EIE-06-256 REEPRO

Promotion of the Efficient Use of Renewable Energies in Developing Countries

REEPRO Level 1 Training of Trainer Programme – Basic Knowledge for Renewable Energy Promotion Lao PDR January 7-18th, 2008 Report

Location

Vocational Teacher training centre
Sokapaluang campus, Faculty of Engineering
National University of Laos
Vientiane Capital

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List of Content

List of Figure

List of Tables

1 Introduction and Course Concept

The REEPRO project is motivated by the fact that poor households in Developing Countries often lack access to basic energy services. Currently the situation for many rural communities of developing countries is characterized by energy poverty and stagnation. The proposed project shall lead to the provision of energy services to those currently un-served or underserved by higher quality energy services on the basis of an introduction of renewable energies and energy efficiency. To achieve the overall objective, REEPRO intents to perform an extensive training and information campaign in the target countries Laos and Cambodia. These trainings target politicians, engineers, technicians and community stakeholders to overcome barriers to renewable energy sources (RES) utilization. The approach of the project is the training of local trainers from the local RES experts down to the community stakeholder level and the mutual development of RES training kit's for each level. The development of a RES training kit in 3 levels is pursued, which targets country RES stakeholders with different educational background from RES experts (1) over technician (2) to community stakeholders (3). Figure 1 shows conceptual framework of REEPRO Project trainings.

The Level 1 Training of trainers is the first step to build capacities of human resources in Cambodia and Lao. The trained trainers are to become a major source of expertise and advice on renewable energy in their respective countries. The training will enable the participants to deliver similar training and assist in implementing renewable energy activities thus creating local multiplier effect.

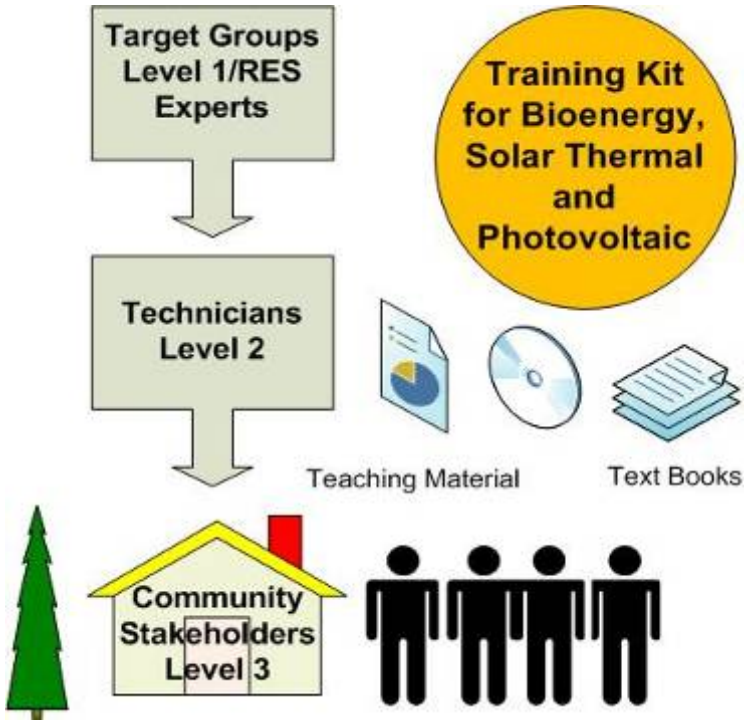

Figure 1: Conceptual framework of REEPRO Project Training

(Source: courtesy of COMPED)

2 The Level 1 Training of trainers Programme Objective and Methodology

The objective of the Level 1 Training of Trainers (TOT 1) is to train the experts and multiplier such as the scientists, engineers, entrepreneurs, etc in renewable energy technologies and relevant subjects. These trainers are encouragingly to become the experts, local entrepreneurs or promoters of efficient use of renewable energy.

Thematic coverage and content of the training included:

- Introduction of REEPRO project and training programme
- Basic knowledge on renewable energy and non-renewable energy. The two specific topics: Biomass energy (Biofuel, Biogas; Gasification); solar energy (Photovoltaic and Solar Thermal applications);
- Interactive studies were also focussed about the subjects of Entrepreneurial, Financing, RES Policy Planning, International Trade and Project Development.
- Case studies: existing (Along Tamey Gasifier project, Cambodia) and planned off-grid PV electrification project (Ban Mane village, Khammuane province, Lao PDR)
- Group works on RE appropriate technology and entrepreneurship on its base;
- Group works on project development: off-grid electrification for Ban Mane village (Khammuane province, Lao PDR) considering all possible technology options;
- Excursion and practical work were implemented on Solar PV and Biodigester

The training was designed and carried out through various learning mechanisms, such as presentations, discussions, case studies, group work, participant presentation on project proposals, and questions and answers.

3 Participants

The 16 participants have participated the TOT 1: 2 freelancers; 2 from private companies; 2 from NGO/NPO[1]; 5 from research institutes and 5 from academic sectors (Appendix Table 1).

4 Trainers/Facilitators

The training package was delivered by project partners and external resource person as below:

Table 1 Training Resource persons

1. Dr. Jan Kai Dobelmann	DGS President	Germany	dobelmann@sesolutions.de
2. Dr. Matthias Klauss	DGS	Germany	klauss@biovad.de
3. Dr. Jyrki Luukkanen	Turku School of Economics	Finland	jyrki.luukkanen@tse.fi
4. Mr. Juha Leppänen	TAMLINK	Finland	
5. Mr. Yrjo Majanne Majanne	TSE	Finland	
6. Dr. Khamphone Nanthavong	Faculty of Engineering, National University of Laos	Lao PDR	khamphon@fe-nuol.edu.la
7. Mr. Bounsou Matmanisone	Technology Research Insti-	Lao PDR	TRI@stea.gov.la

[1] NGO/NPO: Non-government Organization/Non-profit organization

	tute (TRI)		
8. Dr. Bounthanong Phonthi-pasa	Village off-grid Promotion and support (VOPS) Co.	Lao PDR	phonethipasa@yahoo.com
9. Mr. Simon Henschel	Sunlabob Co.LTD	Lao PDR	Contact@sunlabob.com
10. Mr. Phothanouthong Xay-sombath	SNV biogas program	Lao PDR	pxaysom-bath@snvworld.org
11. Mr. Souksavanh Xayalath	Department of Production and Trade promotion Ministry of Industry and Commerce	Lao PDR	suksaya@yahoo.com

Dr. J. K. Dolbemann, Dr. M. Klauss and Dr Jurki together with Dr. Khamphone Nanthavong (Faculty of Engineering, National University of Laos) have participated in conducting the parts of training in solar PV, Biomass and Project development, respectively.

5 Description and Outcome of the Training

5.1 Some changes

Schedule

The schedule and programme of the training is given in Annex B. Some changes in the training programme were made, as followed (marked in blue):

- Day 2: practice on PV systems was moved from Day 5 and placed into after noon session of day 2, and hence entrepreneurship was forwarded to the next following day.
- In Day 3: Presentation of Solar thermal was conducted by Dr Khamphone Nanthavong (Dr Kai Dolbemann took a visit to the Garment factory)
- In Day 3: Added presentation on Sunlabob rural electrification business concept (Presented by Mr. Simon Henschel from Sunlabob Co.), and therefore, some presentations on biomass by Dr Matthiass Klauss were forwarded to the following days respectively.
- In Day 6: field trip took whole day instead of half day as scheduled
- In Day 7: morning session was added presentation on off-grid electrification program (presented by Dr Bounthanong Phonethipasa from VOPS Co.)
- In Day 8: presentation on National Biogas program was added (by SNV Laos resource person)
- In Day 9 late afternoon, the study trip to Renewable Energy technology centre of TRI at km 14 was organized.

Training methods

- Due to insufficient language skill of some participants (about 5 of 16), the training was frequently interpreted in Lao by Dr Khamphone (usually in brief), therefore, each topic took slightly more times then planned. However such approach provided better understanding to those trainees.

5.2 Outcome of the training.

Day 1

- Morning session of the Day 1 started by the short opening ceremony. Dean of the FE, Assoc. Prof. Dr. Boualinh Sousouvanh and Assoc. Prof. Korakanh Pasomsouk, Head of Mechanical department have participated the opening ceremony. Opening remarks were jointly made by Dr. Jan K. Dolbemann on behalf of DGS and Assoc. Prof. Dr. Boualinh Soysouvanh;
- Introduction of REEPRO project: summary, background, approaches and expectation of the project given by Dr. Jan Kai Dolbemann from DGS
- Basic knowledge about renewable energy and non-renewable energy; energy sources; basic electrical applications and construction basics; and assessment of possible energy sources in Laos presented by Dr. Khamphone Nanthavong (FE/NUOL)
- In the afternoon session, presentation on Solar PV was made by Dr Jan K. Delbemann

Day 2 included the following topics:

- Continued lectures on solar PV
- Exercise on PV system (solar home system) sizing was done on the beginning of the afternoon session:
- Then trainees practiced with real solar home system: Explanation on Solar panel construction and types; Observation for state of charge of the battery; Appliances connection; Panel slop and orientation; Charge Controller installation; Measurement of system voltage (operational and open circuit voltages) and current (operating and short circuit currents); Consideration and tasks of SHS Maintenance and repair.

Day 3 started with lecturers on entrepreneurship by Dr. Dolbemann

- Group discussion on business opportunity: trainees were divided into 4 groups. The groups were given 30 minutes to discuss on business opportunities for case, if the campus of Faculty of Engineering was ‘placed’ some where isolated location, far away from the city. Then each groups presented their discussion results.
- Afternoon session was busied with solar thermal application principle, presented by Dr Khamphone Nanthavong; Dr Kai Dolbemann visited the garment factory

Day 4 included the following topics:

- Dr J. Kai. Dolbemann leaving for Phnompenh. The Biomass session was facilitated by Dr Mattthiass Klauss (DGS);
- Additional 30 minutes presentation on Sunlabob rural electrification business concept was presented by Mr. Simon Henschel (Sunlabob rrenewable energy Co.LTD)
- Afternoon session continued with lectures on Biogas by Dr. Klauss

Day 5:

- The day was busy with lectures and exercises on biogas digestion

Day 6: whole day was for field trip Sunlabob pilot spot at Ban Sorg village, Sangthong district, Vientiane capital

- trainees departed to the Sunlabob pilot spot for field practice on Solar PV and biogas plants. The field trip was facilitated by Dr. Khamphone Nanthavong and Dr. M. Klauss
- During the trip, trainees have observed and learned experiences with PV systems (installation, management scheme and maintenance service)
- Unfortunately, the biogas digester there has been stopped functioning for several months, thus the trainees were not able to make real gas measurement.

Day 7: TSE team succeeded the training

- RES policy planning and a case study of Anlong Damrey gasifier in Cambodia brought by Dr. Jyrki Luukkanen from Finland
- Project management and business management including sensitivity and risk Analysis and financial Management given by Mr. Juha Lepp from Finland
- Added presentation: resource person, Dr Bounthanong Phonthipasa from VOPS was invited to present concept of the off-grid rural electrification program under framework of the Rural electrification program, conducted by the Ministry of Energy and Mines and supported by the World Bank

Day 8:

- Lectures and Group work on project SWOT analysis, facilitated by Dr. Jyrki Luukkanen and Mr. Juha Leppänen. Moderated by Dr Khamphone Nanthavong
- In Afternoon session: added presentation on Lao-SNV biogas program by Mr. Phouthanouthong Xaysombath, representative of SNV Laos

Day 9:

- Project's Financial analysis by Dr. Jyrki;
- Financing tool in Lao PDR: Introduction, equity, debt financing, banking systems given by Mr. Bounsou Mammanisone (TRI)
- Afternoon session started with exercise on project financial analysis
- International trade: legal and regulation; financial transaction: mode of payments, sale terms custom procedures, and trader manual for Lao PDR presented by Mr. Souksavanh Xayalath from department of Production and Trade Promotion, Ministry of Industry and Commerce
- Added activity: study tour to Renewable energy Technology centre of TRI at km 14. FE/NUOL facilitated the trip by providing transport.

Day 10, Final day of the training

- Project work: analysis of electrification option for case of Ban Mane village (refer to Project work in annex C)
- Each of the Trainees group was to analyze and present one of the four possible schemes of off-grid electrification options: (1) Solar home systems; (2) PV system with mini grid; (3) Community solar Battery charging stations; (4) Gasification genset;
- Afternoon session: TSE team was guided for city sightseeing before departuring to Hanoi;

- Training evaluation by the Trainees: evaluation forms were filled;
- Discussion on Further matters:
    - Trainees have agreed that: Training kit editing workshop will be on 28-29 February 2008, instead of 29 February – 1 March as suggested by the third project meeting in Phnom Penh, because 1 March is a Saturday, not so convenience;
    - Trainees expressed their willingness to participate REEPRO working groups (table 2), which are to work on (1) editing and creating of training kits for all levels; (2) conducting of relevant trainings;

Table 2: Groups of Interesting for Training Kit Workshop Development

Solar energy	Biomass	Project Management
Mr. Khambang Vilaysane (Sunlabob)	Mr. Boualy Vongvisith (RIS)	Mr. Bouangern Xayalath (CDEA)
Mr. Phonesavanh Vorasane (TRI)	Mr. Vilath Samvichit (LIRE)	Assoc. prof. Sengprasong Phrakonkham (FE/NUOL)
Mr. Phouang Phouthavong (FE/NUOL)	Mr. Khampha Keomanichanh (CDEA)	Mr. Sili Khouphannavong (Freelance)
Mr. Southana Sysaath (Freelance)	Assoc. prof. Sengratry Kythavone(FE/NUOL)	Mr. Thongvanh Vilayphonh (FE/NUOL)
Mr. Vongsavanh Chanthaboune (FE/NUOL)	Mr. Soukanh Vannapho (TRI)	Mr. Volachit Piliyasouth (TRI)
		Mr. Phayvanh Vongsaly

The main outcome of the training is:

- Participants are acquainted with the knowledge of renewable energy, business management of being entrepreneur, concepts of current energy trend and modern technology in energy conversion for meeting energy demands of human and sustainable natural resources management
- Learned experiences on success and failures of existing RE project in Lao PDR and other countries.
- Identified follow up activities to be implemented with participants for the upcoming training of the project and will assist in training kit improvement and finalization.

6 Evaluation of the Training Programme

All the 16 participants contributed to the evaluation of the training workshop. The evaluation results can be described by the following figures and graphs (Full evaluation is attached)

General feedback (figure 1)

- Mostly trainees need more excursion (14/16), more practical work (14/16); more project work (14/16); more workshop (14/16); more lectures (10/16);
- While 13 of 16 trainees agreed that the combination of lectures, workshop and practical works are appropriate which contradicts previous feedback (?); difficulty of the course is appropriate (11/16); the activities gave sufficient practice and feedback (12/16); the teaching materials were appropriate (15/16) (?);
- Mostly (14/16) agreed that the materials presented in a manner that were understandable; the mixture of technical and entrepreneurial issues was appropriate (14/16); the contents are relevant to my job (12/16);
- Mostly (13/16) trainees have agreed that the course meets their expectation.

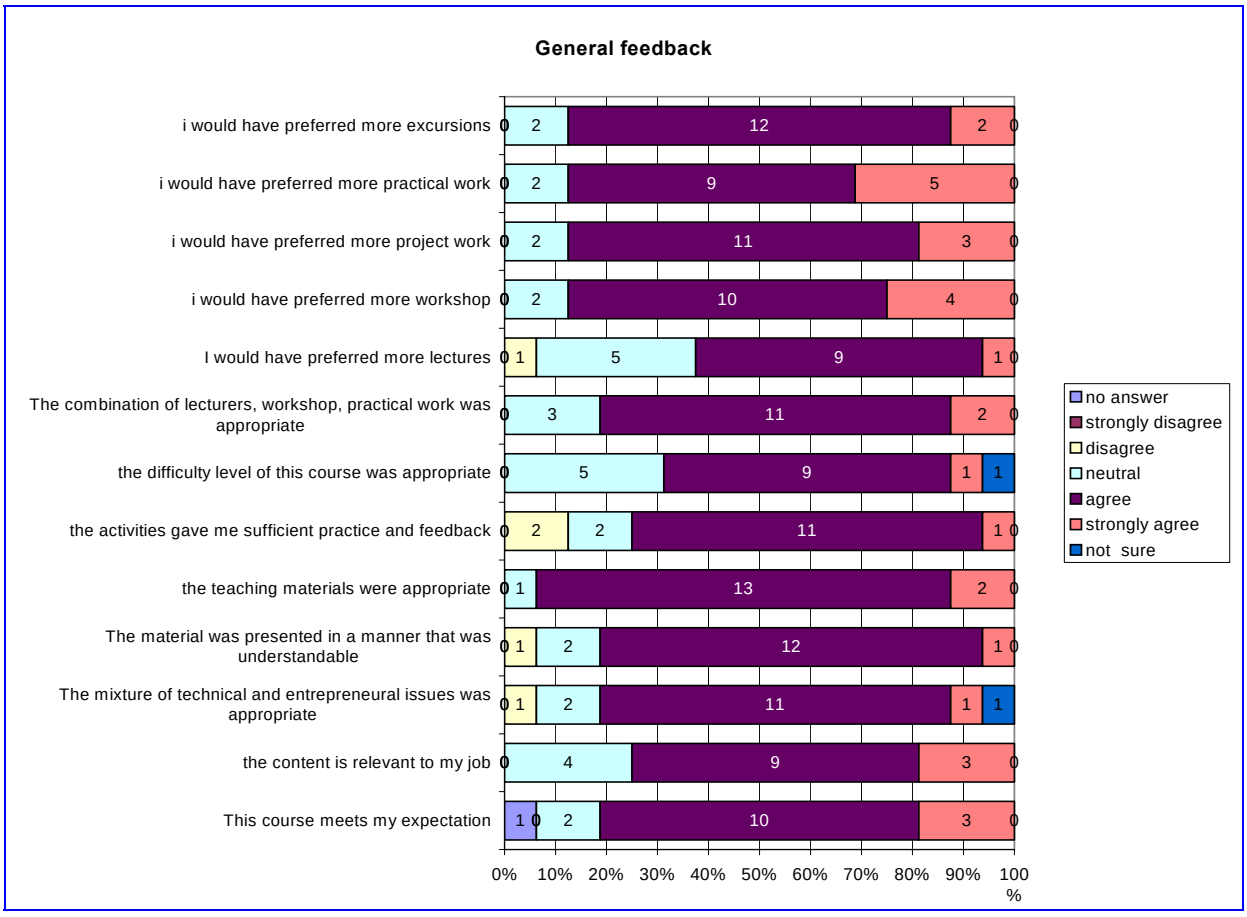

Figure 2 General feedback

- Although there are some trainees do not agree that the activities gave sufficient feedback and practice (2/16); understanding (1/16); mixture of technical and entrepreneurial issues (1/16); one does not agree on adding more lectures;
- Two trainees suggest to add such more topics as (1) how to prepare project proposal and what legal procedures needed; (2) maintenance of each provided technology; while 4 others say 'no' and mostly did not give opinion on this issue;
- Obviously, feedbacks on a performance of each topic are also good (figures 3-7)
- When trainees were asked about further education demand, mostly (11/16) agreed that they got enough information to co-operate with the REEPRO team in the per-

formance of the REEPRO activities, while some need more trainings, desirably to be conducted in weekend (2 days a week) or compact training (2 to 5 week days) (figures 8-9)

- Mostly trainees have expressed their willingness to get more trainings on each topics (figure 10);

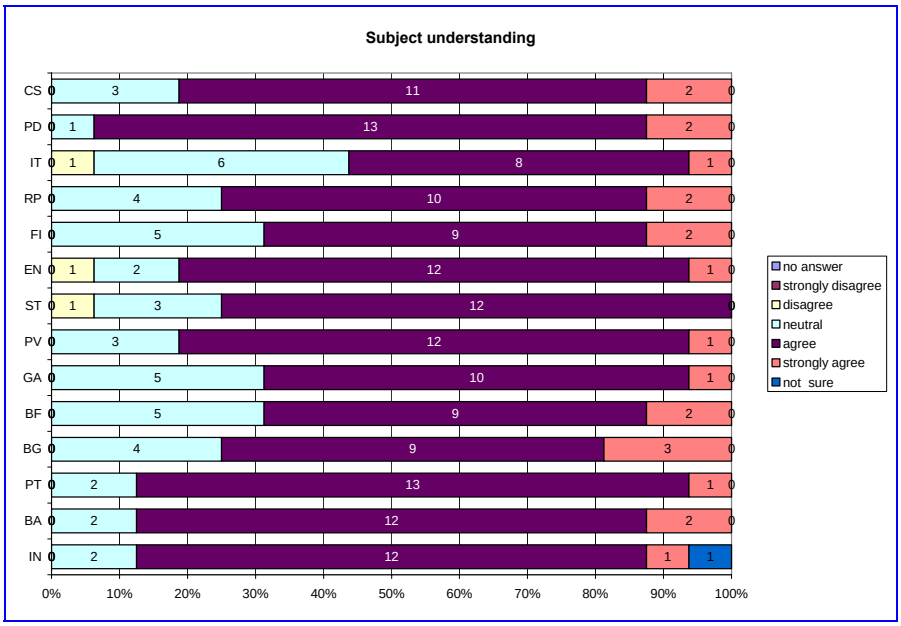

Figure 3 Materials understanding

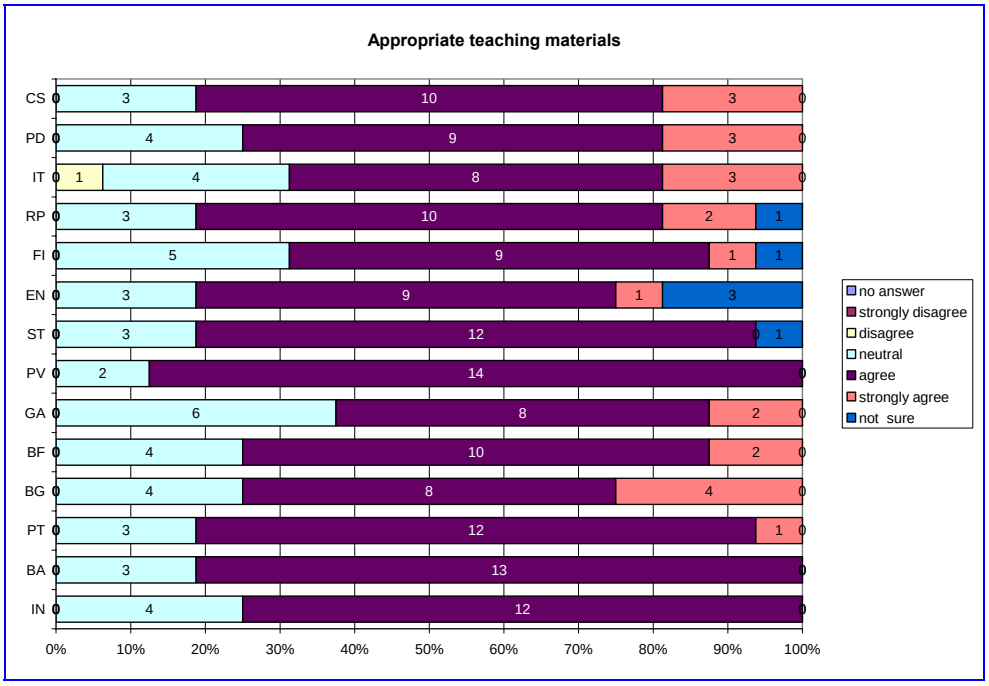

Figure 4 Teaching materials are appropriate?

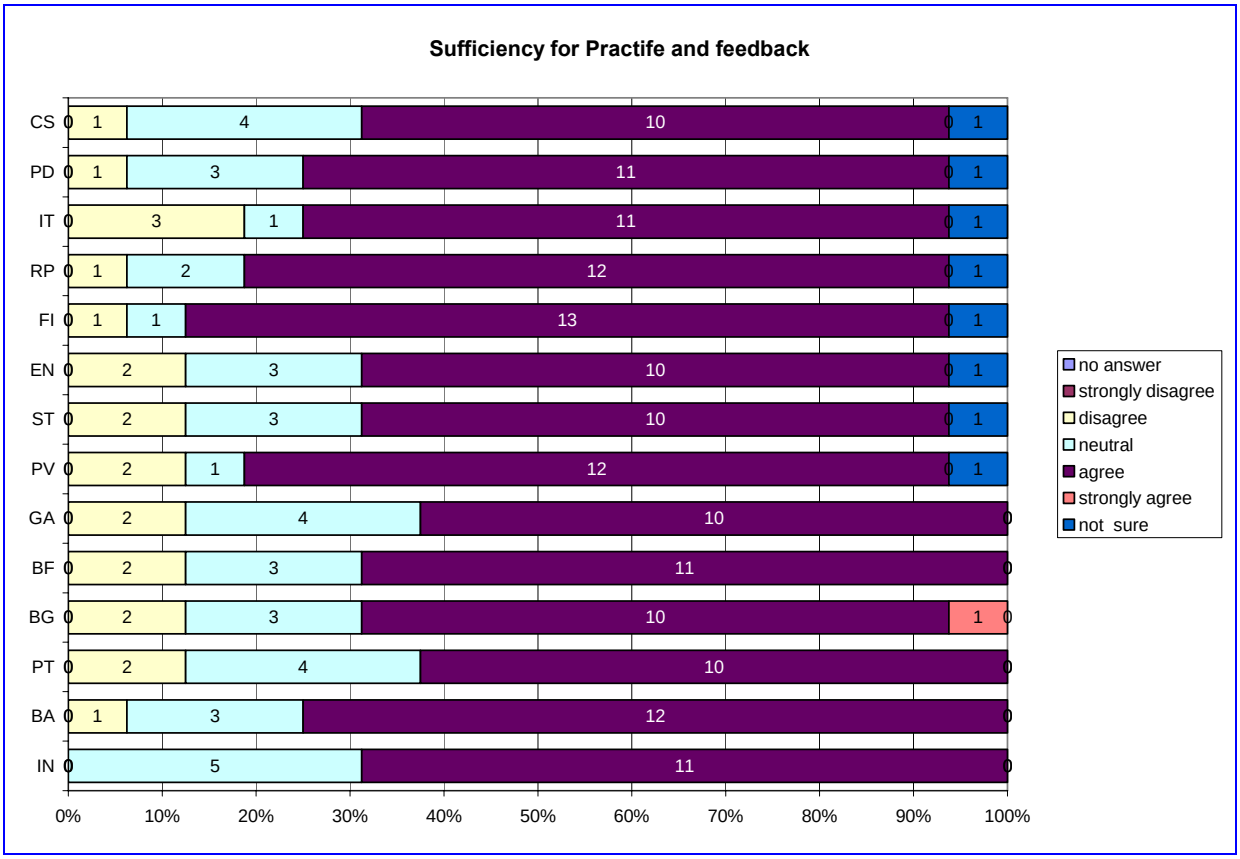

Figure 5 Sufficient materials for practice and feedback

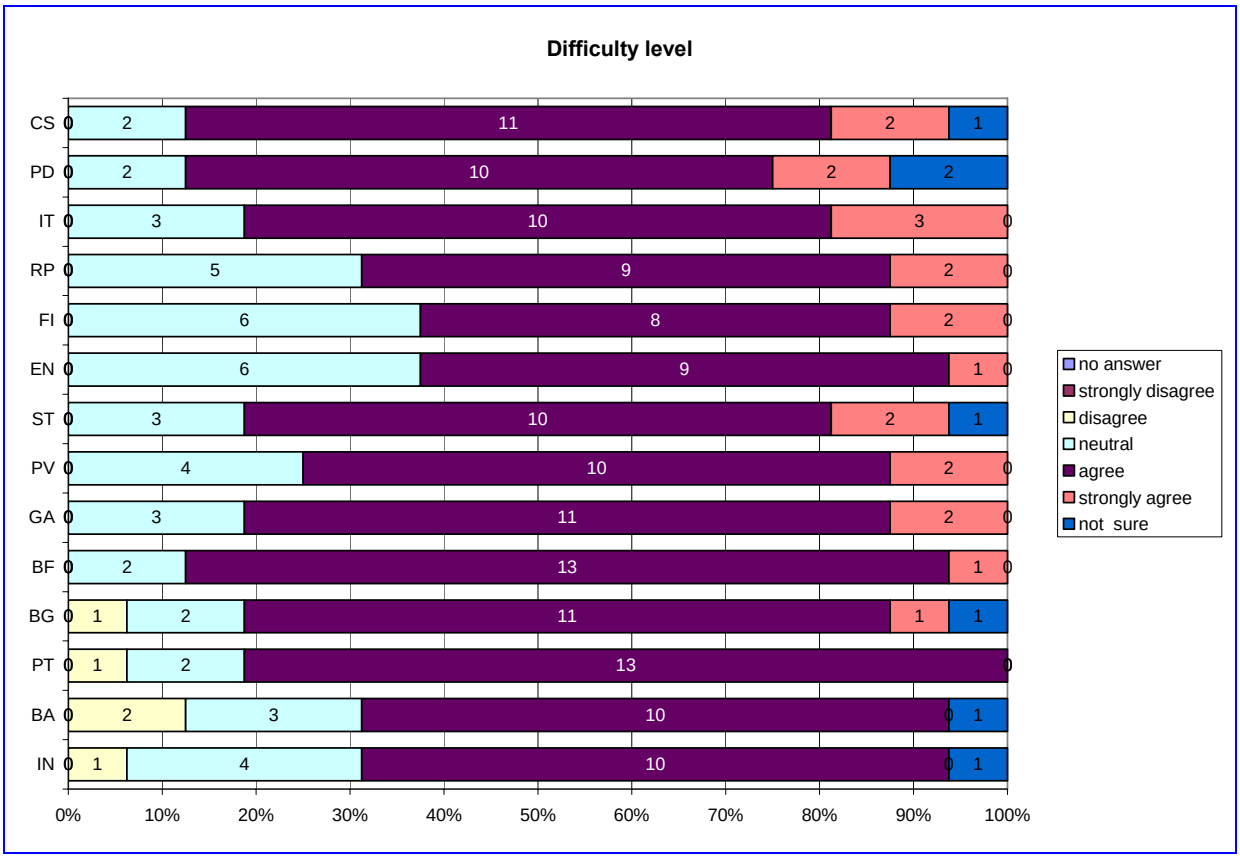

Figure 6 Difficulty of training materials

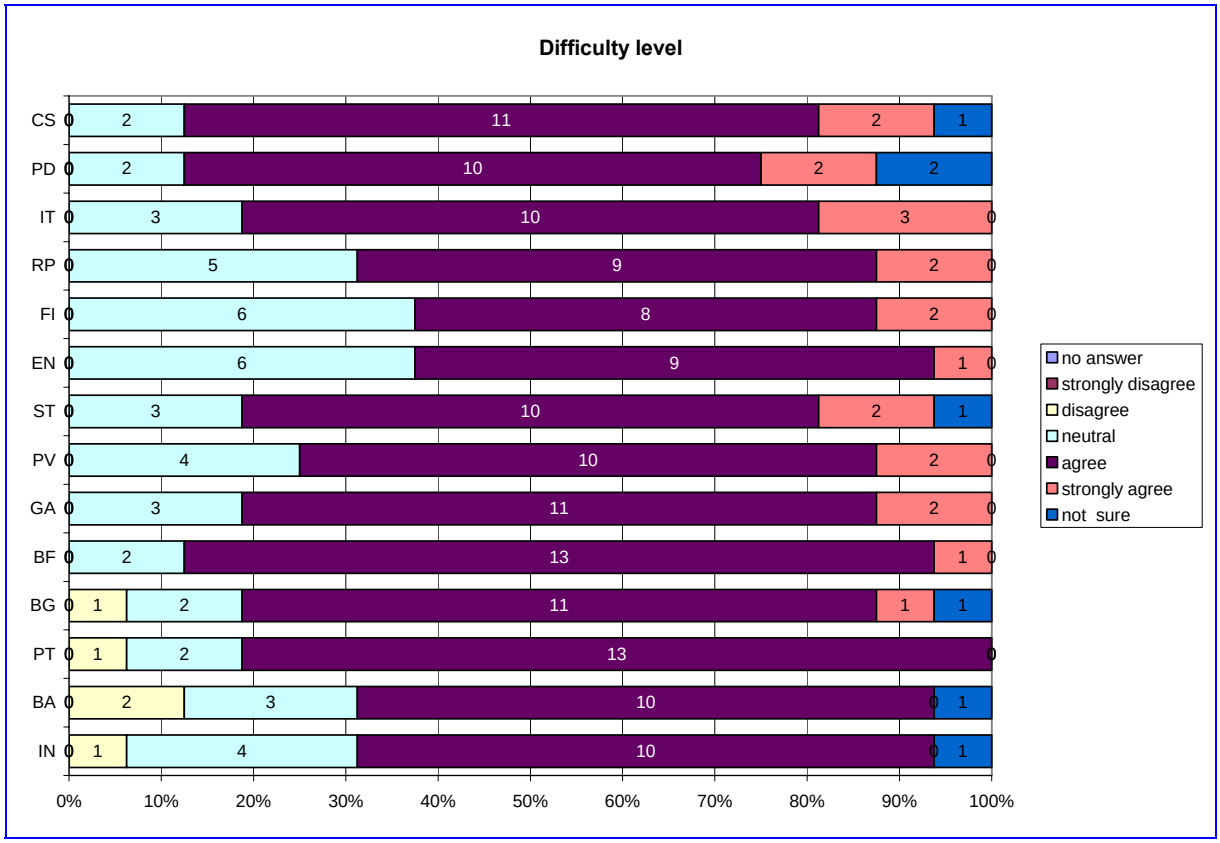

Figure 7 Use of knowledge to my daily work

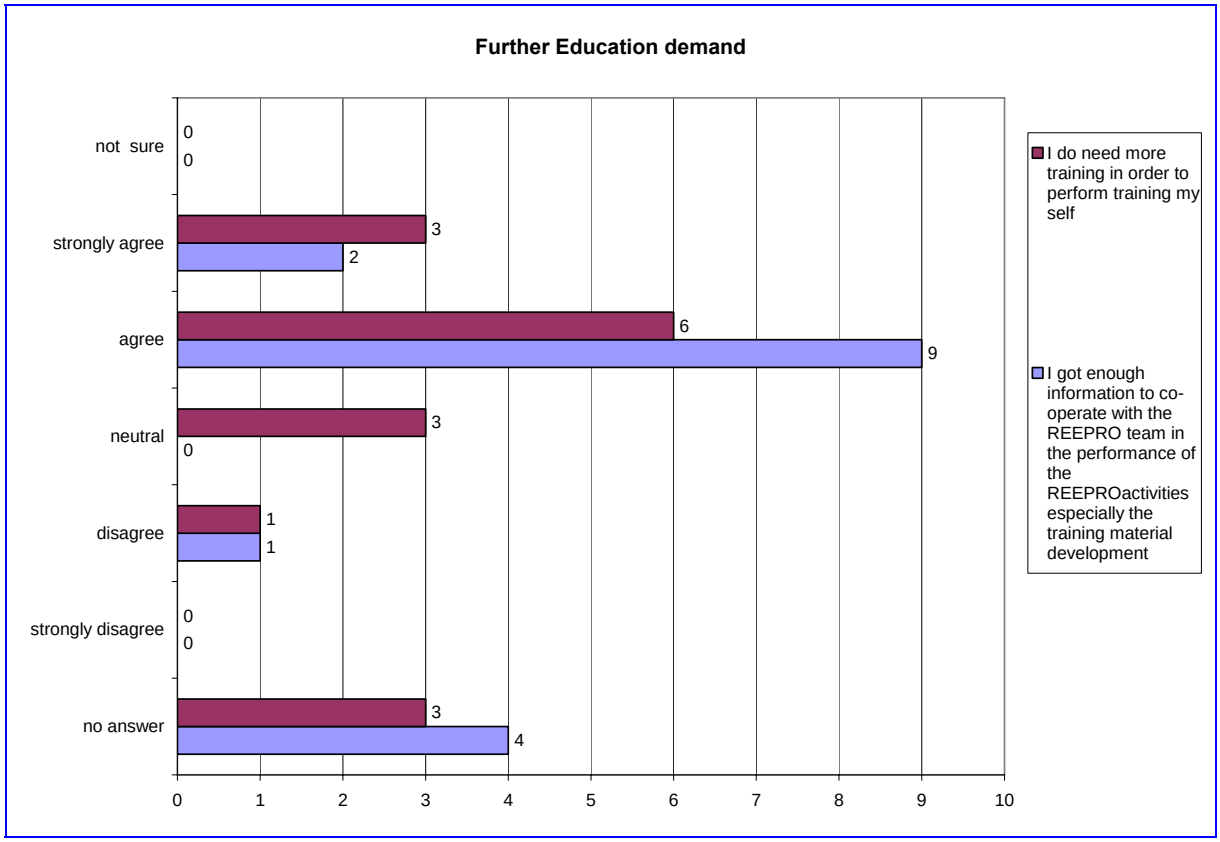

Figure 8 Further education demand

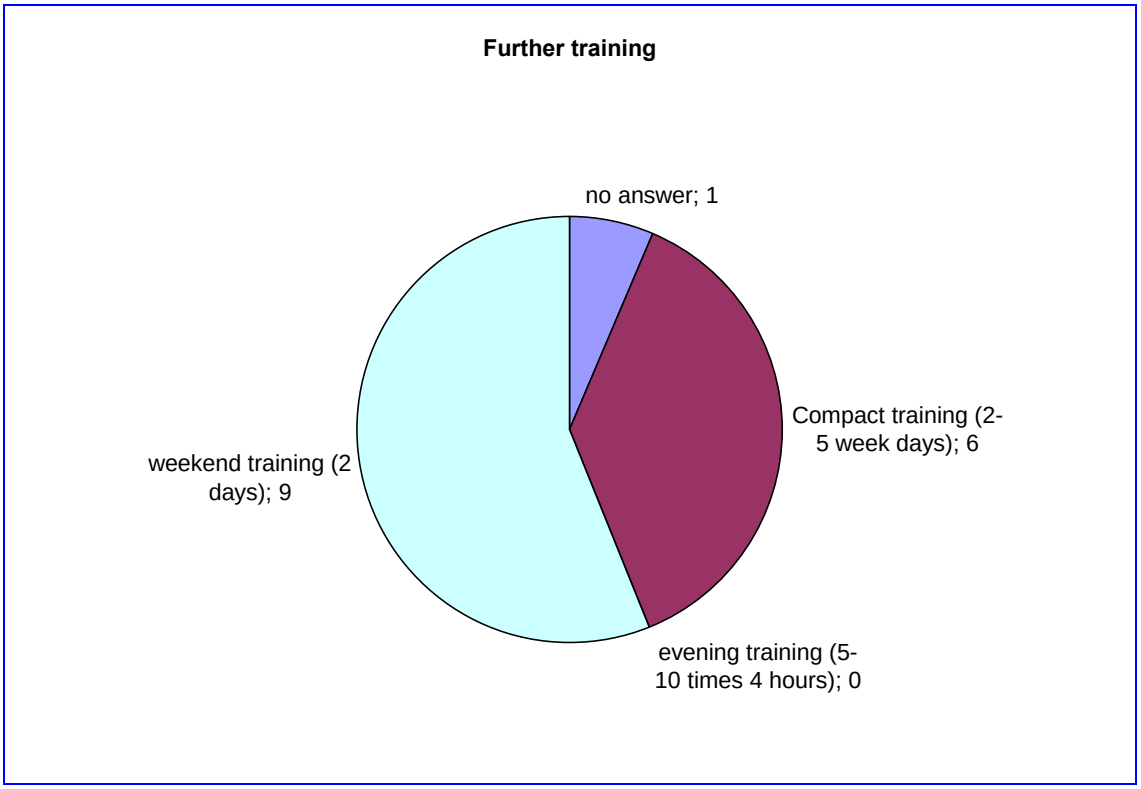

Figure 9 Further training needs

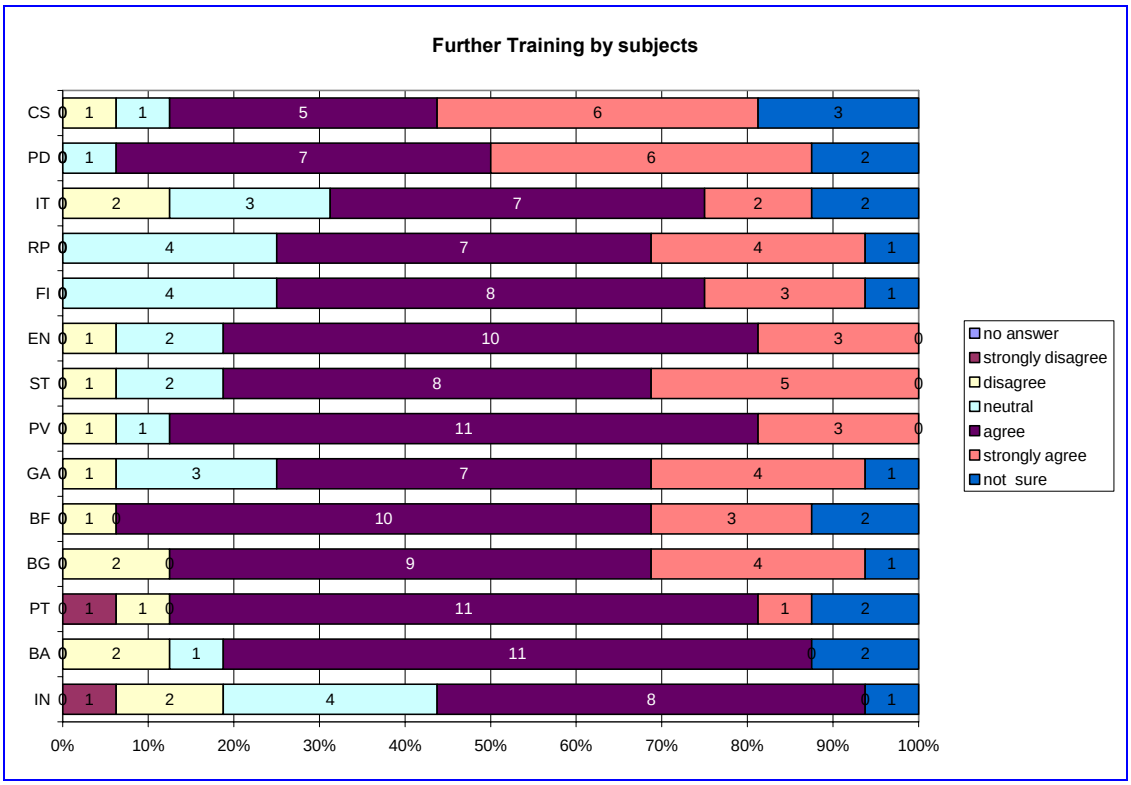

Figure 10 Interests in getting further trainings

7 Annex

7.1 Annex A: List of Participants

1.	**Mr. Bouanly Vonvisith** *Researcher* *Research Institute of Science (RIS)* *The Science and Technology Agency (STA)* *Nahaideo, Vientiane capital* **Lao PDR** ☎(856) 21 20 1799 e-mail: boualee@hotmail.com	
2.	**Mr. Bouangen Xayalath** *Project assistant* *Community Development and Environment Association (CDEA)* *Nahaideo,* *Vientiane capital* **Lao PDR** ☎(856) 20 200 3820 e-mail: bsayalath@yahoo.com	
3.	**Mr. Khambang Vilaysane** Sunlabob Renewable energy Co.LTD *Watnak,* *Vientiane capital* **Lao PDR** ☎(856) 20 245 8579 e-mail: contact@sunlabob.com	
4.	**Mr. Khampha Keomanichanh** *Acting president* *Community Development and Environment Association (CDEA)* *Nahaideo,* *Vientiane capital* **Lao PDR** ☎(856) 20 222 2187 e-mail: keomanichanh@yahoo.com	

5.	**Mr. Phayvanh Vongsaly** *Financial consultant* *Off-grid Promotion and Support (VOPS) Co.* *Rural electrification Program, Department of Electricity/Ministry of Energy and Mines (DOE/MEM)* *Ban Sivilay* *Vientiane capital* **Lao PDR** (856) 20 564 9373 e-mail: airnoyvong@yahoo.com	
6.	**Mr. Phonsavanh Vorasane** *Technical Staff* *Technology Research Institute (TRI)* *The Science and Technology Agency (STA)* *Nahaideo* *Vientiane capital* **Lao PDR** (856) 21 21 8711 e-mail: triresearch@hotmail.com	
7.	**Mr. Phouang Phouthavong** *Deputy Head of Department* *Faculty of Engineering/National University of Laos (FE/NUOL)* *Watnak* *Vientiane capital* **Lao PDR** (856) 20 240 0879 e-mail: pphouthavong@yahoo.com	
8.	**Mr. Sengprasong Phrakonkham** *Head of Department* *Faculty of Engineering/National University of Laos (FE/NUOL)* *Watnak* *Vientiane capital* **Lao PDR** (856) 21 95 1294	

	e-mail: sengprasong@yahoo.com	
9.	**Mr. Sengraty Kythavone** *Associate professor* *Faculty of Engineering/National University of Laos (FE/NUOL)* *Watnak* *Vientiane capital* **Lao PDR** (856) 20 770 4904 e-mail: sengratrys@yahoo.com	
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11.	**Mr. Soukanh Vannapho** *Director,* *Renewable energy technology centre (RETC/TRI/STA)* *Nahaideo* *Vientiane capital* **Lao PDR** (856) 21 218711 e-mail: tri@stea.gov.la	
12.	**Mr. Southana Syasaath** *Freelancer* *Dongpalab* *Vientiane capital* **Lao PDR** (856) 20 576 3220 e-mail: soothana@hotmail.com	
13.	**Mr. Thongvanh Vilayphonh**	

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14.	**Mr. Vilath Samvichit** *Technical staff* *Lao Institute for Renewable energy(LIRE)* *Watnak* *Vientiane capital* **Lao PDR** (856) 20 532 1957 e-mail: contact@sunlabob.com	
15.	**Mr. Volachit Piliyasouth** *Technical staff* *TRI/STA* *Nahaideo* *Vientiane capital* **Lao PDR** (856) 21 217811 e-mail: chitpiliyasouth@yahoo.com	
16.	**Mr. Vongsavanh Chanthaboune** *Lecturer* *FE/NUOL* *Watnak* *Vientiane capital* **Lao PDR** (856) 20 601 2707 e-mail: vong_ch@hotmail.com	

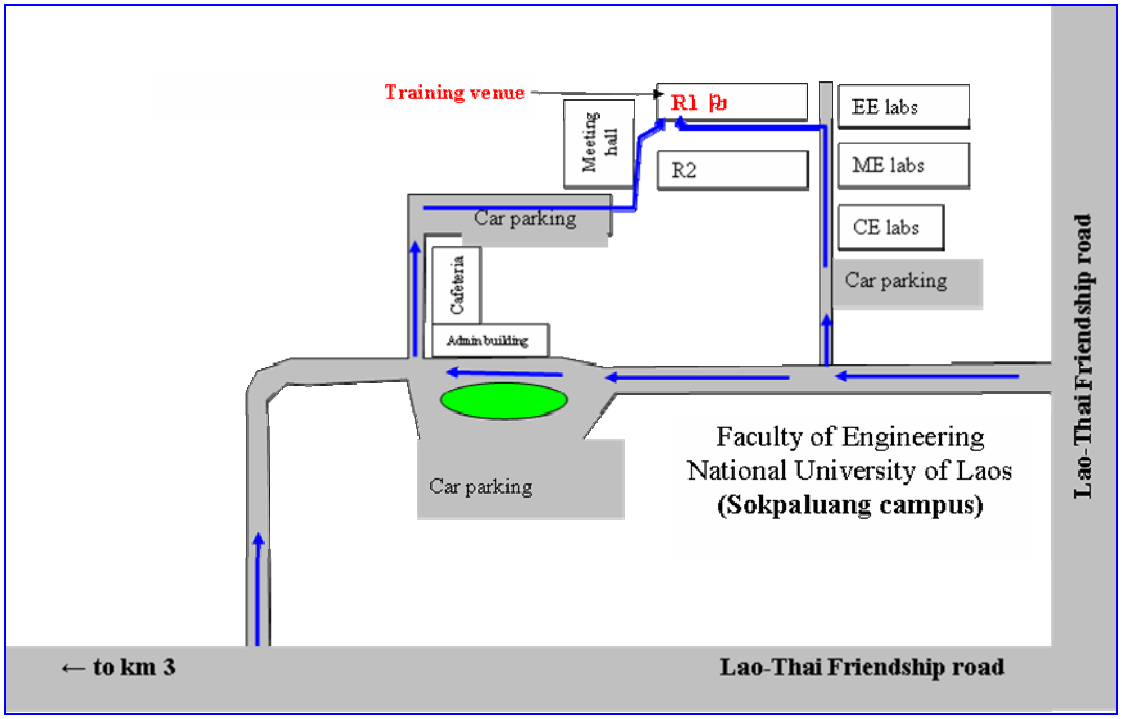
7.2 Annex B: Schedule and Programme of the Training

EEK 1: REEPRO Level 1 Train the Trainer Programme Laos– Basic Knowledge for Renewable Energy Promotion

	07.01.2008	08.01.2008	09.01.2008	10.01.2008	11.01.2008	12.01.2008
Units	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Saturday**
9:00-10:30	**Introduction** **Basics** BA01 - Renewable Energy (RE), Basics and Definitions BA02 - Sources for RE *Dr. Khamphone Nanthavong, NUOL*	**PV** PV04 - PV System planning *Dr. Jan Kai Dobelmann, DGS*	**Entrepreneurship** EN02 - Concept Building & Role Identification EN03 - Micro Enterprise Planning & Assessment EN04 - Micro Enterprise Management *Dr. Jan Kai Dobelmann, DGS*	**Biofuel** BF01 Types of Biofuels, Basics and Definitions BF02 Generation BF03 Production BF04 Biofuel utilization *Dr. Matthias Klauss, DGS*	**Biogas** BG04 - Components of AD Systems *Dr. Matthias Klauss, DGS*	**Practical Work/Excursion PV/Biomass at Sunlabob spot, Sangthong district (Vientiane capital)** *Dr. Khamphone Nanthavong, NUOL, Dr. Matthias Klauss, DGS*
11:00-12:30	**Basics** BA03 - Fundamentals of Electricity and Construction BA04 - Assessment of possible sources Dr. *Khamphone Nanthavong, NUOL*	**PV** PV05 - PV System commissioning and maintenance *Dr. Jan Kai Dobelmann, DGS*	**Entrepreneurship** EN05 - Fund Utilisation & Management *Dr. Jan Kai Dobelmann, DGS*	**Biogas** BG01- Microbial Basics and *Dr. Matthias Klauss, DGS* Invited presenter (Sunlabob rural electrification business concept))	**Biogas** BG04 - Components of AD Systems *Dr. Matthias Klauss, DGS*	**Practical Work/Excursion PV/Biomass at Sunlabob spot, Sangthong district (Vientiane capital)** *Dr. Khamphone Nanthavong, NUOL, Dr. Matthias Klauss, DGS*
13:30-15:00	**PV** PV01 - PV System Types and applications PV02- PV Cell Types *Dr. Jan Kai Dobelmann, DGS*	**Practical work PV** *Dr. Khamphone Nanthavong, NUOL; Dr. Jan Kai Dobelmann, DGS*	**Solar thermal system** ST01 - Solar thermal system Types and applications *Dr. Khamphone Nanthavong NUOL*	**Biogas** BG02 - Processes and Parameters of AD Systems *Dr. Matthias Klauss, DGS*	**Biogas** BG05 - Example Calculation of Biogas and Energy Yields, Plant Operation *Dr. Matthias Klauss, DGS*	**Practical Work/Excursion PV/Biomass at Sunlabob spot, Sangthong district (Vientiane capital)** *Dr. Khamphone Nanthavong, NUOL, Dr. Matthias Klauss, DGS*
15:30-17:00	**PV** PV03 - PV System Components *Dr. Jan Kai Dobelmann, DGS*	**Practical work PV** *Dr. Khamphone Nanthavong, NUOL; Dr. Jan Kai Dobelmann, DGS*	**Solar thermal system** ST01 - Solar thermal system Types and applications *Dr. Khamphone Nanthavong NUOL*	*BG03 - Input and Output Materials and their Use* *Dr. Matthias Klauss, DGS*	**Biogas** BG05 - Example Calculation of Biogas and Energy Yields, Plant Operation *Dr. Matthias Klauss, DGS*	**Practical Work/Excursion PV/Biomass at Sunlabob spot, Sangthong district (Vientiane capital)** *Dr. Khamphone Nanthavong, NUOL, Dr. Matthias Klauss, DGS*

WEEK 2: REEPRO Level 1 Train the Trainer Programme Laos– Basic Knowledge for Renewable Energy Promotion

	14.01.2008	15.01.2008	16.01.2008	17.01.2008
Units	**Monday**	**Tuesday**	**Wednesday**	**Thursday**
9:00-10:00 10:00-10:30	**Power transmission and storage** *Dr. Khamphone Nanthavong, NUOL* *Invited lecturer: Dr Bounthanong from VOPS*	**RES policy planning** RP03 - Stakeholder involvement + International and regional energy planning context RP04 - RES policy in Laos / Cambodia *Dr. Jyrki Luukkanen, TSE*	**Financing** FI02 - Performing Financial Analyses *Dr. Jyrki Luukkanen, TSE*	**Project work** *Dr. Jyrki Luukkanen, TSE, Dr. Khamphone Nanthavong, NUOL*
11:00-12:30	**Gasification** BF01 - Types of Gasifiers, Basics and Definitions BF02 - Sources for gasifier power generation *Yrjo Majanne, TSE*	**Project Management** PD01 - Project development *Juha Leppanen, TSE*	**Financing** FI03 - Available Financing Tool in Laos *Mr. Bounsou Mathmanisone,TRI*	**Project work** *Dr. Jyrki Luukkanen, TSE, Dr. Khamphone Nanthavong, NUOL*
13:30-15:00	**Gasification** BF03 -Fundamentals of gasification production BF04 - Utilization of producer gas *Yrjo Majanne, TSE*	**Project Management** **PD02 - Project management** *Juha Leppanen, TSE*	**International trade** ***MOIC*** *Mr. Sousavanh Xayalath*	**Evaluation discussion of further work** *Dr. Khamphone Nanthavong, NUOL; Khampha Keomanichanh, CDEA*
15:30-17:00	**RES policy planning** RP01 - Strategic planning of energy systems, introduction RP02 - Guidelines for strategic planning *Dr. Jyrki Luukkanen, TSE*	**National Biogas program (presented by SNV Laos representative)** **Financing** FI01 - Financial management *Dr. Jyrki Luukkanen, TSE*	**Project work** *Dr. Jyrki Luukkanen, TSE, Dr. Khamphone Nanthavong, NUOL* *Study Trip to Rnewable energy technology Centre (TRI/STA)*	**Evaluation discussion of further work** *Dr. Khamphone Nanthavong, NUOL; Khampha Keomanichanh, CDEA*



Further Information:

- **Catering:** Coffee breaks: **Room R1.202**; Lunch: **FE cafeteria**.
- **Practical field trip** (**Saturday 12 Jan 08**): Ban Sorg, Sangthong district, Vientiane capital (Sunlabob's pilot spot)
- **Training language:** Presentation **– in English & Lao;** Slides**- in English;** Training material**: English**
- **Contact persons:**
  - **Dr. Khamphone Nanthavong (020 541 4347 or 246 7192,** khamphon@fe-nuol.edu.la **);**
  - **Mr. Thongvanh Vilayphonh (020 565 8386;** fmetvanh@yahoo.com)
  - **Ms. Daoheuang Siboriboune (020 572 8882)**

Table 3 Participants data base for TOT 1

N°	title	first name	last name	organization	street	email	Tel	hand phone	Fax
1	Mr.	Bouangern	Xayalath	CDEA	Nahaideo	bsayalath@yahoo.com	(856-21) 243312	200 3820	
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3	Mr.	Khambang	Vilaysane	Sunlabob Co. LTD	Lao-Thai Friendship road	contact@sunlabob.com	(856-21) 313874	245 8579	(856-21) 314045
4	Mr.	Khampha	Keomanichanh	CDEA	Nahaideo	keomanichanh@yahoo.com	(856-21) 243312	502 2759	
6	Mr.	Phayvanh	Vongsaly	VOPS	Ban Sivilay	airnoyvong@yahoo.com	(856-21) 415388	564 9373	
7	Mr.	Phouang	Phouthavong	FE/NUOL	Lao-Thai Friendship road	pphouthavong@yahoo.com	(856-21) 951294	240 0879	(856-21) 314382
8	Assoc. prof.	Sengprasong	Phrakonkham	FE/NUOL	Lao-Thai Friendship road	sengprasong@yahoo.com	(856-21) 951294	770 9666	(856-21) 314382
9	Assoc. prof.	Sengratry	Kythavone	FE/NUOL	Lao-Thai Friendship road	sengratrys@yahoo.com	(856-21) 951296	770 4904	(856-21) 314382
10	Mr.	Sili	Khouphannavong	Freelancer	Nongbouathong	sili1234@gmail.com		540 7916	
11	Mr.	Soukanh	Vannapho	TRI	Nahaideo	tri@stea.gov.la	(856-21) 218711	566 6982	
12	Mr.	Southana	Sysaath	Freelancer	Dongpalab	soothana@hotmail.com		576 3220	
13	Mr.	Thongvanh	Vilayphonh	FE/NUOL	Lao-Thai Friendship road	fmetvanh@yahoo.com	(856-21) 951296	565 8386	(856-21) 314382
14	Mr.	Vilath	Samvichit	LIRE	Lao-Thai Friendship road	contact@sunlabob.com	(856-21) 313874	532 1957	(856-21) 314045
15	Mr.	Volachit	Piliyasouth	TRI	Nahaideo	chitpiliyasouth@yahoo.com	(856-21) 218711	561 7020	
16	Mr.	Boualy	Vongvisith	RIS	Nahaideo	triresearch@hotmail.com	(856-21) 218711	784 4946	
17	Mr.	Vongsavanh	Chanthaboune	FE/NUOL	Lao-Thai Friendship road	vong_ch@hotmail.com		601 2707	

VOPS: Village Off-grid Promotion and support Co.; TRI: Technology Research Institute; FE/NUOL: Faculty of Engineering/National University of Laos; RIS: Research Institute for Science

- CDEA: Community Development and Environment Association; LIRE: Lao Institute for Renewable energy