

Hybrid pumping in Tanzania

Flexible solar powered drinking water for communities



Subject	Nyarugusu refugee camp	Location	Nyarugusu, Tanzania
Application	Drinking water	Project Partner	Epicenter Africa
Size	740 m ³ /day for about 37,000 people	Installation	2016

Nyarugusu refugee camp is the third largest and one of the best known refugee camps in the world. Set up in 1996 in the western province of Kigoma, Tanzania, it is supporting 155,000 displaced people with hundreds more arriving every day.

This project has replaced a diesel generator powered pump with a LORENTZ solar hybrid pump system. Using the existing generator now only for seamless power blending through a LORENTZ SmartPSUk2 to extend the solar day this project has resulted

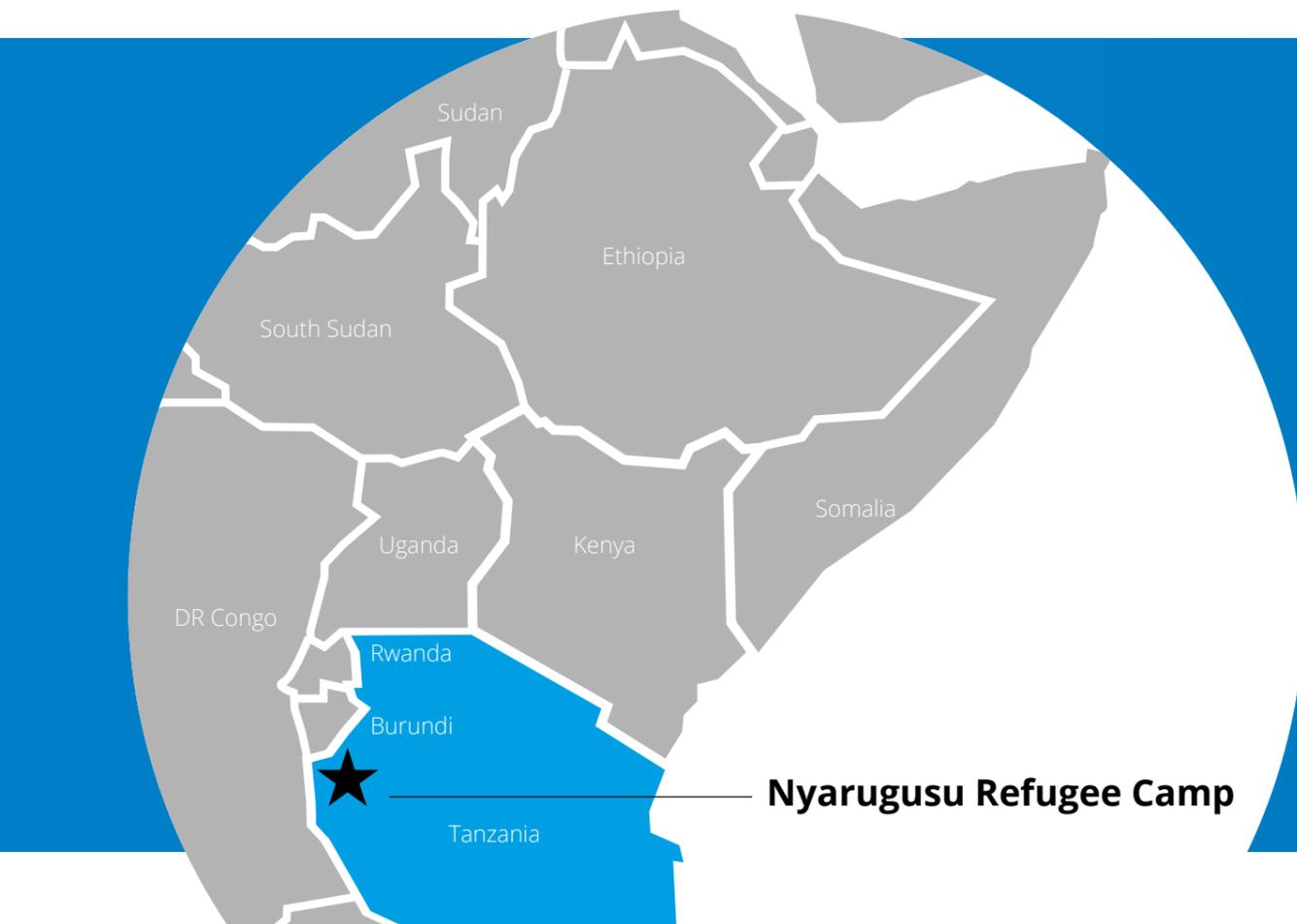
in significant operating costs savings. The LORENTZ hybrid solar pump system provides a sustainable water supply for thousands of people with the flexibility to adjust and increase the amount of water on demand at any given time.

LORENTZ 
The Solar Water Pumping Company

Problem

Nyarugusu refugee camp is located in western Tanzania close to the borders of Burundi and DR Congo. It has been in operation since 1996, setup by the UNHCR and the Tanzanian government. Today it hosts over 155,000 refugees predominantly from Congo and Burundi with the number of people expected to increase strongly in the near future.

Water supply in the camp is historically based on diesel generator powered AC water pumps resulting in huge costs of running the systems for the supporting organizations. Regular maintenance and fuel supplies amounts to 51,000 USD per year for running just one pump system in this particular camp thus raising major concerns about the sustainability of the water supply.

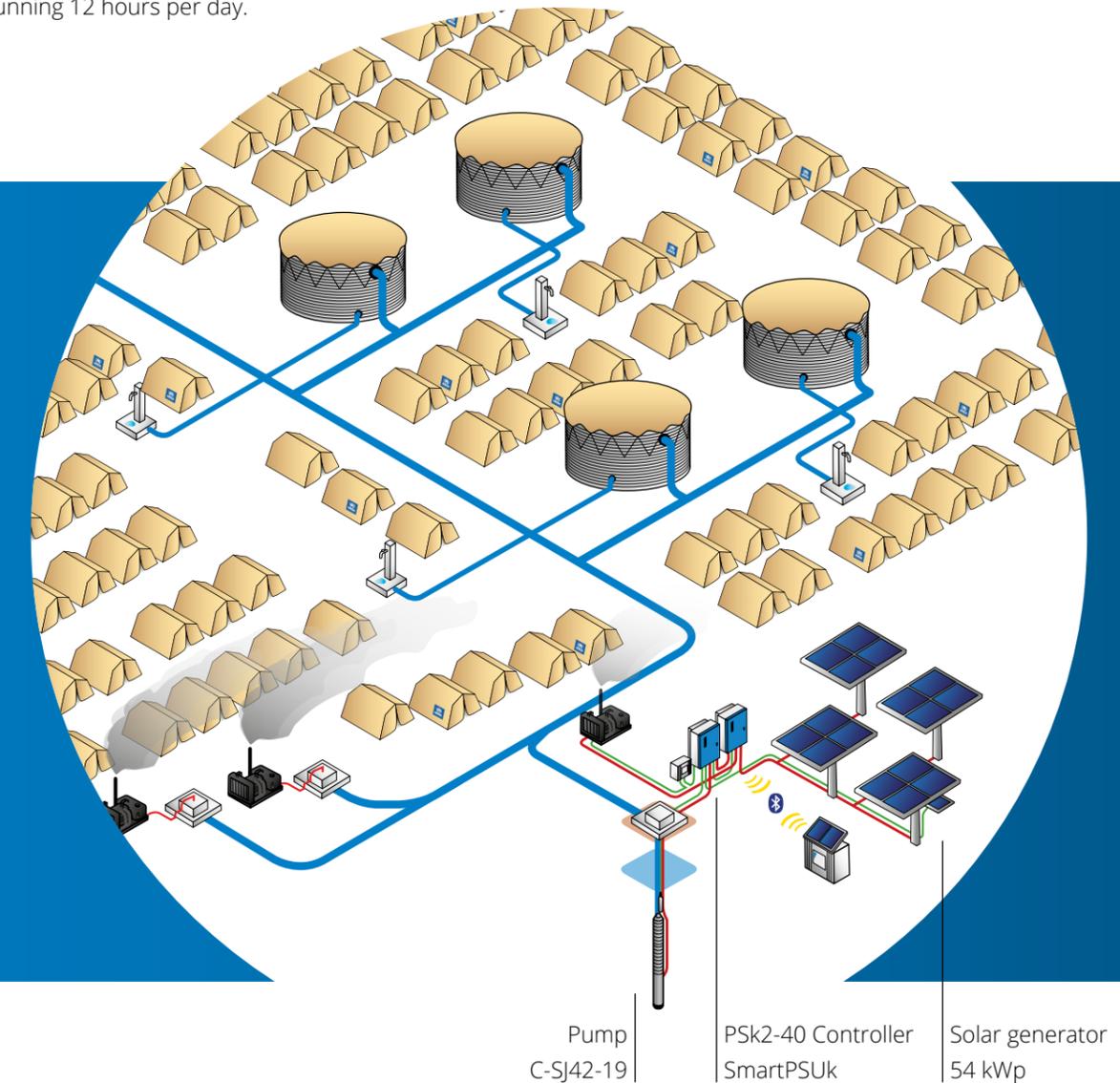


Solution



Epicenter designed a LORENTZ solar water pump system with optional hybrid power supply as a pilot project to replace one of the diesel generator powered AC pumps. This particular borehole currently has a daily demand of 740 m³ per day at 110 m TDH previously powered by an 80 kVA generator running 12 hours per day.

The LORENTZ hybrid solution features the PSk2-40 C-SJ42-19 submersible pump powered by a 54 kWp solar array for an average daily output of 437 m³ on solar power alone.



In May 2015 Oxfam has started working to support refugees in Tanzania. Oxfam is a leading NGO on water and sanitation projects (WASH), installing water supplies, constructing water tanks and facilities. Oxfam has already contributed hugely to the development of solar water pumping in East and Central Africa.

Based on this experience they contacted LORENTZ partner Epicenter Africa to design a pilot solar powered pump system for the Nyarugusu camp with the aim to lower running costs of the water supply while simultaneously having a flexible solution to adjust to rising water demands.

To then meet the demand of 740 m³ and provide flexible pumping reserves for a sudden influx of people Epicenter Africa installed a LORENTZ SmartPSUK2. The SmartPSUK2 allows seamless and automatic blending in of a second power source when there is insufficient solar power to meet the desired amount of water.

Local and remote monitoring and management of the pump system is possible with the LORENTZ CONNECTED infrastructure. Detailed information and configuration is done via the included PumpScanner Smartphone App. To monitor and manage the system performance remotely a PS Communicator was installed.

SmartSolution – Hybrid Power



SmartPSUK2

SmartPSUK2 runs PSk2 into a hybrid pumping system.

SmartStart

The SmartStart integrates with the PSk2 and SmartPSUK2 to provide generator control and autonomous power.

PSk2 controller

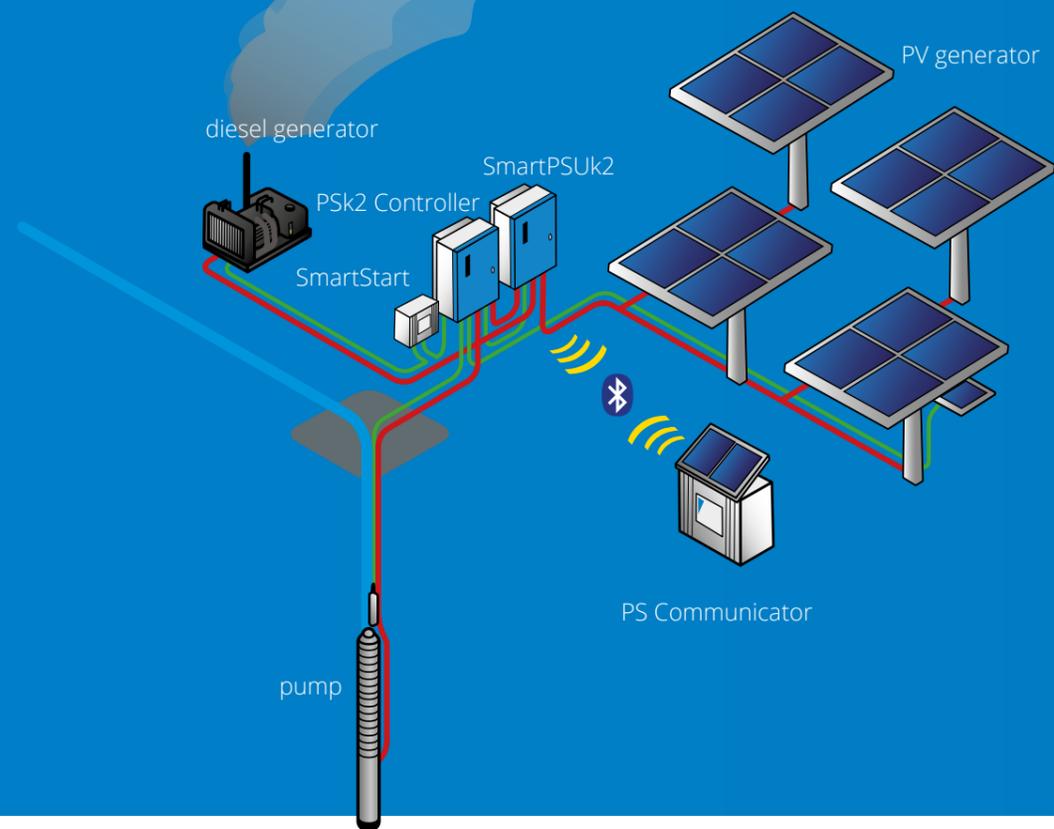
The controller is at the heart of the system, managing both system operations, power sources and constantly optimizing the system for maximum water output.

Hybrid operation

PSk2 can use solar with either grid or generator power. The system seamlessly blends the available solar power with external power sources automatically.

Simplicity and reliability

Being primarily a solar solution, even when the diesel generator fails the system will still provide water. This provides enhanced reliability independent of a single power source.



There are applications and times when solar power alone is not the most practical or economical solution. SmartPSUK2 provides a way to fully utilize your solar investment while using an alternative power source when solar alone is not enough.

By blending solar with an alternative power source the SmartPSUK2 acts as a top up when the sun cannot meet the water need. PSk2 manages the start and end of day transition from solar to grid or from solar to generator power seamlessly and without the need for any operator intervention.

PSk2 with the SmartPSUK2 will allow you to deliver your 24 hour water needs and manage seasonal demands simply and cost effectively.

Wide range of pumps

PSk2 has a wide range of submersible and surface pump systems available to meet your water needs. Submersible pumps are available that can pump from 200 m depths and surface pumps available for flows of up to 457 m³/h.

The PSk2-40 C-SJ42-19 pump system installed in Nyarugusu can pump from 200 m depth and can reach flows up to 63 m³/hour.

Power source

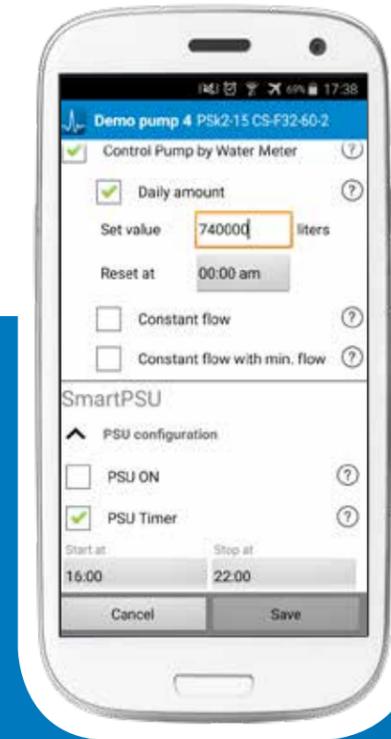
Smart hybrid pumping in the Nyarugusu installation means the LORENTZ PSk2-40 uses the solar resource to the maximum. The AC power share from the existing 80 kVa diesel generator will be kept as low as possible and is only utilized as a backup power source.

PumpScanner

Detailed on site information and configuration.

pumpMANAGER

Advanced but simple monitoring and management of your system remotely.



Daily amount

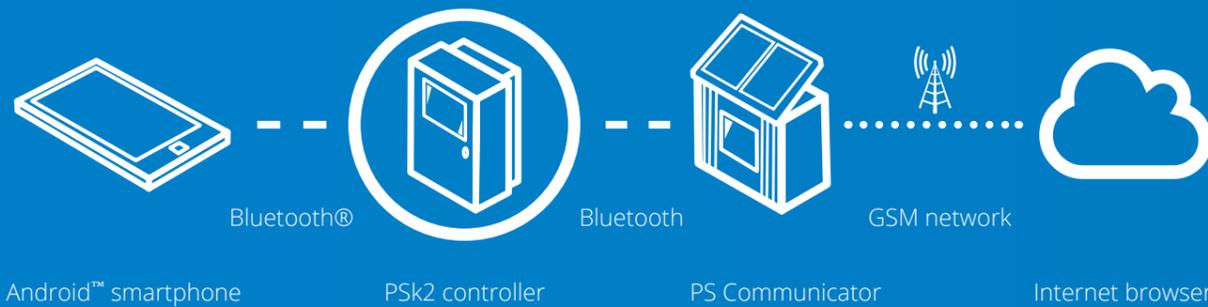
The LORENTZ pump system can be configured to pump a specified amount of water per day. Nyarugusu borehole no.4 will shut down after pumping 740 m³ and restart this procedure on the next day.

SmartPSU configuration

If the water target can't be reached on solar power the diesel will be switched on automatically in a defined time schedule. After pumping the set amount the diesel generator will be stopped automatically.

PumpScanner

pumpMANAGER



PumpScanner

pumpMANAGER

The PSk2 is part of the LORENTZ CONNECTED software eco system. The system is configured on site by the installer using PumpScanner, an Android™ based App. Common configuration is done with three clicks and there is full access to configure system behavior based on additional sensor inputs. The PSk2 constantly records operational data and provides access to rich information for both customers and technicians.

The PSk2 can also be connected to our pumpMANAGER managed service. This is a simple, cloud delivered, pay monthly service that takes away the complexity of remote monitoring and management. One low fee means that you can see exactly what the system is doing, make changes to settings and receive alerts irrespective of location.

Remote monitoring

Fully monitored and managed on any web browser with pumpMANAGER, the pump in the Nyarugusu camp can be reconfigured at any time to flexibly meet changing demands. Servicing costs are lowered as the pumps' status can be checked online.





Energy source	LORENTZ hybrid	
	Diesel	PV
Capital investment	-	100.000 USD
Efficiency	30 %	100 %
Fuel energy content	35.2 kWh/l	-
Running time per day	12 h	-
Fuel consumed	136 l	-
Cost per unit	1.00 USD/l	0 USD
Annual fuel cost	49,500 USD	0 USD
Spare parts	1,950 USD	0 USD
Labour	500 USD	300 USD
Annual operational costs	51,950 USD	300 USD
Total 5 year costs*	259,750 USD	212,500 USD
Total 10 year costs*	519,500 USD	325,000 USD

*Calculated without any annual cost increase

The total investment to equip borehole no.4 with a LORENTZ PSk2-40 hybrid pump system was 100,000 USD including the PV array and setup. In the hybrid scenario the only additional operational cost for the PV system are for occasionally cleaning the modules.

Annual operating costs for the previous diesel generator powered system mount up to 51,950 USD. The largest part with 49,500 USD here is the required diesel with additional costs for replacements of filters, oil changes, decarbonizing and overhauling.

For simplicity this example was calculated without any annual increase in fuel and labor cost. Even without any increase in prices, which would have to be expected, the RoI of the LORENTZ hybrid solar water pumping system is about 3 years.



Due to high operational costs there where concerns about the sustainability of the water supply for the 155,000 people in Nyarugusu, especially as this number can potentially grow fast. The aim for Epicenter Africa was to lower these costs with a flexible solution to meet higher demands if necessary.

Recent analysis confirmed the LORENTZ hybrid system installed at borehole no.4 alone will lead to more than 30,000 USD in annual cost savings for the water supply in Nyarugusu. Within three years the system will have payed for itself, opening up funds to support more people.

Depending on the water needs the existing generator can be used as a backup power source to extend the solar day at any given time. This provides the much needed flexibility for the future when the number of refugees increases as is to be expected.

From left to right

**Broad view of the installation site at Nyarugusu;
Well head, NGO staff, protected installation area, PV array, water outlet.**



Contact

About Epicenter Africa

Epicenter Africa are an approved LORENTZ Premier Sales and Service partner.

Epicenter Africa are experienced in delivering their customers very professional project results in usually difficult circumstances. Their scope of operations include:

- ▶ Needs analysis, planning and specification
- ▶ Supply of solar water pumping systems
- ▶ Supply of solar products
- ▶ Installation and commissioning
- ▶ After sales support and service

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About LORENTZ

LORENTZ is the global market leader in solar powered water pumping solutions. Founded in Germany during 1993 LORENTZ has pioneered, innovated and excelled in the engineering and manufacturing of solar powered water pumping. Today LORENTZ is active in over 130 countries through a dedicated network of professional partners. LORENTZ technology uses the power of the sun to pump water, sustaining and enhancing the life of millions of people, their livestock and crops.

Simply - **Sun. Water. Life.**



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