a design life of 40,000 hours, or over nine years of operation at 12 hours a night.

The light fitting is a professionally designed and manufactured LED light head, designed with easy replacement of the LED tube light fittings if required. It can also be adjusted to provide different lumen outputs and timer settings. These options are customizable depending on the communities' requirements.

SESA offers different battery technologies. One is the maintenance-free and temperature-stable absorbed glass matt (AGM) lead acid design. The other, a lithium ion battery, which has a very long life and enduring design.

SESA can retrofit or design the appropriate solar panels for a specific community to provide the required power load. Our modules produce more power than needed even at the lowest insolation level and ensures a very high level of operational reliability even in winter, still providing adequate levels of insolation to recharge the battery during daylight hours.

Streetlighting is a simple and effective way to bring modernity to communities that have never enjoyed electrification before. The impact of even small amounts of light in dark rural towns is real and immediate, and begins to draw important linkages between the local population and the Afghan Government that provides them.

SESA uses state-of-the-art solar streetlight units with high-intensity light-emitting diodes (LEDs) and durable batteries in its streetlighting projects. We customize unit designs and battery capacities to respond to our clients' needs, allowing for flexibility, durability and affordability.

All the critical lighting and control components of each solar streetlight unit are contained inside the light head itself because of ultra compact and efficient design. The light head is fully sealed against dust, insects and moisture. It is made from cast aluminium and has only a single well-glanded access point for the power cable from the solar PV panel to enter. The light shield is a highly impact- and UV-resistant clear polycarbonate sheet.



SOLAR WATER PUMPS

Using the sun to pump water is one of the simplest and most direct ways to use renewable energy to improve incomes. By building on existing activities, solar water pumps are easily integrated into current irrigation and cropping activities, or used to make previously unusable lands productive. Pump systems can be used in applications ranging from domestic water provision, irrigation, stock watering or industrial uses.

Solar water pumps are very low-maintenance and need little user input. When the sun comes up, the pump starts automatically, and when the sun sets, the pump stops. Water can be drawn from depths of over 200 meters with pump power outputs between 0.5 kW and 10 kW available to provide a wide range of water pressure and volumes. Pumps are typically submersible and made with abrasion- and corrosion-resistant stainless steel.

SESA also provides training, service and support for solar pump installation and maintenance.



SOLAR WATER HEATERS

One of the most cost-effective applications of solar energy in any country is the direct conversion of the sun's energy into hot water.

SESA offers two solar hot water systems. For domestic use, where reliable power supply is not available, we recommend using the uncomplicated vacuum tube technology that operates without any electrical connection. Working on a thermosiphon principle, these solar hot water units are typically available in tank sizes of 100, 200 or 300 liters, which can also be linked to form larger systems if required.

Institutions such as schools, hostels, hotels or government facilities that require larger quantities of hot water and will have available power (city grid or solar power) may be better suited to use a pumped circulation system that operates multiple hot water panels linked together to provide thousands of liters per day.

In summer, water temperatures can be expected to reach 80 to 90 degrees celsius. In winter, temperatures will be lower but still significantly reduce the total electrical demand by using any available solar energy to raise the water temperature.

SESA also offers a diesel- or gas-fired boiler that automatically turns on to raise the temperature of the hot water outlet if it drops below a preset level. This ensures that consumer comfort and expectations are always met.



The Panjshir Valley Wind Power Project



Location:	Panjshir Valley, Panjshir Province
Project	<ul style="list-style-type: none">• 10 x 10kW wind turbines
Components:	<ul style="list-style-type: none">• 3000 AH batteries• 65kW diesel generators
Beneficiaries:	Local Government offices
Implementing	<ul style="list-style-type: none">• Panjshir Provincial Reconstruction Team
Partners:	<ul style="list-style-type: none">• United States Agency for International Development
Funding Source:	United States Agency for International Development

The Panjshir Valley is a remote valley in north-central Afghanistan. There was no grid-connected electricity and the Government of Panjshir relied heavily on diesel power, which became cost prohibitive in the long run.

It was determined in 2004 by New Zealand-based Empower Consultants that the Valley has workable wind resources. Based on this, the local government, in cooperation with the Provincial Reconstruction Team, conducted a competitive tender for the construction of a wind farm, with the intention of powering local government offices.

The project needed a blend of off-grid wind turbine technology, installed by hand without heavy lifting equipment. The American-made Bergey wind equipment provides power to a set of German SMA inverters that supplies 400 VAC power to the end users, and stores surplus energy in a set of lead acid batteries for rare periods of low or no wind. When no wind is available, or when demand exceeds the capacity of the turbines, a backup diesel generator is automatically started.

The project has functioned successfully in the harsh mountains of Afghanistan since 2008 with no technical problems and only periodic scheduled maintenance by SESA.



Location:	Sayed Karam, Paktiya Province
Project	<ul style="list-style-type: none">• 100kW solar PVs
Components:	<ul style="list-style-type: none">• 250kVA diesel generator backup• 14-km transmission line
Beneficiaries:	600 households with 50-75 commercial establishments
Implementing	Local Shuras
Partners:	
Funding Source:	Gardez Provincial Reconstruction Team

The project was commissioned by the Gardez Provincial Reconstruction Team to provide electricity to four villages in Sayed Karam, a remote community in Gardez, Afghanistan.

The project components included a 100-kW solar PV and inverter system, with a 250 kW diesel backup unit, a 14-km long 20-kV transmission and distribution line, and prepaid metering electricity system.

Before the project, the communities relied solely on diesel generators for basic lighting. However, since there was no organized approach to collect funds to pay for fuel, the operating costs rapidly (within weeks) became prohibitive and the generators became unusable by the community.

As a solution, SESA introduced prepaid electricity metering to ensure that the community-based organization (CBO), which manages the system, receives the income needed from individual consumers to pay for ongoing maintenance and support.

Part of the assistance SESA provided was to help the community Shura to formally register the CBO, open a bank account, and organize project finances to allow long-term management, maintenance and operation of their power system. SESA continues to provide training and community management coordination and project support. Spare parts and key equipment are held by SESA in Kabul to allow rapid support for the project indefinitely.

Sayed Karam Solar PV Project



Location: Panjshir Valley, Panjshir Province
Project Components:

- 900W solar PVs
- 900W solar inverter/charger units
- Deep-cycle gel cell batteries for low maintenance
- Internal cabling and lighting fixtures

Beneficiaries: 20 Health clinics
Implementing Partner: Panjshir Provincial Reconstruction Team
Funding Source: Panjshir Provincial Reconstruction Team

SESA provided solar power systems to 20 health clinics in the Panjshir Valley to operate small appliances, lighting, water pumps and, in some cases, solar water heaters. Power can also be used for refrigeration of medicines and for communication in emergencies.

The clinics are all remote and none are supplied by reliable power. Some have diesel generators, but none could afford to keep the generators running. Without these simple solar power systems, the clinics had no ability to even charge a cellphone or provide quality lighting or operate even the most basic of electrical health service equipment. In these 18 project sites, this is now possible.

SESA installed solar PV sets with inverter/chargers and battery sets to store power through bad weather and at nighttime. Installation was fast, which took approximately two days per site. The expected operational time for the units is 10 years with little or no maintenance, other than periodic battery checks and ensuring the panels and cabling are secure. The PV and inverter units should last 20 or 30 years each, ensuring the availability of power for many years.



Location: Paktika Province
Project Components:

- 15kW wind turbines
- 5kW solar PVs
- 5kW inverter, with 3000 AH @ 48 VDC battery set

Beneficiaries: Educational and medical facilities in Orgun and Sharana
Implementing Partner: Paktika Provincial Reconstruction Team
Funding Source: United States Agency for International Development

The Paktika PRT identified that many Afghan infrastructure projects relied on diesel generators for base power supply. These proved unsustainable and projects often ended in failure when local authorities cannot meet the operational costs of the infrastructure provided.

The Sharana Hospital Wind/Solar Hybrid System and Orgun Educational Center projects were initiated by the Paktika Provincial Reconstruction Team to ensure a sustainable power supply from combined wind and solar resources and allow peak power demands to be met by an existing backup diesel generator.

SESA used its Containerized Renewable Energy System (CRES), a technology that uses a standard 20-ft shipping container as a base platform. The CRES allows SESA to perform most of the time-consuming system construction and testing in Kabul, followed by a rapid system installation and commissioning period in the field. This method reduces risks for the installation team and facilitates project completion.

This project combined wind and solar resources and diesel generators to provide electricity to educational and medical facilities in Orgun and Sharana. With the more reliable supply of power, the facilities become more useful to the community and the 'return on investment' from the entire facility is improved significantly.

The medical facility can now count on being able to run critical equipment on demand, and the facilities and working conditions improve the ability to attract and retain staff. The same is true for the educational center where computers, lights, projectors and fans are now possible to run, with a subsequent improvement in facility performance.

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