

Solar-powered Drinking Water Pumps for Communities and Villages



Subject	United Nations Development Program (UNDP)	Location	Khyber Puktunkhwa (KPK) province of Pakistan
Application	Drinking and sanitation water for communities and small irrigation projects	Implementation	Project planned and installed by Alternative Power Technologies
Size	102 locations across the province	Installation	2010/2011

The application of LORENTZ solar powered water pumping systems for drinking water, sanitation and small irrigation projects has resulted in a reliable water supply delivered in a cost effective and economically sustainable way. This project has significantly improved the lives of over 50,000 people across 7,987 households.

PROBLEM: The Khyber Puktunkhwa province has been subjected to natural and manmade crisis on a wide scale. The region suffered significantly in the 2009/2010 floods and has suffered additional loss of human life, civil amenities and infrastructure during the military operations against militants in the area. The result of these crises was dis-

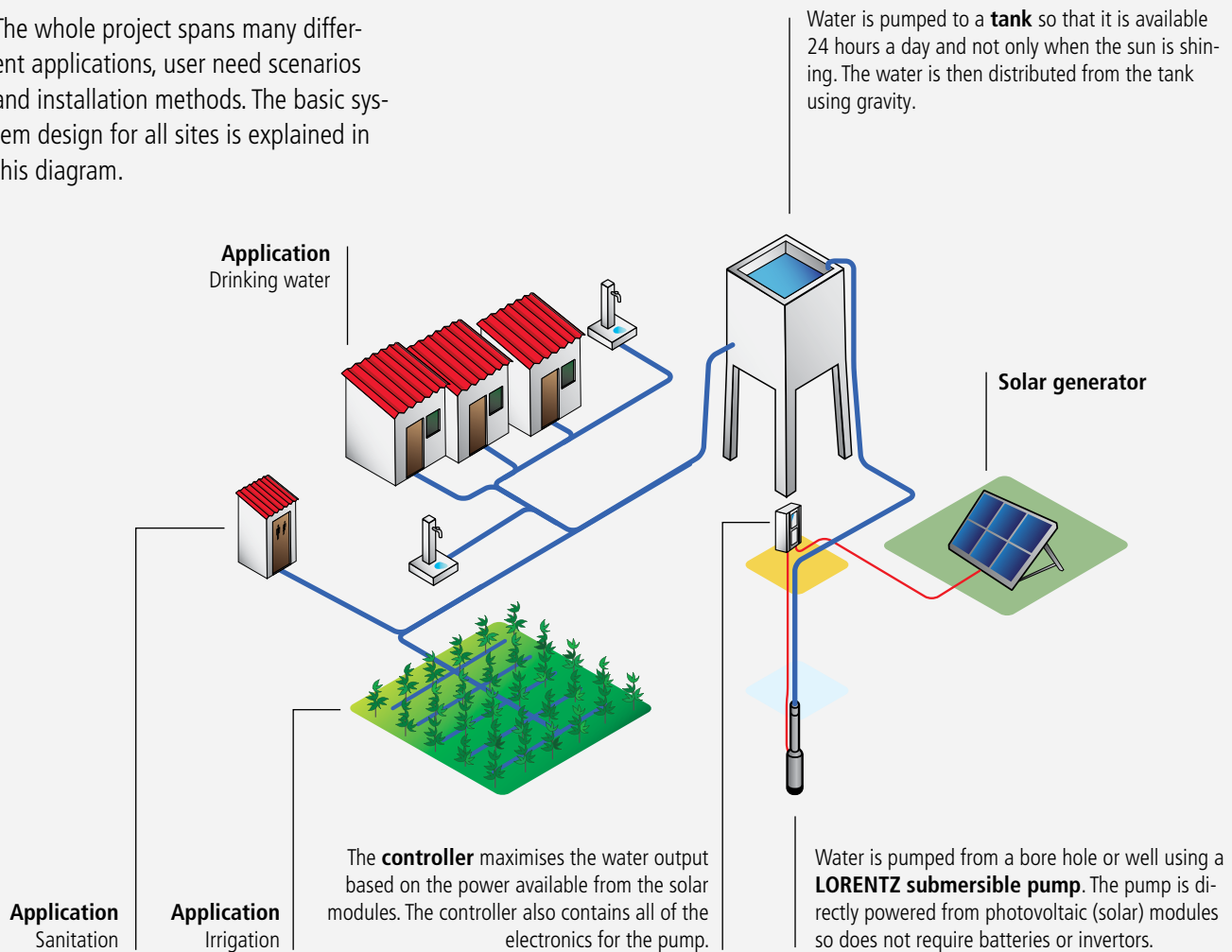
placement of over 2 million people, destruction of energy and water infrastructure as well as loss of crops and livestock.

Access to water has become complicated with many households relying on water that is manually drawn from a well and carried miles back to the home. The problem of delivering water to this area more effectively is further complicated by a lack of grid power. Even where local grid connected electricity is available it is unreliable and typically delivers 50–150V instead of 220V. Most communities started to use diesel pumps or generators but the cost of operation (fuel and maintenance) were prohibitive, even as a short term solution.

SOLUTION: To aid repatriation and resettlement of the population, United Nations Development Program identified 102 sites where a reliable and robust water supply would make a significant positive impact on the local community and economy. Alternative Power Technologies (APT) proposed a solution to UNDP using LORENTZ solar water pumping solutions. Each site was assessed and a solar pumping systems were configured for each site. Aftab Kahn, Director Technical, of APT said, "The range of LORENTZ pumps meant that we could specify and install a pump which closely matches the lift and flow requirements for each site. Having such a large range of highly efficient pumps meant the amount of photovoltaic modules (and cost) was kept to a minimum."

Technical Overview

The whole project spans many different applications, user need scenarios and installation methods. The basic system design for all sites is explained in this diagram.



Benefits of the LORENTZ technology

The LORENTZ pumps use DC brushless motors which are very reliable and provide efficiencies of over 90 %. The high efficiency means less solar modules are required and the high reliability mean the long term cost of ownership is low.

By adopting a modular design philosophy, which separates the electronics from the motor, LORENTZ solar pumps are very reliable as no electronics are below ground level. The modular design also allows economic parts replacement if any failures occur during the long life of the LORENTZ system.

LORENTZ has wide range of solar water pumping products for different pumping applications ranging from single household solutions to large scale irrigation products.

Project scope

The following mix of sites were identified as being significant in aiding the local communities

Location of Installation/Applications	Number of pumps/locations
Community centers, mosques	62
Communal well, hand pumps replacement	17
Hospitals	7
Irrigation, public land	5
Schools (grade 1 to 7)	7
Gurdwara (Sikh worship place)	2
Orphanage house	2

Examples



Koz Palao: Communal well in Swat
installed 17/8/2011

Koz Palao is in the village of Shalpin located in the mountains of northern Swat. These villagers have acute water problems with long trips to collect water from a hand pumped well. This site was surveyed by UNDP team and considered as one of the most deserving places in this region.

A LORENTZ PS1800 C-SJ8-7 solar pump with 8 × 175Wp solar modules were installed in one day to provide the well users with a reliable, accessible water supply.

Local Community Representative Shair Akbar said, "There are around 1,000 people in this village and their persistent water problem has been solved by solar pumping. Molvi Abdul Shakoor prays in every Jumah for the welfare of people who installed solar pumps for them."

Annual water flow	4,609,220 USG
Annual cost savings	158,775 PKR
Annual emissions offset	4,891 kg CO ₂



Khapal Kor Foundation: Orphanage in Swat
installed 28/8/2011

Khapal Kor Foundation (KKF) was built in October, 1996 to accommodate the orphans of Malakand region. It is located in Swat near to the city of Mingora. The 3,500 orphans residing here are provided with free education and skills development to give them equal opportunities in society. APT team along with the UNDP team surveyed this site on 21/8/2011, the director of KKF was very excited about the solution.

A LORENTZ PS1200 C-SJ8-5 solar pump was installed with 7 × 120Wp modules in a single day.

Muhammad Ali, Director of KKF said, "This installation of the solar pump has solved many issues for us. The orphanage benefits by having a stable, reliable water supply and we are able to invest money that was spent on diesel into benefiting the students."

Annual water flow	4,243,125 USG
Annual cost savings	127,020 PKR
Annual emissions offset	3,913 kg CO ₂



Final results

The project was successfully completed across all 102 locations.

This project has delivered reliable potable water to 7,987 households. This equates to 50,000 people that now have the benefit of knowing that they have water when they need it, without unreasonable physical effort.

The following data shows the yearly emissions that have been avoided as a result of this project. The carbon emissions and other pollutant figures are calculated based on the diesel generator usage that the solar pumping projects now avoid.

Green house gas emission prevented from the solar pumping project:

Pollutant/Emissions	
Carbon dioxide	273,165 kg/year
Carbon monoxide	674 kg/year
Unburned hydrocarbons	74 kg/year
Particulate matter	51 kg/year
Sulfur oxide	549 kg/year
Nitrogen oxides	6,016 kg/year



About Alternate Power Technologies

Founded in U.S.A., APT and its subsidiary Solar Power Technologies (Pvt) Ltd engineers, implements, trains and supports renewable energy solutions in places around the world where renewable energy adds the most value for its customers, their homes and communities. With more than 350 successful installations, APT facilitates sustainable and affordable renewable energy based projects to power water pumping, telecom sites, remote telemetry stations, drip irrigation, health clinics, rural schools and households, village/community lighting and income generating micro-enterprises.

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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. Over 75,000 LORENTZ systems use the power of the sun to pump water and sustain life in 120 countries.

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