
Technological Innovations

REDP has recognized that technological innovations are the key for the development and the basis for technological innovations and adoption is R&D. In this regard, REDP provides support for the development and testing of highly potential prototypes, technology transfer and adoption, product engineering and optimization and study of rural energy and community development efforts.

Rural Energy Development Programme (REDP) has accorded high priority for the development of appropriate technologies for production and use of electricity. REDP supports private sector and non-governmental organisations to adopt technologies to local conditions and to test innovative ideas. Through its Research & Development (R & D) unit, REDP has been implementing activities for the promotion of renewable energy systems by considering the local capacity, cost reduction, quality improvement, fuelwood replacement and promotion of end-uses.

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Photo above: A child studying under the light from Light Emitting Diode (LED)

level to provide policy inputs and district level activities with conceptual framework.

Various studies, reports, workshops, seminars as well as the experiences gained by the REDP are the basis for identifying the areas requiring further research. In addition, REDP has completed a research study on the status of R&D pertaining to micro-hydro in Nepal. The study has, among others, identified the areas requiring R&D and prioritized them too. Moreover, the study has suggested suitable institutions to carry out the works. The report forms the basis for defining the needs for further technology development and promotion and to mobilize and coordinate with potential institutions and donors to carry out R&D works.

In line with the programme's goal to build up capability within Nepal, local expertise are mobilized to the maximum extent possible. Private Sector Organizations and Non-Governmental Organizations are identified and assigned to carry out R&D works. R&D works for prototype development are sub-contracted to competent local Private Sector Organizations (PSO). To carry out studies REDP also seeks professional serv-

ices of expert/ organization depending upon the nature of work.

The outcomes of the research / study are well documented and the results are well disseminated either through publication, workshops and seminars. The relevant outcomes of the research/ studies are provided to the district administration and central authorities as policy inputs. Furthermore, the valuable experiences gained through action research, R&D and progressive studies are internalized in training conducted by the programme.

In its short period, REDP has carried out numerous R&D works that has led to technological innovations, adoptions, cost reduction and increased efficiency in the area of rural energy. Brief descriptions on some of the R&D initiatives undertaken with REDP support is given below.

Pre-stressed RCC Pole

The cost of transmission and distribution of electricity from micro-hydro installation is considerably high. The prevailing practice of using local woods for poles, which are not properly treated and have a very short life, requires changing the poles very frequently. On the other hand, the popular tubular steel poles are both expensive and require high transportation cost. DCS-Butwal has been subcontracted to design, fabricate and test a manually operated machine and pre-stressed RCC poles for evaluating the suitability in rural areas. DCS has designed the pre-stressing machine and the frames as per Indian Standard (IS) and has tested the pre-stressed poles thus produced in the laboratory.

Low-head Propeller Turbine

If the water in the irrigation canal could be utilized also for power generation by using low head turbines, the impact of both turbine and irrigation could be enhanced optimally. In this context, an attempt was made to develop an indigenous turbine to suit the local conditions. REDP supported Kathmandu Metal Industries to design, fabricate, install and field test a low head propeller turbine. The turbine has been installed in Katunjabesi of Kavre successfully generating 8 kW electricity, which is distributed to all 46 households.

Plant Seed Oil

To test the burning quality of oil from Jatropha seed in conventional stove, REDP had supported Green Energy Mission/ Nepal. The organization collected about two quintals of Jatropha seeds, locally known



Runner of the Turgo Turbine

as Sajiwan through the mobilization of local people. Different blends of Jatropha oil and kerosene were tested in the conventional stove to determine the best combination. Jatropha oil was also transesterified to improve its calorific value and to remove other chemical impurities as well to be used as bio-diesel. This oil was tested in a restaurant of Katunjabeshi and has the potential for replacing or reducing the use of kerosene in rural households.

Gasifier

Notwithstanding its widespread application in the neighboring countries like India and China, the technology was introduced only recently in Nepal with REDP initiative. A three kilowatt charcoal gasifier, based on IIT design, was fabricated and tested at National Structure and Engineering Workshop, Lalitpur. Then the gasifier has been transferred in Chaubas VDC, Kavre for field testing since 13 June 1998. The Chaubas VDC of Kavre was selected for field testing due to abundance of wood waste, available in the village. Chaubas has a successful community forestry programme covering about 800 hectares of land. Further 1000 hectares is covered by government owned forest. The villagers have taken up the responsibility of operation of the gasifier.

Three-Phase IGC

Though a number of Nepalese manufacturers assemble IGCs, the know-how is limited to pico and single phase IGCs. This has limited the use of induction generator, which is more rugged and economical than the synchronous one in higher ends. REDP has thus supported National Power Producers, Kathmandu, to design and field test a three phase IGC. The design

and fabrication of a prototype have already been completed.

Pump as Turbine

For small micro-hydro schemes, use of a pump as turbine (PAT) can be effective compared to a custom built turbine. Moreover if proven it will be off-the-shelf turbine which is ready for use. REDP has supported Kathmandu Metal Industries (KMI) to undertake PAT. The PAT has been successfully installed and operated in use in Gotikhel VDC of Lalitpur. Eight households of the VDC have benefited from the 1 kW turbine.

Horizontal Axis Peltric-set

Although peltric-sets are in use in a vast number in various parts of the country, their use was limited mostly to lighting. In order to overcome this problem a horizontal-axis peltric-set has been manufactured and successfully field tested in Kusadevi, Kavre. Fabricated and field tested by Nepal Yantra Shala & Energy, the peltric-set has a power output of 5 kW. With this peltric-set, end-uses like agro-processing, saw milling have been established. This R&D has been carried out in collaboration with PDDP and ITDG- Nepal.

Turgo Turbine

In spite of the development of this type of turbine in 1919 in the European countries, the technology is not yet transferred into the country, hence limiting its wide-scale proliferation. The turgo turbine is a high capacity free jet of impulse turbine. Due to the very special buckets turbine, a very large jet of water is directed to the runner, relatively of small diameter and with very high speed. The main advantage of this type of turbine is that, for a given head and power output, this simple turbine could run at a faster speed than complicated multijet peltons or crossflows. REDP sub-contracted Kathmandu Metal Industries (KMI) for the fabrication and field testing of a turgo turbine. The turbine of 5 kW capacity has been installed and field tested successfully in Thansingh of Katunjabesi, Kavre. The electricity has been distributed to 32 households.

On-going R&D Works

Low Cost Lighting Systems

Provision of low cost lighting systems is the best option to meet the demand of rural people with low income. With this objective, REDP subcontracted Center for Energy Studies (CES) of Institute of Engineering (Tribhuvan University) for the design, construction & field testing of low cost lighting systems in Nepal. Recent development of modified Light Emitting Diode (LED) are being considered for the small area lighting purposes because of their high luminous intensity. LEDs last an average of 100,000 hours and are 10 to 50 times more efficient than incandescent lamps. LEDs are rugged, energy efficient and versatile. The field -



Pump as Turbine installed in Gotikhel VDC, Lalitpur

testing of these lighting systems are on-going in Mangaltar and Katunje VDCs of Kavre district. With the successful completion of this R&D initiative, it is expected that the cost of the SHS would be reduced by around forty percent. Similarly, more households could be electrified by a MH scheme with these lighting devices.

Preparation of Software

In spite of its long history of development, there is no uniformity and standardization of MH. Moreover, the limited design manuals that are available, are referred by very few professionals. In order to make the design of the MH scheme more simple, easy, quicker and efficient, it was felt quite necessary to design a software on MH so that even low level technicians who are engaged in this sector, could practice the design procedure leading to the technical soundness and sustainability of the schemes. Moreover, the right design would result in cost reduction and time-savings too. With this very objective, REDP has sub-contracted Nepal Software for the Design of Software on MH.

"REDP had broken the myth of development"

Dr. Jagdish C. Pokharel, Member
National Planning Commission