



GYST



Global Youth Service Team

BGET - GYST Solar Electrification Project for Karen and Burmese Migrant Schools



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## Introduction

BGET (Border Green Energy Team) and 6 members of GYST (Global Youth Service Team) installed PV power systems for Tiar Aor Kiar Primary School and Light School and UV water purifiers for the first and Nya Li Ah Hta School in Mae Ramat and Mae Sot from 6 July, 2009 for 2 weeks. The schools were selected for solar power systems because all of them are located in remote rural areas, not grid-connected and also have student dormitories which have more need for power at night. BGET and GYST went back to Nya Li Ah Hta School to check the solar power system installed in 2008 and this time installed a UV-water purifier.

### Solar electrification for migrant schools

#### Tiar Aor Kiar Primary School



The school is located in a Karen village, Dala Okla, with about 300 people of 74 households who are mainly Christians and Buddhists. Their main economic activities are farming rice, corn, bean, sugar cane and livestock. The villagers' illiteracy rate is high in the village.

In the village, <sup>1</sup>about 20 households holding Thai ID cards had a Solar Home System (SHS) installed by the Thai government in 2005. Tiar Aor Kiar Primary School as a non-officially registered school gets support from NGOs such as TOPS (Taipei Oversea Peace Service) and BMWEC (The Burmese Migrant Workers Education Committee).

Its general information and current situation was told by the principle and a teacher, Htee Ku Hser.

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<sup>1</sup> It is not the exact number but one of the teachers mentioned it during an interview.

## 1. General information

- 1) Number of students: 102 (boys: 53 / girls: 49)
- 2) Age range : 3 – 15 years old
- 3) Number of teachers: 7
- 4) School hour: 8.30 a.m. - 12 p.m., 1 - 3 p.m., and 7 - 9 p.m. ( Monday - Friday )

The official school hour is between 8.30 a.m. and 3 p.m. except 1 hour lunch break from 12 to 1 p.m. Between 7 - 9 p.m. in the evening, some of students come to school to do their homework and study under the teachers' supervision as their parents are mostly illiterate so the teachers spend extra hours for the children. The school holiday is from March to May and 2 weeks in December.

### 5) School buildings

There are 4 buildings, 2 classroom buildings and 1 teacher's house for 3 male teachers, next to one another and another building for 2 female teachers is located across the school. About 10 students are staying in the teachers' houses. Each classroom building has 3 rooms for different classes and the teacher's house has 2 kitchens and 3 rooms.

- (1) Classroom buildings × 2
- (2) Teachers' dorms × 2
- (3) Toilet × 1

### 6) Current energy resources

#### (1) Lighting

The school uses 4 boxes of candles a day for lighting. 1 box has 6 candles and costs 13 Bahts, so they pay about 260 Bahts every month for it. Also, the students come to study in the evening bring their candles for their own use. They don't use Kerosene lamps neither rechargeable torch lights.

#### (2) Cooking

They make and use charcoal for cooking; collect wood during weekends and burn it in a pit and cover it with earth in layers to cool it down for about a week.

### 7) Water situation

There are 5 wells in the village.

## 2. Installation

The solar panels were installed in the middle of the playground and the controller, inverter, batteries and the water purifier were installed in the teacher's house.

- 1) Solar power system
  - (1) 130 watts × 2 panels
  - (2) Battery 125 amp-hours × 2
  - (3) Controller 12 volts 30 amps
  - (4) Inverter 220 volts AC / 300 watts
  - (5) Light (AC 20 watts) × 5
  - (6) Outlet × 1
  - (7) Watt Hour Meter × 2

- 2) UV water purifier

It purifies 3 liters of water per minute and inactivates illness-causing germs.

### **3. Villager interview**

To understand the situation with Solar Home Systems (SHS) in the village, a couple of households were interviewed with a teacher's translation from English to Karen and vice versa. It is recommendable to spend more time to interview with more villagers in the future so that more in-depth information will be collected to diagnose benefits and problems of the existing SHSs.

The first interviewees were a young couple running a grocery store. They had 2 preschool kids. The first installed system included 2 lights but they added 1 more light later. They have a 65 W TV, 10 W speakers, and sometimes borrow a DVD player from their neighbor to watch movies. They also use a mobile phone and a rechargeable torch light. Before the SHS was installed, candles and kerosene lamps were used in the house. The lights are on between 7 - 10 p.m. or 11 p.m. and they go to bed at 10 or 11 p.m.

They explained quite a few benefits from SHS; 1) the store was used to be closed at 7 p.m. but now at 10 p.m. so more income is generated; 2) it allows them to have more social life with neighbors such as watching TV and movies together and also they offer the neighbors to charge their torch lights for free; 3) TV help them access to more information of Thailand and Burma.

As their kids are young, they didn't see its impact on their academic performance. The system seemed to run without big problems but there were minor problems such as frequent on and off of lights at the early stage and when the battery didn't work, they didn't know what the problem was but finally refilled the water after asking around in the market. It is assumed that there was not enough training or information for the villagers to maintain the system. During the rainy season, the electricity was enough to power the lights but not for a TV. However, they satisfied with the SHS and its performance in general.

The second interviewee has 6 children and 2 of them are students and 1 of them is a new born baby. They have 2 lights but one of them was broken; it is not clear if the lamp or ballast is broken and a 38 W TV and also a 35 W DVD player. Because of the baby, the light is on around 6 p.m. in the evening and off at 6 a.m. in the morning. Concerning that they used to use candles for light before, SHS seemed to bring much comfort to their life. They watch TV mostly in the morning between 7 - 10 a.m. during week days but 8 - 10 a.m. during weekends. In rainy season, they turn off the light and TV as they think lightning or thunder could break the system. The interviewee pointed out some benefits of the SHS; 1) the kids can study longer in the evening; 2) they have more time to be with their family and neighbors; 3) TV helps them an easy access to more information. However, it didn't seem that people about potential maintenance cost such as replacing the battery when it is run out as they answered a new battery would cost around 300 Bahts and about 100 Bahts for a second hand one whose real cost is about 5,000 Bahts.

### Light School



In 2007, Light School was founded in a Karen-Burmese migrant village near a cow market in Mae Sot and a NGO called PPDD (Peoples Partner for Development and Democracy) supports it. The students are mostly Karen and some of them are from Burma and other ethnic minority groups. The interviews were carried out with the principle, Anna and a teacher, Win at the school.

#### 1. General information

- 1) Number of students: 136
- 2) Age range : 3 – 15 years old

3) Number of teachers: 8 (4 of them stay in the school)

4) School hour: 8:45 a.m. - 3:30 p.m. (Monday - Thursday) and 8:45 a.m. - 12 p.m. (Friday)

The official school hour is between 8:45 a.m. and 3:30 p.m. and the school offers lunch for the students. The vacation is from the 2<sup>nd</sup> week of March to the 2<sup>nd</sup> week of June. During the vacation, they run alternative classes such as dancing and singing for a half day on Monday, Wednesday and Friday between April and May. Moreover, some of students whose families are in Burma go back home during the vacation but some whose families are in Mae Sot stay in the school.

5) School building

The school consists of 2 school buildings of 7 classrooms, 1 dormitory building of 2 rooms separated for boys and girls, a kitchen and a dining hall in a same building, a teacher's house of 3 rooms including a room for students, a clinic, a library, a toilet of 4 rooms, a bath room, a storehouse for school supplies and a building to grow mushrooms for income generation.

(1) Classroom building × 2

(2) Dormitory × 1

(3) Teachers' house × 1

(4) Kitchen with a dining hall × 1

(5) <sup>2</sup>Clinic

(6) Library

(7) Toilet × 1 (4 rooms)

(8) Bathroom

(9) Storehouse

(10) Mushroom building

6) Current energy resources

(1) Lighting

The school used 3 - 4 packs of candles, which costs 100 Baht, a week for lighting. The students staying in the dorm go to bed around 8.30pm or 9pm.

(2) Cooking

They use charcoal for cooking and it costs about <sup>3</sup>1,200 Bahts a month and fire wood

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<sup>2</sup> The clinic is not only for the students but also for the community; doctors come to visit twice a month on Sundays from Mae Tao Clinic and one of the students was sent to the clinic to get training.

<sup>3</sup> 1 bag of charcoal costs 190 Bahts and 10 bags are bought at once.

from the field in dry season.

(3) Water pump

To pump water from the well, they use a gasoline pump and pay about 100 Bahts a month.

7) Water situation

There is a well built before the rainy seasons this year; water pipes are connected to buildings such as the kitchen, toilet and bathroom, however, they used to carry water from a lake near the school before. Because of its location in the middle of corn field using pesticide and chemical fertilizer, the water is not drinkable so they buy 6 bottles of water which costs 10 Bahts for each 10 liter bottle.

## 2. Installation

The solar panels were installed on the roof of the kitchen & dining hall and the controller, inverter and battery in the teacher's house. A decision was made not to install the UV water purifier at the Light School at this time. The possibility exists of an agricultural chemical contamination problem for which UV treatment is ineffective. We await the results of testing of the well water in order to make a decision on what water purification system is best suited for the school.

1) Solar power system

- (1) 130 watts × 1
- (2) Battery 80 amp-hours × 1
- (3) Controller 12 volts 10 amps
- (4) Inverter 220 volts AC / 150 watts
- (5) Light (DC 10 watts ) × 3
- (6) Watt Hour Meter × 2

## 3. Expectation

According to the interview, there are some expectations with the solar power. Firstly, teachers expect better safety for the students not to use candles at night as much as before. Since the buildings are all made of bamboo and wood, they have been always careful of using candles. Secondly, better academic performance is expected as they can study longer under the better condition with light. Moreover, the school has its own long run future plan to purchase electric appliances for better education such as computers, sound systems, a TV, and a DVD player.

## Nya Li Ah Hta School



The school is located in a Karen village, with the population of about 250 who are Christians and Buddhists, 1 hour away from Mae Sot and 10 - 15 minutes from the border. According to a TOPS staff, many of the Burmese students are brought to the school when their parents go to work in Thai territory from Burma and go back with their parents on their way home because of the geological reason. They expect better education covering the subjects of Burmese, Thai, Karen and English with more materials and supplies in Thailand. There are only 2 houses with SHS as the systems were provided only for the households holding Thai ID cards.

### 1. General information

- 1) Number of students: 83 (boys: 40 / girls: 43)
- 2) Age range : 4 – 15 years old
- 3) Number of teachers: 5 (2 or 3 staying in the school)
- 4) School hour: 9 a.m. - 3:30 p.m. (Monday ~ Friday )

The official school hour is between 9 a.m. and 3:30 p.m. and the school offers lunch for the students. The vacation is from March to May and there are 10 days off during the school terms. 30 students living in the dorm whose families are in Burma go back home during the vacation.

#### 5) School buildings

The school consists of 2 <sup>4</sup>classroom buildings, a <sup>5</sup>dormitory building, a kitchen with a dining hall in a same building, a teacher's house rooms,

- (1) Classroom building × 2

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<sup>4</sup> One of them is for grade 1-2, preschool students, and the other smaller one is for grade 3-4.

<sup>5</sup> It has 2 separate spaces in a big room and the other a lot smaller space with 2 sections.

- (2) Dormitory × 1
- (3) Teachers' house × 1
- (4) Kitchen with a dining hall × 1
- (5) Toilet × 1

6) Current energy resources

(1) Lighting

Before the solar power was installed, they had used to use candles for light. With the solar power system, they don't use candles during dry season but rainy season. In rainy season, they use 40 bags of candles and each bag has 6 candles and costs 12 Bahts.

(2) Cooking

They use charcoal for cooking and it costs about 960 Bahts a month. 1 bag of charcoal costs 80 Bahts and 12 bags are used a month.

7) Water situation

There are 2 wells in the village and one of them for drinking and cooking and the other one is for washing and etc.

## 2. Installation

1) Solar power system

The solar panels were installed across the classroom buildings on the play and a controller, an inverter and batteries were in the big classroom building in 2008. The wooden fence around the solar panels was probably to protect the system from the students

- (1) 120 watts × 2
- (2) Battery 125 amp-hours × 2
- (3) Controller 12 volts 30 amps
- (4) Inverter 220V AC / 300W
- (5) Light ( AC 20 watts ) × 6

: The big classroom, teacher's house, big dormitory building has 2 lights for each.

- (6) Watt Hour Meter × 1

2) UV water purifier

The UV water purifier was newly installed which was brought back from Light School.

### **3. Use of power**

- 1) Dormitory: 6 - 9 p.m.
- 2) Teachers' house: 6 - 9 p.m.
- 3) Classroom building

They use the lights after sunset for studying; some of slow learners come to the classroom to study in the evening and also if there are exams, some of them study in the same place.

### **4. Review**

The teachers answered that the solar power system helped the students study longer in the evening so that they could have more opportunities to show their talents and also it brought better safety to the students at night as they don't use candles as much as before. The system had no problem except the Watt Hour Meter melted out since one of the teachers took out acid and connect the wires back in a wrong way. In rainy season, the power is not enough for 6 lights but only 2 lights for the dormitory and teacher's house so they still use candles in rainy season. One of the teachers complained about the cost for candles, and it might show their high expectations with solar power when it was installed.

## **Discussion**

According to the project of Nya Li Ah Hta School in 2008 and expectations of schools with newly installed systems, it is expected that the solar power systems would bring better safety not using candles as many as before and improve the students' academic performance in the long term. Furthermore, assuming that they use fewer candles with the system, there will be cost reduction of energy source for light. In these respects, it is recommended to ask the teachers or staffs of each school to keep a record of students' academic improvement, especially of those students, the so called slow learners, study at school in the evening and also the changes of money spent for energy source for light in regular base. The records will help to show the differences between before and after the installation of the power systems. Moreover, it would be helpful to keep the system sustainable if there are regular check-ups of the system operation including breakdowns of each part from the technical point of view. For the installers, it will be useful to collect the records from each site and statistically analyze them in regular base, for example, once a year, to understand the impact of their projects.