Renewable Energy Technology in Asia Project Implementation in Lao PDR

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1. INTRODUCTION

Renewable Energy Technology in Asia: A Regional Research and Dissemination programme (RETs in Asia)" was sponsored by the Swedish International Development and Cooperation Agency (Sida) and coordinated by the Asian Institute of Technology (AIT) and involved twelve national research institutions (NRIs) of six Asian countries: Bangladesh, Cambodia, Lao PDR, Nepal, Philippines and Viet Nam.

The overall objective of the programme was to promote and disseminate mature/nearly mature renewable energy technologies in selected Asian countries through the adaptation of the technology to local requirements and condition. The programme covered three RETs: photovoltaic, solar drying and biomass briquetting and briquette stoves.

The Phase-I of this program held during 1997 to 1998, and Phase-II for the period 1999 to 2001 was approved.

RETs in Asia programme were implemented by Technology Research Institute, Science Technology and Environment Agency (TRI/STEA) in photovoltaic technology based in applications in the country.

2. ACHIEVEMENT

The first phase of the RETs in Asia programme contributed to local capacity enhancement in Lao PDR through training, technology transfer and adaptive research and created awareness of the technology through demonstration of PV systems. A brief description of the activities and achievement in Phase-I is as follows:

a). TRI developed a low cost state-of-charge indicator, which are used to indicate the charge status of battery. This device is specially used with the systems under battery charging station, which have no charge controllers. The indicator has 3 (three) LED lights of different color (e.g. green, yellow and red), which turn on, automatically in different states of charge of the battery. The users can easily identify the low charge level and take their batteries to the charging station for recharging. The cost of each state-of-charge indicator was about 40,000 KIP (~US$ 4). This device helped to avoid the use of charge controller and reduced the system cost. TRI also studied the locally available DC ballasts and improved their performance to make suitable for using in PV systems.

b). TRI installed one Battery Charging Station (BCS) and five Solar Home Systems (SHS) in Phon Ngam Village, Attsaphone district under Savannakhet province to demonstrate use and benefit of the technology among the potential users. The village is about 30 km from the nearest grid electricity and having almost no chance of being connected to the grid network in near future due it's remote location. The PV electricity brought many positive impacts including improvement in quality of life, children education, income generation, etc. It also increased the awareness of the technology among the rural people and further demands of such installations were noticed.

c). TRI trained users of the PV systems on smooth operation and to take care of their systems. Local young people were also trained to build up technicians who would be able to install and do the maintenance of the systems. TRI also sent two staffs to technology transfer training held in Nepal, which helped in building in-house capacity.

The second phase continued the research and dissemination activities that were addressed in phase I. these included mainly the development of PV systems/accessories locally trough adaptive research, demonstration of PV technology among potential consumers, dissemination of PV technology by workshops courses seminars, collection of information about the PV systems/accessories available in the country and performance monitoring of demonstration systems. A brief description of the activities and achievement in Phase-II is as follows:

a) TRI carried out the survey to collect data on available PV systems and accessories in the country. The objective of this study was to create a source of information and to prepare technology fact sheets for the above which would be a useful tool to the future implementers of PV technology with in the country. The survey shows that solar system is being used in the country since early 1981 but was confined within few government sectors. However, it was introduced to the private sector in 1998 with the installation of demonstration systems by TRI. At present there are many types of applications of PV systems e.g. solar home systems, battery charging stations, vaccine refrigeration, water pumping, remote sensing, micro wave remoter, etc. Up to February 2000, the total installed capacity of the PV systems in the country is 162.10 kWp. Based on the information collected through survey of systems/accessories available locally, TRI prepared some Technology Fact Sheets on PV system/accessories available in the country to provide future PV project implementers with the detailed information about the components available in the country, their types and quality, remarks on field tests and costs which would help them in designing and planning a sustainable project.

b) In PV demonstration activity, TRI installed two type of PV application such as: solar hybrid battery charging system and solar water pumping system in the Renewable Energy Technology Center (RETC). The **hybrid battery charging system** is a new concept in the country. The objective of this system is to show a model of supply electricity to a cluster of households/shops. The system has been

developed by combining together the ideas of Solar Home System (SHS) and Battery Charging Station (BCS). This is similar to the conventional battery charging station but avoids the hassle of carrying battery to the charging station from distant places by choosing the clients nearby to the charging station. The solar modules with the battery charging facilities are to be installed in one household which is identified as the **Key House (KH).** The other nearby houses are provided with one battery and DC lamps which are known as **Satellite House (SH).** Three storage batteries are charged every day by turns from Monday to Saturday.

a **solar water pumping system** installed for demonstration and research purpose in the energy park. The objective of the system will be to demonstrate and research the application to the potential users and the project implementers with the practical knowledge and benefit of the technology.

c) TRI, in cooperation with the Department of Electronic (DOE) carried out the adaptive researches on improving efficiency of DC ballast and Charge controller. Due to PV module and some of the accessories are generally imported. The imported accessories available in the local market often pose technical difficulties in operation since in many cases they are not particularly suited for the operating condition in the county. DC ballast available in the country which are usually used with the lead acid battery to power the fluorescent lamps in rural areas or in mobile shops, which it very low efficiency and high current consumption and low illumination which are impractical to use with PV system.

   Through adaptive activities, TRI improved DC ballast with less consumption, long life of lamp, bester illumination, and also completed of testing prototype of automatic charge controller with feature of overcharge protection, low voltage disconnect and auto reconnect. The field test will be done soon.

d) Public awareness on PV application was rose up through dissemination activities such as national dissemination workshop, out door exhibition and field demonstration. Moreover the people can access to information through dissemination material as brochures and installation of BCS and SHS manual

e) Training programme and technology transfer also done through this programme, TRI trained 14 technicians to develop skilled technician in rural areas who are expected to take over the maintenance of the PV systems in the locality, enhance the local capacity on the technology, to create employment opportunity in the rural areas, and disseminate the technology among the rural people. TRI also sent 4 staffs to technology transfer training on transistor regulator and Inverter technology held in Solarlab, Vietname.

   Moreover, three technicians attended special student programme held in AIT.

3. CONCLUSION

Information gathered from the survey of PV systems/accessories shows that use of PV systems is increasing slowly. Most of the accessories for the PV system are imported. These imported items suffer from lack of spares and after-sales-service. They

are very expensive too. Therefore, development of accessories locally is essential. The information will be useful to future program implementers in designing and planning PV projects.

The evaluation of the BCS shows the encouraging effect of demonstration. It has created more demands in its operating areas. Management committee consisting local people has proved to be the best approach for maintaining the system. Several BCSs have been installed in Lao by the foreign investors after the demonstration of this model. The demonstration of SHS has also been successful to create awareness of the rural people about the technology. It has also helped to build the local capacity and created the employment opportunity.

Under framework of RETs in Asia Programme, the Public awareness on RETs was increased, also the capacity of technicians and researchers are enhanced. The dissemination workshop provided a new dimension for Lao PDR to plan for photovoltaic applications in remote rural areas. The presence of government officials and international agencies will help in planning and decision making in this regard.

TRI made considerable progress in this phase. However, few activities were not done according the work plan. The remaining works can be completed in phase-III.

Status of Biogas and Biomass in Lao PDR

By Technology Research Institute (TRI)

1. Introduction

The agricultural residue in the country is a main factor to develop the use of biomass technologies such as: biogas technology, improved cook stove, etc. The biogas technology is more appropriate than the other, to reduce the number of wood from deforestation, and reduce the GHG emission from the waste of animal dung. Besides, in rural areas, most of the households have their own animals. It is therefore, the biogas technology thus become the most suitable technology for rural and livestock farm.

In Lao PDR, it is estimated that there are about 4 million metric tons of animal dung per year, the gas value could be produced by the biogas technology amount about 280 million cubic maters. There is a vast potential to adopt the biogas technology in the country.

Table 1. Number of Buffalo, Cattle, Pigs, Goats and Sheep, Poultry in some provinces

Province	Buffalo x1000	Cattle x1000	Pigs x1000	Goats and Sheep x1000	Poultry x1000
Vientiane M.	32.7	49.7	15.7	1.8	1340.0
Savannakhet	186.2	213.3	99.6	20.7	1416.6
Salavanh	68.9	69.4	54.7	3.5	566.91
Champasack	116.1	121.4	58.3	2.1	1250.7
Huaphanh	63.1	40.8	146.4	11.6	800.5

2. Status of Biogas and Biomass Utilization in Lao PDR

In Lao PDR, the use of biomass as energy is covered 90% of total energy consumption in the country, especially fuel wood for cooking and using in small-scale factories, and also, the waste from agriculture some have been used for gardening and rice fields only. However, the utilization is still low level of technique and technologies.

The materials needed for biogas plant construction in range from 8 m^3 to 16 m^3, and expected cost of biogas range from 8 m^3 to 100 m^3 are enclosed, all material vary depend on local market.

In the past few years, the biomass technologies have been developed and transferred to the local by government organization and some private sectors. TRI as a government organization have introduced the biomass technologies to the social of Lao PDR such as: Biogas technology, Improved Cooking stove and promotion of biomass technologies.

Recently, TRI installed more than 10 biogas plants with capacity of 8 cubic meters and 16 cubic meters in the country with the objectives to demonstrate and create the awareness of Lao people on the advantage of biogas technology. Moreover, TRI organized the training courses for Improved Cooking stove, and biogas plant construction for technicians from government organization, private sectors and provincial technicians.

Biogas technology, which use animal dung to produce gas for cooking, can reduce the fuel wood for cooking, it is also, reduce the number of animal that affect the environment such bad smell and release CH_4 which cause green house gas and cause earth temperature increase. The impact of this technology will reduce the deforestation of people for fuel wood, utilize animal dung for households cooking, and the waste after production of gas can be used as fertilizer for garden and rice fields.

Improved Cook Stove with 40% of fuel saving is also subject to the above-mentioned on biogas, due to its efficiency that uses less fuel wood, and gives more energy, it is also cause the reduction of fuel wood for cooking.

Conclusion

The rural energy consumption is the key issue for rural development, which is one of eight main strategic development plants of Lao Government, as well as the environment protection. The main energy consumption of rural people is fuel wood, major use of fuel wood is for cooking, and small-scale industrial. The increase of population will also increase the need of energy, and then increase the number of deforestation and impact to the environment problem.

In technical term, biogas is appropriate technology for rural people who is engages in agricultural because it is not only gets energy from waste or residue from agriculture, it can use waste from biogas back to their field in bio-fertilizer. However biogas technology adoption is still low in rural area due to it is high cost investment and complicate in construction and material, current assignment for researcher are suitable size, and easy of construction.