

## **Report**

### **Final Workshop “Rural electrification decentralized energy options (REDEO)**

**Asian Institute of Technology, Thailand**

**30 June 2005 – 1 July 2005**

#### **Introduction**

The final workshop of the Rural Electrification for Decentralized Energy Options (REDEO) project was held at AIT during 30<sup>th</sup> June - 1<sup>st</sup> July 2005. The partners of this project are the Innovation Energie Development (IED), Asian Institute of Technology (AIT) and Association pour le Recherche et le Development des Methodes et Processus Industriels (ARMINES)/ Centre d' Energetique des Procèdes– Energetics Centre (CEP) of the Ecole des Mines des Paris. The project is funded by the EC ASEAN Energy Facility through the Asean Centre of Energy, Jakarta.

The workshop was aimed to present the REDEO tool, its applicability, methodology, and cases studies to the participants, and to discuss the improvements that could be considered. The tool has been developed targeting the three countries: Cambodia, Lao PDR and Vietnam. Participants from the Philippines and Indonesia were also invited to this workshop to learn about the developed tool and to obtain their suggestions. The program schedule and the list of participants are given in Annex 1.

#### **Welcome Session**

Prof. Kumar (Energy field of study, AIT) presented the objectives and gave a brief introduction about the REDEO project. Dr Anjali Shanker (Director, IED) welcomed the participants and briefly summarized the activities and future directions. Prof. Chongrak Polprasert (Dean, School of Environment Resources and Development, AIT) then welcomed the participants and opened the workshop.

#### **Session I:**

The following presentations were made in this session:

1. Development of the REDEO tool – by Prof. François Neirac
2. Assessment of the software programs and areas of application for Cambodia, Laos and Vietnam – by Prof. S. Kumar

Annex 2 gives the presentation made by Prof. François Neirac, while the presentation by Prof. S. Kumar is given in Annex 3.

#### **Discussions**

- The participants were informed about the hardware and software requirements for the REDEO tool, its technical structure, installation details, and further improvements that are envisaged.
- Other software tools that could be used for rural electrification using renewable energy, their advantages and disadvantages, and their applicability in Cambodia, Laos and Vietnam were also presented.
- Since the REDEO tool has developed targeting Cambodia, Lao PDR and Vietnam, it considers only mini hydro, biomass and grid extension as options. The

participants suggested that wind and geothermal resources and technologies using these resources could be added as options.

- There were many questions regarding various other soft-wares available and the developed REDEO tool. It was clarified that most of the other soft-wares are electricity accounting type while REDEO which is programmed in Manifold (using GIS), provides possibility of planning in a given area/region. It was further said that it is possible to use software like RETScreen with REDEO for sensitivity analysis.
- Answering another question, it was clarified that the output of Homer software could be used as input to Vipor software.
- Answering a question on whether REDEO finds an optimum scheme, the participants were informed that there is no specific algorithm in REDEO to find the optimum technique from a group of options. This was further clarified that various options could be analyzed for the different criteria considered by the user, and depending on the criteria it is possible to select/choose/identify the right option.
- Regarding the possibility of purchasing REDEO, the participants were informed that the prototype REDEO tool is free, though the platform Manifold on which REDEO works is not free.

### **Session III:**

The session III stated with Dr Anjali Shanker's presentation entitled "REDEO approach and tools". A copy of the presentation is given in annex 4.

### **Discussions**

- A detailed user manual is available. The criteria can be reset by the user.
- The number of localities is not limited by the software.
- Answering a question regarding the applicability of REDEO in Indonesia being a group of islands, it was clarified that it could be implemented at provincial level individually, rather than Indonesia as a whole.
- Regarding the scoring technique used, the participants were informed that there is no universally standard scoring method but analytical information could be used in scoring and flexibility has been given to the user. It was further said that scoring has to be consistent throughout the localities.
- In explaining the flexibility of REDEO it was said that it is possible to do the scoring in two aspects as: one scoring through various sectors (education, health, etc) and in each sector there is another score to be input (in the school sector, whether it is a high school or a secondary school or a primary school). This was further explained by showing the possibility of manual change to CHPDs (Centers with Higher Potential for Development).
- To another question, the participants were informed that the software is in optimization stage and the speed would not matter after the optimization.

### **Session IV:**

Dr Anjali Shanker continued her presentation on "REDEO approach and tools".

## **Discussions**

- Though the parameters in calculating load forecast use a specific formula, it could be modified as required. But, it has to be done while developing the model and cannot be modified later.
- Load factor can also be considered and presented as an output from the tool.
- Regarding the technical aspects of the tool, it was clarified that it is possible to do load-flow studies but it does not support Short Circuit Current analysis.
- It was noted that daily load curves are not used in the analysis but load duration curve over a year could be produced.
- Participants were informed that training is planned for Laotian and Cambodian users, and if there are others interested, this could be considered.
- The participants suggested to include financial indicators in the tool.

## **Session V:**

The following presentations were made in this session:

1. Rural electrification in Brazil and Bangladesh: Lesson for CLV countries – by Dr N. Mithulanathanan
2. Need of rural electrification: Cambodia – by Dr Chulasa Praing
3. Application of the REDEO Methodology(Kampong Speu Province, Cambodia) – by Mr. Pierrick Yalamas

Copies of the presentation are given in annex 5, 6 and 7 respectively.

## **Discussions**

- Country background, power system and electrification status as well as rural electrification best practices of Brazil, and Bangladesh were discussed in this session.
- It was pointed that in Cambodia, rural areas use small expensive diesel generators while urban users are having grid electricity pay much less.
- In discussing the REDEO tool, it was shown that it is possible to identify whether the program is running or not from the script.
- It was suggested to indicate the scale in every map.
- The meaning of the scenario was explained as the given set of initial conditions that would give a particular output.
- The participants were informed that clustering is done to avoid the removal of too many localities.

## **Closing (Day 1):**

Dr N. Mithulanathanan summarized the presentations and discussions during the day, and thanked the participants for their useful contributions in preparing presentations and participating in the discussions.

## **Day 2 (July 1, 2005)**

The second day was started by Prof. S. Kumar, who presented the agenda.

## **Session VI:**

The following presentations were made:

1. Electrification in Vietnam – by Mr. Tang The Hung
2. Country background and Power sector status : Laos – by Mr. Anousak Phongsavath

Annex 8 and 9 respectively gives the above presentations.

## **Discussions**

- Vietnam power system loss which was stated as 12.09% was further clarified that it is the system loss up to customer, where the customer could be a representative of a group/village.
- Explaining the renewable energy status in Vietnam it was stated that there are three types of renewable sources would be considered in the future, namely: biomass/biogas, mini/micro hydro and solar. Regarding solar, there is lack of expertise in the implementation, but will be suitable for islands.
- Mini grids are implemented in some islands but they are not implemented in mountain areas of Vietnam.
- Stating about the tariff in Vietnam it was stated that government imposes ceiling on the tariff (700 Dong per kWh).
- One major challenge is the fact that for households in rural areas in Vietnam, using 1-2 lamps, the revenue is about \$1 per month, which results in difficulties in payment to staff.
- Explaining the tariff status in Laos, it was stated that there are three different categories namely: national (grid connected), mini grid and off grid where they use different methodologies to calculate tariff. According to the explanation, mini grid tariff is set by local authority based on EDL (Electricity de Laos) and fuel price which is not fixed. Off grids have only a 'monthly repayment' and the ownership of the power source is offered to the customer at the end of repayment.
- It was interesting to note that rural users are more willing to pay and appear to afford the payments for electricity.
- It was clarified that EDL does the planning for grid extension but, approval of the MIH (Ministry of Industry and Handicraft) is needed. Thus, responsibility of planning and policy making in grid extension in Laos is by MIH. It was also stated that off grid expansion is not under MIH.
- Stating about the current micro hydro projects carried out in Laos, it was said that except one or two projects granted by Japanese all the other projects are open to the private sector.
- In selling power from SPP (Small Power Plants) to EDL, tariff criteria used differ depending whether SPP is grid connected or not. If SPP is grid connected normal tariff is used while if it is isolated the tariff is compared with the imported tariff. These tariffs are revised in every two years.
- The existing hybrid system in Lao consists of a 100kW PV (Photo Voltaic) system integrated to a 70kW hydro system. PV panel is used only for pumping water for hydro system which generates power for electrification. In Lao PDR, micro hydro appears to have the greatest potential.

- Lao has already planned on electrification from 2005 to 2008 for the southern provincial rural electrification. 54,000 households are to be grid connected and 30,000 are planned to electrify by off grid. It was stated that northern part is most difficult part to be electrified. It was also stated that the frame work and funds are already exists. Some of them are done by NGOs and some are self-owned (e.g.: Pico hydro).

### **Session VII:**

Mr. Pierrick Yalamas continued his presentation on “Application of the REDEO Methodology”.

The presentation is given in Annex 10.

### **Discussions**

- The appropriateness of the terminologies used, in the tool were discussed.
  - ‘Population coverage’ was decided to be changed to ‘household connected’
  - ‘Investment cost’ was decided to be changed to ‘Present value of the total investment cost (excluding operation and maintenance cost)’
  - ‘kWh life cycle cost’ was decided not to be changed but was decided to add one more indicator as ‘Discounted kWh cost’ considering user perspective
- It was requested to include more indicators in the tool:
  - Affordability of the local community – such as number of high, medium, and low income level people in a community are available, this indicator could be included
  - Land use - was answered as this would be possible if data is available and can be used to identify the possible resources and to know whether an area is a developed area or not.
- In answering the question on possibility of displaying the fact that whether distribution system has considered or not in the analysis, it was explained that it is a matter of changing the terminology in the display and thus it would be possible.
- It was also pointed that summary tables should be prepared and the tool should produce a summary of assumptions made and results.

### **Session VI:**

The following presentations were made:

1. Expanded rural electrification in Philippines– by Ms Carmencita A. Bariso
2. Country Presentation : Indonesia – by Mr. H.P. Nainggolan

Annex 11 and 12 give the above presentations.

### **Discussions**

- In explaining the way the Philippines are organized for the development, it was stated that they have seventeen administrative regions and by last year 6 regions data have been updated. Data on all regions are to be updated and a list of indicators available was stated: Socio economic profile, energy resource profile, power/energy development plan, electrical energy plan etc.

- It was also stated that GIS maps are available and power plant side data as well as energy resource data are available. But, the main issue exists in the demand side.
- For the case of the Philippines, the indicators could include, potential economic level of local communities (ability to pay), land use, peace and order situation, etc.
- Deregulation has been started and is expected to be implemented by 2005 in Indonesia.
- It was noted that in Indonesia, SPPs cannot sell power directly to the customer but to the PLN.
- It was stated that most of the data needed for the use of REDEO tool are available in Indonesia.
- For the case of Indonesia, it was suggested that the load forecast should be done at the provincial or the district level.

### **Closing**

The participants were requested to provide feedback regarding the REDEO tool and the workshop. These are summarized in Annex 13.

Dr Anjali Shanker summarized the discussions and highlighted the major points as given below:

- Even though the methodology suggested in the REDEO model for load forecasting was classical, it is clear that in the countries considered for the study, these methods have not yet been systematically implemented. It was therefore thought that REDEO tool would be of great assistance to the planners in these countries.
- The tool will be developed in a user friendly manner.
- The specifications that should be included in the tool to identify what project that should be implemented in a particular area on a priority basis.
- To include the financial analysis in the tool specific indicator could be identified or the REDEO output should be able to input into another software tool (such as RETScreen) where financial analysis could be done.
- The tool is expected to help government to decide where to implement. It was noted that all participants from the countries had expressed the results of the tool to be used for the private investors, though the appropriate institutional and regulatory framework are still not in place in the countries. This cannot be addressed by the tool.
- The lessons on rural electrification from Brazil and Bangladesh, as well as from Thailand would be of relevance to the participants.
- Regarding the discussion on indicators, globally there could be two types of indicators – default and customized.
- The comments and suggestions by the participants would be considered carefully for implementation in the REDEO tool.

Dr Anjali Shankar thanked the participants for their comprehensive and detailed presentations.

Prof. Kumar thanked the participants for their active participation.



**Final Workshop**  
**Rural Electrification Decentralized Energy Options (REDEO)**  
**Asian Institute of Technology, Thailand**  
**30<sup>th</sup> June – 1<sup>st</sup> July 2005**  
**Agenda**

**June 30<sup>th</sup> 2005 (Thursday)**

08:00 – 08:45	Registration
08:45 – 09:30	Inauguration Opening remarks by Prof. S. Kumar, AIT Welcome remarks by Dr. Anjali Shanker, IED Inaugural address by Prof. Chongrak Polprasert, SERD Dean, AIT Workshop Opening by Prof. Mario T. Tabucanon, Acting President, AIT
09:30 – 10:00	<i>Group Photo Session and Coffee/Tea Break</i>
<i>Session 1</i> <i>IED)</i>	<i>Presentation of the REDEO Approach and tool (Anjali Shanker,</i>
10:00 – 10:45	The REDEO planning approach The REDEO Model Global flowchart of REDEO Main inputs and outputs of REDEO
10:45 – 11:00	<i>Discussion</i>
<i>Session 2</i>	<i>The software tool</i>
11:00 – 11:30	Software programmes/tools for Rural Electrification ( <i>Kumar, AIT</i> )
11:30 – 12:00	The REDEO software tool (François Neirac, CEP) Hardware and software requirements to run the tool Technical structure and choices (programming languages, etc.) Installation instructions Guidelines Potential for additional functionalities and further improvement
12:00 – 12:30	Discussion
12:30 – 13:45	<i>Lunch</i>

<i>Session 3</i>	<i>Rural Electrification Planning framework</i>
13:45 – 14:30 Electrification	Analysis and comparison of main characteristics of Rural Planning Frameworks in various countries inside and outside ASEAN –key findings ( <i>Mithulananthan, AIT</i> )
14:30 – 15:00	Discussion
15:00 – 15:30	<i>Coffee/Tea Break</i>
<i>Session 4 Cambodia</i>	<i>Rural Electrification Planning in Kampong Speu province,</i>
15:30 – 16:15	Present challenges ( <i>Hongpeng Leang, MIME</i> ) Need for Rural Electrification Planning in Cambodia Specific situation of the Kampong Speu province
16:15 – 17:00	Application of the REDEO methodology and main results (IED, Pierrick Yalamas)
17:00 – 17:30	Discussion Summary of 1 <sup>st</sup> day
<b>July 1<sup>st</sup> 2005 (Friday)</b>	
<i>Session 5</i>	<i>Rural Electrification Planning in Oudomxay province, Lao PDR</i>
08:30 – 09:15	Present challenges (MIH): Need for Rural Electrification Planning in Lao PDR Specific situation of the Oudomxay province
09:15 – 10:00 Pierrick	Application of the REDEO methodology and main results (IED, Yalamas)
10:00 – 10:15	Discussion
10:15 – 10:45	<i>Coffee/Tea Break</i>
<i>Session 6</i>	<i>Rural Electrification Planning in Lao Cai province, Vietnam</i>
10:45 – 11:30	Present challenges (IoE): Need for Rural Electrification Planning in Vietnam Specific situation of the Lao Cai province
11:30 – 12:00	Application of the REDEO methodology and main results (IED)
12:00 – 12:15	Discussion: Comments on REDEO approach
12:15 – 13:45	<i>Lunch</i>
<i>Session 7</i>	<i>Evaluation of the relevance of the REDEO Project</i>



13:45 – 14:30 Feedback from main stakeholders of REDEO projects (CLV countries)  
14:30 – 14:50 Relevance of a REDEO approach in the Philippines (DoE)  
14:50 – 15:20 Relevance of a REDEO approach in Indonesia (PLN)  
15:20 – 15:30 Discussion

*Session 8 Discussion of future collaboration between partners*

15:30 – 16:00 Feedback from various participants  
Brief presentation of the conclusion from each of countries  
16:00 – 16:30 Closing session  
Workshop summary (*Anjali Shanker, IED*)  
Workshop closing (*Kumar, AIT*)

**Rural Electrification Decentralized Energy Options (REDEO) Project Workshop  
(30 June 2005 – 1 July 2005)**

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