

Memo on Interviews / Field Surveys

Subject	13. Village Electrification by Community of Myanmar		
Date	06 2001	Prepared by	K Yamaguchi
Ref. No.		Note	

Sanpo village group (Micro hydro)

Source: Field Survey



75KW Power Station for Sanpo village group, Taunggi Tsp, S. Shan State (Picture Provided by U
Khun Kyaw)

1. Location: Sanpo village group (5 villages among 21 villages of the group are electrified), Taungyi Tsp., Southern Shan State
2. Date of power supply started: 1997
3. Total No. of Households 730 & Population: 3260
 - a. Sanpo South: hh400, pop 1600
 - b. Sanpo North: hh140, pop 600
 - c. Sanpo East: hh50, pop250
 - d. Thietyetpin: hh110, pop650

- e. Meung yer seing hh30, pop160
- 4. Percentage of the number of Electrified Households: 100%
- 5. Average annual income level of the household: 50,000-300,000
- 6. Power Source: 75KW Small hydro
- 7. Transmission/Distribution System: Grid
 - a. Transmission: 6 miles
 - b. Distribution: 1 mile radius
- 8. Total Project Cost: about 10 million Ks
 - a. Cost 5million Ks to contract with U Kun Kyaw
 - i. Most cost for construction and material
 - b. Villagers contributed by free labor
- 9. Source of the cost: totally by the villagers
 - a. Collection of money of 5 million Ks: four times five categories: one time 10000Ks/hh, 5000Ks, 1500Ks, 800Ks, and 300Ks based on the family income
- 10. Tariff System in Detail
 - a. Lighting: 40Ks/hh/month, TV 500Ks/hh/month, Karaoke 1000Ks/hh/month
 - b. Free for Street (50 lamps), School, & Bagoda
 - c. Average time to use: 12 hours/d (6pm-6am)
 - d. Monthly sales in total: 21,900Ks
 - e. Collection of tariff: by assigned villagers as community service
- 11. Operation/Management System in detail (How villagers participate to operate and maintain)
 - a. Leadership : Village electrification committee was formed up and elected executive committee members get responsibility to operate and manage the small hydro power generation plant.
 - b. Operation: 6,000Ks/month for operator in power house
 - c. The surplus 15,900 (sales-opex) is fund for maintenance and transmission line (Monetary keeps the money)
- 12. Comments:
 - a. Village administration is a little different from other Myanmar area
 - b. 1 primary school for five villages
 - i. 500 students, 4 gov. teachers, 1 head master, and 7 paid (7,000Ks/month) private teachers
 - c. Village birth: 50 babies/ year, 20 death/year, (no of children increased by 5 times in ten year)
 - d. 1 monastery 6 pagodas
 - e. 2 rice mills
 - i. 12-14 hp; 2 gallon/day, 8-9hours operation/day, 3 month continuous/year
 - f. major problem of the village: shortage of water from spring—the system is old
 - g. transportation

- i. 5 no. of 240cc car (charge 200ks/person for one way to Taunggyi)
- h. Communication by messenger
- i. Cooking by firewood: might be shortage in the future (10 years)
- j. Village Economy
 - i. Major cash crops: mostly garlic and corn
 - ii. 95% have their own farm, but in dry season the land cannot be cultivated so that they work for other farmers (30%)
- k. Construction (Ex. Transmission & Distribution line) is on the job training by U Khun Kyaw.

1. List of Hydroelectric Plants Established by U Khun Kyaw

Followings are the Hydro-Electricity established by U Khun Kyaw (Hydro-Power Engineer, REAM) for remote villages in Shan State for rural development. Listed are above 5KW plants and about 100 plants under 5 KW have been established since 1973.

List of Hydroelectric Plants Designed by U Khun Kyaw									
No.	Village	Township	Capacity	Unit	Type of Turbin	Year, Established	Capital Cost (current 1000Ks)	Capital Cost (current \$US)	Remark
1	MONG NAUNG	KYAAY SI	20 KW		CROSS FLOW	1984	500	10000	
2	PAN OUNT	HSI SENG	10 KW		CROSS FLOW	1984	250	5000	
3	MONG PON	LOI LEM	20 KW		CROSS FLOW	1985	500	10000	
4	MONG PON	LOI LEM	20 KW		KAPLAN	1989	1620	18000	NAUNG KYAO
5	PIN DAWK	KENG TONG	20 KW		CROSS FLOW	1986	500	1000	
6	TI TAIN	TAUNGGYI	10 KW		CROSS FLOW	1986	250	5000	
7	PAN SAUK	HO PONE	7.5 KW		CROSS FLOW	1987	270	4500	
8	NAM KOKE	HO PONE	10 KW		KAPLAN	1990	495	5500	MONASTERY
9	DADAH GYI	PIN DAYA	14 HP		KAPLAN	1990	504	5600	U SOE NEW (OIL MILL)
10	DADAH GYI	PIN DAYA	15 HP		KAPLAN	1990	540	6000	U AUNG WIN (RICE MILL)
11	DADAH GYI	PIN DAYA	16 HP		KAPLAN	1991	576	6400	U THAN PE (SUGAR MILL)
12	DADAH GYI	PIN DAYA	16 HP		KAPLAN	1991	576	6400	U KYAW KYAW (OIL MILL)
13	OH KONE	KUT KAI	12 HP		KAPLAN	1992	528	4800	RICE MILL(HOME LIGHTING)
14	MISSION SCHOOL	HSEN WI	12.5 KW		KAPLAN	1992	687.5	6250	
15	PONE TOON	HSEN WI	20 KW		CROSS FLOW	1993	1200	10000	OWNER AIK YEE
16	38TH MILE	HSEN WI	7.5 KW		CROSS FLOW	1993	450	3750	OWNER B.K. DUO
17	HSEN WI	HSEN WI	50 KW		FRANCIS	1994	3000	25000	
18	203 COMMAND	HSEN WI	10 KW		KAPLAN	1995	600	5000	
19	HOT SPRING	HSEN WI	10 KW		KAPLAN	1995	600	5000	OWNER MAR GUM
20	MONG KNOWN	MONG KUCK	15 KW		KAPLAN	1995	900	7500	MONASTERY
21	WIN BO	KENG TONG	20 KW		PELTON	1996	1200	10000	
22	SAUNG HPOO	TAUNGGYI	75 KW		FRANCIS	1996	4500	37500	
23	NAM BAY	TAUNGGYI	5 KW		CROSS FLOW	2000	2640	8000	
24	P.N.O FARM	HSI SENG	15 KW		CROSS FLOW	2000	2475	7500	
25	NAUNG BO	HSI SENG	5 KW		CROSS FLOW	2001	1050	3000	
26	MONG SI	KUT KAI	10 KW		KAPLAN	1999	1584	4800	
27	DAH MOE NYE	KUT KAI	10 KW		KAPLAN	1999	1584	4800	
28	PAUNG SENG	KOO KANG	10 KW		KAPLAN	2000	1680	4800	
29	LOI SAO	HSI SENG	5 KW		CROSS FLOW	2000	1050	3000	
30	4TH MILE	HO PONE	16 HP		CROSS FLOW	1989	768	6400	OWNER HTUN HAN
31	NAM PA MU	PIN LAUNG	5 KW		CROSS FLOW	1999	990	3000	OWNER U MYINT OO
32	SHWE PA SONE	BAHTOO	20 KW		KAPLAN	1997	1200	10000	
33	PIN BU	KYAW KBA	15 KW		CROSS FLOW	2001	2450	7000	

Source: REAM

Naung Bo village (Micro hydro)

Source: Field Survey



Transmission & Distribution line constructed by villagers (Naung Bo Village, Hsi-Seng Tsp, S. Shan State)

1. Location: Naung Bo village, Hsi-Seng Tsp., Southern Shan State
2. Date of power supply started: March 2001, construction start Dec 2000
3. Total No. of Households 40 & Population: 200
4. Percentage of the number of Electrified Households: 100%
5. Average annual income level of the household in 50,000-300,000Ks
6. Power Source: 5KW Micro hydro
7. Transmission/Distribution System: Grid
 - a. Transmission: 1,600 feet x 2
8. Total Project Cost: initially about 600,000Ks
 - a. Cost 400,000Ks for contract with U Kun Kyaw for design, construction and material
 - b. Villagers contributed by free labor
9. Source of the cost: totally by the villagers (Total 1.13 million Ks)
 - a. Collect money by several installments
 - b. Borrowed from U Khun Kyaw with interest 3%/month (market 6%/month)
 - c. Contribution of each installment differs by the family; total 35 hh plus 1 monastery
 - i. 50,000 Ks x 11hh
 - ii. 35,000 Ks x 12hh
 - iii. 30,000 Ks – monastery

iv. 15,000 Ks x 11hh

10. Tariff System in Detail

- a. Free for a while

11. Operation/Management System in detail

- a. Village electrification committee (Chairman, Secretary, Treasure (U Pok), Book keeper)
- b. Operation: one non-paid operator

12. Comments:

- a. Area is Pa-oh 100%
- b. Want to expand the capacity from 5 to 8 KW by changing the generator

Pinpu village (Micro hydro)



Source: Field Survey

5KW Hydro Power Station for Pinpu Village

1. Location: Pinpu village, Kyaukpadaung Tsp., Meiktilar District, Mandalay Division
2. Date of power supply started: 16.12.2000
3. Total No. of Households: 87, Population: 643
4. Percentage of the number of Electrified Households: 55hh/87hh
5. Average annual income level of the household in 20,000-100,000 Ks
6. Power Source: Micro hydro
 - a. 5KW at present
 - b. planning to expand the capacity up to 7KW to supply nearby village
7. Distribution System: one mile grid line
 - a. 40 numbers of 20W street light
 - b. 55 numbers of 20W fluorescent light for 55 households
8. Total Project Cost: \$US 7000
 - a. Cost of Power Source 5KW: \$US 3,450
 - b. Cost of distribution system: \$US 2,150

- c. Percentage of foreign importation in the total cost: 10.3% of project cost
 - d. Installation & Material transportation up to site: \$US 1,400
 - e. Old dam and the system was constructed in 1984 lead by monastery with 4lakh excluding labors
 - f. The old system was given-up when main shaft was broken and the village could not afford to replace it.
9. Source of the cost: Japan Grass Root Grant
10. Tariff System in Detail
- a. Average use in KWH/Household: 20WH/D
 - b. Lights 20W: 200ks/lamp/month
 - c. For public 90Ks/hh/month
 - d. TV: 150ks/month
 - e. Average time to use: 5 hours/d (6pm-11pm)
 - f. Total collection: 11,500Ks/month
 - g. Average payment in Kyats: 200-300Ks/household/month
 - h. Who collect the tariff: Executive members (2 linemen) of village electrification committee → record book + receipt
11. Operation/Management System in detail (How villagers participate to operate and maintain)
- a. Leadership : Village electrification committee was formed up and elected executive committee members get responsibility to operate and manage the small hydro power generation plant.
 - b. Operation: assigned persons of one operator, one watch man and one line man are in charge of respective duty under administration of Executive committee. I primary phase, villagers from each families are alternately assigned to take voluntary care those duties. In later phase, it is planned to assign a suitable person(s) of the village at suitable payment.
 - i. Operation Cost 3,000Ks/m for operator
 - ii. Money collectors each 300Ks/m
 - iii. Monthly balance about 8,000Ks/m surplus for next projects → Yuma bank in the name of VEC. 2 of three members signature necessary to draw money
 - c. Maintenance affairs: periodical maintenance procedure was launched together with system operation training by REAM. Occasional discussion and education arrangement with leading committee, villagers and REAM have to make monthly income generation scheme will be established for monthly expenses of operation and maintenance
12. Comments:
- a. Accordingly to water resource situation, 4 hours water accumulation in dam for four hours generator operation. This situation can improve by raising dam height at suitable level and by extending water catchments area.

- i. Trips to river: 10 times a day by women for domestic use
- b. This project system operation is still under trial phase, to make understand the dam water accumulating situation and system material performance. Some improvements are expected during this trial phase.
- c. Cooking by firewood of nearby forest
- d. Communication by messenger
- e. Income generation process will start after that trial phase.
- f. This project has many trial exercises to practice between local community, UN/FAO zonal developers, private material & technology supplier and REAM to exploit better relationship and proper institutional network deal.
- g. Benefits are
 - i. Own lights: they paid about 600ks/month for candle and kerosene before electricity
 - ii. Street lights (safe travel at night inside village)
 - iii. Education
 - iv. Home business
 - 1. Increased labor hours of cotton weaving
 - 2. Clean Crops (can sell with high price)
 - 3. dying cotton
- h. Another village projects
 - i. Domestic water system by electric pump using the electricity fund
 - ii. Supply to another village by increasing the total capacity of the system
- i. General Characteristics
 - i. 100% Burmese
 - ii. No school, no clinic
 - iii. Transportation by foot only taking many hours
 - iv. Average 15 birth 7 death
 - v. 1 monastery 7 pagodas
- j. Machines in use
 - i. Oil mill by diesel: 15hp 750ks/gallon, 8hours/day, 4gallons/day, 10 month/year
 - ii. Rice mill: 12hp
 - iii. 3 crop grinders (for animal feeding): 12 hp 6hour/day, 4m/year
 - iv. irrigation pump: 12 hp 4-24hour/day, 3month/year
- k. Economy
 - i. Corn, Sesame, Ground nuts, Bean, and Cotton
 - ii. Land owner: 59hh of 87hh



1. Location: Kone-le village, Mahling Tsp., Meiktilar District, Mandalay Div.
2. Date of power supply started: 27.8.2000
3. Total No. of Households: 120, Population: 660
4. No.of Electrified Households: 100%
5. Average annual income level of the household: 150,000Ks
6. Power Source: Solar Photovoltaic 520W
7. Distribution System:
 - a. Local made portable batteries are mobile electric power carriers
 - b. Battery from each household has to charge alternately batch by batch at five days intervals timing
 - c. Five days power consumption of each house, battery power storage capacity and charging capacity of the Solar BCS are calculated and designed to meet the system specification and power distribution performance
8. Total Project Cost: Estimate expenditure in \$US 7,632: (REAM estimate value in the year 2001)
 - a. Cost of Power Source (Solar PV power system)
 - i. Materials: \$US 4,250
 - ii. Installation/commissioning/performance test: \$US 750

- b. Cost of power distribution system:
 - i. Total battery cost: $8V \times 44$ (initial number) batteries = \$US 947
 - ii. Battery workshop facility cost: \$US 920
 - c. Necessary building (shelter, support and protection structure for Solar BCS facilities): \$US 765
 - d. Training/Education/monitoring process for system maintenance: free services by REAM
 - e. Percentage of foreign importation in the total cost: 50% of the project cost
9. Source of the cost: Local private donor (2/3 came from the owner of Kanbawza Bank, 1/3 came from a gold smith shop owner in Mahling Tsp.)
10. Tariff System in Detail
- a. Average use in KWH/Household: 16WH/Day/Household
 - b. Average time to use: 4 hours per day (6pm-10pm)
 - c. Average expenditure by villagers in using the system in Kyats:
 - i. Capital cost to buy battery-217 Kyats/ month(6 months durability base)
 - ii. Battery charging cost-120 Kyats/ month(20Ks→5Ks(June 25, 01)/ charge X 6 times)
 - iii. Battery maintenance cost-84 Kyats/ month(average)
 - d. Income generation process:
 - i. Tariff collection: 5Ks per battery charging (20 batteries per day charging capacity) = 100Ks/day
 - ii. Tariff collector: Leading committee
 - iii. Income/ Fund: Ks.3600 per month (average); 50% use for operator and the rest is for maintenance & development fund
 - iv. Actual charging income is lower about 30-40% due to partially damaged battery problems
11. Operation/Management System in detail (How villagers participate to operate and maintain)
- a. Village organization: each family head of all families of the village was organized as members of village Renewable Energy User's Group (REUG) of Kone-le village under the administration of VPDC
 - b. Leadership: a board (7 executive members) of village REUG by elected among family heads including elder person(s), person(s) with prominent knowledge on battery and any active person(s) who has keen interest on the project. This executive board has leadership role and responsibility to manage the project in long run
 - c. Ownership: the whole facility of the project is totally owned by the village REUG
 - d. Operation: daily system operation is done by a assigned person(s) [villager(s)]

- i. Board of elected leaders has to administrate that assigned person(s) by studying the whole process performance and monitoring detail work procedures regularly
- e. Maintenance:
 - i. long-term maintenance procedure is guided by REAM's technicians by participating as advisor of REUG
 - ii. details of regular (periodical) and occasional maintenance procedures were launched after first training
 - iii. Annual or necessary check on technical and performance achievement has to be monitored by executive board members of REUG and REAM.
- f. Operation & Maintenance cost:
 - i. Voluntary portion- all villagers (members of REUG) are responsible to provide their affordable labor (operator-executive member is paid 1800 ks/m)
 - ii. Regular payment- battery charging fee and battery workshop income are regular source of fund which needs to use in system operation and maintenance works
- g. Fund management: fund is managed by board of REUG
 - i. accumulating the regular fund
 - ii. authorizing expenses
 - iii. monitoring the battery workshop income and expense

12. Comments:

- a. Major Benefits
 - i. Increased working hours at time by 3-4 hours/day
 - ii. Before electricity each hh spent 25-35 Ks/day for lighting
 - iii. Operating surplus $3,600-1,800=1,800\text{Ks/m}$ → keep in treasure's house
- b. This model Solar BCS of Kone-le village is designed at the capacity of donor's budget availability. Accordingly it cannot be considered as a proper system for whole village electricity requirement.
- c. This system design is focused on basic need (minimum electric power requirement), aimed to fulfill one small light facility for each house at four hours per day usage character of grassroots people.
- d. No trouble with solar panel, but deterioration in batteries
- e. Power supply requirement for people other than lowest above classified grassroots level cannot be fulfilled at this project capacity. Electric power demand for houses with more lights or more lighting time requirement and other common electric appliances like TV (now 9BW TVs), radio & cassette and etc. are not included here. For that extra power requirement (beyond the project capacity), villages have to charge their batteries at the nearest charging shop (4 miles far).

- f. For such kind of particular village nature and size (Kone-le village), to be a real whole village electrification design, at least three times capacity is required to fulfill the conventional needs.
- g. Quality of batteries using in this system should be in good condition to match with solar charging nature (slow and linear current charging). Accordingly quality controlled same kind of batteries must be facilitated for the whole village at the same time. Different voltage and sizes batteries make problems in charging.
- h. Battery workshop function is also very important to run together with the Solar BCS to check and repair instantly at the charging station when battery arrive to charge.
- i. Occasional education and training plan is essential to make aware the whole village to understand about the proper usage of battery and electrical appliances.
- j. Village Feature
 - i. Burmese 100%
 - ii. 1 primary school: 70 students and 4 teachers, no clinic but 1 health worker
 - iii. Annual birth 6, death 4
 - iv. One monastery
 - v. Literacy ratio 100%
 - vi. Water from underground
 - vii. Transportation by bicycle
 - viii. Ladies work for cotton weaving for cash
 - 1. Cotton rug: 1000ks/piece
 - 2. An introduction of 12 hp electric weaving machine will increase the productivity significantly → will increase the number of weaving machine from 8 to 24 machines in the village instantly.
- k. Machines in the village
 - i. Weaving and sawing machine x 4 by manual power
 - ii. Irrigation pump diesel 12 hp x 10: 12 hr/day 4m/year 750ks/gallon
 - iii. Crop chopping machine 12 hp x 5
 - iv. Mini-tractor x 1
- l. Economy of the village
 - i. 50% landowner of total 600 acres → cotton, beans, and sesame
 - ii. Land owners receive subsidy (ex. 3,000Ks/year for 1 acre of cotton field)
 - iii. Paid farmer's income 100Ks/day/person → average 300Ks/day/hh
 - iv. Others
 - 1. Jaggary making
 - 2. Black smith
 - 3. Bicycle repair
 - 4. Carpenters



Battery Charging Station, Kone-le Village



Mr. Yamaguchi & Roger with Villagers for interview survey

Kya-O-gyi Viillage (Solar & Battery)



Source: Field Survey

Shelter of Water Tank and the Water Tap

1. Location: Kya-O-gyi village, Kyaukse Tsp., Kyaukse District, Mandalay Division
2. Date of project completed :1989
3. Total No. of Households: 65, Population: 320
4. Percentage of the number of Electrified Households: (drinking water supply 100%), 50% (battery power supply)
5. Average annual income level of the household: <100,000Ks
6. Power Source: Solar Photovoltaic (1,113W)
7. Distribution System: SPS and BCS situated inside the village
8. Total Project Cost: \$US 24000.00 including UNDP, administration, and training costs (2001 price by REAM estimate)
 - a. Cost of Power Source: 60%
 - b. Cost of distribution system: 20% (with tube well facility)
 - c. Percentage of foreign importation in the total cost: 70% of project cost
 - d. Installation & Material handling up to site: 20%
9. Source of the cost: UNDP
10. Tariff System in Detail

- a. Average use in KWH/Household: 16WH/D (50% battery charging)
- b. 20 gallons per head water delivery per day
- c. Average time to use: 12 hours/d (8am-3pm)
- d. Average payment in Kyats: 15K/charge
- e. Average 15 batteries (6/8/12V,15-35Ah) per day
- f. Water delivery is free of charge
- g. Tariff collection: Executive members of village leaders group organized under village PDC

11. Operation/Management System

- a. Leadership: Village leaders organize a water distribution committee and assigned some chosen members get responsibility to operate and manage the SPV pump station.
- b. Operation: one assigned person of one operator is in charge of respective duty under committee administration
- c. Maintenance: Occasional check, system performance recording, necessary repairs and maintenance educating to the users are provided by REAM at free services

12. Comments:

- a. Regular maintenance required for better application and sustainability
- b. Systematic management scheme is necessary to be implemented by village committee
- c. Training and education program with regular monitoring process by a qualify group or organization is necessary
- d. REAM is currently taking care in observing, checking, doing immediate repair (when it is favor), giving possible instructions for improvement, recording the on sight situation and reporting to Water Resource Utilization Department (WRUD, Ministry of Agriculture) on all 36 stations voluntarily
- e. REAM's free services is not cover the all 35 stations throughout Myanmar due to expenditure and time consumption transport situation to sites
- f. WRUD has 36 similar systems start established since 1989 at villages in Sagaing, Mandalay, Magwe & Yangon Divisions as listed below: (as of July 1, 2001)

No.	Division	Township	Village	Capacity	Population	Conditions
1.	Mandalay	Meiktilar	Thangone	896W	1045	using
2.	Mandalay	Meiktilar	Mezalgone	1113W	655	
3.	Mandalay	Meiktilar	Kwet-nge	1113W	740	controller problem
4.	Mandalay	Meiktilar	Ngasetkan	896W	400	
5.	Mandalay	Mahlaing	Magyipinpu	896W	830	using
6.	Mandalay	Mahlaing	Yate-kyin	896W	600	using
7.	Mandalay	Mahlaing	Sei-doe	896W	330	using
9.	Mandalay	Tharsi	Kyatee	1152W	685	using
10.	Mandalay	Kyaukse	Kya-O-gyi	1113W	320	using
11.	Mandalay	Wyan-dwin	Palawa	1113W	680	using
12.	Sagaing	Buddalin	Thayogone	896W	745	using
13.	Sagaing	Sagaing	Kyaukse	1113W	1570	using
14.	Sagaing	Sagaing	Yonepikan	896W	420	using
15.	Sagaing	Shwebo	Mabay	896W	800	using
16.	Sagaing	Ayardaw	Ingyinkan	896W	632	using
17.	Sagaing	Ayardaw	Ayardaw	896W	1450	using
18.	Sagaing	Ayardaw	Naungyi-ai	1113W	1800	using
19.	Sagaing	Monywa	Namakha	1113W	1300	pump damage
20.	Sagaing	Myinmu	Htisaung	896W	700	system stop
21.	Magwe	Magwe	Kyarpyit-in	1152W	987	using
22.	Magwe	Magwe	Daungnay	896W	930	Controller problem
23.	Magwe	Magwe	Manawgone	896W	1400	using, 2 broken modules
24.	Magwe	Yesagyio	Nipasadow	1113W	1163	using
25.	Magwe	Yesagyio	Kyaukpu	1113W	363	no information
26.	Magwe	Minbu	Konethar	1113W	1850	system stop for repair
27.	Magwe	Sinbaungwe	Chaunggaok	896W	870	using
28.	Magwe	Taundwingyi	Thebyu	896W	550	using
29.	Magwe	Myetae	Sangalay	896W	480	using
30.	Magwe	Saling	Thangone	896W	520	using
31.	Magwe	Myaing	Thartut	1113W	1045	using
32.	Magwe	Pakokku	Magyipinpu	1113W	970	using
33.	Yangon	Hlegu	Ngasudaung	896W	1800	using
34.	Yangon	Shwepyithar	Ward(6)	896W	450	using
35.	Yangon	Hlaingtharyar	Thaungyigwin	1113W	1485	system stop
36.	Yangon	Tarmwe	WRUD	1113W		demonstration

Kabyu Viillage (Solar & Battery)

Source: REAM

1. Location: Ka-byu village, Kyaukpa-daung Tsp., Kyaukpa-daung District, Mandalay Div.
2. Date of Power Supply Started 1.6.2000
3. Total No. of Households 320, Population 1728
4. Percentage of the number of Electrified Households: 12%
5. Average annual income level of the household: <100,000Ks
6. Power Source: Solar Photovoltaic
7. Distribution System: Batteries from student houses are charged at Solar BCS station (situated at the school) alternately at their scheduled term to fulfill the specified power capacity. Students have to carry and bring back their batteries at set scheduled timing.
8. Total Project Cost: Estimate expenditure in \$US 926 (value in the year 2001)
 - a. Materials: \$US 741
 - b. Installation/commissioning/performance test: \$UD 185
 - c. Cost of power distribution system:
 - i. Total battery cost: no project expenditure (use villagers' own batteries)
 - ii. Battery workshop facility cost: not included
 - iii. Operator cost: free service by village side
 - d. Necessary building (shelter, support and protection structure for provided facilities: provided by school fund
 - e. Training/Education/monitoring process for system maintenance: free services by REAM
 - f. Percentage of foreign importation in the total cost: 80% of the project cost
9. Source of the cost: Japanese Grassroots Grant (village school contribute their land space and necessary labor to implement the project)
10. Tariff System in Detail
 - a. Average use in KWH/Household: 16WH/Day/Household
 - b. Average time to use: 4 hours per day (6pm-10pm)
 - c. Average expenditure by villagers in using the system in Kyats:
 - i. Capital cost to buy battery- 1,300 Ks/ battery(6months durability)
 - ii. Battery charging cost- 60 Ks/ month(at recent fix rate of 10Ks/battery)
 - iii. Battery maintenance cost- 40 Ks/ month(average)
 - d. Tariff Collection

- i. Tariff collection: 10Ks per battery charging (6-8 batteries per day charging capacity)
- ii. Tariff collector: Parent -Teacher Association of School(PTA)
- iii. Income/ Fund: Ks. 3,300 per month (average);
 - 1. 40% use to buy books for poor students
 - 2. 40% use for PTA fund (operation, maintenance & others)
 - 3. 20% keep fund for outstanding students

11. Management System in detail (How villagers participate to operate and maintain):

- a. Village School organization: Every village school has PTA organized under the administration of school headmaster.
- b. Leadership: -PTA receives the project facilities and also take responsibility to operate and take care the Solar BCS System-the executive board of PTA has leadership role to manage the project function in long run
- c. Ownership: -the whole facility of the project is owned by village school PTA
- d. Operation: -daily system operation is done by a assigned person(s) [school staff(s)];
- e. Maintenance:-long-term maintenance procedures in details are given at training by REAM
- f. Operation & Maintenance cost:
 - i. Daily charging matter: school staff is assigned as part of his duty
 - ii. Regular payment: - battery charging fee and battery workshop income are collected by assigned person(s)
- g. Fund raising & control: fund raising & control process is managed respective PTA by accumulating the regular income and authorize the expenses of operation and maintenance

12. Comments:

- a. This Solar BCS for school is designed at the capacity of budget and Targeted to cover some extend of students' study light.
- b. This system design is focused on basic need (minimum electric power requirement), aimed to fulfill one small light facility (4W) for a student's house
- c. Power supply requirement for people other than lowest above classified capacity can not be fulfilled. Electric power demand for others houses are not included here. For that more power requirement (beyond the project capacity) , villages have to charge their batteries at other charging shop.
- d. Quality of batteries using in this system should be in good condition to match with solar charging nature (slow and linear current charging). Accordingly quality controlled same kind of batteries should be charged at the same time.

- e. Battery workshop function is also very important to run together with the Solar BCS to check and repair instantly at the charging station when battery arrive to charge. Partially or totally damaged batteries can disturb the charging circuit of the system.
- f. Occasional education and training plan is essential to make aware the whole village (especially students) to understand about the Solar electric energy and knowledge of battery and electrical appliances.
- g. This project cover area (10 village schools) is quite large to make aware the students about the usefulness and advantages of the solar photovoltaic power. But each project size is too small to meet the requirement.
- h. REMARK:
Followings are the names of ten villages where schools are situated (in Kyaukpa-daung Township) with the same Solar BCS systems (including frund from UNDP/FAO) established at the same time.
 1. Kabu village
 2. Thayet-taw village
 3. The-kone (west) village
 4. Kone paw-net village
 5. Sine-gaung village
 6. Tauk-sha village
 7. Kyaе-kan village
 8. Saik-thane (South) village
 9. Saik-thane (North) village
 10. Than-pin village

Yonthalin Village (Rice Husk)

Source: Field Survey



1. Location: Yonthalin Village, Henzada T.S., Ayeyarwaddy Division
2. Date of Power Supply Started: April 16, 2001
3. Total No. of Households: 1,100
4. Percentage of the number of Electrified Households: 440hh/1,100hh
5. Average annual income level of the household in Lakh: n/a
6. Power Source/Capacity: Rice Husk Engine Model: RH14, Output 135 KVA
7. Distribution System: Distribution lines inside the village
8. Total Project Cost: 40 lakh
 - a. The cost of the system of the gas engine power generator is 1.5 million Ks. It took 10 days for the installation
 - b. The materials of distribution system cost 2.5 million Ks
 - c. Distribution system construction by MEPE for free. It took 2 weeks for the construction
9. Source of the cost: Villagers
 - a. The 420 hh, who want electricity are requested to contribute between 20,000 and 40,000 Ks per hh based on their ability to pay
 - b. Partially borrowed from area commander
10. Tariff System in Detail
 - a. 2 feet fluorescent lamp; 10 Ks/one night
 - b. 4 feet fluorescent lamp, TV, Radio, and Karaoke; 15 Ks/one night
 - c. Rice cooker or other heating appliances are prohibited
 - d. Max 3 appliances for one household

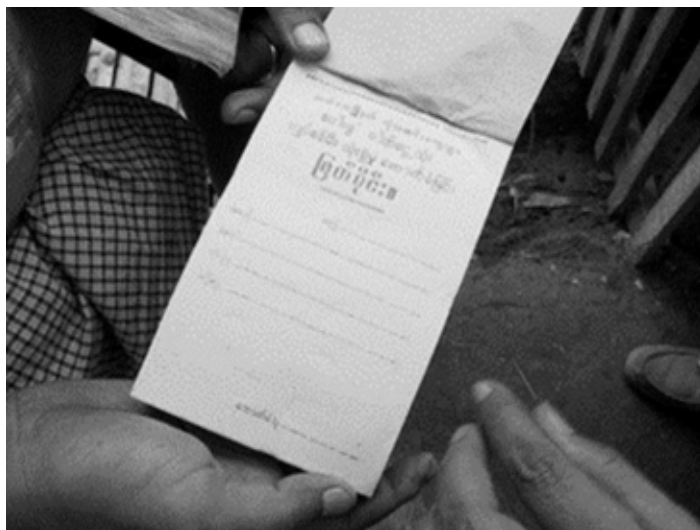
e. Sales: 60,000 Ks/10 days=6,000 Ks/day, or Ave.14.3 Ks/hh/night=430 Ks/month/hh

11. Operation/Management System in detail (How villagers participate to operate and maintain)

- f. Night time 18:00-23:00 for general household
- g. Daytime for hospital and school for free of charge
- h. Cost of rice husk: 5,000-8,000 Ks/10 days = 500-800 Ks/day
- i. Payment for four hired operator: 2,500 Ks/10 days * 4 person =1,000Ks/day
- j. Maintenance cost: 10,000 Ks/10 days = 1,000 Ks/day
- k. Total operation & maintenance cost: 2,500-2,800Ks/day
- l. Leadership: by Village Committee for electrification
 - i. 12 members
 - ii. Chairman is the village leader
 - iii. 1 for maintenance and operation in volunteer
 - iv. 5 members for collection of money: they visit the customer's houses (see sample electricity bill)
 - v. No accountant, calculation is at the site
 - vi. 1 member for rice husk collection
 - vii. No written rule or regulation

12. Comments:

- a. The idea of electrification by rice husk gas engine was discussed between the village leader and the area commander.
- b. 26 neighboring villages are interested in the electrification by the same scheme
- c. Electricity bill sample



**Yonethaline Village, Hinthata Township
Charging for the Consumption of
Husk Power Electricity**

Receipt

Date _____

Name _____

Address _____

Consumption _____

Amount _____

Received By _____

Memo on Interviews / Field Surveys

Subject	14. Meeting with U Khun Kyaw and PNO in Taunggyi		
Date	Jun 15-17, 2002	Prepared by	Y.Nakagawa
Attendants (JICA ST Side)	A.Katayama Y.Nakagawa	Attendants (Local Side)	U Aung Myint, U Kyun Kyaw Ma Shwe Syn
Ref. No.		Note	

1. Objectives and outline

The aim for the trip to Taunggyi held in 15th to 18th Jun 2002 is

- To inform and explain U Khun Kyaw about for the current situation of the application of Glassroots Grant, which set the village electrification of two villages, Hsai Hkao and Han Po, have to wait until the performance of REAM is proved to be enough in other Project,
- To collect the information about villages and confirm the technical spec and design by checking the site, photos, and design drawings, and
- To consult with area authorities to confirm the approval of the project and possibility for the contribution of RE fund.

Unfortunately, as the team could not obtain the security letter arranged by under the offer of MEPE, it was not possible to have a courtesy call to the Area commander nor to investigate the sites where the security arrangement is necessary.

The brief information of two projects that are waiting for the implementation is as follows;

Name of the village	Hsai Kau	Han Poo
Township	Hsihseng	Kekku Vt, Taunggyi 33 miles from Taunggyi
District	Taunggyi	Taunggyi
Household (population)	764 hh. (4676)	86 hh. (377)
Installed capacity	100 kW	10 kW
Estimated capital cost	68,971 USD	4,150,000 Kyat (as of Mar 2002)

2. Meeting with U Khun Kyaw

At the meeting with U Khun Kyaw, information below concerning micro hydro project in the Southern Shan State was obtained.

2.1 Condition of Public Peace

Most of the people in the areas of southeastern Inle Lake are devout Buddhist. Villagers are diligent and faithful to the leader's instruction. They carry out their task until it is accomplished. They do not drink nor gamble at all and have a favorable attitude toward daily work. There are many hard workers who are skillful for bamboo handicraft. Public conditions in this area, including Hsai Hkao and Han Po, where has applied Grassroots Grant, can be said to be safe and preferable. Even one girl goes can to collect fruit or leafs in surrounding area at nighttime by herself. They have good organization such as representatives of villagers gather at monastery in full moon day and discuss about village matter till late at night. According to U Khun Kyaw, there is some areas cultivating opium in "up hill" areas northeast to Taunggyi. There are plenty of hydro potentials, but he says he does not want to have any relationship with those areas to avoid any troubles.

2.2 Han Po

All the installment such as turbine, generator, powerhouse, weir, 36 distribution poles, access road and 5,276 ft distribution line (service wire?) has already been finished except for distribution lines of 1.5 miles which costs about 1,000 USD. U Khun Kyaw had sold his car and motorbike to prepare the cost for installment. (His wife lost her weight at 20 pounds during his absence for construction work in Han Poo. After U Khun Kyaw comes back, she recovered at 5 ponds.)

The village locates 1.5 miles from the power station. The head is 16 ft (4.89 m), discharge is 15.38 ft³/s (0.43 m³/s). Cross flow turbine is applied for generation. The distribution line is single phase of 230 V and is stepped up to 250 V in the transformer at the generator and the reduced to around 200V to 210V by voltage drop among distribution line.

2.3 Hsai Hkai

- General figure of Hsai Hkai

Hsai Kkai people committed the preparation of payment of 25,000 Kyat per a household, the half amount of capital cost will be paid after finishing installment and the remaining 25,000 Kyat will be repaid at three year loan, which bought a kind of suspicion from EOJ about drag relation. Because those amount is thought to be

difficult for general farmers to prepare.

Meanwhile, villagers cultivate many commercial products of garlic, corn, pineapple, soybean, nuts, and so on from the land of fertile Shan Plateau, which enables the people keep good standard of living. The village has big market over a hundred merchants who are farmer trade these crop. They sell their crop by themselves not entrusting outside traders.

Hsai Hkau locates in N20d19'33" E97d14'38", latitude of 1061m. It is a junction of main road that connects Taunggyi and Loikaw and small road from Mawkmai. There seemed only 20 household on map published in 1897-1898. The around area was not stable at the period of 1977-1978, which brought many people move to this village and the households was increased to 500 in 1978.

A new railroad is under construction from Hsai Hkau to Pyinmanar which is finally connected to Mandalay. Hsai Hkau can be said that it locates important area for trading and transportation.

- Technical aspect of Hsai Hkau Micro Hydro Project

Design drawings were checked about Hsai Hkau micro hydro scheme. Diversion weir is designed 1.2 m high and it cross the river, of which need to be taken care. Limestone bedrock comes appear at the intake site and it is preferable for construction. A geologist from irrigation department had investigated the site and confirmed the supporting strength of the bedrock.

Distribution lines are designed in three-phase 400 V and sent by stepping up to 11 kV for the line length of 7 miles and dropped by transformer of 50 kVA. ACSR 35 mm² will be used for the distribution line, 25 mm² is for main line in the village and 16 mm² is for branch.

100 kW turbine is planned to be purchased from china which costs 95,000 Yuan (10,500 USD)

2.4 Other site for micro hydro

U Khun Kyaw also installed recently three micro hydros in villages near Nam Tamhpak River in southern Shan area as shown blow;

Village	Capacity	Capital Cost	Date	Note
Thale U	5 kW, Crossflow	7936 USD	Oct 2001	83 hh, powers rice mill in the daytime and provides electricity in the nighttime.
Lower Nammye	3 kW, Caplan	N/A	May 2002	35 hh
Upper Nammye	5 kW, Caplan	2500 USD	May 2002	83 hh, private school x 1 monastery x 1 pagoda x 1

Also, 20 W turbine is manufactured for Indin village under the request from MEPE, which is waiting to be operated.

U Khun Kyaw's activity is thought to make the regional electrification rate for southern Shan State considerable higher than that of other rural areas in Myanmar.

3. PNO

PNO (Pa-O National Organizaion) is a local administrative government who has jurisdiction over Special Region-6 in southern Shan State. NPO was established for the development of religion, race, natural resources, and society for PaO. A meeting was held with PNO officer, Major Khun San Lwin, in PNO office in Taunggyi.

3.1 Possibility for the contribution of RE Fund

Their development priority is 1. education, 2. Health, and 3. Transportation. They agreed that minimum electricity for lighting in nighttime and radio information is inevitable for the improvement of education and hygiene condition. Reportedly, PNO found new resource of jade mine, which counts 3,000t equivalent. The resource was contributed to central government. They invested 10 million for cement plant for job opportunities and technical experience for habitants and that was not paid at once but repaid by a loan. They are not affordable to be a contributor of the Fund. Self-support electrification of villagers is preferable for them and they agree to the concept of the Fund. PNO requested exchange of knowledge and information concerning electrification. They offered the invitation to the site whenever needed.

3.2 Ownership and control by MEPE for existing facilities

In the experience of Naung Kai village, there was diesel generator of 36 kVA installed

by MEPE for 500 households. High price of diesel oil made it difficult to run, which lead the introduction of hydropower. It was suggested that tariff collection and management should be under MEPE's control on condition that the installed capacity is over 50 kW and villagers use distribution line of MEPE's property. As for Hsai Hkau village, they already have 4 kVA diesel generator that was installed under Ministry of Progress of Border Areas and National Races and Development Affairs. U Than Naing, Divisional Engineer of MEPE, made investigation of Hsai Hkau and there has been no correspond from him so far. In case for Hsai Hkau, there would be little MEPE distribution line used after the electrification by 100 W hydropower, however, U Khun Kyaw will consult with MEPE on these matters.

3.3 Security and political issues

It is possible for foreigners to go down until Kekku, where many famous Pagodas locate. Song Phoo, where U Khun Khun Kyaw installed 75 W micro hydro and mentioned report of social survey of in Prof. Mya Tein's locates in Kakku Tounship. It is possible to visit Song Phoo to monitor the performance of his micro hydro system and management of electrification by villagers. People under the mission of embassy or company however should arrange security letter even north to Kakku



Fig. Map of Southern Shan Area

The area under PNO's control is north to Hsiheng where Hsai Hkau and Han Po includes. Southern areas to Hsiheng is managed by Red Pa-O (see the right figure). Once there were some conflicts among PNO and Red Pa-O but not any more. A powerful regional monk has great influence on both side of white and Red Pa-O as a spiritual leader and their relation is kept favorable.

Security arrangement is needed for foreigners to investigate southern to Kekku.

4. Suggestion

As most of the installment of Han Po has already finished, Grassroots Grant can not be accepted according to EOJ. It needs to look for another finance source such as Sasakawa Fund.

As for Hsai Hkau, it is planned that villagers bear 50 % of total installation cost and the rest 50 % is applied to Grassroots Grant after the performance of REAM's management in Samalauk village.

5. Market information

A market price in Taunggyi concerning product of the villages in Southern Shan State and electronic devices is as follows

Table. Market price in Taunggyi (as of Jun 2002)

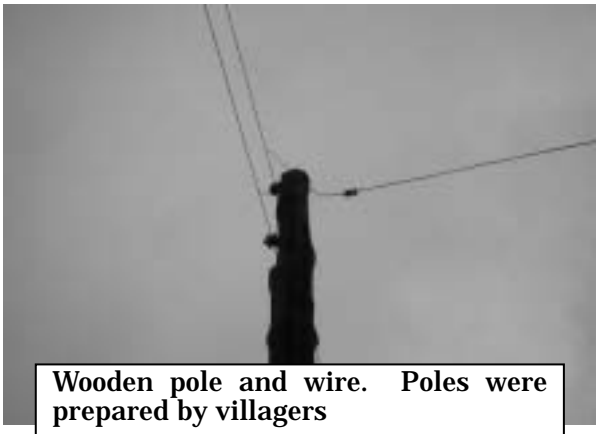
Article	Price in Kyat	Unit
Garlic	500 - 800	Viss
Cauliflower	80	Piece
Chili	50	Cup
Mo Oo (a kind of potato)	200	3 cups
Tea leaf	1,600	Viss
Cooking oil	1,450	Viss
Corn	50	Piece
Pinapple	100	Piece
Pebu (shan bean)	50	3cup
Candle	250	50 pieces
Battery 120 Ah (Panasonic)	33,500	
Battery 70Ah (Panasonic)	19,500	
Cooking stove 1000 W	4,200	
Fluorescent light 2ft maid in Indonesia	400	Piece
ACSR wire	3200	Viss
Insulator	110	Piece
Service wire	35,000	100m
5"/8 9" volt and nut	140	Pair



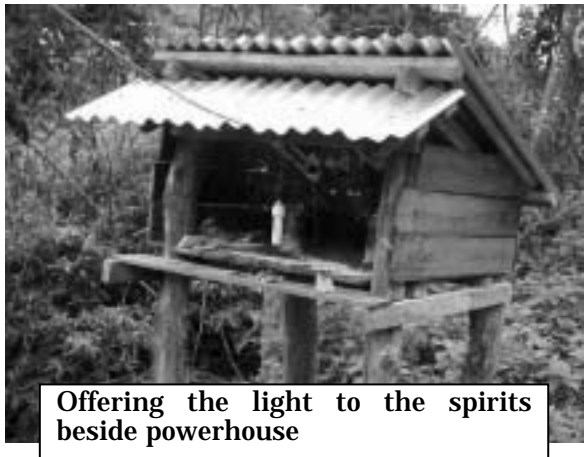
Hanpo villagers and distribution line



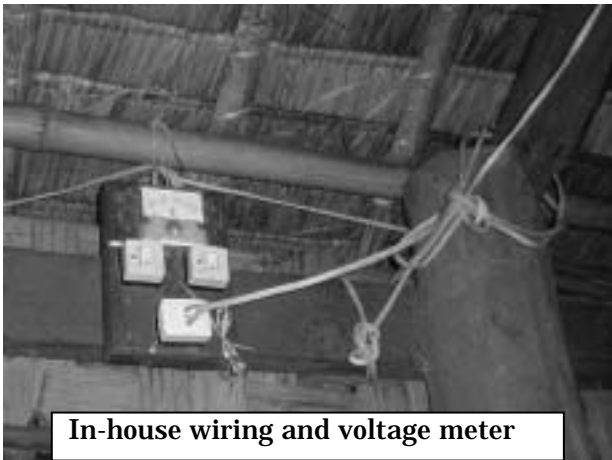
Hanpo village houses



Wooden pole and wire. Poles were prepared by villagers



Offering the light to the spirits beside powerhouse



In-house wiring and voltage meter



Tube light and home shrine



Committee members in Hanpo and micro hydro expert



School children



Intake weir with sandbags



Intake screen



Rock was used for the brick work for structures. Bricks were prepared by villagers to save the material cost.



Waterway with side lining with brick



Crossflow turbine



Penstock and powerhouse



China made generator and belt



Step-up transformer

Memo on Interviews/Field Surveys

Subject	15. Inspection of Village Schemes at Kyauk Ye Oo and Pa-Oh Gawraka		
Date	21.11.2002	Prepared by	
Attendants	JICA team	A. Katayama, H. Kanai, Sudo, Y. Nakagawa	
	Myanmar side	U Ba Ngwe, U Khun Kyaw, U Tun Myat	
Filename		Ref. No.	

Note: Kindly give files to secretary.

1. Kyauk Ye Oo Village

- Village information
 - 554 persons in 144 households
 - 80 households receive electricity
 - 1 primary school, 1 monastery
 - no clinic
 - On market day of every five days, there are transportation services to Taunggyi and Nyaungshwe.
 - Road to the village had opened last year.
 - Average household income at Kyat 250,000 per annum
 - Main sources of income are corn, beans, ground nut, some garlic. All the villagers are more or less land owner, 1-5 acres
 - Village Head U Tun Hlaing
 - VEC leader U Tun Aung, Deputy Chairman U Thein Han



Kyauk Ye Oo Powerhouse



Intake weir



Intake gate



Headtank with bamboo screen



Headrace channel



Penstock



Banki Turbine



Outflow



Generator



Turbine and belts



Pole and distribution line



Primary School



Lights in Village Head House



- Intake and waterway
 - Diversion weir is just 50 cm high, sand bags are washed away, clogged with debris.
 - Steel intake gate with nice hoisting device of wooden roller and bicycle chains
 - Earth channel with bamboo side wall protection
 - Manual spillway upstream of headtank
 - Channel slope is too steep to actuate the spillway automatically.
 - The steep channel erodes channel bed and side slopes and transport

sediments to the headpond.

- **Headtank and penstock**
 - Penstock 450 mm in diameter, 70' in length
 - Penstock too big in view of discharge
 - There was a trace of overflow from Headtank, that is, erosion of right side slope of the headtank.
 - The wall top of the Headtank was inclined and was not in a horizontal plane.
 - Bamboo screen over headtank. It is a nice idea, but depending on its size of space, it may not drop sufficient water into the headtank.
- **Generating equipment**
 - 18" in diameter and 12" in width Banki turbine (Banki → Mitchel → Crossflow turbine)
 - Turbine was manufactured by U Phon Kyaw.
 - Head 37'
 - Q not known
 - Chinese Mindong generator of 20 kVA at 1,500 rpm
 - Exciter diode got damaged and replaced with local made one. Don't operate at maximum voltage of 300 V as it would damage the diode.
- **Distribution lines**
 -
- **Demand**
 - 20 W tube light x 2 nos. per household
- **Construction**
 - Costs at Kyat 2.5 million, completed in March 2002.
 - Kyat 5,000 per tube light was collected as an initial cost. With two tube lights, Kyat 10,000 were collected per household on an average. People who could afford contributed more.
 - First, officer in Nyaungshwe recommended to ask to U Khun Kyaw.
 - But villagers could not see U Khun Kyaw.
 - In stead they met carpenter. Escaped. Find new one, U Taung Sein.
- **Operation**
 - 6:00 p.m. to 6:00 a.m.

A.C. Synchronous Generator

Type : STC-20

Output : 20kW

Voltage : 400/230 V Ampere : 36 • 1 A

Frequency : 50 Hz Rotation : 1500 rpm

Phase : 3 cos : 0.8

Excite Voltage: 94V Current : 0.4 A

Insulator CL : B

Date : Aug 2000

Manufacturer : Mindong Electric Group,
China

- 300 Kyat per tube light per month,
- Free of charge for public (Monastery and primary school).
- 7-men committee, 2 person per shift, voluntary basis
- Evening to start and morning to stop, no standby at station
- Issues
 - Voltage drops to 90-100 V, while the rated voltage is 230 V
 - Probably turbine rotated at a lower speed than rated.

2. Pa-Oh-Gawraka Village (Pao-Sekyoiya)

- Village information
 - Of the total 80 households, 40 h.h. are electrified.
 - Not sufficient power and no money for the remaining 40 households.



Welcomed by villagers



Dinner



Villagers



Visual Guide



Intake weir



Intake pond



Headrace channel



Spillway from Headrace channel



Screen on Headrace channel



Slope failure below Headrace



Headtank



Penstock



Penstock support



Reducer



Turbine and generator



Switch



Deadend post and cable connection

- Intake and waterway
 - Weir by wooden peg and sandbags for about 2 m high
 - There is no gate facility to block excess flow entering into waterway during flooding.
 - Channel slope is much better than Kyaye Oo, but should preferably gentler.
 - There is a significant size slope failure due to the overflow of the channel, probably during the test operation.
- Headtanck and penstock

- Headtank is too small and cannot function as desander.
- Penstock length at 44'
- Penstock route forms a path for rainwater. It will erode the route and hit the generator. Protection works are badly needed.
- It is recommendable to inspect the one U Khun Kyaw built at Tha Le U for the protection works of the penstock slope.
- Generating equipment
 - Banki turbine of 10 kW
 - Test operation at 170 V
 - Powerhouse not built yet.
 - Head 28'
 - 14" in diameter and 8" in width
 - Owner of the Aung Thitser Workshop is U Aung Sein, who made this turbine.
 - Generator is Mindong Electric (Group) Co., Ltd., made in China, which can be placed order in Taunggyi or Nyaunshwe.
 - No power house is built yet. It should be urgently built to avoid generator from watering.
- Distribution lines
 - Distribution line length is reportedly 2 miles long, but it seems longer.
 - Cable of distribution line is a de-stranded wire from 25 mm² ACSR.
 - Pole intervals at 150'
- Demand
 - There are 60 nos. 2 feet tube lights in total in 40 households.
 - However, due to the limited capacity of the distribution lines, only 40 nos. tube lights are being used.
 - No TV
- Construction
 - Construction started in June 2002 and commissioned in October 2002
 - Costs were Kyat 1,826,000, equally shared at Kyat 40,000 per household with somebody contributed more.
 - Generator at Kyat 200,000
 - Turbine at Kyat 250,000
 - Villagers provided work

A.C. Synchronous Generator	
Type :	STC-10 (125mm)
Output :	10kW
Voltage :	230/115 V Ampere : 43.5/87 A
Frequency :	50/60 Hz
Rotation :	1500/1800 rpm
Phase :	1 cos : 1.0
Excite Voltage:	80V Current : 4.1 A
Insulator CL :	B
Standard Q :	MDT02-1997
Date :	Aug 2000

force, aggregate, and 600 sandbags free of charge.

- Taung Sein & U Aung Sein made basic design by own learning.
- Operation
 - Tariff not collected yet since just commissioned and villagers paid initial capital costs.
 - Operation by 2 person per shift, villagers of 40 households receiving electricity in turn.
 - No operator at night
 - 6:00 p.m. to 6:00 a.m.
- Issues
 - Voltage 300 V at generator drops to 120 V.

3. Bawdi Gone Village

- Village information
 - Village head is U Nanda
 - All the 40 households are electrified.
 - There are in total 120 nos. 2 ft tube light (20 W).
 - Distribution line 1,000 m long
 - Located on hilltop, seems blessed village
 - A big house seen on hilltop.
- Generating equipment
 - Head 33'
 - 7.5 kW
- Distribution lines
 - 3,000' long.
- Construction costs
 - Construction was by U Taung Sein

Memo on Interviews/Field Surveys

Subject	16. Inspection of Village Schemes at Thale Oo		
Date	22.11.2002	Prepared by	
Atten- dants	JICA team	A. Katayama, H. Kanai, R. Sudo, Y. Nakagawa	
	Myanmar side	U Ba Ngwe, U Khun Kyaw, U Tun Myat	
Filename		Ref. No.	

Note: Kindly give files to secretary.

4. Tha Le U

- Village information
 - Tha Le U Village is located 45 minutes from Nyaungshwe by boat.
 - The Villagers arrived at an idea of village electrification with micro hydro when they saw the mini-hydro introduced at monastery.
 - Then, villagers organized Village Electrification Committee, Monk being the chairman.
 - Two monasteries contributed Kyat 100,000 each while each household bore Kyat 25,000.
 - A person who knew U Khun Kyaw in the past when U Khun Kyaw was Chairman of Taunggyi Local Government recommended that the villagers contact and ask U Khun Kyaw for the village electrification. Three villagers visited the Industrial Zone to see him, however, they failed. Thereafter, they came to know U Khun Kyaw is living in Taunggyi, they visited him at home, finally to ask him for his help in the village electrification. U Khun Kyaw explained his idea of his electrification program and came to agreement.
 - 70 % of the households are landless while the 30 % hold land of 3 acres on an average. Growing two crops a year.
 - The landholders' income level at Kyat 500,000 is two times that of landless at Kyat 200,000. The average is at Kyat 250,000.
 - The landless works as peasant or daily wageworkers.



Tha Le Oo Powerhouse



Intake site with debris skimmer-cum-guide wall



Wooden intake gate



Headrace channel



Headtank



Excess water spillway of Headtank



Crossflow turbine with guidevane without draft tube



Turbine at operation



Tailrace channel w/o water



Tailrace channel in operation



Outfall w/o water



Outfall in operation



Turbine-belt cover & generator



Step-up transformer 230/400 V
showing rated voltage in operation



Lights in powerhouse



Thanks for lighting



Deadend tower (400 V)



Distribution line at the longest span



Lighting in monastery



Streetlight (20 W) and typical house



Streetlight (20 W)



Right connection of two 16 mm² ACSRs



Study of Visual Guide



Leaving Tha Le U Village

War Khaung Lar Pyae Kyaw (9), 1363 (Myanmar Year)
U Khun Kyaw and Thale Oo Villagers cooperatively built.
12.9.2001, Wednesday

Board on the power house

- Intake and waterway
 - Well-elaborated intake layout with debris skimmer-cum-guide wall and wooden gate
 - Headrace channel with stone-protected side walls
 - Downstream half section of the channel has steeper slope to have supercritical flow and higher velocity than hydraulically required. FSL of Headtank could have been set at a higher level. Water surface profile in the headrace channel should preferably be of subcritical flow being controlled by the water level of Headtank.
 - The capacity of excess water spillway is small. Accordingly, the discharge through the intake gate should be carefully adjusted to about required level by the well-trained operator.
 - The spillway is connected to a pipe drain, which is not very recommendable in general as it could be clogged with debris. A step-type spillway is recommendable in general.
 - The excess water spillway may be provided, if site topography permits, upstream of the Headtank to avoid the excess water from directly hitting the powerhouse.
 - Intake weir is repaired with sand bag in the dry season.

- Headtank and penstock
 - Slope protection can be the sample.

- Generating equipment

- Crossflow turbine with guidevane but without casing/draft tube
- Step up to 400 V and after transmission, the receiving voltage is about 200 V.
- Turbine and belt have a protection covers.

KOYO A.C. Synchronous Generator

Type : ES-20 No. 91012

Output : 20kW

Voltage : 230/115 V Ampere : 87/174 A

Frequency : 50/60 Hz Rotation :
1500/1800 rpm

Phase : 1 cos : 1.0

- Distribution lines

- There are 84 poles in total, with number plate and cap plate on top of pole to protect from erosion by rainwater.
- Cables are 16 mm² ACSR.
- Support poles are local wooden post.
- ACSR cost in Taunggyi was Kyat 3,700 (about \$3.4) per viss (about 1.6 kg).

- Demand

- Of the total 118 households in the main village of Tha Le U, 81 households are electrified with 240 tube lights in total.
- 165 hh in the Seinpen and 154 hh in Inn Wa are not yet.
- 2 monasteries, 1 clinic, 2 primary schools are supplied free of charge.
- There are 30 TV sets. TV sets are switched off by 11:00 p.m. and thereafter villagers change to charge their battery from the network power. Battery is charged at Kyat 50 per time.
- Peeling of garlic can be made at nighttime.
- There are 24 streetlights (2' tube light) in total.
- The water source is spring. Little seasonal effect.

- Construction

- Of the total construction costs of about Kyat 5 million, about Kyat 2.5 million are for contract works by U Khun Kyaw (Kyat 1.9 million for actual costs and Kyat 0.6 million for his services for supervision and management), and the remaining Kyat 2.5 million is the villagers contribution by providing work force, materials (concrete aggregates), and buildings.
- The construction works were started on 19 January 2001. The Project was commissioned on 12 September 2001.

Upon completion of the power station, a villager's house nearby was first electrified. In addition, a large searchlight was brought in and strong light was emitted towards the sky over the Tha Le U village. Villagers rushed to the power station next morning. With the financial support by U Khun Kyaw accepting deferred payment for the costs of ACSR cables for the distribution lines combined with all the villagers' participation, the construction of the 4 km long distribution lines was completed only in one week period.

- Operation

- Operation from 6:00 p.m. to 6:00 a.m., in winter time, power supply will be started from 5:30 p.m.
- When there is a ceremony, power supplied also in daytime.
- 3 operators per shift (1 chief + 2 helper), all the 81 households in turn
- Check receiving voltage in the village by wireless and adjust the voltage output
- Kyat 50/tube/month
- There are voltage meters at 15 households.

U Khun Kyaw trained the village operators for 7 days staying at the powerhouse throughout the night. His contribution to training the village operators is essential for securing the sustainable operation.

To Know Duty for the Night Guards

- Check Dynamo, turbine, Belt, Bearing box
- Clean Filter, and water ways
- Only after checking thoroughly, open the water Gate.

First open the Iron Gate from water storage tank.

Second open the wooden door.

After open the water gate, push down the change over switch only when dynamometer shows 230 voltage.

Sometimes there are sparks from change over switch

(When change over switch is loose) Do not be afraid. Just pull down the switch.

Never keep change over switch mid way.

Operation manual board in the power house

- Issues

- High-tension transformer is needed to reduce the transmission loss.

5. The Village downstream of the plant

- Village information

- 20-30 households
- There are six schemes of micro hydro in other villages within in Thale U

Village Tract, each scheme with generator capacity at around 7.5 kW.

- Collected Kyat 50,000 per household
- Receiving half the rated voltage

3. Appendix (board and cost table shown in Tha Le Oo Power Station)

Brief Feature of Tha Le Oo Hydro power Station	
1. Location	Southern Shan State, Nyaung Shwe Township, Thale-Oo Village Tract, Thale-Oo Kone Thar Village, Eastern Side of Inle Lake, near Nant lee Stream
2. Area of station	15 feet square
3. Starting date for building	19 January 2001
4. Starting of electricity generation	12 September 2001
5. Length of water way and width	672ft* 3ft
6. Length * Width* Breath of Water Tank	32ft* 8ft* 4ft
7. Surplus water outlet gate	1
8. Water Gates	2
9. Water Outlet Canal	64ft* 3ft
Length of water pipe	43ft 3inch
Diameter of water piper	15 5/8inch
Distance from station to village	14850ft
Type of electrical Wire	16mm Aluminum 716Kg
Type of Tur wine	15in dia pipe
Type of Dynamo	Dynamo 20 KW
Type of fan belt	super bell 160
Type of step up	Step up transformer 20KVA
Type of air intake	Length 6ft, Width 4 inch
Lamp Posts	84
Electricity Households user	81
Thale Oo Kone Thar School Lamps	20
Thale Oo Inn School lamps	20