

# Border Green Energy Team Kick-Off Report



**October 19, 2005**

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# Shedules

## Original Timeline

Project: <b>Border Green Energy Team</b>													
06-Mar-05													
Year	1	2	3	4	5	6	7	8	9	10	11	12	13
Month													
<b>Village Sustainability</b>													
Recruit Staff													
Initial Village Surveys													
Formulate Plan of Attack													
Train Staff													
Start Village Trainings and Start repair work in villages													
Continue Work in first County													
<b>Micro Hydro Work:</b>													
Identify Villages													
Design Systems													
Procure Equipment													
Install Systems (two)													
<b>Camp Trainings:</b>													





## **Weekly Reports**

### ***Weekly Report: Sept 13 2005***

BGET came to Ta Song Yang District to meet people who work in Orbortor (sub district or Tambon level management).

There are 5 Tambons that we plan to talk to them. They are Mae Tan (แม่ต๋าน), Mae Wa Luang (แม่วะหลวง), Mae U Su (แม่อุซู), Mae Song (แม่สอง), and Ta Song Yang (ท่าสองยาง).

We started at Tambon Mae Tan . The head of Orbortor was having a meeting. We made appointment to come back at 2 pm. The lady who works in the office gave us some information about their plan to have a local Tambon technician to maintain the SHS.

The next one was Mae Wa Luang. There was no one that we can talk to, so we made an appointment for 1 pm to meet with Prathan Sapha which has the lower level of making decision at Orbortor.

### ***Weekly Report: Sept 17-23, 2005***

Salinee Tavaranan  
BGET Project Coordinator

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The Planned Schedule for the Week

- 19 Purchase tools for technician training
- 20 Visit Solartron and DEDE
- 21 Meet with Eh Kalu for supplies and training
- 19 – 23 Meet with Hans for future camp training
- 17 – 31 Formulate technician training manual

#### ***Saturday 17 September, 2005***

Salinee was in Bangkok and shopping 35 tool kits (multi-meters, pliers, wire strippers, U and ring clips, small spade screw drivers, medium convertible screw drivers, electrical tapes, and utility knives) for technician training in October. The shopping would not have been done without help from Chom's brother, Nu.

Andrew (at Mae Sot) worked on final proposal for Solartron and updated Mae La Camp Training pictures.

#### ***Monday 19 September, 2005***

Salinee (in Bangkok) worked on the proposal in Thai version for Solartron meeting on Wednesday including the broken SHS data and a sample of survey form.

Andrew (in Mae Sot) worked on technician manual for the village training.

***Tuesday 20 September, 2005***

Andrew (in Mae Sot) sent out the health statistic and patient tracking reports to Eh Kalu. He also contacted Hans (ZOA) about the possible future camp training which would be after October 10th when Hans comes back from Netherlands and Mae Hong Sawn

Chris, Sirikul, and Salinee had a meeting with DEDE in Bangkok about their battery charging stations. The meeting minute is below (Salinee has sent out an email):

*Chris, Sirikul, and Salinee were supposed to meet with Khun Amnuay who is the Deputy Director General at DEDE but he had to go to an urgent meeting at the House. Instead, we met with Khun Pirach (Senior Scientist) and Khun Suree (Senior Engineer) from Bureau of Solar Energy Development.*

*They addressed their failures of the battery charging station as local managing problems. They have claimed the warranty from the installation company from time to time when the systems failed.*

*We told them that we are working on training the local technicians to maintain the PEA's Solar Home Systems by approaching the local government (Or-bor-tor) and with the help from local NGOs (TOPS, KNCE). We asked them if there is anything that we can help to maintain their systems in Tak Province and let them know that we have tried to fix their system once.*

*They mentioned that they have 5 million baht budget for maintaining their battery charging station. The policy is that they will have a bidding process for one company to maintain all of the systems. If that is the case, we could be the subcontractor for the company at Tak Province. There is a possibility that the rule might change to split the budget into different regions. They would know this in a couple months. We can try to bid for this but we have to have a registered organization being our umbrella organization due to the government auction restriction.*

*They also asked for the list of training expenses in the villages (tool kits, transportation and gas, food, trainer fee, maintenance fee, etc.) if we would set up one. I will work on this.*

*Sirikul asked them for the data of their charging stations in Tak Province which still are under warranty and the one that warranty expired. They would email that to Chris or Salinee.*

*From Salinee's opinions, DEDE realized that our work would be useful for their systems and would lower their cost of maintenance. Also, we already have the connections with local NGOs and government. They would like to help us. We just have to play by the rules.*

Chris and Salinee went to Palang Thai Office and had an interview with a reporter from Sarakadee (meaning Documentary) Magazine at 4 pm. The reporter is focusing on different types of renewable energy in Thailand. He contacted Palang Thai for Solar Energy and the government funded Solar Home System Program. He is interested in coming to Mae Sot and going to the village to get some inputs from the villagers. He proposed the date from October 1 to 3. He will contact Salinee in Mae Sot to arrange the trip.

### ***Wednesday 21 September, 2005***

Andrew (in Mae Sot) continued working on the technician manual. He also contacted Eh Kalu and set up the meeting at dinner on Thursday 22 after Salinee comes back from Bangkok.

Chris and Salinee had a meeting with Solartron at their Bangkok office at 9 am. The meeting minute is below (Salinee has sent out an email):

*Christ and Salinee did not meet Dr. Dusit but we met with Khun Sujarit (Government Sales Manager), Khun PalaPol, and Khun Santipap (engineers who work on the installation of SHS).*

*They briefed the company history. It registered as a company in 1986. The company has worked on water pumping systems, battery charging stations, public long distance phone systems, mini-grid and hybrid systems in 3 National Parks. For solar module production, they have the plant in Nakorn Ratchasrima Province (northeast of Thailand) producing 30 MW per year. The cells are imported but they have a plan to produce the solar cells in 2007 using semiconductor wafers.*

*They have training class at their branch in Bangkok twice a month (the second and third Saturday of the month). This is open to anyone who is interested in solar and other renewable energy technology of Solartron's products and systems. The class covers the basic ideas and the usage of the systems. The speakers would come from the academic institutes that they have connections with.*

*They mentioned about surveying the SHS after 1 year and a half of installation. It is part of their contract with PEA.*

*They realized the inverter problems. They said that the first lots of inverters are having problems after they have been installed but the currently improved ones operating better. Also, the problem of PV installed in shading, they said that sometimes the owners of the systems didn't want it to be installed where more appropriate according to the cultural belief of locations. Chris also showed them the pictures of reversed diodes, missing metal connector, and melted terminal strips. They realized that the first 2 were their production defects. They didn't seem to know what caused the melted the diodes but Chris explained that was from direct-connected reversed polarity of batteries to PV.*

*Solartron understands how important of the training to the local technicians and villagers and will propose to their Director (Khun Wandee) about our project. Even better, they asked if there is anything else we would like from them, would 200 inverters be enough for starting since we might run out before we return the broken ones and receive the new one (concerning lead time). They*

*realized that the demonstration systems are important for the training as well. At the end, we told them that we will come up with different options of funding which are training expenses (tools, transportation, etc.) and how often, fixing systems per broken unit, fixing systems per year, and the total budget for SHS part of our projects. They will decide how much they can help us. It seemed to Salinee that they might be able to offer more than what we first asked them.*

*Salinee will work on dividing the different types of budget.*

*They also asked us to let them know about the training, so they might send someone to help us train the technicians.*

Chris added that Solartron certifies ISO 9001 version 2000, ISO 14000, and ISO 18000. It includes collecting their customer warranty claim forms and information which we have to provide them if we are to fix the systems for them.

### ***Thursday 22 September, 2005***

Salinee arrived Mae Sot.

Salinee and Andrew worked on budgeting to propose to Solartron.

Salinee, Andrew,

*3) Central "refresher" Training in Mae Sot, addition of his people in Or-Bor-Tor meetings, or possible trainings in camps attended by his folks. He said we should wait on the result of our discussions of visiting clinics before deciding on another central Mae Sot training.*

*As for Or-Bor-Tor trainings, Watit is not big on this idea - it depends on many factors but will have to keep this in discussion.*

*Trainings in camps attended by his folks would only really be helpful if we had physical systems to work with in the camps. Part of this relies on our demo system from Solartron, but even this is not the best as it will not be exactly what the clinics have. It would be better if we could get our hands on a traveling clinic system as well.*

*4) Additional systems for clinics currently without Solar Power. He didn't have any immediate numbers but Andrew told him Walt definitely needed some numbers by Dec 1.*

*5) Talk of new systems also brings up redesign issues.*

*- Fold-able or roll-able panels if possible..*

*- Lighter and more powerful batteries - who doesn't want that?*

*Not sure if the following items really fit under redesign. Andrew thinks we can definitely look into these items.*

*- Lights for night use of microscopes. He couldn't give me any tech specs on the scopes. Andrew has his GHAP friend looking into this.*

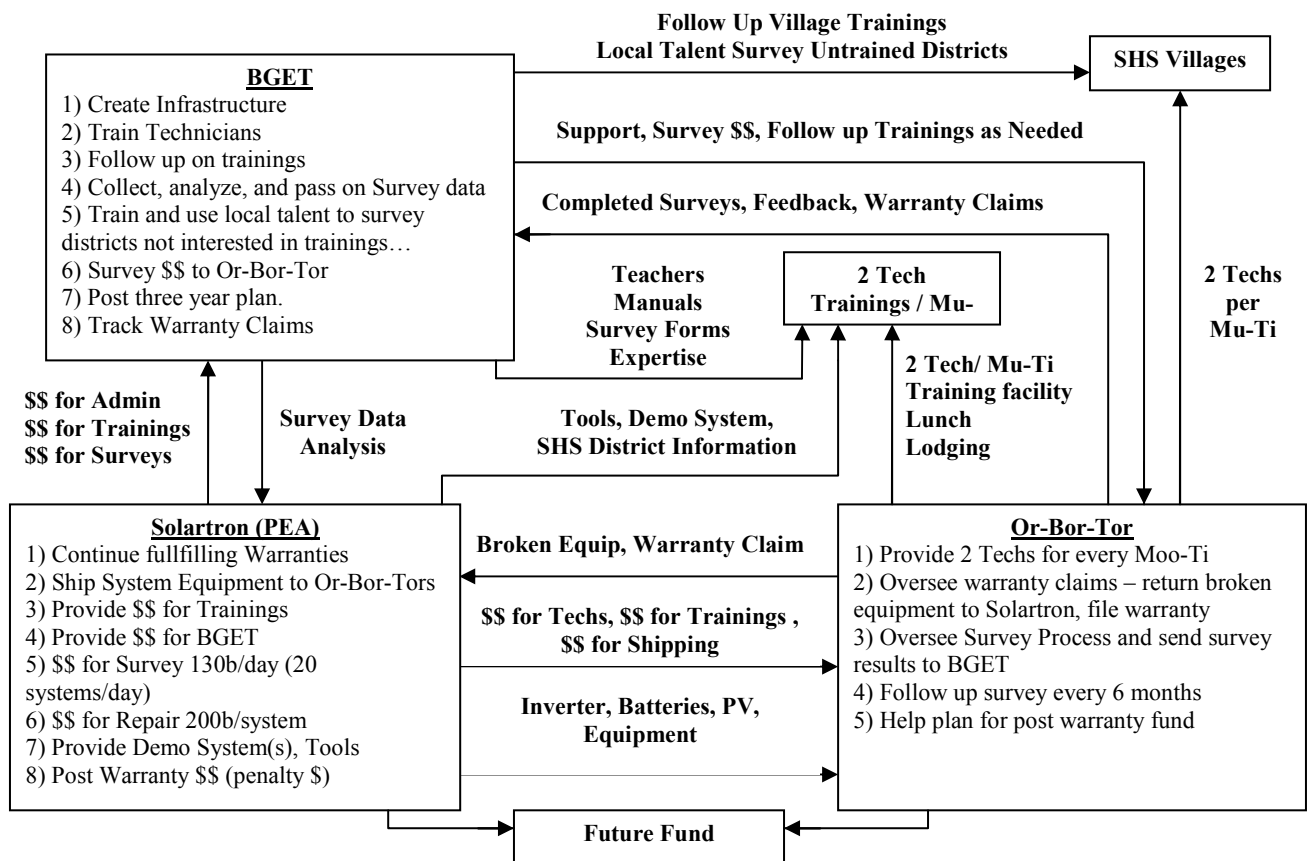
*- UV filtration system. A power hog, no? Any thoughts?*

Andrew's own addition, Pfizer has donated about 20 laptops over the past 2 years to the clinics. They run these as well as a printer and scanner off of our panels with an inverter... We can do it for the laptops, but wouldn't it be better to look into cutting the inverter out and just running on DC? Maybe we can get in the loop with Pfizer and have them donate DC equipment next time... they certainly have enough money.

6) MH training and evaluation. We need to fit this in the mix somehow. Those clinics with semi-operational systems would be better served by a site visit than further training... although hopefully the guy at the Mae La training is able to make his system function better. Andrew thinks Salinee and Andrew can actually handle all of the MH we covered at Mae La as it was fairly cursory, having Chris along at these trainings would be the best.

**Friday 23 September, 2005**

Andrew worked on BGET SHS project structure and came up with the flowchart below. Watit, Andrew, and Salinee had a meeting about the SHS structure and the functions of: BGET, Or-bor-tor, and Solartron. Watit gave some inputs on the plan.



**Money Notes:**

Tech Rate for Survey and Repairs is based on 130b / day rate. Days for survey and repair is based on 20 systems a day.

Work days = (# of systems in Techs Moo-Ti / # of Techs in Moo-Ti) / 20 Systems a Day

This rate will be paid for at least the first two surveys. Following that until the end of the warranty period, techs will be paid by broken systems fixed.

Salinee received the UNDP Micro hydro proposal from Watit. She will read during the weekend and see where she can help with the further steps for this project.

### **Summary**

BGET accomplished most of the schedule except for meeting with Hans about future camp training. He is away until October 10. We will contact him when he gets back for his trip.

## ***Weekly Report: Sept 26- Oct 7, 2005***

Salinee Tavaranan  
BGET Project Coordinator

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The Planned Schedule for the Weeks

- 26 – 28 Pa Dae student training on Solar Home System
- 17 – 31 Formulate technician training manual
- 1 – 3 Possible technician training at Tam Bon Mae U Su
- 4 Starting the Mae U Su's village survey

### ***Monday 26 to Thursday 29 September, 2005***

Watit contacted Or-bor-tor Mae U Su for the expected training (half of three days after their monthly meeting). Apparently, they did not mention our training at their meeting on the 19<sup>th</sup>. Watit suggested that we should contact them back after the other two technician trainings at the end of the month (19<sup>th</sup> – 21<sup>st</sup> and 25<sup>th</sup> – 27<sup>th</sup>) and use these as examples.

Salinee contacted Khun Nukul from PEA about these two trainings. He mentioned that he would bring some inverters from Solartron to our trainings.

Salinee contacted her advisor at Chulalongkorn University about the UNDP funded micro-hydro project that the engineering students might be interested in as a senior project. She emailed the proposal to the professor for the announcement. Salinee will set up the date for the presentation of this project by Chris during the first week of November.

Andrew worked on technician training manual. He also worked on the survey data.

Salinee and Andrew prepared warranty claim forms and letters of introduction to the head of the villages where BGET planned to have the survey on September 30 to October 3.

On Wednesday 28, Salinee contacted Khun Narin from PEA according to the process of warranty claims. The information of the conversations is below.

### *The Process of Warranty Claim*

*Solartron → PEA North Region 2 → Mae Sot PEA → Or-bor-tor*

*The PEA in Bangkok never deals with the warranty claim but they have done just the one that BGET reported to them. Narin also mentioned that there were the repeated claims for the same broken systems to Solartron and they complained about it. The person who can contact Solartron should be from PEA North Region 2 but there are also the cases that the claims filed from Mae Sot PEA directly if they need Solartron to fix the systems more quickly (from Salinee's phone conversation with PEA North Region 2 in Pitsanuloke Province). Salinee also asked if there was the case that Solartron had to pay for the late fee after 7 day notice. The answer was none. Solartron acted fast enough not to pay the fee. It might be true assuming because there are not many broken systems reported.*

*Salinee also talked to Nukul (PEA). He is coming to our trainings on Oct 19 – 21 and Oct 25 – 27. He could only bring 15 inverters (from Solartron not from PEA) with him. Even though he knew that both Or-bor-tor have 2,600 SHS the 15 inverters would not be enough to fix all the broken systems. The rest of broken systems need to file the claims to Solartron.*

*Before this (after Salinee knew that the reporter from Sarakadee Magazine would come to the village), Andrew suggested that we contacted Solartron and asked for 30 inverters to take with us for our own survey (our team and TOPS interns). She could not get a hold of the government sales manager for two days. Finally, Salinee called the other person on his cell phone. He said that he would talk to his boss and get back to us by yesterday but we never heard back from them Salinee even mentioned that it would be good image for them on the article if they provide us the inverters.*

*From these conversations, it might be more difficult to get help from Solartron than we thought. It also seems that PEA and Solartron work together (Salinee's opinion). We might have to step back and do our job the way that we don't have help from Solartron (training and help villagers to file warranty claims). We will still proceed the proposal to Solartron with Walt and Chris' inputs.*

*We will submit the warranty claim forms (which Andrew made) to the Or-bor-tor for the broken system from this survey and ask them to submit to Mae Sot PEA. We will follow the process and see what will happen.*

### ***Survey System Trip in Tambon Mae Wa Luang 30-09-05 to 04-10-05***

*BGET, 3 TOPS interns, and 3 people from Sarakadee Magazine went to Mae Po Village in Moo 3 of Tambon Mae Wa Luang on September 30. We planned to survey 2-3 Moo in Mae Wa Luang but we could finish only one (Moo 3).*

*The magazine team stayed with us until Oct 2<sup>nd</sup> and left for Mae Hong Son Province for information on Solar Power Plant. We mentioned to them about our data on failed systems and it is expected to get bigger if the information does not reach Solartron and they come to fix it. We also mentioned that we are working on helping the systems sustainable and trying to get Solartron provides us the inverters but we haven't been contacted back about this yet.*

*We have surveyed 164 systems and found 16 failed systems (10.3% failure)*

*11 systems have broken inverters*

*3 systems have bad batteries*

*1 system has melted terminal strips*

*1 system has both bad battery and broken inverter*

*According to PEA data, Moo 3 has 179 systems. There were some houses that we did not survey because no one was home.*

*On the last day, we stopped by Or-bor-tor Mae Wa Luang and dropped off the warranty claim forms for 14 broken systems (we could not provide the information for the other two systems because the owners were not home when we checked the systems). We asked them to send these forms to the provided address of Mae Sot PEA and follow up the claims since they will get the penalty fee after 7 days when Solartron receives information if the systems would not be fixed.*

*We also stopped at Mae Tan and Mae Song Or-bor-tor to confirm about the trainings on 19 – 21 and 25 – 27 of October. We will mail the letter and project information to them next week.*

*One of the TOPS interns (Pong) told us that he heard one broken system that we reported to PEA during the village training has been fixed. He does not know when it was fixed and what happened to the other 5 systems.*

*We follow the proper process to fix the broken systems with the help from Or-bor-tor. We have to see how fast can Solartron act with the process.*

*We will also send the letter and project plan to all 6 Or-bor-tor in Tha Song Yang and let them know that we will have the training in 2 Or-bor-tor.*

*We will try to approach Or-bor-tor in Mae Ra Mad District next month the same way and try to set up the training there.*

***Wednesday 5 to Friday 7 October, 2005***

Salinee sent out the technician proposal for 6 Or-bor-tor in Tha Song Yang with the confirmed training in Mae Tan and Mae Song. BGET will follow up with the other 4 Or-bor-tor to set up the training in November and December.

**Summary**

BGET have not accomplished the plan schedule for the student training in Pa Dae and Mae U Su. The student training would need the demonstration system because we will not be able to have the training close to the SHS villages. The Mae U Su training has to be rescheduled in the near future (November or December).

***Weekly Report: Oct 10 – 14, 2005***

Salinee Tavaranan  
BGET Project Coordinator

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The Planned Schedule for the Weeks

- 14 EU proposal deadline

**Thai Village SHS Project**

- BGET received 15 inverters from Solartron (through Bangkok PEA).
- BGET received 1 demonstration system from PEA (need to be picked up in Bangkok).
- Andrew finished writing the technician trouble shooting manual for the training.
- Mae Sot PEA received the warranty claim forms that BGET sent through Or-baw-taw Mae Wa Luang from the last survey on October 17, 2005. PEA will forward the information to Solartron by October 18.

**Refugee Camp Training**

- Meeting with Hans from ZOA: Planned to bring 6 students (Engineering Study Program) from Mae La Camp to survey SHS in Mae Ra Mat District on November 14 to 19, 2005. ZOA will support the expenses (food, fuel, and possible instructor fee).
- Next camp trainings:
  - Planned for Um Pium Camp (2 hours from Mae Sot) and Nu Po Camp (5 hours from Mae Sot). It will be less theory and more practical. The Um Piam target groups will be students from Agriculture School or Carpenter School.
  - Next training will be in the third week of January 2006 considering ZOA schedule

- Sent letters asking for permission to Mae La Camp Commander, Camp Education Coordinator, and Camp Committee Chairman

### **UNDP Micro-Hydro Project**

- KNCE has to report the project progress to UNDP in 3 months after the first budget approval (Watit mentioned that it would be anytime in October).
- BGET contacted a professor at Chulalongkorn University and set up this project as an Engineering Senior Project. If it works out, the students will collect the site data and design the system with help and support from BGET. Chris will present the project information to students on the first week of November.
- If the project with Chulalongkorn U. does not work out, BGET needs to collect the site data and design the system.

### **Meeting with Walt and Chris in Bangkok on Saturday 15,2005**

- BGET will submit the Solartron Proposal (during the first week of November) after the first 2 technician trainings.
- Include GE Newsletter, BGET photo on website, ISO issues, Solartron possible future market into Solartron Proposal.
- Try to get more inverters from PEA for the village survey on November 14 – 19
- Proposal for Bangkok Solar: Chris will send email to them, Salinee will write a proposal asking for 10 (43-W) solar panels and a demonstration system for camp training.
- Salinee will contact PEA for Bangkok Solar system specifications.
- Possible funding for BGET: ASHDEN Awards, 2 individual(Phillip and Linda) in Canada for tool kits



0.2 5	Introduce Manuals, How to use tech manual, tech responsibilities, survey form	How to use manuals, tech responsibilities after the training. Survey form, broken systems, what can be fixed. Want needs to be put in for warranty.	need 1)tech manuals 2) solar manuals
0.7 5	Volts, Amps, Watts BASIC	From GE, Palang Thai Manual	
0.2 5	Safety	Patience, think everything through, electricity can be dangerous, whole system approach, shorts, battery considerations	
1	Lab 1: System Visit, Talk about energy flow, Tight terminations, cleanliness, good clean wiring. System location (leaky roof, high traffic) <b>LUNCH</b>	1 -3 groups, all working houses	need 1)empty system block diagrams
0.5	Panel Orientation and the movement of the Sun.	No PSH stuff. Just explain that the panel needs to be perpendicular to the sun to give its maximum output, and that shading is a big deal. Cleanliness too - because dirt is just like shading.	
0.5	Brief FORTH unit Summary	Specific Information on the FORTH Charge controller - what do the LED's mean. What to look for as far as trouble indications. What to look for as healthy indications. What does a charge controller do?	
1	Multimeter Use	What is a multimeter? How to make measurements. Safety. Why does this help you?	
0.2 5	Solar Panel Health	Shading, Voc, Isc. How to measure - what they mean. SAFETY!!	

0.7 5	LAB 2: 3 groups		same houses as lab 1	Homeowner Interview, Solar Panel Measurements, Voc, Isc. Solar Panel Site assessment.					
<b>END DAY 1</b>									
<b>HOMEWORK - 1 House per 2 people System survey up to this point.</b>									
0.2 5	Homework collation		People write down HW1 results on big sheets of paper and hang around class for further. All houses should have working systems.	it would be great if we had 10 big sheets with survey questions on them that people could fill out.					
0.2 5	Battery Safety		Short circuits. Acid. Recycling						
0.5	The Battery		Energy Storage. How the battery fits in the system. Charging of battery. Discharging. LVD						
0.5	The Charge Controller		What a charge controller does. How it fits in the system. Load controller.						
1	Battery Maintenance and Homeowner Education		Talk about battery maintenance and its importance for a sustainable system. Talk about homeowner education.						
1	Putting it altogether DC		look at the entire DC system as a whole. How can you tell if it is working? Without a VM? What are the signs? With a voltmeter.						
0.5	LAB 3: Battery and Charge Controller		3 groups	Back to Same survey house to finish up DC survey.					
<b>LUNCH</b>									
0.5	Add results to surveys around room		Talk about houses with good DC systems.						

2	LAB 4 - Everybody		1 group	GO to abnormal DC houses. Burnt diodes. Bad Charge controller. Bad battery. Have class fix what is broken and talk to homeowner about the system and system maintenance (Karen Interns).
1	Abnormal DC House discussion		How to repair. Similar scenarios. What to do? Fix or warranty? Class input. Sustainability	
0.5	The Inverter		Talk about the inverter and what it does.	
	<b>END DAY 2</b>			
	<b>HOMEWORK - 1 House per 2 people System survey houses with inverter problems (do all DC but AC issues). Do not diagnose.</b>			
0.2 5	Homework on big sheet of paper		People write homework on big survey sheets	
0.2 5	Talk about surveys		Talk about what people found out about AC systems without diagnosing. How much experience do they have with AC?	
0.5	Inverter and AC Wiring		Talk about whole AC system	
0.2 5	AC system safety		nuff said	
0.5	Ballasts and Lot Fai		Diagnosing bad ballasts and bad bulbs	
0.2 5	Continuity		what continuity does for you	
1	Lab 5		3 groups	troubleshooting AC wiring
	<b>LUNCH</b>			
0.5	AC system Questions from class			





## Letter to Mae La Chairman

34/53 Mae Sot – Mae Tao Road 63110  
Phone: 055 – 542 068 / 01 376 2027

17 October, 2005

**Subject** Asking permission to bring students from Engineering Study Program (ESP) at Mae La Refugee Camp, Amphur Tha Song Yang, Tak Province to participate in practical training and survey Thai Solar Home Systems

**To** Mae La Refugee Camp Committee Chairman

According to Taipei Overseas Peace Service (TOPS), ZOA Refugee Care, Karen Network for Cultures and Environment (KNCE) and Border Green Energy Team (BGET) would like to ask a permission to bring 6 students (personal information is attached) from Engineering Study Program at Mae La Refugee Camp who have participated in solar and micro hydro electrification training on September 5 to 9, 2005 to participate in further practical training and survey Thai Solar Home Systems at Moo 3, Sam Maun Sub-district (Tambon), Mae Ra Mat District on November 14 to 19, 2005. The survey will include providing the Thai villagers the basic solar home system user knowledge and maintenance.

During the survey, the students will stay at the heads of the village houses or the members of Tambon local organization (Or-baw-taw) of Moo 3, Sam Maun Sub-district, Mae Ra Mat District, Tak Province.

The transportation for the students will be driven by Mr. Watit Hathaipatsorn holding ID number: 3 6305 00082 609 and Mr. Yotin Pupha-O-ran holding ID number: 8 6306 84007 452. The vehicles numbers would be either ฅว 5994 Bangkok or ฅจ 5628 Tak.

The participated non-government organizations would be ZOA Refugee Care, TOPS, KNCE, Palang Thai, Green Empowerment (USA) and BGET.

The information provided for your permission. Thank you.

Best Regards,

( Sam Lai )  
TOPS Director

# **Solartron Proposal**

## **Solar Home System Project**

### **Border Green Energy Team (BGET)**

**Date of Proposal**      October 10, 2005  
**Project Name**            Or-Bor-Tor Solar Home System Technician Training. Diagnosis, Maintenance, and Repair of the Broken Systems of Tak Province

**Project Duration**      3 Years. Project started on September 1, 2005.

#### **Organization Information**

**Name**                      Border Green Energy Team (BGET)  
**Address**                  PO Box 66 Mae Sot, Tak Province 63110  
**Phone**                    055-542-068 / 01-376-2027  
**Fax**                        055-542-068

**Project Coordinator** Salinee Tavaranan

#### **Project Objectives**

- To build a core team of technicians working together in a coordinated manner to enhance the sustainability of 15,000 government-installed solar home systems (SHS) in remote communities in Tak province in Thailand.
- To use Thai solar home systems as hands-on classroom for high level, real-world training on solar system construction, maintenance, and repair to build capacity of Thai technicians.
- To increase access to replacement parts and reduce bottlenecks to SHS warranty claims for these systems.

#### **BGET Needs**

- A rotating stock of SHS parts that can be used by local technicians to fulfill warranty claims on the spot. This would greatly reduce costs and the chances of any penalties from more than a 7 day delay.
- As the charge controller/inverter has the highest failure rate we would like to start with a stock of 675 inverters and 100 batteries. Bad inverters would be tagged with complete house/failure information and returned to Solartron by BGET or Or-bor-tor.
- Technical manuals for each system component as well as one or two demonstration/testing systems for classroom use.
- Funding as per attached budget

#### **Overview**

Starting in mid-2004, the Thai government began installations in an ambitious two-year program to provide solar home systems to 203,000 remote households. Of these, an estimated 15,000 are located in Tak province, mostly in the western part along on the Thai/Burma border.

***Based on a survey of 402 systems in Mae Ramat and Tha Song Yang districts in Tak province, 8.2% of the systems have failed within the first year.*** The charge controller/inverter was the recurring first point of failure. Based on system design and our experience in other countries with similar systems, we are concerned that these high failure rates will continue to grow unless substantial steps are taken to improve operations & maintenance and provisions for the repair of failed components.

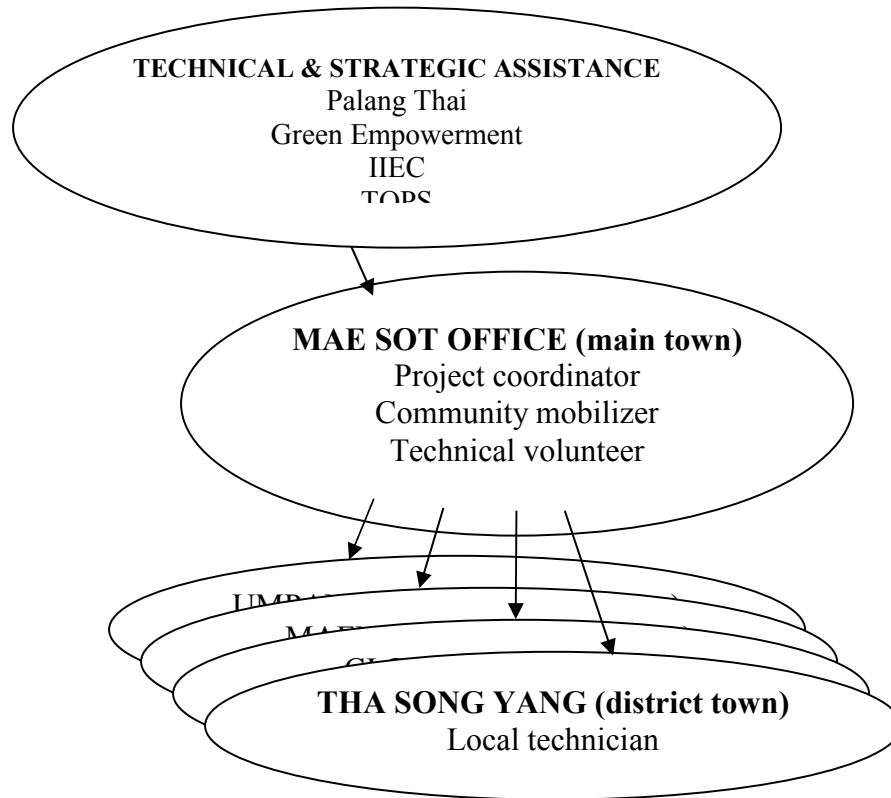
In sum, the Thai government has committed significant sums of taxpayers' money for solar electric systems that, while appreciated and useful, will fail in significant numbers unless steps are taken to ensure their sustainability. As they fail, decision makers will form opinions about the usefulness of solar electricity or other renewable energy for future rural electrification initiatives.

### **BGET Team Composition**

The foundation of the program is the establishment of a team of dedicated, competent professionals with the skills and resources to repair systems, teach villagers about ways to ensure that their systems last as long as possible, provide services for removing and recycling dead lead acid batteries from villages, help with warranty claims, and help ensure the sustainability of all renewable energy electricity generation within villages.

The composition of the team is shown in the figure below. Three team members (the project coordinator, community mobilizer, and volunteer technical expert) will be based in the central provincial town of Mae Sod. Beyond that, every major village (Moo Tii) will have two local technicians trained at monthly workshops and with access to the full resources of the team. There is a significant chance that these technicians may already be employees of the Tambon.

## Border Green Energy Team Structure



The Project Coordinator is Salinee Tavaranan, a Thai national who is taking an extended leave from a PhD program in solar energy at the University of Massachusetts, Lowell. Her duties include reporting, fund raising, and organization of the entire effort. She also provides technical support and knowledge to all members of the team.

The Community Organizer is Watit Hathaipassorn, a Karen with extensive experience in community mobilization in Tak province. He coordinates community contributions and community logistics for the project, organizes the trainings, and finds appropriate candidates for the technician positions.

The Technical volunteer position is currently filled by an engineer from the US with a commitment from an engineer from Sweden in February. He/she helps with trainings, repairs, and coordinates on technical issues with the Provincial Electricity Authority and with technicians and engineers from installation companies and from local government.

Local Technicians have the skills to repair solar electric systems. Each works in the communities of their district, systematically surveying government installed solar home systems, making basic repairs, helping with warranty claims, and teaching villagers about operation and maintenance.

In addition, technical, logistical and strategic support will be provided by Chris Greacen (Palang Thai, based in Bangkok, Thailand), Sirikul Prasitpianchai (IIEC, based in Bangkok), and Walt Ratterman (Green Empowerment, based in Portland, Oregon). Both Chris and Walt each have over 15 years of practical experience working with teams to develop, teach, build, repair, and maintain renewable energy systems. Sirikul has 6 years experience in the solar electric industry in Thailand and a graduate degree on solar electric engineering.

### **BGET Activities**

The Border Green Energy Team works to provide conditions for sustainable operation of solar home systems and other renewable energy systems in the Thai/Burma border area. Key tasks include:

1. Surveying Thai SHS: Systematically surveying and maintaining a database of every solar electric system encountered including information about date of commissioning, GPS coordinates, date of each visit, status of system, repairs made.
2. Helping improve conditions for maintenance: This includes teaching villagers about proper operation and maintenance, helping to facilitate local sale of distilled water and basic supplies to ensure longevity, and ensuring proper removal and recycling of dead batteries.
3. Fixing: Repairing systems that can be easily repaired. This includes fixing basic manufacture or installation defects, increasing average annual sunlight exposure (usually by moving module to better location at house), replacing broken lights, as well as processing parts that fail under warrantee. Repair work also includes discussing options for more expensive repairs such as replacement of equipment or system modifications in the event that the warrantee has expired or is not applicable.

### **BGET Training Schedule (as of 8 October 2005)**

BGET has already scheduled trainings in the following locations. Trainings focus on system diagnosis, repair, and maintenance. All trainings include a Thai language manual. Trainings would be greatly enhanced with the aid of technical manuals for each system component as well as a demonstration/testing system for classroom use.

- **17 – 23 February 2005** Training in Mae Sa Pao, Tambon Mae Wa Luang, Tha Song Yang District
- **2 – 4 September 2005** Training in Huay Kra Ting, Tambon Pra Tart, Mae Ra Mat District. There were Bangkok PEA representatives joined this training.

- **19 – 21 October 2005** Confirmed training in Tam bon Mae Tan, Tha Song Yang District expecting to have a representative from Bangkok PEA joining the training.
- **25 – 27 October 2005** Confirmed training in Tam bon Mae Song, Tha Song Yang District expecting to have a representative from Bangkok PEA joining the training.

### **Information on Proposed Funding**

Besides the stocked inverters batteries and the demonstration systems that Solartron could provide for BGET, Solartron could also support the project by funding the technician trainings and funding to maintain and survey the systems. The first year goal of BGET is to train, survey, and fix the systems in Tha Song Yang and Mae Ra Mat Districts which have almost 9,000 Solar Home Systems. BGET plan to expand the project into the other districts in Tak Province containing approximately 6,000 systems.

BGET will act as Solartron representative to repair the systems. We will inspect the systems and try our best to fix the broken systems immediately including the systems that have been reported to be broken at Or-bor-tor with the Solartron provided equipment in stock. BGET will mail the broken parts, warranty claim form, and the system information to Solartron. **Under no condition(s) whatsoever will BGET ever assume responsibility for warranty penalty fee.**

**Table: Proposed Funding for BGET Projects**

Quantity / Duration	Proposed Budget	Amount (Baht)	\$
	<b>Local Technician Training</b>		
1 (for First Year) 1 Year (Expected 12 Trainings Each)	First and Second Technician Training First and Second Technician Training for First Year	130,413 1,564,960	\$3,260 \$39,124
1 (for Second Year) 1 Year (Expected 12 Trainings Each)	First and Second Technician Training First and Second Technician Training for Second Year	127,980 1,535,760	\$3,200 \$38,394
1 (for Third Year) 1 Year (Expected 12 Trainings Each)	First and Second Technician Training First and Second Technician Training for Third Year	127,980 1,535,760	\$3,200 \$38,394
<b>3 Years</b>	<b>Total Training Cost</b>	<b>4,636,480</b>	<b>\$115,912</b>
	<b>Maintenance and Surveying the Systems</b> (Including Overhead Cost)		
1	Broken Sytem for First Year	1,923	<b>\$48</b>
1	Broken Sytem for Second Year	2,011	<b>\$50</b>
1	Broken Sytem for Third Year	2,011	<b>\$50</b>

The first training covers basic knowledge of the Solar Home System, the utilization of tools, system inspection, and basic system repair. Training duration is 3 days. Each participant (local technician) will receive a tool kit, technical manual, trouble shooting manual, and survey forms. The technicians will survey and repair the systems in their areas after the training. They will pass on basic SHS knowledge and maintenance to the villages. For example this would include refilling distilled water in the battery and the cleaning and shading of solar panels.

The second training will take place 6 months after the first one. The duration is 2 days. It will cover how to use a hydrometer to measure the specific gravity of the battery electrolyte, answer all questions raised by the technicians, and discuss how to make the systems sustainable after the warranty expires.

## List of Surveyed Broken Systems

Date of Survey: 2 – 3 September 2005 in Mae Ra Mat District

ที่	ชื่อ - นามสกุล	บ้านเลข ขที่	ห ม ที่	ชื่อบ้าน	ตำบล	อุปกรณ์ที่ชำรุด
1	นายจะโช ตระกูลสุพนา	37/3	6	บ้านห้วยกระทิง	พระธาตุ	อินเวอร์เตอร์
2	นายธนา ตระกูลสุพนา	88	6	บ้านห้วยกระทิง	พระธาตุ	อินเวอร์เตอร์
3	นายวาจะ ตระกูลดิฐธรรม	26	5	บ้านต้นผึ้ง	สามหมื่น	อินเวอร์เตอร์
4	นายพิจิตร ชัยทวีอนันต์	149/1	5	บ้านต้นผึ้ง	สามหมื่น	อินเวอร์เตอร์, แบตเตอรี่
5	นางพะโพ กาญจนพันธ์บุญ	38/2	5	บ้านห้วยส้มป อย	สามหมื่น	อินเวอร์เตอร์
6	นายบุงจะแฮ เพียงตะวันกุล	47/1	3	บ้านห้วยส้มป อย	สามหมื่น	อินเวอร์เตอร์, แบตเตอรี่

Date of Survey: 13 – 14 September 2005 in Tha Song Yang District

ที่	ชื่อ - นามสกุล	บ้านเลข ขที่	ห ม ที่	ชื่อบ้าน	ตำบล	อุปกรณ์ที่ชำรุด
1	นางยุพิน	69	1	บ้านขอแจะ กา	แม่ะหลว ง	อินเวอร์เตอร์
2	นายโบลชา ไพโรประชา	36	1	บ้านขอแจะ กา	แม่ะหลว ง	อินเวอร์เตอร์
3	นางจำปา กัมภีร์ตะวัน	24	1	บ้านขอแจะ กา	แม่ะหลว ง	แผงโซลาร์
4	น. ส. วาพอลอ วณาเฉลิมศรี	62	1	บ้านขอแจะ กา	แม่ะหลว ง	อินเวอร์เตอร์
5	นายจอต อัศวินภูเขา	35	1	บ้านขอแจะ กา	แม่ะหลว ง	อินเวอร์เตอร์

6	นายพะมอแห รุ่งเรืองห้วยแป	40	1	บ้านแม่ตะปู	แม่ะหลว ง	อินเวอร์เตอร์, แผงโซลาร์
7	นายพะนุ ตะวันรุ่งสาง	72	1	บ้านแม่ตะปู	แม่ะหลว ง	อินเวอร์เตอร์, แผงโซลาร์
8	นายมีเหล่า บวรกิจดำรง	8/1	5	บ้านปะน้อยปู	แม่ะหลว ง	อินเวอร์เตอร์
9	นายติว สมวงศ์ดอนไทย	360	5	บ้านปะน้อยปู	แม่ะหลว ง	อินเวอร์เตอร์
1 0	นางสิริพร สัจจะศักดิ์สิริ	13/2	5	บ้านปะน้อยปู	แม่ะหลว ง	แผงโซลาร์
1 1	สตต ประชา รั่วจิตร	381	5	บ้านปะน้อยปู	แม่ะหลว ง	อินเวอร์เตอร์, แบตเตอรี่

Date of Survey: 30 September – 3 October 2005 in Tha Song Yang District

ที่	ชื่อ - นามสกุล	บ้านเลข ขที่	ห ม ที่	ชื่อบ้าน	ตำบล	อุปกรณ์ที่ชำรุด
1	เคราะห์ฉาย ศิริคัมภีรภาพ	62	3	แม่โป	แม่ะหลว ง	แบตเตอรี่รี
2	น.ส. มะดอย ติรสผลกล	130	3	แม่โป	แม่ะหลว ง	อินเวอร์เตอร์
3	พะดอย หอมดอกคักดี	105	3	แม่โป	แม่ะหลว ง	อินเวอร์เตอร์
4	นายยอดชาย ดอกไม้ชอวิไล	7/1	3	แม่โป	แม่ะหลว ง	อินเวอร์เตอร์
5	นางเต๋ฉาย วรรณสามคีรี	127	3	แม่โป	แม่ะหลว ง	อินเวอร์เตอร์
6	นางสโรชา พงศ์อัญสกุล	168	3	แม่โป	แม่ะหลว ง	อินเวอร์เตอร์
7	นายทวี คงสถิตย์	51	3	แม่โป	แม่ะหลว ง	อินเวอร์เตอร์,
8	เพ็ญศรี เจียดตระกูล	6	3	แม่ะหลว	แม่ะหลว ง	แบตเตอรี่รี, อินเวอร์เตอร์
9	นางน้อแประ ดอกไม้ชอวิไล	2/3	3	แม่ะหลว	แม่ะหลว ง	อินเวอร์เตอร์
1 0	จะยง บงกชฤดี	13/1	3	แม่ะหลว	แม่ะหลว ง	อินเวอร์เตอร์
1 1	นางหม่อเอสา โอภาชัย	67	3	แม่ะหลว	แม่ะหลว ง	อินเวอร์เตอร์
1 2	นายวาทิต ชัยสิทธิ์พนาลัย	13	3	แม่ะหลว	แม่ะหลว ง	แบตเตอรี่รี
1 3	นายดิกระ มนต์หิมพานต์	112	3	แม่ลาดี	แม่ะหลว ง	แผงโซลาร์
1 4	นายจ่อเอ กนกวงศ์จรรยา	71	3	แม่ลาดี	แม่ะหลว ง	อินเวอร์เตอร์

## Example of Survey Form

(1) Surveyor's Name: <b>อัศวิน ชมชดพนา</b>	(2) Date of Survey: <b>2 ต.ค. 2548</b>
(3) Name and Last Name: <b>นางนอประระ ดอกไม้อชวลี</b>	(4) Number of People in House: <b>4</b>
(5) Address Number: <b>2/3</b>	(6) Moo: <b>3</b>
(7) Village: <b>แมะหลวง</b>	(8) Tambon/District: <b>แมะหลวง</b>
(9) Amphur: <b>ทาสองยาง</b>	(10) Province: <b>ตาก</b>
(11) Latitude (N): <b>17° 48.255'</b>	(12) Longitude (E): <b>97° 56.871'</b>

Tyes of Electric Appliances	Power (Watts)	Hours of Use	WH (W x Hours)
หลอดไฟฟ้า 2 ดวง	10 วัตต์	4	40
ทีวี 21 "	75 วัตต์	1	75
(13) Total Wh:			<b>115</b>

### Number (14) - (18) and (35) - (37) use when the system broken

(14) What kind of problems have you had with the system?	<b>อินเวอร์เตอร์ เสีย</b>
(15) How long has the system been broken?	<b>เดือนกว่า</b>
(16) Have you contacted anyone?	<b>ไม่เคย</b>
(17) What was the response from that person?	<b>-</b>
(18) Have the system been fixed? If yes, how?	<b>ไม่</b>

(19) Do you know about the system warranty? How?

**ไม่ทราบ**

(20) Did the installer tell you anything?

**ช่างติดตั้งบอกว่าจะต้องเดินน้ำกั้นในแบตเตอรี่ ถ้าน้ำแห้ง**

(21) Do you gain benefits from Solar Home System? How?

**ลูกสาวห่อผ้าตอนกลางคืน**

(22) Have you been maintaining the system? How?

**ไม่การเดินน้ำกั้นหนึ่งครั้ง และเช็ดแผงโซลาร์เซลล์**

(23) Most of the equipments are still under warranty (batteris 2 years, inverters 3 years, and solar panels 5 years after the installation). The system owners would not have to pay for the equipments if they notify Solartron to fix their systems. But if the warranty expires the system owners have to pay for the expensive equipments themselves in order to fix the systems. One option is that Or-bor-tor might plan to set up the funding to maintain systems in the future by collecting some amount of money per month to buy these expensive parts. Would you be able to afford to pay for this funding? If so, how much?

Yes

50 Baht

30 Baht

**20 Baht**

10 Baht

System Components	Brand	Serial Number
Solar Panel	Solartron SP 120	(24) <b>'003197120604</b>
Inverter / Charge Controller	FORTH SH - 1210 M	(25) <b>1604701999</b>
Battery	3K EBB - 125	(26) <b>4190297</b>

Status of Each Component		
Solar Panel	(27) <b>Working</b> Not Working	(28) Isc (กระแสไฟฟ้าลัดวงจรของแผง) = <b>1.62</b> Amp (29) Voc (ศักย์ไฟฟ้าวงจรถัดของแผง) = <b>19.3</b> V
Inverter / Charge Controller	(30) Working <b>Not Working</b>	(31) Broken Component <b>Inverter Controller</b>
Battery	(32) <b>Working</b> Not Working	(33) ระบบศักย์ไฟฟ้า = <b>11.65</b> V
Wiring	(34) <b>Good</b> Bad	

(35) Has system been modified?	<b>ไม่</b>
(36) Could you fix the system? If Not Why?	<b>ไม่ เพราะไม่มีอินเวอร์เตอร์เปลี่ยน</b>
(37) How did you fix the system?	<b>-</b>