Grid -Connected Photovoltaic Power Generation System in Thailand: Case of Libong Island

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ABSTRACT

The PV power generation system grid connected at Libong Island is a cooperative project between DEDE and NEDO in a Demonstrative Research of Solar Energy Application for a 100 kW capacity installation. The facilities are formed by three systems distinctly different in sizes and characteristics from each other, which are a PV power station (85kW), PV power systems for schools (3 schools, 3 to 6 kW) and AC modules (ten locations, 110W PV panel and 100 W micro inverter at each). System installation was completed in May 2003 and has provided power supply to 450 households. The village could have 3 more hours a day of electricity use. This mostly benefits to students in accessing the longer daytime of electricity supply for their education. Not only the project makes the better basic infrastructure to the village but also the better life quality to the Libong Islanders.

1. Introduction

The 100 kW grid -connected PV power generation system at Libong Island is operated at Ban Batupute, Kantang District in Trang province under a cooperative project between DEDE: Department of Alternative Energy and Efficiency and NEDO: the New Energy and Industrial Technology Development Organisation, Japan jointly with PEA: the Provincial Electricity Authority of Thailand. The project started in 1992 for two-phase implementation. Phase 1 was in 1993 for a 4 kW prototype PV battery charging station at Ban Bon Khao Kang Riang in Kanchanaburi Province. That station has provided 147 households for electricity use and still having the great community participation in system operation and maintenance up to the present. This PV station was awarded in the Thailand Renewable Energy Award 2003, in the category of "Off-Grid Power System" and later was nominated for the ASEAN Energy Award 2003. A project phase 2 was in 1994 for a 40 kW PV battery charging station at Ban Pruenai, Yao Island in Phang-gna Province, providing service to 500 households. Later on, PEA installed a diesel power plant and extended its transmission line to this Island that effected to less utilisation of DEDE PV station. With some restrictions in development and expansion of that PV station, the system was finally transferred for re-installation at Ban Batupute on Libong Island and was inaugurated once in June 13, 2003 by the Energy Ministry, Dr. Prommin Lertsuridej.

2. PV System Characteristics

The system total capacity is 100 kW which the facilities are formed by three systems distinctly different in sizes and characteristics from each other as the following:

1) Main PV power station of 85 kW generating capacity with power control system, located in 6 rai-area close to PEA diesel power plant and is supportive by local administrative district. The plant installs 2 sets of PV array and supporting structure at capacity of 41.50 and 43.60 kW; 2 sets of 270 kWh battery; 2 sets of 45 kW inverter; and a control building. Figure1 illustrates the system overall diagram.

2) PV power generation for three schools in a total capacity of 13.2 kW. They are for 5.5 kW at

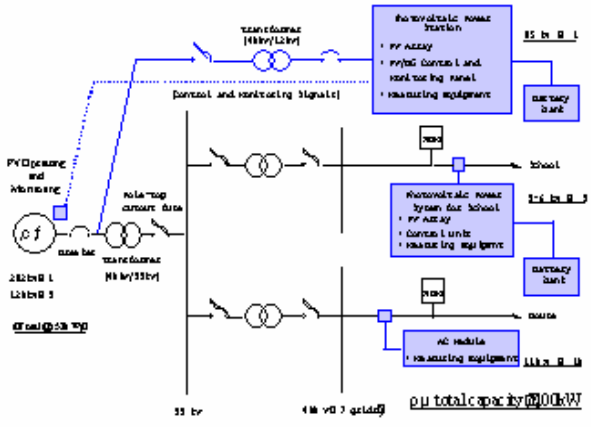

Fig 1: System Overall Diagram

Ban Batupute School, 4.4 kW at Ban Koh Libong School and 3.3 kW at Ban Lung Khao School.

3) AC module PV system for 10 units with a 110 watt-PV panel and a 100 watt-micro inverter are installed on electricity post for each unit and connected to a low voltage grid in a village. This facilitates us to identify the power supply configurations and its impacts on typical system operation.

Figure 2 illustrates the PV system overall diagram at Libong Island.

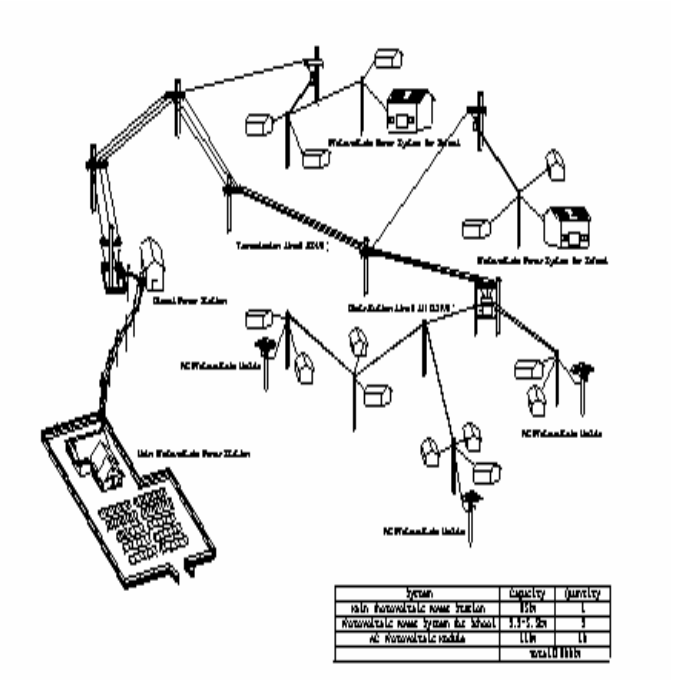

Fig 2: Libong Island PV System Overall Diagram

3. Results and Discussion

The project has fully achieved on its objectives and target, not only in term of RD&D programme but also in practical on operation and maintenance. The system installation has benefits to the remote rural area in Libong Island for 450 household electrification. These Islanders can access electricity supply for 3 more hours a day, i.e. 2 hours in the morning from 8 a.m –1 p.m. (whilst previously was 9 a.m. to noon) and 5 p.m.-midnight (whilst previously was 6 p.m.-midnight). This results in improving of a better basic infrastructure in local and communities with a better life quality of villagers at Libong Island.

Another benefit is on using this renewable energy for a 100 kW power generation can reduce a need in annual diesel fuel use by 20,000 –26,000 litres and no emissions released from this PV system plant. Besides the cleaner environment resulting from utilising a PV technology, the promising educational quality of rural students and teachers is also increasing.

However, the project is designed for a 5 year-operation, starting from April 1999 to complete in March 2004. It is now in a final stage of project evaluation and conclusion from data collected since February 2003 to date.

4. Conclusion

The demonstrative research project for solar energy application at Libong Island has remarkably achieved on its objectives for a grid-connected PV power generation system. It gives us a study result of a quantitative impact on PV power generation system connected to utility grid. The project can be further developed for system or plant extension and other applications using experiences on effective operations from this demonstrative plant. This project achieves of both its own target and of national energy strategy on increasing use of renewable energy for power generation. It supports the community for local energy self reliance, and the country on lessen an energy import dependency and on GHGs emissions mitigation by using this environmental sound technology.

With this success, DEDE will pursue and promote solar energy utilisations and PV applications, either for health care clinics or water pumping stations and even “solar home” for direct users.

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