

# Solar-powered Drinking Water Pumps for Communities



<b>Subject</b>	Dadaab IFO-II Refugee Camp	<b>Location</b>	Garissa County, North East Kenya
<b>Application</b>	Drinking and sanitation water for a refugee camp	<b>Implementation</b>	Project installed by Epicenter Trading Co. Ltd.
<b>Size</b>	13,000 USG per day average from a 400 ft deep borehole, 14.8 kW PV generator	<b>Installation</b>	2012

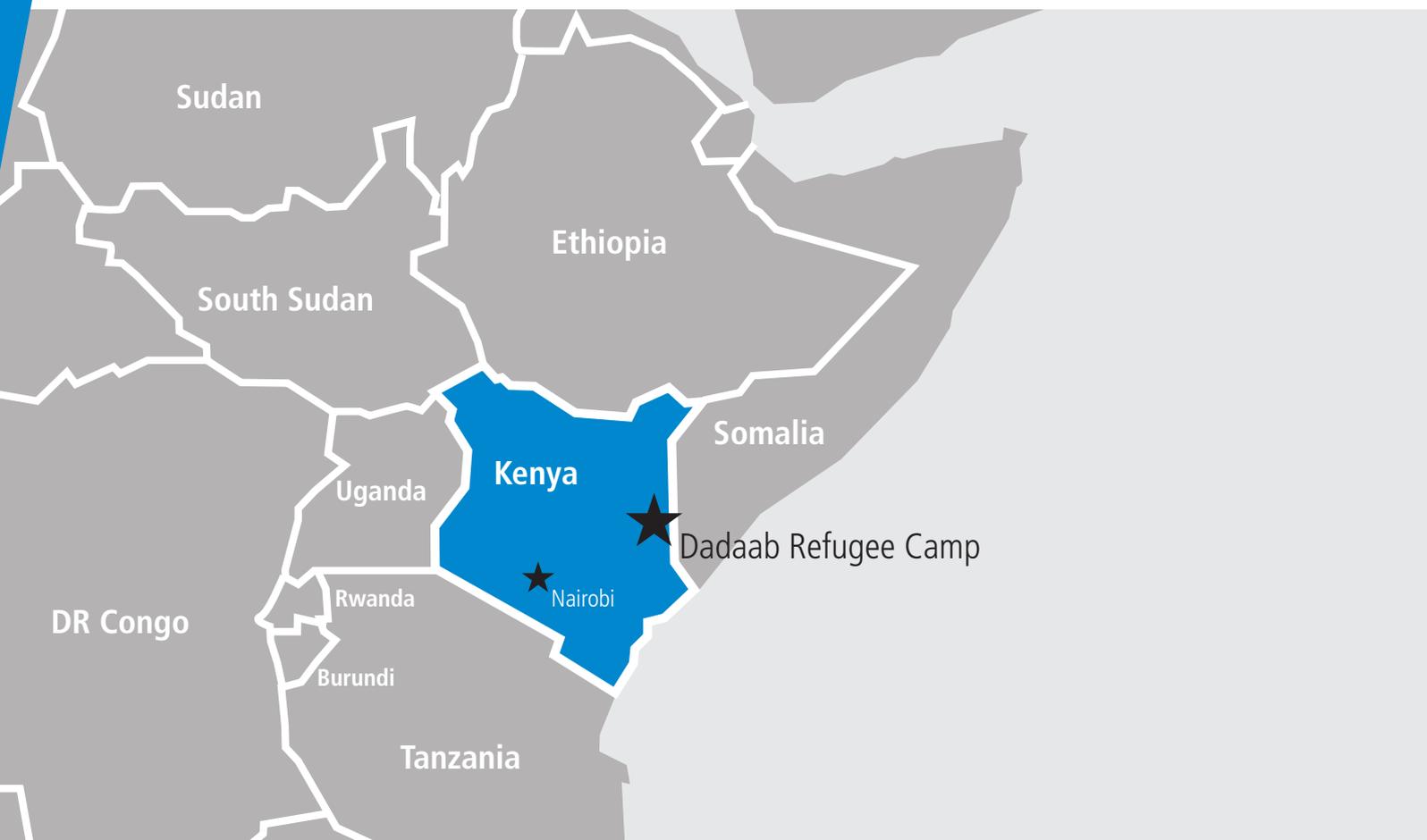
**Dadaab is widely recognized as being the largest refugee camp in the world. The collection of camps located on the Kenya Somalia border have been helping displaced people in East Africa with a multi-agency approach for over 20 years. This project has replaced one of the diesel generator powered pumps with a LORENTZ solar powered pump. This project has resulted in significant operating cost savings and removes both risk and complexity in water supply. The solar powered water pump provides a sustainable water supply for thousands of beneficiaries in Dadaab.**

Dadaab Refugee Camp is located 45 miles from the Kenya, Somalia border. This area experiences up to 10 hours of sunshine daily most of the year round, with temperatures ranging from 85 °F to 110 °F and low relative humidity.

The Dadaab Refugee Camp is a complex hosting over 500,000 predominantly Somali refugees and over 20 humanitarian organizations. The camp has been in operation since 1991, and has been mainly managed and funded by the UNHCR. UNHCR has engaged other humanitarian organizations as im-

plementing partners looking after various needs of the refugees in the camps such as water, sanitation, health, housing, food, education, legal affairs etc.

The camp currently has five settlement sites, IFO, IFO-II, Dagahaley, Hagadera and Kambioos. In 2011 and 2012 the camps experienced a mass influx of refugees mainly from Somalia due to civil war and drought. The swelling numbers of refugees have necessitated the formation of new camps to help decongest the existing camps as well as settle the new arrivals.



Dadaab is purely dependent on the infrastructure provided by UNHCR and the implementing partners. Power is only available from several large Diesel Generators which run 24 hours per day. The only source of water is from boreholes which are on average 430 ft deep. Food is provided by WFP and other facilities provided by the organizations who are given the responsibility.

The operation at the Dadaab Complex is estimated to cost USD 200m annually, with the Water and Sanitation (WASH) budget at USD 20m. Boreholes are the only source of water for all residents of Dadaab including the community around the camp.

Currently there are about 40 boreholes at the Dadaab Camp, 24 in the refugee settlement sites, 5 in the humanitarian complex and 11 in the hosting community around the camp. Boreholes in Dadaab are generally high yielding with yields of up to 18,500 USG/h and depths between 400 ft to 460 ft.



**PROBLEM:**  
**Diesel Powered Pumping Systems**

The existing borehole pumps in and around the camp are powered by diesel generators. UNHCR has constantly raised concerns on the rising cost of running and maintenance of these boreholes due to the rising cost of fuel as well as availability of replacement parts, machinery and personnel to maintain them.

This necessitated UNHCR to commission an energy assessment to explore the use of renewable energy, particularly solar energy as an alternative power source. The findings of this audit indicated clearly that solar energy was indeed a suitable solution and in fact would provide more sustainability for these pumping systems

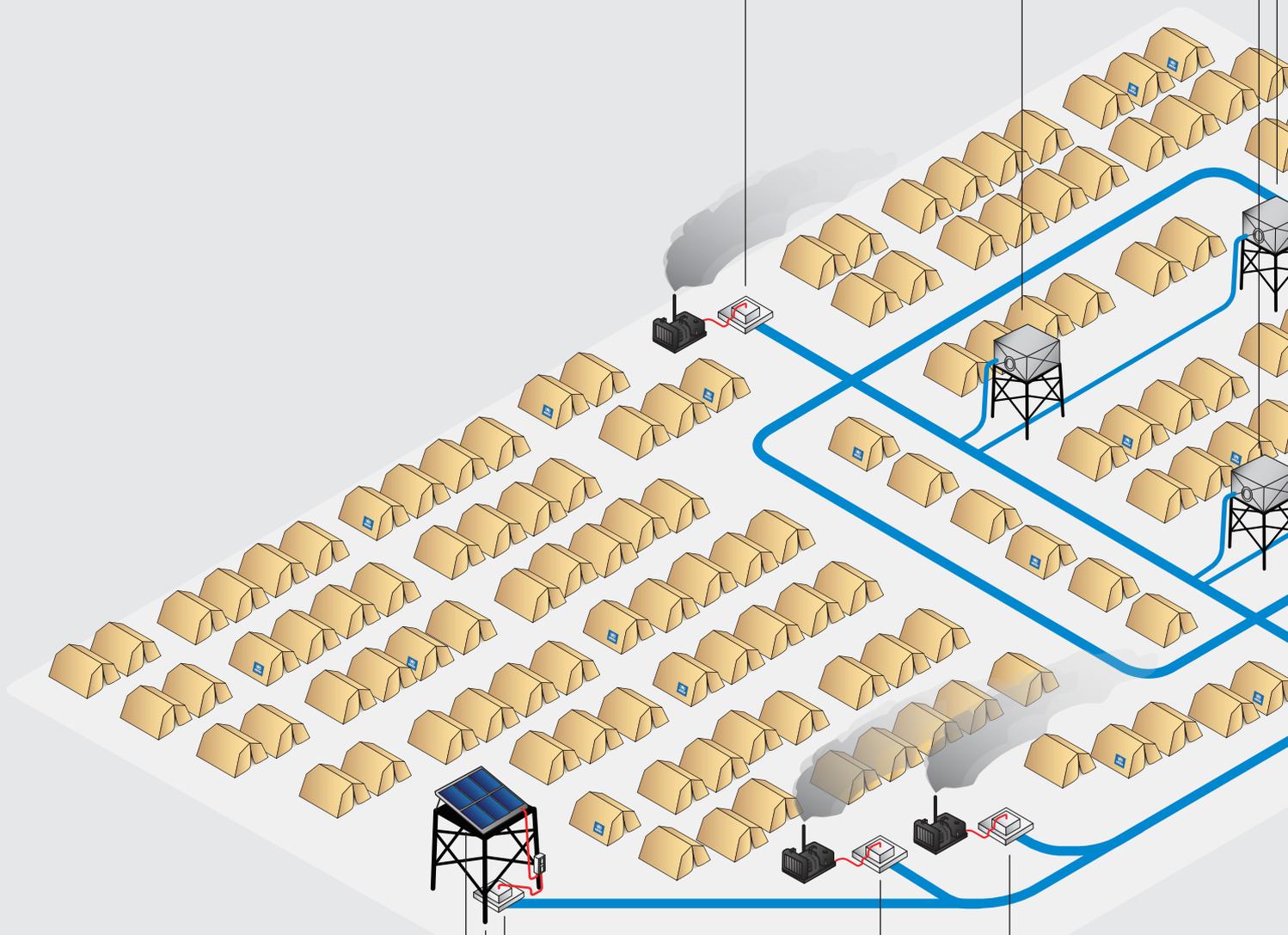


# IFO II Refugee Camp Water System

**Borehole D**  
13,200 USG/day  
430 ft

**Reservoir 1**  
26,400 USG  
65 ft

**Reservoir 2**  
26,400 USG  
26,400 USG



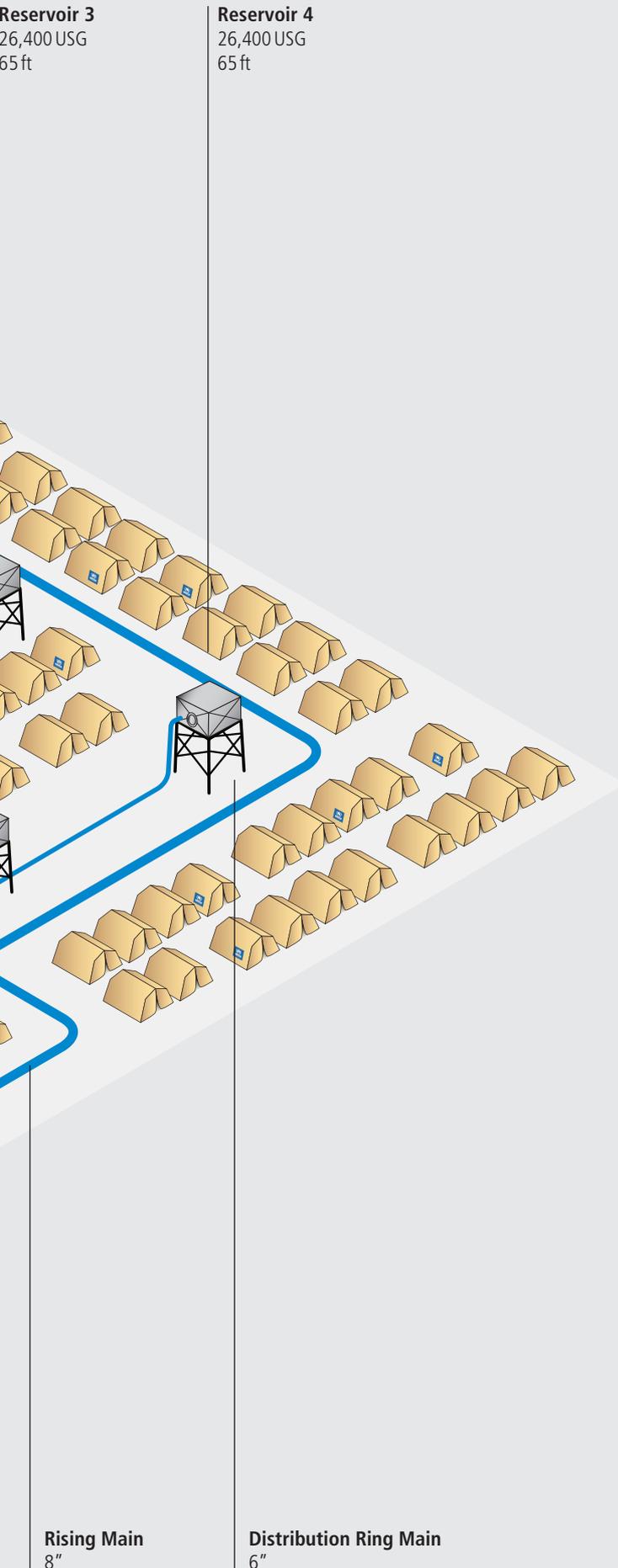
**Solar generator**  
14.8 kWp

**Borehole C**  
10,600 USG/day  
430 ft

**Pump**  
PS9k-C-CJ8-44

**Borehole A**  
16,000 USG/day  
430 ft

**Borehole B**  
16,000 USG/day  
430 ft



## **SOLUTION:** **The Solar Pumping Solution**

Oxfam GB is one of the implementing partners at the Dadaab refugee camp tasked with the supply of water and sanitation facilities. Oxfam took the initiative to equip one of the boreholes with a solar pumping system. The system was designed, installed and commissioned by Epicenter Trading Co. Ltd who are an Approved LORENTZ Sales and Service Partner.

## **SYSTEM DESIGN**

The system is designed to supply over 13,200 USG of water per day (currently measuring over 18,500 USG) using a LORENTZ PS9k-C-CJ8-44 Solar pump powered by 80pcs of 185Wp, 24VDC PV modules. The PV modules are mounted on the pump house roof.

The water is pumped from a depth of 430 ft below the ground into storage tanks raised 65 ft above the ground level.

The water is distributed around to the common watering points by gravity so is available 24 hours per day without the need for generator or battery power.

“We install LORENTZ solar pumping systems very regularly. In the last five years solar water pumping has really advanced and with reduced solar module pricing is now very affordable. We would now consider this a medium sized system, the capabilities and applications for solar pumping are now very broad. Epicenter Trading believe there are many more projects where solar is the most logical and economic solution, both for commercial projects and aid agencies”

Mary Njue, technical manager of  
Epicenter Trading

## RESULTS

Recent analysis carried out by the field engineers at the Dadaab camp indicate that this system is expected to provide an annual saving of about \$10,000 compared to a generator powered system of a similar capacity. The annual operation cost was found to have reduced by over 70% and by 60% including the capital cost of the system.

The high operational cost savings make the return on investment very fast for the solar system. The break

even point for this system is under three years based on operational cost savings alone and ignoring re-use or sale of the existing generator.

Epicenter Trading Co. Ltd installed the Solar borehole pumping system at the Dadaab IFO-II refugee camp. The system, which is the first in the camp, has elicited great interest and many humanitarian organizations are now considering solar pumping as opposed to the traditional diesel generators.

“We are very pleased with the results, the solar water pump is performing better than we expected and we are quite surprised about the amount of water it produces. This system provides us immediate operational costs savings plus it ensures we will have water even if the diesel supply chain is stopped for any reason.”

Brian McSorley, Humanitarian Programme Coordinator of Oxfam Kenya



## Return on Investment

	Diesel	Solar
Annual Fuel Cost	6,083 USD	USD
Operator Cost	1,800 USD	900 USD
Guarding / security	2,700 USD	2,700 USD
Lubricants	576 USD	
Filters	540 USD	
Servicing	200 USD	
Operational costs	11,899 USD	3,600 USD
Annual capital costs	835 USD	1,507 USD
<b>Total annual cost</b>	<b>12,734 USD</b>	<b>5,107 USD</b>
<b>10 year cost<sup>1</sup></b>	<b>171,971 USD</b>	<b>56,340 USD</b>
<b>20 year cost<sup>1</sup></b>	<b>521,382 USD</b>	<b>126,873 USD</b>
<b>Production cost per m<sup>3</sup> (10 years)</b>	<b>0.94 USD</b>	<b>0.31 USD</b>
<b>Production cost per m<sup>3</sup> (20 years)</b>	<b>1.43 USD</b>	<b>0.35 USD</b>
<b>Daily savings (20 years)</b>		<b>54 USD</b>

<sup>1</sup> Assuming an annual general cost increase of 3% and an annual 10% increase on fuel





## ABOUT EPICENTER TRADING

**Epicenter Trading are an approved LORENTZ Sales and Service partner who operate in South Sudan and Northern Kenya.**

Epicenter Trading are experienced in delivering their customer very professional project results in sometimes difficult circumstances. Our 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 a 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 120 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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