NRSP's *environmental initiative* *in rural areas*

in collaboration with LEDTronics, Inc. USA

Village-based Renewable Technologies in Energy Sector for the poor

NRSP

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Village based renewable technologies in energy sector for the poor

The electricity produced through renewable sources results in reduced pollution and contributes towards reduction in global warming. Pakistan can harness the freely available renewable sources of energy like the wind, sun, biomass and oceans and reduce its dependence on imported oil.

Switching to renewable sources of energy can reduce:

- Heavy burden of amount, spent on fossil fuels for electricity generation, on national economy;
- Heavy pressure on our foreign exchange resources; and
- The fast depletion of natural fuel reserves.

Estimated air pollutants from various economic sectors of Pakistan*

Thousand tonnes

Sector	CO_2	SO_2	NO_x
Industry	53,429	982	-
Transport	18,987	105	-
Power	53,062	996	76
Domestic	39,098	40	-
Agriculture	6,368	40	-
Commercial	4,261	25	-

* Economic survey 2001-2002

Solar pump with sun tracking system

It is a DC powered submersible pump (positive displacement, low voltage) constructed of high quality marine bronze and stainless steel, these pumps were designed for corrosion free service in clean portable water. They can be installed in a well, cistern or lake. It takes energy from photovoltaic cells, made from silicon and other semiconductor materials, enable direct conversion of solar energy into electricity.

NRSP imported its model SD 12-30 (12 litre per minute at 30 meters total dynamic lift). It is designed to fit into a 125 mm (5") inside diameter well casing; 150 mm (6") with optional sand shroud.

The pump requires no lubrication. It operates from 12 to 30 volt DC power source including solar panels, batteries, or a combination of both. ¾" drop pipe is used for water lifting.

A controller is recommended to be used as an interface between the power source and the pump on all systems. It provides much greater pump system efficiency, motor protection, system control features and diagnostics.

The pump along with sun track rack is installed at Community organization Hattar of Fateh jang tehsil of Attock district in a well. The water table in the well is at about 45 feet. The pump is placed at 60 feet. The output of the pump is about 1500 gallons per day. A water reservoir has also been constructed to collect water. The collected water is used for irrigating the fields and for drinking purposes.

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Solar panels with sun tracking system

Storage tank for solar pump

Solar Pump Capacity			
Meters	Gallon per minute	Ampere	Source
30	3.55	3.71	120 W Solar panel

Sun Tracking System:
The Track Rack begins the day facing west. As the sun rises in the east, it heats the unshaded west-side canister, forcing liquid into the shaded east-side canister. As liquid moves through a copper tube to the east-side canister, the tracker rotates so that it faces east. The heating of the liquid is controlled by the aluminum shadow plates. When one canister is exposed to the sun more than the other, its vapor pressure increases, forcing liquid to the cooler, shaded side. The shifting weight of the liquid causes the rack to rotate until the canisters are equally shaded. As the sun moves, the rack follows (at approximately 15 degrees per hour), continually seeking equilibrium as liquid moves from one side of the tracker to the other.

Solar powered low intensity LEDs

Solar power takes lots of daylight and converts it to little bit of energy. The LEDs use little bit of energy but produce reasonable amount of directed light. The use is where there is presently no light. An efficient 2 W LED bulb, gives out light only in one direction equivalent to about a 20 watt bulb.

Source: 15 W solar panel
The system includes three LED bulbs of 1.2 watts requirement. The bulbs can be illuminated for 5-6 hours. The Community is also using a small fan powered through the system.

The system is installed at Head office NRSP and Community organization Hattar of Fateh jang tehsil of Attock district.

Systems of two and four LED bulbs (capacity: 1 Watt) and solar panels of 6 and 15 Watts capacity respectively are being installedat different regions of NRSP.

LED fitted on a roof

Only **2.5 Watts** Energy compared to 35W Halogen

LED fitted lantern

Solar Concentrators

Besides the utilization of solar energy in photovoltaic energy systems, effective use can also be made of thermal energy from the sun. One of the devices used for the purpose to cook food is solar concentrator. Workshops were arranged in FUs of Rawalpindi and Turbat regions to demonstrate its use. It cooked the food for a family in duration of less than an hour without using any fuel except sunlight. Its cost is Rs.1,900. To fulfill the community need, they are being supported in its arrangement.

Solar Concentrator

Wind Mill / Turbine

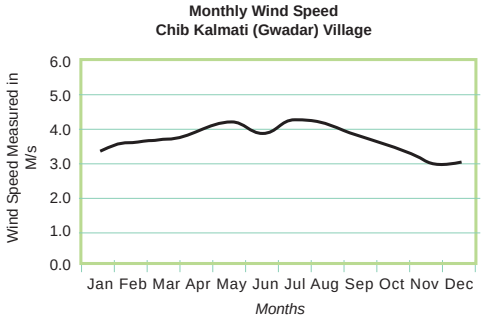
With the wind turbines specially designed for use in low resource areas, there are good prospects of generating electricity along the 1250 km long coastline of Pakistan. In addition there are possibilities of locating wind turbines in offshore in shallow waters.

Initially to introduce the technology of household level wind turbines, NRSP imported 3 wind chargers (Rutland 913) from UK. As a second step a local manufacturer was identified and shown the wind charger who is trying to replicate it.

Two out of the 3 imported units were installed in COs, one in CO Dhok Ganda, FU Fateh jang, district Attock and the other in Wahid Bukhsh Bazar village of District Gwader in June 2002. The system has a low wind speed start up of just 5 knots (The unit of wind speed). According to the data received by Empower Consultants, the wind speed at Chibkalmati village that is about 8 kms from Wahid Bukhsh bazaar village was found to be between 6 and 9 knots through out the year. The maximum capacity of this wind generator is 1500 watts. In Gwader it is producing 500-700 watts. An inverter is also associated with the generator that converts 12 volts DC. into 220 volts AC.

Windmill/turbine

Wind mill/turbine is a device that converts wind energy into electricity. Wind power is used to rotate blades mounted on a rotating axle. The rotating moment is used to generate electricity in an electric generator.



Wind Generator

Household level Biogas Plants

The biogas plants constructed in CO Jabbi Niazi and Korak, FU Fateh jang, with 50% community contribution, were found to be working efficiently. The two households found that the gas was enough to meet the domestic cooking requirements. The efficiency of effluents from the plants, which is reported to be a better natural fertilizer than the one prepared by traditional methods, will be tested in the next growing season.

Many more biogas plants in Rural Support Programme's project areas are being constructed with the collaboration of Pakistan Council of Renewable Energy Technologies.

Household level Biogas plants:
Biogas, a clean-burning methane-rich fuel gas produced through anaerobic digestion (bacterial action in a tank without air) of suitable biomass feed-stocks, is the only biomass-derived modern energy carrier for household applications. It can be generated from cattle dung and animal wastes. Biogas systems offer multiple benefits. The digester effluent is usually a good fertilizer, and, for cooking and other household thermal tasks, it is simple and reasonably efficient to use the gas directly in conventional low pressure gas burners. Biogas can also provide lighting when used in mantle lamps.

Household level Biogas plants:

- About 40% saving of fuels like wood or animal dung;
- Reduction in female's health hazards due to smoke and poisonous gases;
- Time saving; and less blackening of cooking utensils and kitchen walls

Solar Stills

Unsafe drinking water causes the majority of deaths and diseases in developing countries. Solar still is a device used for water purification. The equipment consists primarily of a shallow basin (colored black inside) with a transparent glass cover mounted at a slight angle above the basin. There are no moving parts to wear out. The sun heats the brackish water in the basin, causing evaporation. Moisture rises, condenses on the cover and runs down into a collection trough, leaving behind the salts, minerals, and most other impurities, including germs.

One solar still was provided to Pind Dadan Khan Field unit of NRSP to search out its efficiency.

Solar Still

Solar Dryer and Geyser

Efficiency of Solar dryer and geysers is being noted in Rawalpindi region of NRSP. The activity is being conducted in collaboration with Pakistan Council of Renewable Energy Technologies.

The basic principles of solar water distillation are distillation replicates the way nature purifies water. The sun's energy heats water to the point of evaporation. As the water evaporates, purified water vapor rises, condensing on the glass surface for collection. This process removes impurities such as salts and heavy metals, as well as destroying microbiological organisms. The end result is water cleaner than the purest rainwater.

Fuel-efficient Stoves

Wood, stubbles, dung and grass are used daily in about 60% of the households in Pakistan as energy for cooking and heating. Mostly these are burnt in open fires or inefficient stoves in poorly ventilated kitchens. The result is a toll in death and ill health.

Biomass smoke contains many harmful constituents such as carbon mono-oxide exposure to which can cause or contribute to acute respiratory infections, pneumonia, tuberculosis, lower birth weights, nervous and muscular fatigue. Smoke especially coal smoke also contains sulfur, nitrogen oxide and hydrocarbons which can lead to cancer. Sometimes the wood used for burning contains the residues of pesticides applied on it which has its own harmful effects.

Fifty molds of Fuel-efficient stoves were prepared and provided to the Field units of NRSP. The communities were trained for its use. The communities are using the stove molds for constructing Fuel-efficient stoves. Some of the females have started it as an enterprise and are selling the stoves.

Feul Efficient Stove making

Feul Efficient Stove

Traditional Stove

Demonstration of solar technology

to school going children

United Nations Office for Project Services through Ministry of Environment, Local Government and Rural Development along with NRSP's assistance is implementing a project on "Commercialization of wind power potential in Pakistan". In this regard a solar power energy scheme has been installed at Government High School Mastani Rake, Khuda Dad Muhallah, Pasni to demonstrate the use of solar energy to provide power to 2 energy savers, one fan and one T.V. in the school.

Furthermore, wind speed is being noted to launch a wind power project in the area.

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