Synergy of Rural Electrification and Development
Local Stakeholders Views

(Lao PDR and Cambodia)

CAP REDEO
Deliverable D3b

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1. INTRODUCTION

This document is deliverable D3b of the CAP REDEO Project. It summarizes local stakeholders views on Rural Electrification and Development, and through the presentation of different actor profiles – both in the main text as in the annexes - the reader will obtain a better grasp of the day to day realities of rural electrification in Lao PDR and Cambodia.

Firstly, in chapters 2.1 and 3.1 the document provides a general overview of the energy sector and its stakeholders in Lao PDR and Cambodia respectively. The majority of the national and provincial stakeholders mentioned have been interviewed based on the same questionnaire. There is a bias towards public parties since the working sessions were mainly focusing on project partners involved with planning.

Secondly, in chapter 2.2 for Lao PDR and chapter 3.2 for Cambodia a summary of the interviews themselves is presented. In these interviews the stakeholders give their view on rural electrification and development. The chapters are structured by the outline of the questionnaire and present a selection of answers and remarks from the different stakeholders. The full interviews are attached as Annex A and B for Lao PDR, and in Annex D and E for Cambodia.

Thirdly, in Annex C1 for Lao PDR and Annex F for Cambodia, this document provides an overview of village entrepreneurs and end-users of energy products in two provinces and selected other regions in Lao PDR and Cambodia. Interviews with these stakeholders give qualitative information on the people behind the numbers presented in the final CAP REDEO planning tool. The interviews were held before the results of the planning tool were communicated.

In the main body of this document, certain quotes have been presented in an anonymous manner. ETC handles stakeholders' opinions in a respectful manner, and does not wish to discomfort the informants. If the reader is interested in knowing more about a certain quote and contacting a certain informant, ETC can be contacted and the informant will be asked for follow up.

2. ENERGY SECTOR OVERVIEW LAO PDR

2.1 Overview of the energy sector and stakeholders in Lao PDR

In Lao PDR the majority of the urban areas are electrified and about 50% of the population of 6 million people has access to electricity. Lao PDR has an enormous hydro potential of 23 GW of which 630 MW (2.7%) was harnessed in 2005. Prices for electricity are kept low (as low as 0.03 USD / KWh).

The country's electricity law is from 1997. Under this law the Ministry of Energy and Mines (*MEM*) has the main duty of preparing strategic power sector plans, to collect and process data, to prepare regulation on generation and transmission development, as well as to prepare recommendations about tariffs. There is no separate regulator in Lao PDR.

Overall responsibility is vested in the Department of Electricity (*DOE*), whereas Hydro Power Office (HPO)/Hydro Power Development Division (HPD) is the focal unit for generation and transmission planning and development, and the Rural Electrification Division (RED) is responsible for grid and off grid electrification.

The Electricity de Lao PDR (*EdL*) is the only state owned utility resorting under MEM. EdL has about half a million clients in Lao PDR and is the implementing agency for hydro projects and government shareholder in Independent Power Producers (*IPPs*).

From the actual installed hydro capacity 45% is owned by EdL and 52% by IPPs, leaving a small part (<3%) for other parties in provinces (*independent private parties* < 500kW, PPA with province <2MW).

There are virtually no other energy distributors with the exception of two renewable energy (solar) companies (*Sunlabob and Sengsavang*). There are virtually no private investors because a power purchase agreement (PPA) based on the low tariff offered by EdL is financially not viable. There is one private non-profit institute dedicated to sustainable development in the (renewable) energy sector: the Lao Institute for Renewable Energy (*LIRE*).

The distribution and transmission in Lao PDR can be divided in four principal areas (Northern, Central 1 and 2, Southern), served by EdL, and isolated supplies, served by EdL, whereas off grid electrification is served by parties like Sunlabob, Sengsavang or pilot development projects.

In 2006 the Electrical Construction and Installation Company (*ECI*) became independent from EdL. The company is a para-statal. At the provincial level ECI's main task is to implement the Provincial Socio-Economic Strategy Plan.

Within this plan the priority to electrify rural areas has been set and the plan is implemented with finance from ADB and World Bank.

The headquarters of ECI are based in Vientiane. The headquarters mainly oversee the work of the provincial entities. Contrary to EdL, ECI has no presence at the lower district level. ECI in Khammouane has 23 permanent staff and hires between 30-40 temporary staff if needed.

At Khammouan province the Provincial Department of Energy and Mines (*PDEM*) has a list of about 10 *private installation companies* that help implement the investment plans. These 10 companies are in direct competition with ECI. These companies have to react on calls for tenders published in newspapers. They make use of local subcontractors at district level and lower if required.

Finally these tenders are commissioned by the Government from Lao PDR through a program called the Rural Electrification Project (REP) financed by the World Bank and the Northern Area Rural Electrification Projects (NARP) financed by the Asian Development Bank. Both programs together intend to reach 72.000 connections between 2007 and 2009.

2.2 Selection of national and provincial stakeholders views in Lao PDR

During the course of the CAP REDEO project interviews were held with selected stakeholders. Starting with the CAP REDEO project partners, different stakeholders were asked the same set of questions. A selection of the responses is presented in the next paragraphs. The full answers can be found in annex A (Lao PDR National Stakeholders) and Annex B (Lao PDR Provincial Stakeholders).

1 What is your opinion of the situation with regard to rural electrification in Lao PDR?

National level
The electrification grade in Lao PDR is about 50%. The majority of the urban areas are electrified; the unconnected part is mainly in rural areas. It is the government's target to reach 70% electrification in 2010 and 90% in 2020, says the Head of the Rural Electrification Division of MEM, Mr Anousak Phongsavath.

However, private actors have their doubts about the feasibility of the goal set by the government: "…this goal will probably not be reached, because of the government's focus on electricity to generate export revenues rather than extending the inland electricity grid. As a result, there will be many 'white spots'

left in the country that will not be filled up by the public side and cannot be filled up by the private side on its own.

Mr. Bounta Bontsabang, in charge of rural electrification in the province Khammouane, is happy with rural electrification as rural electrification directly contributes to development.

Provincial level
Mr. Kampu, the Head of Electrification Department of the Provincial Department of Energy and Mines, says: If many projects come to help it would go great. Laos is poor, so right now there is not enough money for executing the plans. The distances to cover are big.

The current situation in Khammouane province is not quite good, says Mr. Phonsavath Xayavong of Electricité du Laos. This is because the equipment is not always up to standard: sometimes the power goes off. “We try to change the equipment to improve the grid. The insulators are the main problem. There are not always enough wires and they are not always thick enough.”

2 What are the most urgent problems with regard to rural electrification?

National level
“The implementation capacity to reach the targets set for 2010 and 2020 is limited. Therefore we want to involve the private sector to help us reach our targets” says the Head of the Rural Electrification Division of MEM, Mr. Anousak Phongsavath.

A private sector representative indicates that “in Lao PDR there are only two companies in renewable energy, Sunlabob and Sengsavang. … There are several issues that obstruct the private sector to grow. First of all, private partners are not allowed to produce more than 500 kW or so. When you want to produce more it has to be in a public-private partnership (PPP: up to 2MW with provincial department and higher than 2 MW with national). Also the government subsidizes the electricity tariffs and determines the tariffs. It is almost impossible to earn back investments in electricity generation. With the current focus on rural electrification and its accompanying low tariffs, subsidies and grants spoil people and create a hard environment for business. I would even say that you can’t make money this way.”

Provincial level
Mr. Bounta Bontsabang, the director of the Provincial department of Energy and Mines says that funding sources to get electricity to all remote areas in Laos is a problem.

Mr. Kampu, the Head of Electrification Department of the Provincial Department of Energy and Mines, indicates that the department of electrification does surveys in rural areas, which however can not go faster because of the

mountainous areas. There are few entrepreneurs that want to build lines and the government itself does not have the financial capacity to do it.

A representative from the private sector indicates that it is not all that easy for the private sector to get involved: “[we]…have to respond to government tenders in newspapers. This is a rather unfair competition with parastatal and semi-parastatal companies.” He doesn’t perceive the competition with other private companies as a problem; “that is normal business”.

3 What do you see as the Government’s role in rural electrification?

National level

“Last year’s Party Conference number 8 held in Vientiane by the Peoples Party has prepared, discussed and approved eleven development programs. One of these programs focuses on infrastructure and has given priority to rural electrification. The idea is to improve and expand rural electrification, starting in areas close to urban centers. At this party conference a Rural Electrification Fund has been approved as well, and a Secretariat has been set up to handle the fund. This secretariat is placed within the Ministry of Mines and Energy within the department of Electrification’’, says the Head of the Rural Electrification Division of MEM, Mr. Anousak Phongsavath.

A private sector representative stresses the need for “a coordinating centre which also has an advisory function. The coordination centre should be completely transparent. The current problem is that EDL monopolizes the sector. As the World Bank demands PPP’s, ECI was split up from EDL. ECI does most of the installations and EDL only gives small bits to private parties. That is not open and transparent”.

Another private sector representative would like to see a strong government that is capable to support and provide a framework for the private side to operate.

Provincial level

Mr. Bounta Bontsabang, the director of the Provincial department of Energy and Mines tells us that the Department of Energy and Mines plays a role as policymaker. It intends to increase the number of households that are connected to the grid. By 2010 it is planned to reach 70% of the population. By 2020 it intends to reach 75% with grid connections and an additional 15% with off grid solutions.

Mr. Kampu, the Head of Electrification Department of the Provincial Department of Energy and Mines sees a role for the government to give money to support advertisement for rural electrification.

4 In your opinion, what is the role of national entrepreneurs in rural electrification?

National level
"The private sector should be more involved and mechanisms should be installed to support the private sector" says one of the private sector representatives. He also indicated the need to support LIRE "a great organization for the private sector in energy… ". Further support is needed for a legal framework and in finance.

Mr. Anousak Phongsavath, the Head of the Rural Electrification Division of MEM, indicated that "there is only one national enterprise in Lao PDR and that is Electricity de Lao (EdL). This company is state owned and active in all provinces.
So far EdL was responsible for generation, transmission and distribution. At this very moment a discussion takes place about the separation of the generation and transmission tasks (remaining under EdL) from the distribution tasks. It intends to create a national rural electrification company (Electricity, Construction and Installation, or ECI for short) responsible for amongst others the distribution."

Mr. Boungnong Bouttavong of EDL specifies this further: "EDL is a state enterprise, but in the long run maybe in ten years or so it might be privatized. There are some thoughts about privatization, but no concrete action has been taken."

Provincial level
Mr. Kanthy, the ECI director in Khammouane tells us that the Electrical Construction and Installation Company (ECI) became independent from EdL in 2006. ECI's role in rural electrification is linked to implementation: installation of low, medium and high voltage lines. It generally starts implementation with a site visit. It is important to explain the local authorities and population about the plans and the use of electricity. It is also necessary to inform the villagers that electricity costs money.

A private sector representative mentions his solution for rural electrification which is "to set up public-private partnerships, in which the fixed assets (e.g. the electricity grid) and capacity building (e.g. in setting up productive uses of energy) is done by the public side. The private side comes in as a service provider to sell electricity and maintain the energy systems (e.g. dams, solar panels, gen sets, etc)."

5 And how do you see the role of local entrepreneurs in rural electrification?

National level

"There is a list of about 60 companies that take care of the installation of hardware in the provinces. Moreover there are companies that generate, distribute and sell to the grid (PPA)", says Mr. Anousak, Head of the Rural Electrification Division of MEM. "However the costs of production for mini grids and micro hydro are highly variable and depend much on the local circumstances."

Within the province of Khammouane, entrepreneurs play an important role, says Mr. Bounta Bontsabong, the Director of the Provincial Department of Energy and Mines. The PDEM has a list of about 10 companies that have implementing capacity in this type of work. "Here in Khammouane province we have a private entrepreneur who invested 15 billion KIP to expand the grid in Borana district. He invested in a 22kW generation plant and .4 kV transmission lines. The government is paying him back, little by little".

Houng Heoung, representative of a provincial private company, installs from household wiring to 22kV transmission lines. The difference with ECI is that he is 100% private and that he cannot install high voltage lines (115kV). Another difference is that he has to respond to government tenders in newspapers.

Provincial level

Mr. Bounta Bontsabang, the director of the Provincial department of Energy and Mines says that "… provincial companies work in a mother and child relation with local entrepreneurs. The local companies get feedback from the provincial ones. Suppose they get a subcontract they will have to invest an amount of about 30% of the contract amount. These companies are only involved in installation and transmission. They are not involved in the distribution of services". The local entrepreneurs are however in the possibility to install electricity themselves as well: "Within the context of Laos all provincial and local entrepreneurs are also permitted to invest in generation, as long as the capacity installed is not more than 2 MW. However the problem is that the electricity tariff set by EdL is the lowest in the ASEAN region and therefore for many small generators the tariff as per PPA is not sufficient to generate electricity in a profitable way".

Other government representatives feel that local entrepreneurs should expand their grids, as EDL depends on those entrepreneurs (Mr. Kampu, the Head of Electrification Department of the Provincial Department of Energy and Mines). An EDL representative feels that local entrepreneurs should install equipment, but not sell electricity.

6 How do you envisage rural electrification over the next ten years?

National level

"Our challenge is to find out how to achieve the 70% electrification grade. Our next step is to clarify how to implement the master plan for rural electrification. What will be our resources and what will be applied where? We also need to show to entrepreneurs where the business is for them and try to involve them in our rural electrification effort", says Mr. Anousak, Head of the Rural Electrification Division of MEM.

A private sector representative states "one of the most important challenges is not to find the best technology: PV solar, micro-hydro, wind energy, etc are all there and well-established. What lacks are the concepts and business models to make these existing technologies compatible with the livelihoods of people and, by doing so, to encourage productive use of energy and other aspects of development."

Provincial level

Mr Kampu, Head of Electrification Department of the Provincial Department of Energy and Mines is positive: "In the next ten years it will keep on growing, because many projects come to help. The most important renewable power sources are 1. Hydro, 2. Solar, 3. Biomass".

Mr. Bounta Bontsabang, the director of the Provincial department of Energy and Mines is a bit more critical: "There is space for improvement to reach the targets set. For example we import electricity from Thailand at the moment. This will hopefully change in the future. We now recently upgraded the Nakey Nam Theun (NT1) from 210 MW to 430MW. Further we are constructing the NT2 with a capacity of 1080 MW. It is foreseen that this hydro installation will also reserve 90MW for local consumption. The difficulty we have here is to find funds to build the High Voltage transmission and Low Voltage distribution lines".

7 Do you have a message related to Rural Electrification that you wish to bring forward?

National level

Mr. Anousak, Head of the Rural Electrification Division of MEM: "Money is very important to implement the plans. However above all we need to encourage participation of all stakeholders, including the private sector".

A private sector representative indicates that according to his experience the "locus of knowledge and innovation of generator-grids is the rice mill. Family and neighbors are connected. Also the saw-mills in pagodas are a source of innovation in village grids."

An EDL employee warns us for the GIGO (Garbage in Garbage out) trap: "when working with a planning model it is important what you put into it. Wrong things give wrong results which can have bad implications."

A final *cri de coeur,* from a private sector representative goes to all those institutions that have been involved in rural electrification over the past decades. Rather than trying to do rocket science, he would like to see reflection on those approaches that were successful and, more importantly, those that failed. A whole lot can be learned from projects that underestimated the way of life in rural areas and/or neglected aspects of sustainability. According to him, wasting donor money using unreliable business models is harmful for rural communities as well as for the private sector.

Provincial level
Some messages:

- When you have a project, please come here
- We need different funds: grants, risk capital, normal equity and also long term soft and more commercial loans.
- It is worthwhile to study the risks and the profits in investing in small dams
- Focus on clean technology development; hydro.
- In any case of electrification development, environmental impact assessment is always needed.

Source: Interviews
Annex A: National stakeholders (4)
Annex B: Provincial stakeholders (9)

2.3 Local Stakeholders energy providers and end users Lao PDR

The content of the interviews held in Kammouane province can be found in Annex C1: Village stakeholders (26).

Interviews were held in 9 villages in 5 districts of Khammouane province.

District	Village	End user Grid	End user PV	Dealer PV	End user Battery	Battery Chargers And/or Generator	Hospital Pagoda School	End user user not connected
Hinboun	Ban Hinboun	3						
Hinboun	Ban Laokha		1		1	1		
Hinboun	Ban Song Hong					1		
Thakhek	Ban Nabouab	1 (plus biogas)						
Mahaxy	Ban Phovatay	1				1		

Mahaxy	Ban Phonsaat	2					1	
Nhommalath	Ban Phonsavang	2					1	
Nhommalath	Ban Na Gnor/ Ban Laow						3	
Hinboun	Ban Thana Neua		2	1				1
Xaybuathong	Ban Pha Huang	1				1		1
Total	**26**	**10**	**3**	**1**	**1**	**4**	**5**	**2**

The personal stories of end users in Lao PDR can be found in Annex C1. They are offering an in depth view into people's family life and – in some cases - business life, and emphasize the importance of electricity for their development. In general terms the following anecdotal observations can me made related to rural electrification and development:

- Where the grid came in, the use of car batteries is disappearing (which is not always the case in Cambodia).
- Where the grid came in, people mentioned that wood processing and furniture making became possible.
- Where solar came in, commercial battery charging is reducing.
- Where large scale hydro came in, not all members of the community were equally informed and aware of the possible consequences.

3. ENERGY SECTOR OVERVIEW CAMBODIA

3.1 Overview of the energy sector and stakeholders Cambodia

Cambodia has 14 million inhabitants and an electrification rate of les than 20%. The power sector is being reconstructed after the 80s. Starting point were about 600 or more private smaller and larger gen set operators with little supervision from a regulatory body. In contrast with Lao PDR, prices for electricity are high in Cambodia (up to and higher than 1 USD/KWh).

The electricity law of Cambodia (2000) is rather new and indicates that the Ministry of Industry, Mines and Energy *(MIME)* is responsible for government policies, strategies and planning in the power sector.

A special body, the Electricity Authority of Cambodia *(EAC)*, the national regulator, ensures that services and use of electricity will be efficiently, qualitatively sustainably and transparent.

Electricity de Cambodia (*EDC*) is a state owned corporation under the MIME. Nowadays EDC owns and operates the generation, transmission and distribution assets in 12 of the 24 larger cities in Cambodia. In the remaining towns and in the more remote areas Rural Energy Entrepreneurs (*REEs*) are in charge of generation and distribution.

At the *provincial level* in Kampong Cham province the EDC has about 12.000 connections in three districts, whereas REEs serve about 36.000 connections in the remaining part of the province.

In Kampong Cham town, *the provincial capital*, EDC is in charge of operations. EDC generates, buys and distributes power, however investment plans, e.g. to upgrade distribution from 6KV line to a 22 KV lines, are handled at Phnom Penh and subcontracted to other (international) parties.

The REEs receive an authorization to invest from the provincial department of MIME (*DIME*). However, licenses to generate and distribute energy are issued by the national regulator, Energy Authority of Cambodia (EAC), based in Phnom Penh. EAC takes the investment plan into consideration and issues a license with conditions: e.g. a temporary license for 1 or 2 year.

For small investment (less than 120 kW) by smaller REEs the decision making process is decentralised and only a DIME authorization is required.

At the provincial level DIME is more involved with administration of regulations than with formulation and policy thereof.

As indicated earlier, EAC promotes efficient and cheap electricity for customers. Electricity prices can go up to 1 USD per kWh in case of generation by remote isolated diesel gen sets. Therefore EAC foresees and supports a process of connecting and consolidating REE concessions to give way to cheaper electricity imports from Vietnam, Lao PDR and Thailand. In this process a national grid will be build to connect the larger towns. Moreover EDC's future role in transmission, and possibly distribution in new towns, will increase.

The roles for larger *licensed REEs* (e.g. 500-1000 clients) will gradually change from generating and distribution in one smaller concession, to distribution only in larger concessions (1000+ clients). This expansion and consolidation will require more investment in Medium Voltage lines (MV lines) in and around towns. With the consolidation it is also expected that earlier un-electrified areas in between the former smaller concessions will get access to electricity as well.

The intention of smaller *unlicensed REEs* (e.g. <50 clients) is not always to grow. Part-time entrepreneurs might be interested to keep electricity generation and distribution as a site activity. Therefore, entrepreneurs are not always interested to invest to comply with higher standards. EAC foresees that in the future unlicensed REEs will have to co-operate with larger REEs, e.g. operating under their licence. EAC does not foresee in special standards for smaller unlicensed REEs.

Finally, the Rural Electrification Fund (*REF*) is established to help implement the Masterplan Rural Electrification that has been prepared by the government in close cooperation with the Japanese International Cooperation Agency (JICA). The plan states the ambition to electrify all villages before 2020 and 70% of the households before 2030. The Government of Cambodia has received a World Bank loan and a GEF grant to fund the REF to help realize that ambition.

The REF offers subsidy to *project developers* assuming that *end users* will benefit from lower investment costs for new installations of mini utilities (only licensed REEs) and for Solar, Micro hydro and more recently also Biomass gasification.

Regarding REE applications, REF has received applications for 36.000 connections from 62 companies, for a total amount of 6.9 MW whereas 6.8 MW was the target. These applicants are waiting for approval and implementation.

The subsidy program for the renewables is under review. So far three private companies have applied for the subsidy in the solar sector (*Khmer Solar, Kamworks and KCB*). There is no company that applied for mini or micro hydro subsidy and there is one private company active in the biomass gasification (*SME Renewables*).

3.2 Selection of national stakeholders views from Cambodia

During the course of the CAP REDEO project interviews were held with selected stakeholders. Starting with the CAP REDEO project partners and project, different stakeholders were asked the same set of questions. A selection of the responses is presented in the next paragraphs. The full answers can be found in annex D - Cambodia National Stakeholders and Annex E - Cambodia Provincial Stakeholders.

1 ***What is your opinion of the situation with regard to rural electrification in Cambodia?***

National level

"Presently, there is not enough electricity supply in rural areas of Cambodia", states Mr. Tun Lean, general director of Energy in MIME. The situation is that in Cambodia 17% of the population is electrified and according to Mr. Tun Lean the target is to have 70% of all rural households connected to grid quality in 2030.

Mr. Chea Kim Long from the Department of Health explains that in the national hospitals built with support of the Ministry of Health vaccine conservation is powered by either solar PV or gas (gas is mostly used as it is cheaper), and surgery is powered by a standby genset as it needs a lot of power (not by an electric grid). For the rural populations who do have access to electricity, it is often very expensive.

Mr. Theng Marith (director of the regulation department at EAC) explains that in the last four years the picture has changed: first, the infrastructure had to change. Now, the first objective is the expansion of rural grids by giving existing REE's licenses for new zones. We would like to integrate the small ones into the bigger ones to create larger zones (this could be done in a number of ways). In 5 years we will be trying to build big zones only (22kV has to become the standard) connected to the EDC network along the road. EDC has planned to own all the transmission lines in 5 years. Tariffs will be regulated and thus price differences between provincial towns, district towns and villages will be smaller. Independent Power Suppliers will be able to sell to EDC.

Mr. Meas Vanthon of the planning department of the Ministry of Education tells us that electricity supply exists only in some rural places of Cambodia. Most places do not have an electricity supply yet. People in rural areas rely on a few types of energy sources such as kerosene lamps, batteries, etc. Moreover, in places where electricity is supplied, the price for electricity is very high, up to 1 US$/kWh.

Provincial level
Mr Poun Run, the chief energy officer of DIME, knows there is little electricity access in rural areas, and that most people in Cambodia simply do not have the money to pay for electricity.

Bot Mr. Ros Kim Thorn, deputy director of the Department of public works and transport, and Mr. Cchuy Mong Srengm the chief administrator of the department of Education, emphasize the need for electricity to get businesses started, as well as for agricultural purposes, e.g. for irrigation to get water to farms. Mr. Cchuy sketches the sparse access to electricity by saying that out of 876 schools only 4 or 5 have access to grid electricity. About 30 have purchased their own generator.

2 What are the most urgent problems with regard to rural electrification?

National level
Mr. Tun Lean, general director of Energy in MIME indicates that there are two main urgent problems in Cambodia: 1) big lack of power supply in rural areas, 2) price of electricity is still high for rural people.

Mr Meas Vanthon of the planning department of the Ministry of Education agrees; the rural population is poor, but the electricity tariff in rural places is high.

According to the regulator the lack of power supply can be explained in two manners: “From a technical point of view: the feasibility to build an efficient and safe grid of standardized networks. The experience is that the rural area networks cannot follow the national standards. From a financial point of view: funds are needed. In the example where one has to invest $ 8,000 for an acceptable standard of LV-lines, an entrepreneur might be willing to invest only $ 4,000 to reach an acceptable rate of return, which means that a subsidy from the Rural Electrification Fund is needed for the other $ 4,000 to meet the standards”, as Mr. Theng Marith, director of the regulation department at EAC, explains.

Mr Chan Sodavath, director of corporate planning & projects at EDC, sees urgent problems both at the supply as well as the demand side, a bit like Mr Theng. On the supply side, he mentions the weak technical skills of entrepreneurs who are currently offering electricity services, resulting in dangerous situations sometimes. The investment needed to start a decentralized electricity grid is high, and entrepreneurs often need to give their land, their house and other belongings as collateral to the bank in order to obtain a loan to be able to buy a diesel generator. The demand side however shows quite modest consumption, with only 20% of customers being businesses which use some more electricity, and thus entering the energy provision trade is still a big risk. To be able to make money, an entrepreneur must have a long term vision in the poor rural areas.

Mr. Hel Tony, Deputy Director of the Ministry of planning adds to this that “Local authorities, particularly the commune councils, do not have their own income from local tax collection. In practice this means that they do not actively attract private investors, so the interest to invest in the communes is limited. This is especially the case in isolated communes where private investment alone is not enough to operate sustainably, and where contribution from public investment is lacking”.

Provincial level
All respondents at the provincial level mention price as a bottleneck: the price of grid electricity is too high, but prices of diesel and fuel are also high, so generator driven electricity supply is also costly. Decentralized energy options include factories which sell their own electricity to neighbors at a relatively cheap price: Mr. Poun Run, the chief energy officer of DIME, sees this as an opportunity the government should use in planning.

3 What do you see as the Government’s role in rural electrification?

National level
“The Government plays a role to prioritize the rural electrification sector” according to the general director of Energy in MIME, Tun Lean. “It is necessary that the Government prepares a rural power development strategy and planning, which will be used as guideline for rural energy development sector in the country”.

Mr. Sodavath (Director of corporate planning & projects at EdC) specifies this further: “The Government should play a role in finding cheap electricity sources so that electricity users will also pay less for their consumption. For poor people, a subsidised connection should be offered as currently done by the REF (Rural Electrification Fund). By doing so, poor people can also access quality grid electricity. The Government should continue to promote private sector participation by investing in the sector, particularly in rural areas where the public grid has not reached”.

Mr Theng Marith stresses the need for coordination between government ministries such as MIME, EAC and DIME to guarantee smooth implementation.

Mr Chea Kim Long from the Department of Health adds that MIME should find and realize cheaper power sources such as hydro power, biomass, etc so that Cambodian people will get cheaper electricity tariff which is already the case in neighbouring countries such as Vietnam, Lao PDR and Thailand.

Mr Meas Vanthon of the planning department of the Ministry of Education thinks three main points should be considered by the Government of Cambodia, namely the Government should develop rural electrification policy; the electricity tariff in rural places should be well regulated so as to make rural people afford it; and the Government should find other types of electricity sources to replace the electricity supplied by the diesel generation.

Provincial level
Respondents are a bit concerned about the power of the national government to change the situation. There are no real investments and the national government is following private investors and initiatives, but there should be more of a pro-active attitude according to some provincial level respondents. Import of electricity is also mentioned as an option for the Cambodian countryside.

4 In your opinion, what is the role of national entrepreneurs in rural electrification?

National level
"National entrepreneurs like EDC should prepare their own development planning on rural power supply services, complying with Cambodian Government Policy. Furthermore, they should extend power transmission and distribution systems to rural areas and develop potential electrification projects, which are environmentally friendly" according to the general director of Energy in MIME, Mr. Tun Lean.

Mr. Sodavath of EDC agrees, and actually says that he sees EDC's role as providing electricity to existing private entrepreneurs who can then resell the electricity to customers. This should result in cheaper electricity for the end users.

Mr. Theng Marith, director of the regulation department at EAC, expresses his view on national entrepreneurs from the private side. "Their role is also important, because without national entrepreneurs we can not grow. In the past they were not able to comply with the quality standard set by EAC and they did not understand the power sector. Now we might expect some conflicts between entrepreneurs who want licenses and EAC who wants to follow the procedures. With growth and consolidation of license areas, two neighboring enterprises might ideally merge to handle larger investments, but in practice might get conflicts over tasks and responsibilities of each individual entrepreneur in the merge-company. Alternatively one might buy out the other with consequent stress."

Mr. Chea Kim Long from the Department of Health thinks that the national energy entrepreneurs such as EDC should go further than what they currently carried out, namely supplying only in the main places such as in provincial and capital towns. They should extend the supply network to reach rural areas, even when local private entrepreneurs are already supplying electricity to local populations. A PPA agreement should be signed between EDC and local private entrepreneurs indicating clearly the rule regarding whole and retail sales of electric power. By doing so, the rural people can have access to cheaper electricity so that more people will be able to afford electricity.

A representative of the private sector adds: “The national entrepreneurs like EDC should expand their areas of supply as much as possible in order to reach the rural areas and then sell electricity to the existing local private entrepreneurs already supplying electricity in the area. The local entrepreneurs play a role as retail sellers reselling electricity from EDC to the end users in their areas based on the agreed tariff. By doing so, the electricity tariff will be much cheaper than the electricity supplied from their own stand alone diesel generators.”

Provincial level
National entrepreneurs should invest in expansion and extend their networks to ‘far away’ rural places. Investing in generators in busy towns is also suggested as an option for national entrepreneurs to become involved in rural electrification.

5 And how do you see the role of local entrepreneurs in rural electrification?

National level
The local entrepreneurs should demonstrate that they are able to manage such works because they have enough skilled staff, materials and financial capacity. But, it shall not be forgotten that the training of technical staff and governmental staff remain necessary, says Mr Kheang Chan, Director of EDC training center.

Mr Suon Dy, provincial director of DIME Kampong Cham explains the importance of local entrepreneurs for Cambodia and his province. He indicates that EDC is the utility providing electricity to the city of Kampong Cham. No private entity is providing electricity in the city. However any area further than 40 km from the main line is eligible for investment for private parties. Many REEs have received a license (20) or are unlicensed entities (13, < 125KW) under the regulator (EAC)). All have received an authorization to do business by DIME.

Mr. Sodavath from EDC sees two distinct roles for local entrepreneurs, depending on the area they live in. In places with a public grid extension they should play a role as a main electricity retailer by buying electricity from the public grid and then selling it to the local population. By doing so, the local people will have access to cheaper electricity consumption. In places without a public grid extension they should improve their electricity system (particularly the distribution system) in order to (1) minimise power losses due to incorrectly selected cables and (2) meet EDC’s technical requirements so that EDC will accept to sell electricity to them as electricity retailers.

Mr. Theng Marith, director of the regulation department at EAC, thinks that the role they can play depends on the economic growth of an area. Local entrepreneurs are the base of development, yet the question is whether their client-base will be sufficient enough to grow further and deeper into rural areas.

A representative from the private sector agrees that local entrepreneurs are important, but they should play a role as the main electricity retailer by buying electricity from the EDC grid and then selling the electricity to the local population (rather than them producing and supplying electricity from their own gensets which is not possibly profitable and not sustainable).

Provincial level
Local entrepreneurs should invest in generators to provide electricity to small villages, or they could work together with EDC and EAC. However, there is awareness about the difficulties for local entrepreneurs as well: sometimes local entrepreneurs can invest in the hardware, but then the problem of covering the running costs remains.

At the moment, there are informal entrepreneurs in the rural areas which have been around for quite a while, and are running their electricity business, yet they do not have money to invest in expansion. Maybe, somehow, they could work together with licensed Rural Energy Entrepreneurs to expand their services.

6 How do you envisage rural electrification over the next ten years?

National level
The rural electrification in Cambodia will be developing rapidly because there will be more electricity supply coming from hydropower sources producing cheap electricity. They are currently under construction, managed by private investors. This electricity will be sold to EDC in the form of a wholesale. EDC will resell the electricity to the local existing entrepreneurs in rural areas. Prices will be based on a fixed tariff which must be cheaper compared to tariffs from diesel generators, according to Mr. Kheang Chan, Director of EDC training center.

Mr Tun Lean, the general director of Energy in MIME presents the plans of the Government of Cambodia, who will encourage the private sector to participate in developing the power sector in rural areas of Cambodia; who will promote and disseminate the energy saving in rural areas; and will promote the use of renewable energy sources such as Solar Home System, Biomass, Hydro electricity and wind, etc.

Mr Theng Marith, director of the regulation department at EAC, says that they expect expansion and consolidation of grids. Eventually the largest will be connected to EDC (must be standardized), only big licenses. Further the transmission will be 22 kV between connected areas.

Mr. Loeung Keosela M. Eng, Managing Director of the Rural Electrification Fund says: In the end we want to create a situation where EDC generates electricity and organises imports and exports. EDC should own the transmission lines and REEs purchase the electricity from EDC and distribute.

Mr. Chea Kim Long from the Department of Health knows that according to MDGs, 70% of the population will have access to a high quality grid extension. But he thinks that it will be difficult to achieve because the government will not have enough capacity to invest in rural places. Therefore, private sector participation will be the only way to bring electricity to those areas of Cambodia. The government should works closely together with private sector actors.

Provincial level
According to the governmental plans, the availability of electricity will increase, and prices will drop. The aim is to have 70% electricity coverage by 2020. All provincial respondents are positive about these plans, and some have specific ideas on e.g. hospitals to be connected to the grid.

7 Do you have a message related to Rural Electrification that you wish to bring forward?

National level
Mr. Theng Marith's (director of the regulation department at EAC) message to licensees would be: "Cooperate to survive, growth doesn't kill you! But you have to cooperate and to invest to survive." His message to smaller REE's would be: "Try to understand and cooperate!"

Mr. Chan Kheang (Director of EDC Training) indicates that in order to develop the sector as fast as they want, they should support REEs through:
- Providing staff training,
- Modernising technical materials,
- Applying modern techniques,
- Monopolising their areas of electricity supply

Mr. Chea Kim Long from the Department of Health thinks that the Government should work together with the private sector to offer power supply services in rural Cambodia in order to find an affordable electricity tariff for the rural end-users.

A private sector representative wants to stress the importance and suitability of Solar Home Systems for rural areas in Cambodia as an option for electrification of the area.

Mr. Sodavath (Director of corporate planning & projects at EdC) stresses the role of the private sector and EDC: We should support, encourage and promote those private entrepreneurs in rural areas. Help them obtain cheaper loans and make them feel that nobody will come to take over their current places in the future. If so, they will be confident and strongly participate in the sector together with the public state owned company (EDC) in order to achieve the MDGs in Cambodia.

Mr. Mao Sam Ngat from Khmer Solar thinks that rural people should be made aware of the advantages of having Solar Home Systems. They should be aware that SHS is also an electricity option in remote areas.

Mr. Tun Lean, general director of Energy in MIME, finds it most important to deliver the message that people provide rural electricity services with acceptable quality.

Provincial level
Some messages:

- Price of electricity should decrease
- Hospitals, schools and markets urgently need electricity
- Especially farms should have lower cost electricity
- Clear and detailed RE planning would be useful for the lower level governments to be able to follow and implement.

Source:
Source Interviews
Annex D: National stakeholders (9)
Annex E: Provincial stakeholders (5)

3.3 Local Stakeholders energy providers and end users Cambodia

The content of the interviews held in Kampong Cham province can be found in annex F1: Village stakeholders (45 interviews).

Interviews were held in 14 villages with 45 people of Kampong Cham province.

Kampong Cham	**REE licensed**	**REE Non licensed**	**End user grid**	**End user PV**	**End user not connected**	**End user Battery**	**Battery Chargers and/or Generator**	**Hospital Pagoda School public lighting**
Village 1					1		2	
Village 2							1	
Village 3	1 (gasifica-tion)		1(+bat)			1	1	
Village 4	1 (distribu-tion)					1		
Village 5								1

Village 6	1		1					
Village 7				1			1	
Village 8		1	1					
Village 9	1		2					
Village 10	1							
Village 11	1							
Village 12	1		2			1	2	1
Village 13		1	4			2		2
Village 14		1(+bat)	1 (+bat), 3				1	2
Total 45	**7**	**3**	**14**	**1**	**1**	**5**	**8**	**6**

The personal stories of end users in Cambodia can be found in Annex F. They are offering an in depth view into people's family life and – in some cases - business life, and emphasize the importance of electricity for their development. In general terms the following anecdotal observations can be made related to rural electrification and development in Cambodia:

- Where the grid came in, the use of car batteries is not disappearing due to high fuel prices

- Where the grid came in, former battery chargers innovate in new activities like food processing and restaurants near the main roads.

- Where the grid came close to remote areas, former battery chargers innovate in new activities (DVD) or mobile sound systems.

- Where fuel price increased, the interest in biomass gasification from REEs and rice-millers grew, using rice husk or wood from plantations (e.g. rubber wood) as fuel.

4. CONCLUSION

The interviews with stakeholders (47 interviews in Lao PDR and 59 interviews in Cambodia), which are presented in this document, have resulted in a wide array of views and opinions at three different levels (national, provincial, local). The presentation of these views contributes to a better understanding regarding the pace and the direction of the development of the rural electrification sector.

What becomes clear is that the rural electrification planning takes place in quite different contexts in the two countries. In Lao PDR, electricity is heavily subsidized and the price consequently low and – where provided - therefore affordable to a large percentage of the population. This is a stark contrast with Cambodia, where electricity prices are high. In terms of market development, these are realities to be taken in to account, as they do influence the feasibility of involving the private sector, which will be influenced strongly by the electricity pricing in already electrified areas in the country.

Both national and provincial stakeholders emphasize the importance of rural electrification for the broader development of the regions. Both Lao PDR and Cambodia have set ambitious targets for the coming years. In both countries, one of the main bottlenecks seems to be the implementing capacity of existing companies, as perceived by these stakeholders. This is either explained by a lack of large entrepreneurs capable of doing so, or by stringent regulations set by the governments. Also, the amount of money needed to invest in these non-electrified regions is large, whereas the profitability of doing so is questionable for a private entrepreneur.

In terms of end users, there are interesting differences, even though all respondents who are currently not connected to an electricity grid express the wish to be connected, and people who are connected express the importance of electricity in their daily lives. Respondents often mention the safety of electricity versus diesel powered electricity generation as an advantage. Also, the reliability of grid electricity is mentioned as an advantage (whether valid or not), as well as the broad range of appliances people can then use. Many respondents express the possibility to be connected to the electricity grid as a way of ‘modernizing the family’s living standards’, therewith indicating the possibility to use (electric) appliances which will make their daily tasks more efficient.

In terms of entrepreneurial end-users, it seems that families who try to make a living while having access to electricity are doing better than the families without access. The ‘electrified’ families have more options: either battery charging, rice milling, powering a small workshop etc. compared to merely farming, or having a simple shop.

LIST OF ANNEXES

LIST OF LIRE REPORTS WITH ETC INPUT IN CONTEXT OF CAP REDEO

Field report on potential of biomass gasification for village electrification in Xieng Khouang (004), October 2008: pdf

Field report on potential of rice husk for gasification in Khammouane and Bolikhamxay (002), August 2008: pdf

Biomass gasification in Lao PDR: A feasibility study on biomass gasification at potential sites in Bokeo and Xiengkouang province, January 2008: pdf

Report: Technography of pico-hydropower in the Lao PDR (003), October 2008: pdf

ANNEX A

NATIONAL STAKEHOLDERS LAO PDR

Name	Mr. Boungnong Bouttavong M.Sc. and M.Eng.
Organization	Electricité du Laos (EDL)
Function	Manager System Planning Office
Country	Laos
Date of interview	5 October 2007

1. What is your opinion of the situation with regard to rural electrification in Cambodia/Laos?

We have a plan to electrify 90% of total households of Laos in 2020.

2. What are the most urgent problems with regard to rural electrification?

We need a lot of investment money and presently, the main supporters are World Bank and Asian Development Bank.

3. What do you see as the Government's role in rural electrification?

EDL is a public utility and is building an 115kV line to connect Khammouan to the north and to Savannahket. Currently the electricity is heavily subsidised (by the Government of Laos), According to the study report supported by World Bank in year 2004, it said that Electricity tariff in Lao PDR is lower than long run marginal cost 17%. but we want to reduce the subsidies in steps. There are 7 tariff categories, in which household category break down in to 3 sub-categories. The average tariff in year 2006 is about $ 0.05 per kWh. For generation EDL is attracting private partners now, but transmission and distribution are staying with EDL.

4. In your opinion, what is the role of national entrepreneurs in rural electrification?

EDL is a state enterprise, but in the long run maybe in ten years or so it might be privatised. There are some thoughts about privatisation, but no concrete action is taken.

5. And how do you see the role of local entrepreneurs in rural electrification?

In the few areas that are not going to get electricity other options have to be studied. Those areas are high on the mountains and have no roads to it. People have to walk paths to reach those places. I don't really know what would be best. The cultural issues are probably not so grief, because in every village there are people speaking Lao and everybody wants electricity.
But I could think of possible problems related to the ethnic minorities. Some might not understand the concept electricity. Maybe people can use solar there or hydro or a hybrid system. Maybe even wind.

6. How do you envisage rural electrification over the next ten years?

If we get the investment money, things will improve. In 2009 the 115kV line from Pakxan-Thakhek-Pakbo will be finished and at the end of 2009 also Nam Theun II Hydropower project. There is a big mine that runs on electricity from Thailand, but Nam Theun II will be able to take over the power supply. The coal mine is run by a very rich Australian company that will bring in some income. Also Nam Theun II will provide Thakhek from power.

7. Do you have a message related to Rural Electrification that you wish to bring forward?

With a planning model it is important what you put into it. Wrong things give wrong results which can have bad implications.

Name	Anousak Phongsavath
Organisation	Ministry of Energy and Mines
Fuction	Head of Rural Electrification Division
Country	Laos
Date of interview	5 October 2007

1. **What is your opinion of the situation with regard to rural electrification in Cambodia/Laos?**

The electrification grade in Laos is about 50%. The majority of the urban areas are electrified, the unconnected part is mainly in rural areas.
It is the government's target is to reach 70% electrification in 2010 and 90% in 2020.
Unclear is at this moment the strategy to reach this target. So far we have two major programs in grid extension:

- The WorldBank program, which finances grid extension in 7 provinces in the North and Centre of the Laos. This will involve 42.000 households.
- The Asian Development Bank, which also finances grid extension in the North. This will involve 30.000 households.

The off grid company (VOPS) is still small an involved with connection of households in rural areas in the remaining part of the country. For the period 2006-2010 the goal is to reach 10,000 households.

2. **What are the most urgent problems with regard to rural electrification?**

The implementation capacity to reach the targets set for 2010 and 2020 is limited. Therefore we want to involve the private sector to help us reach our targets.
We will focus on small hydro projects to reach this target in the north of the country, based on the JICA financed master plan. Recently some PPA were signed. The private parties will mainly produce for the neighbouring villages and will sell the surplus to EdL (the national utility).
We intend to invite more players to build small hydro with a generation capacity between 70kW and 1,000kW that will typically serve up to a thousand clients.

3. **What do you see as the Government's role in rural electrification?**

The latest Party Conference number 8 of last year in Vientiane by the peoples party has prepared discussed and approved eleven development programs. One of these programs focuses on infrastructure and has given priority to rural electrification in that program.
The idea is to improve and expand the rural electrification starting close to urban centres.
At this party conference a Rural Electrification Fund has been approved. Therefore a Secretariat has been set up to handle the fund. This secretariat is placed within the Ministry of Mines and Energy within the department of Electrification. Mr. Anousak is appointed as head of the Secretariat.
The role of that secretariat is to promote rural electrification, by utilizing as much as possible renewable energy (small hydro, PV, biomass) based on resources available within the country.

4. **In your opinion, what is the role of national entrepreneurs in rural electrification?**

There is only one national enterprise in Laos and that is Electricity de Laos (EdL). This company is state owned and active in all provinces.
So far EdL was responsible for generation, transmission and distribution. At this very moment a discussion takes place to separate the generation and transmission tasks (remaining under EdL) from the distribution tasks. It intends to create a national rural electrification company (Electricity, Construction and Installation, or ECI for short) responsible for amongst others the distribution.

5. **And how do you see the role of local entrepreneurs in rural electrification?**

There is a list of about 60 companies that take care of the installation of hardware in the provinces. Moreover there are companies that generate, distribute and sell to the grid (PPA).
However the costs of production for mini grids and micro hydro are highly variable and depend much on the local circumstances. There is one JICA project that has installed a mini grid against 10,000 USD/kW installed capacity, whereas in Nepal a rule of thumb is 4,000 USD/kW.
Other technologies like solar are even more expensive. Like a company that has installed 10kW against $ 150,000 Further the company involved with the World Bank program receives susbisdies and is therefore expensive as well.
The government encourages provincial companies to get involved in rural electrification.
The first approach is how to promote clusters of villages to make an attractive investment opportunity.
The second hurdle is how to overcome the barrier of a low electricity tariff.
In our discussions we think of diversifying the electricity tariffs. However this is not law yet and we have no regulator appointed as of now to regulate tariffs.
One of our ideas is to position this regulator in between the policy and planning at one hand and implementation (EdL) at the other hand.

6. **How do you envisage rural electrification over the next ten years?**

Our challenge is to find out how to achieve the 70% electrification grade.
Our next step is to clarify how to implement the master plan for rural electrification. What will be our resources and what will be applied where? We also need to show to entrepreneurs where the business is for them and try to involve them in our rural electrification effort

7. **Do you have a message related to Rural Electrification that you wish to bring forward?**

Money is very important to implement the plans. However above all we need to encourage participation of all stakeholders, including the private sector.

Name	Bounthanong Phonethipasa
Organisation	Sengsavang
Fuction	Managing Director
Country	Laos
Date of interview	14 October 2007

We worked together on several projects with a group of consultants since long. In 2003 we established the commercial renewable energy company Sengsavang. We focus on solar and micro-hydro. We are with 9 people permanent staff and 6 part-time staff. Our current big project is VOPS, where 5 of us are employed. We are a service company, selling both products and consultancy.

In Laos there are only two companies in renewable energy, Sunlabob and us. Growth, however, is not threatened by our commercial competition, but by the government. There are several issues that obstruct the private sector to grow. First of all, private partners are not allowed to produce more than 500 kW or so. When you want to produce more it has to be in a PPP (up to 2MW with provincial dept. higher than 2 MW with national).
Also the government subsidises the electricity tariffs and determines the tariffs. It is almost impossible to earn back investments in electricity generation. With the current attention to rural electrification and its accompanying low tariffs, subsidies and grants it spoils people and it creates a hard environment for business. “You can’t make money this way.”

Therefor you see a increasing speed of electrification, but there is little participation of the Lao entrepreneurs and investors. The private sector should be more involved and mechanisms should be installed to support the private sector:
- LIRE is a great organisation for the private sector in energy, such an organisation should receive support and to comparable organisations.
- Legal framework
- Financing
- And very important is a coordinating centre with also advisory an function. The coordination centre should be completely transparent. The problem now is that EDL monopolises the sector. As the WorldBank demands PPP’s, ECI split up from EDL. ECI does the most of the installations and EDL gives only small bites to private parties. That is not open and transparent.

Also in the ministry there are junior people in senior positions. They don’t understand their work good enough and are chasing personal success instead of really caring about rural electrification.

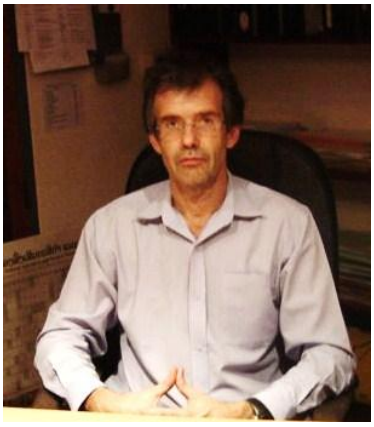
In terms of electrification rate, the provinces in the middle (Bolikhemsay, Khammouane, Savannakhet) are significantly different from the other provinces that they have a lot of flat land which can be more easily electrified. The electrification rates are thus also higher than in the rest of the country. In Khammouane province there is already a 270 MW hydroplant in the Hinboun river and at the moment they are constructing a 1088 MW hydroplant, called the Nam Theung II dam. I expect that the lower areas of Lao within 10 years are fully electrified. The mountain areas have bad accessiblity and bringing electricity goes slowly. Most of the villages cannot be reached during the rainy season and the ethnic minorities there appreciate much to their traditional way of living.

VOPS is the largest program on off-grid electrification in Laos. WorldBank finances 30,000 solar home systems until 2011-2012. The implementation in the provinces is done by PESCO’s, which are on paper private companies, but lack human resource and management capacity. Bounthanong has 4 people permanently stationed in rural field offices and 5 people in Vientiane.

In the North there is little sun and pico-hydro, but there is a lot of bamboo and other biomass. Perhaps there is biomass potential there.

Locus of knowledge and innovation of generator-grids is the rice mill. Family and neighbors are connected. Also the saw-mills in pagodas are a source of innovation in village grids.

Mr. Andy Schroeter – CEO Sunlabob
December 17, 2007
Sunlabob office, Vientiane capital, Lao PDR



Introduction Sunlabob
Sunlabob is a private renewable energy company in Lao PDR. The company was established in 2001 and has been growing ever since. Sunlabob provides energy services for people in remote rural areas, sells renewable energy hardware, provides training for local energy entrepreneurs and rents outs equipment. All these activities are done on a commercial basis, financed by private equity and commercial loans.

Introduction Andy Schroeter
Andy Schroeter is the CEO of Sunlabob and started the company virtually on his own. He has been successful in finding new opportunities and funding that allowed his company to grow. In order to do so, he visits many conferences and workshops all over the world to spread the word about Sunlabob. Because of his involvement since the start, immense network and high commitment, Andy Schroeter is the spider in the web of the company.
During the interview, I have a hard time trying to keep up with writing down the answers of Mr. Schroeter. He has a strong opinion and it is clear to see that he has answered my questions many times before at many different places in front of many different audiences. What follows is my summary and my interpretation of his account.

Status and problem regarding rural electrification in Laos
The government has set forth very ambitious goals regarding rural electrification: 90% of the country should have access to electricity by 2020. According to Mr. Schroeter, this goal will probably not be reached, because of the government's focus on electricity to generate export revenues rather than extending the inland electricity grid. As a result, there will be many 'white spots' left in the country that will not be filled up by the public side and cannot be filled up by the private side on its own.
Traditionally, multilateral institutions, NGOs and donors have been the institutions that are concerned with providing rural electrification where the government falls short. Projects are set up and, after implementation, handed over to the government. Schroeter is very clear on this traditional way: 'it is a dead end'. According to him, there is no future for this approach, because sustainability cannot be guaranteed.
Besides pointing to the main problems, Mr. Schroeter *en passant* mentions his solution: to set up public-private partnerships, in which the fixed assets (e.g. electricity grid) and capacity building (e.g. setting up productive uses of energy) is done by the public side. The private side comes in as a service provider to sell electricity and maintain the energy systems (e.g. dams, solar panels, gen sets, etc).
One of the main problems at this moment is the lack of a clear set-up of such public-private partnerships. According to Schroeter, the private side is ready to engage, but the public side is still weary of too much private involvement. The second problem that he identifies is the lack of funding for these kinds and other activities of Sunlabob.

Role of the government
Mr. Schroeter has a clear opinion on the role of the government in providing rural electrification: 'the government has to have the main responsibility'. However, he continues, he does not see the government taking this responsibility at this moment. The main cause of the problem is the high dependency of the government on foreign aid: '8 billion dollars of aid for a country of 6 million people'. As a result, the government tends to lean back and does not want nor need to take this responsibility.
The stance of the government also complicates the work of private companies like Sunlabob. Mr. Schroeter would like to see a strong government that is capable to support and provide a framework for the private side to operate. Presently, this is not the case.

Role of national and local entrepreneurs

The opinion of Mr. Schroeter is that national entrepreneurs are necessary to ensure sustainability of rural energy provision. Like he mentioned before, the commercial approach is the only way to guarantee this and the public side must come to terms with this and open up for improved collaboration.

Especially in Lao PDR, national entrepreneurs are not able to serve all needs for people in remote rural areas. People needs good and fast service when there is a problem and national entrepreneurs cannot provide this, for reasons that infrastructure is often non-existent and that dealing with a diverse range of ethnic groups puts up additional challenges. Thus, according to Schroeter, local entrepreneurs are of crucial importance: 'they are the key to access the end-user and to ensure sustainability of the energy services provided'.

In sharp contrast with the theoretically pivotal role of local entrepreneurs is the often practical lack of good skills and knowledge to operate an enterprise. People need good training in order to provide sufficient quality service and to keep their business running. Schroeter adds: 'How can you run a company without having a clue on the concept of profit or knowledge on bookkeeping?'

The way forward

To conclude the interview, I ask some questions on Mr Schroeter's vision on rural electrification in and the role of Sunlabob for the near future. One of the most important challenges, he argues, is not to find the best technology: 'PV solar, micro-hydro, wind energy, etc, etc are all there and well-established'. What lacks are the concepts and business models to make these existing technologies compatible with the livelihoods of people and, by doing so, to encourage productive use of energy and other aspects of development.

Sunlabob has gathered a lot of experience by trying out various business models over the course of the years. Therefore, Mr. Schroeter thinks that Sunlabob should focus more in disseminating, fine-tuning and innovating conceptual approaches to rural electrification rather than focusing on hardware. Once affordable and reliable business models have been developed, they can be implemented all over the world, with the help of local private partners.

A good example of a potentially successful global approach developed by Sunlabob is the rechargeable fluorescent lighting system. At the moment, Sunlabob is trying hard to find local partners and funding for the hardware (fixed assets) to implement this new concept world-wide on a full-scale. Franchisees in Africa and Ecuador are being set up at the time of writing this interview.

A final *cri de coeur* goes to all those institutions that have been involved in rural electrification over the past decades. Rather than trying to do rocket science, Mr. Schroeter would like to see reflection on those approaches that were successful and, more important, those that failed. A whole lot can be learned from projects that underestimated the way of life in rural areas and/or neglected aspects of sustainability. According to him, wasting donor money using unreliable business models is harmful for rural communities as well as for the private sector.

ANNEX B

PROVINCIAL STAKHOLDERS LAO PDR

Name	Mr. Bounta Bontsabong
Organisation	Provincial Department of Energy and Mines
Fuction	Director
Country	Laos
Date of interview	5 October 2007

1 What is your opinion of the situation with regard to rural electrification in Laos?
Mr Bontsabang is happy with rural electrification as rural electrification directly contributes to development. It is an important factor that improves the quality of life of the rural population. It takes away the darkness.

2 What are the most urgent problems with regard to rural electrification?
An important problem for the development of the rural population is illiteracy. Electrification offers adults an opportunity to study at night. Moreover electricity is needed in medical centers and schools. The services in the rural areas can be improved with electrification.
Further people in Loas tradionally weave clothes and make baskets. This is also an evening activity. Electricity will make this work easier. Finally in some areas agriculture depends on irrigation. Here again electricity will facilitate irrigation and thus agricultural income. Funding sources to get this electricity to all remote areas in Laos is a problem.

3 What do you see as the Government's role in rural electrification?
The department of Energy and Mines plays a role as policymaker. It intends to increase the number of households that are connected to the grid. By 2010 it is planned to reach 70% of the population. By 2020 it intends to reach 75% with grid connections and an additional 15% with off grid solutions.
The off grid connections are planned to be installed by VOPS (a Laos-WB project) and the remaining part by private entrepreneurs. Some people have chosen pico-hydro as a means of electrification, especially next to the Vietnamese border, where traders sell the systems over the counter. In Khammouane province there is no pico hydro available.

4 In your opinion, what is the role of national entrepreneurs in rural electrification?
They play an important role. Here in Khamouanne province we have a private entrepreneur who invested 15 billion KIP to expand the grid in Borana district. He invested in a 22kW generation plant and .4 kV transmission lines. The government is paying him back little by little. Name of the company (Houng Heoung Construction and Electricity Company). The PDEM has a list of about 10 companies that have implementing capacity in this type of work. HHCEC is the biggest.

5 And how do you see the role of local entrepreneurs in rural electrification?
The earlier mentioned provincial companies work as a mother and child relation with local entrepreneurs. The local companies get feedback from the provincial ones. Suppose they get a subcontract they will have to invest an amount of about 30% of the contract amount. These companies are only involved in installation and transmission. They are not involved in the distribution of services.
Within the context of Laos all provincial and local entrepreneurs are also permitted to invest in generation, as long as the capacity installed is not more than 2 MW. However the electricity tariff set by EdL is lowest in the ASEAN region and therefore for many small generators the tariff as per PPA is not sufficient to generate electricity in a profitable way.

6 How do you envisage rural electrification over the next ten years?
There is space for improvement to reach the targets set. For example we do import electricity from Thailand at this moment. This will hopefully change in the future. We now recently upgraded the Nakey Nam Theun (NT1) from 210 MW to 430MW. Further we are constructing the NT2 with a capacity of 1080 MW. It is foreseen that this hydro installation will also reserve 90MW for local consumption. The difficulty we have here is to find funds to build the High Voltage transmission and Low Voltage distribution lines.

7 Do you have a message related to Rural Electrification that you wish to bring forward?
The big problem is funds. We need different funds: grants, to risk capital, normal equity and also long term soft and more commercial loans. In Khammoune we already received grants form France to invest in the distribution network for 3 villages and to electrify one village with stand alone solar energy systems.

Name	Mr. Kampu
Organisation	Provincial Department of Energy and Mines
Fuction	Head of Electrification Department
Country	Laos
Date of interview	5 October 2007

1. What is your opinion of the situation with regard to rural electrification in Laos?

If many projects come to help it would go great. Laos is poor, so there is not enough money for executing the plans. The distances are big from the countryside to city.

2. What are the most urgent problems with regard to rural electrification?

Many problems, people don't have electricity for living and communication.
Dept. of electrification. They do surveys in rural areas. It cannot go faster because of the mountainous area. There are few entrepreneurs that want to build lines and the gov. is too poor to do it.

3. What do you see as the Government's role in rural electrification?

The gov. gives some money for support for advertisement.

4. In your opinion, what is the role of national entrepreneurs in rural electrification?

Planning and construction of the national grid.

5. And how do you see the role of local entrepreneurs in rural electrification?

Expand their grids. EDL depends on those entrepreneurs. There are 10. They provide off-grid electricity from hydro-power. Khammouan buys also electricity from Thailand

6. How do you envisage rural electrification over the next ten years?

In the next ten years it will keep on growing, because many projects come to help.
Most important renewable power sources are 1. hydro then 2. solar and 3. biomass. There is a French project called 'no limit' covering 1 village Na Teunth, Ngomalad district.
No pico-hydro projects

7. Do you have a message related to Rural Electrification that you wish to bring forward?

When you have a project, please come here.

Name	Mr. Phonsavath Xayavong
Organisation	Electricité du Laos
Fuction	Deputy Manager Khammouane Province Branch
Country	Laos
Date of interview	5 October 2007

1 What is your opinion of the situation with regard to rural electrification in Cambodia/Laos?

Situation is Khammouane is not quite good. This is because the equipment is not always up to standard. Sometimes the power goes off. We try to change the equipment to improve the grid. The insulators are the main problem. There are not always enough wires and they are not always thick enough.

Two projects: REP 1 & 2

2 What are the most urgent problems with regard to rural electrification?

See question 1.

3 What do you see as the Government's role in rural electrification?

4 In your opinion, what is the role of national entrepreneurs in rural electrification?

5 And how do you see the role of local entrepreneurs in rural electrification?

We work with 5 or 6 private companies, to install equipment. Not to sell electricity. Everything is generated by EdL, all hydro.

6 How do you envisage rural electrification over the next ten years?

7 Do you have a message related to Rural Electrification that you wish to bring forward?

Names	Mr. Kanthy, Mr. Soukaseum, Mr. Syphanom
Organisation	Electrical Construction and Installation Company
Fuctions	Director (Kanthy) and deputy directors
Country	Laos
Date of interview	10 October 2007 & 15 October 2007

Electrical Construction and Installation Company (ECI) became independent from EdL in 2006. The company is a parastatal. The company's main task is to implement the Provincial Socio-Economic Strategy Plan. Within this plan the priority to electrify rural areas has been set and the plan is implemented with finance from ADB and World Bank.

The HQs of ECI are based in Vientiane. The HQs mainly oversee the work of the provincial entities. Contrary to EdL, ECI has no presence at the lower district level.
ECI in Khammouane has 23 permanent staff and hires between 30-40 temporary staff if needed.

The recruitment from staff is not very difficult. ECI receives many applications from fresh graduates from the National University of Laos, particularly from the faculty of Engineering. This university also provides sub bachelors curricula in the province. ECI also receives applications from the Technical School which provides an Intermediate diploma. Most staff of ECI has over ten years of working experience.

A yearly training workshop is organized. Each a training workshop is organized on a specific topic, like transmission installation, construction. Staff from the provincial departments can join these training in Vientiane. These meetings are so far organized by EdL. However in the future ECI also intends to organize it.

ECI role in rural electrification is linked to implementation: installation of low, medium and high voltage lines. It generally starts implementation with a site visit. It is important to explain the local authorities and population about the plans and the use of electricity. It is also necessary to inform the villagers that electricity costs money.

With the results of the technical baseline the technicians will return to the office to design a plan. As a next step the clearance work will start. The workers will set up a base camp from where all operations will be implemented: transmission lines and connections to the household.

ECI is only involved in grid connected business. It is not yet involved in site development work related to micro hydro or other stand alone systems. It only works based on government tenders. In the Northern part of Laos there are a few companies active in the installation work of small hydro systems (at Nam Pheung a Chinese company is involved, at Nam Siom a company from New Zealand is active in micro hydro.)
ECI is just independent and not yet ready to develop an area itself. However, in 1999, before its independency it was involved with Borten (1.5 MW) in Seyenbour project.

Further to the schooling Mr. Kanthy mentions that their level of knowledge is sufficient, however the scholars should get or on the job experience.

Finally Mr. Kanthy says that he is happy with the achievement of the province compared to others. They have reached abut 70% electrified and hope to reach 90% in 2006. The challenge is togo deeper into rural areas. Before they electrified areas that already knew a certain level of development, now they are going to areas that are less developed.

SWER was first installed in Khammouane in 1998. The technology was already known Vientiane Province, along the road from Thalath to Luang Prabang. The technology came from Australia.

The transformers are specifically for SWER and have to be imported. Didn't know from where.

The technology was considered a success and more SWER was installed in Laos and in Khammouane. Even now there are more lines planned in the REP phase 1 (Nakai District)

The knowledge of building SWER lines is still present in ECI Khammouane. Very important is good earthing and ECI technicians know how to do that.

ECI has had only positive feedback from end-users. The areas for SWER are poor and people use simple machinery there which have no problems with single-phase electricity.

Costs of construction:
- 1 km 220kV line (8,000-11,000 USD)
- 1 km 380kV line (12,000-14,000 USD)
- 1 km 22kV line (18,000-25,000 USD)
- 1 km 115kV line (60,000-80,000 USD for single line) (120,000-140,000 USD for double line)
- 1 km SWER (22kV) (18,000-20,000 USD)
- 1 km Shielded wire (115 kV): do not constructing.

Name	Phongphef Panyon
Organisation	Houng Heoung Construction & Electrical Installation Co., Ltd
Function	Director
Country	Laos
Date of interview	10 October 2007

Mr. Phongphef Panyon used to have a shop with electrical equipment. In 1990 he joined Xaysomboun company, where he did administrative and financial work. During this work he grew more and more confidence in running own businesses and in 2005 he started a hotel/car-rental service and later that year the Houng Heoung Company. Now he runs three companies: the shop is managed by his wife, for the hotel he employed a manager and Houng Heoung is managed by himself.

Houng Heoung installs from household wiring to 22kV transmission lines. The differences with ECI is thus that he is 100% private and that he cannot install high voltage lines (115kV) Another difference is that he has to respond to government tenders in newspapers. This is a rather unfair competition with parastatal and semi-parastatal companies. The competition with other private companies he doesn't perceive as a problem; that is normal business.

HH has 12 permanent staff and a group of about 20 people who work on commission basis. He sometimes employs village-based labourers. His technical staff consist of three highly experienced technicians; a Czech with 10 years of work experience and two Laotians with seven years work experience. Once in a while he gets interns from the technical schools. They often stay three months. A few he later employed, but the boys are not tough enough for the work. "Sometimes it is so busy that they have to skip lunch and the boys are too weak to handle that," he says, "and also when they have to climb a pole, they get scared of the height." All of them resigned from their jobs.

Mr. Phongphef Panyon is a good client from the bank and experiences no problems for receiving credit at the Lao Development Bank. His main reason for credits is projects. The government –being the contractor- gives a bank guarantee then. If he would apply for a credit he could put his home and his land as collateral. The collateral has to be at least 200% of the credit.

Strengths of running this business are that all the profits are his and he depends on no one for (technical) decisions. Weaknesses are that he cannot share risks (luckily nothing serious has happened so far!) and his negotiating position compared to the parastatal competitors.

He has never heard of SWER.

In the future it is worthwhile to study the risks and the profits in investing in small dams.

Names	Mrs. Lamkeo & Mr. Suphaphon
Organisation	Resettlement Management Unit (RMU)
Country	Laos
Date of interviews	15 October 2007
Names	Mrs. Nilandon
Organisation	Nam Theun 2 Power Company (NTPC)
Country	Laos

The RMU is a governmental office to collaborate with Nam Theun Power Company (NTPC) and they monitor the compensation programs run by NTPC. The compensation program is focused to minimize the negative effects of the resettlement program caused by the dam construction.

Nam Theun Power Company is a consortium of:
Électricité de France International (35%)
Lao Holding State Enterprise (25%)
EGCO, a Thai IPP (25%)
ITD, a Thai infrastructure construction company (15%)

NT II has got to become a model of good dam construction, and is taking much care of environmental and socio-economic issues.

Jatropha was not indicated in the Nam Theun II project plan. But as extra income generation a Jatropha.project was added to the program this year. 5,000 sibblings were bought at a nursery in Gnommalat district and distributed over 30 families in three villages.

The tasks in processing are not defined yet, Kolao Farm Comp. is interested to buy the Jatropha nuts and can guarantee at least 600 Kip per kilo, but it is very likely to be higher than that. Another option that is being considered is that NTPC donates oilpresses to some of the villages. 4-6 kg of nuts can produce 1 litre of oil. Thus the input is 3,600 Kip per litre oil and the challenge is to keep the enduser price under the diesel price of 9,000 Kip/litre.

Fertilizer will be distributed when the time is right for fertilization.

Both the program and the RMU-office will exist until 2013-2014. There are two phases, the first is running from 2000 to 2009 (Commercial Operation Date) and has a budget of $ 8 million and the second phase runs from COD to the end with also a budget of $ 8 million.

Name	Mr. Kampay
Organisation	Department of Science and Technology
Country	Laos
Date of interview	5 October 2007

1 What is your opinion of the situation with regard to rural electrification in Laos?
Looking for location and preparation, looking for generators for hydro. People need electricity.

2 What are the most urgent problems with regard to rural electrification?
Investment money, the rural areas are far away. Difficult situation. Not convenient.

3 What do you see as the Government's role in rural electrification?
They should invest in the grid

4 In your opinion, what is the role of national entrepreneurs in rural electrification?
They (EDL) should receive gov. investment and do the work.

5 And how do you see the role of local entrepreneurs in rural electrification?
Off-grid should be done by organisations.
Diesel generators, some areas also solar cells, people like the pico-hydro, but it is not there.
In his section they research biogas, there is potential for biogas.

6 How do you envisage rural electrification over the next ten years?
The grid will expand very far. In 2020 almost everybody has electricity.

7 Do you have a message related to Rural Electrification that you wish to bring forward?
Their role is to analyse problems. The rural electrification should fit within the general science and technology development. Focus on clean technology development; hydro. Environmental research on Nam Theung 2.

In anycase of electrification development. Environmental impact assessment is always needed.

Name	Mr. Dethsackda Manikhame
Organisation	Department of Agriculture and Forestry
Function	Administrative Officer
Country	Laos
Date of interview	15 October 2007

The department of A&F does not initiate any energy project. The role of this department is on management level. If someone comes with a plan, the dept. write a proposal to funders like ADB and WB. The projects are mainly on forestry. (They are making two very big conservation areas at the moment).
Two demonstration projects involved dept. A&F:

- A foreign investor has looked for the feasibility of sugarcane, of which the waste was supposed to be used for electricity supply. In the end the electricity production would be too far away from the grid, and thus considered not feasible.
- For a 100 ha Jatropha plantation the department has done a land survey and land-use license. For more information he directs us to the dept.of Planning & Investment (DPI).

Mr. Dethsackda doesn't believe in jatropha. Diesel is much easier and even cheaper than Jatropha. Many villagers prefer not to make big changes and see Jatropha as a big risk.

The woodwaste from NT II is huge. It would be interesting to develop a plan for that. The potential is big, but far away and off-grid. Mr. Dethsackda believes there are no investors for that.

The two main cash crops are Eucalyptus and rubber, both by private investors. The Eucalyptus is for Japan and the rubber for Thailand. Khammouane farmers mainly produce for own consumption.

Name	Mr. Saysana
Organisation	Department of Planning and Investment
Fuction	Management & Investment Section
Country	Laos
Date of interview	15 October 2007

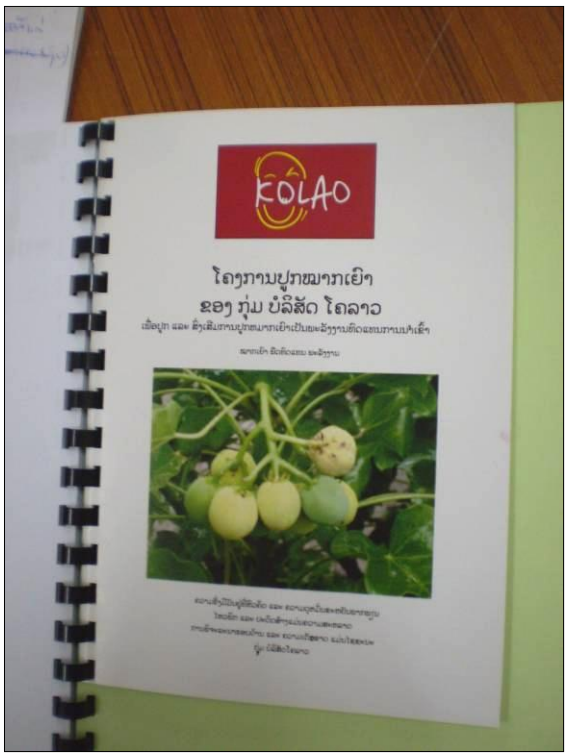
DPI does not implement projects

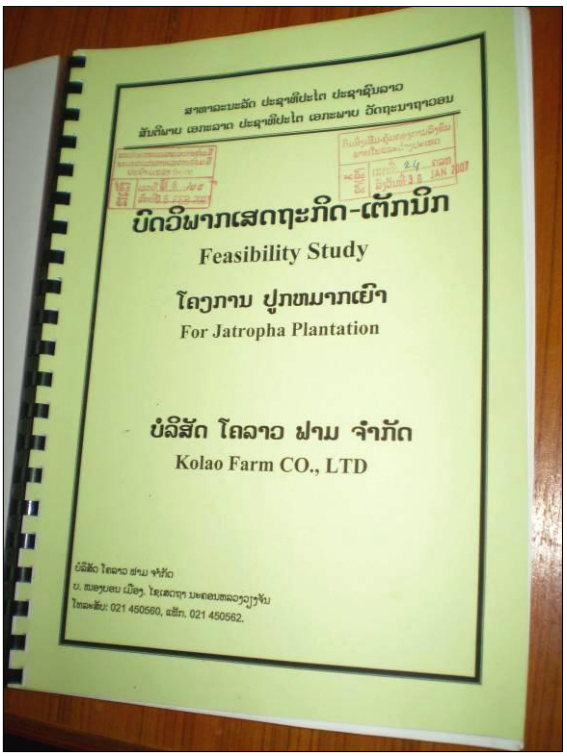
However, Koloa Farm Comp. Ltd. has requested a license for a 100 ha Jatropha plantation. The section management & Investment screened the feasibility study of Kolao and approved implementation.

DPI promotes the so-called “2+3 system” (villager & labour + investment & technique & market)

Kolao has recently planted Jatropha in other provinces on small scale. They now want to build bigger plantations and one central factory to produce the oil.

Mr. Saysana explicitly tells us that if we want to invest in Jatropha, that we seriously should reconsider. It doesn’t sound very profitable to him.





ANNEX C1

VILLAGE PROFILES LAO PDR

Village	Ban Hinboun
District	Hinboun
Name	Mr. Singha
Date	6 October 2007

Ban Hinboun used to be the capital of Hinboun district in Khammouan province. It already has grid electricity since 1979, and seems relatively well-off. Ban Hinboun is located at the aorta of Laos: the tarmac, non-pothole road connecting Vientiane in the north with Pakse in the South.
It has 576 inhabitants in 94 households.

At the end of the muddy road coming from the main road is the house and furniture workshop of Mr. Singha (29). He took over the saw-mill of his father, who has been in the furniture business for more than 10 years, and expanded the furniture workshop over time. In the last year and a half he invested more than $ 2,000 in his furniture shop. He has a permanent staff of 4 people and sees investment in high quality tools as a necessity for his competitive position. In the neighbouring village there are three other furniture workshops. He produces on demand only, mainly for people in Vientiane, the local market is very small and exporting to Thailand is forbidden.

However, there is doubt on the future of the furniture business. Because of stricter regulation on wood-cutting it is difficult to get wood. So he has chosen to change business and ordered a $ 6,000 press from Thailand for brick making.

Mr. Singha is married to Mrs. Pitsana and they have two children. As a wedding gift he got the rice mill from his father-in-law. His father-in-law had the mill since 1999 and Mr. Singha has taken over in 2003. The husk coming from the mill can be divided in fine husk that he keeps as fodder for his 18 pigs and coarse husk that he gives away as fertilizer for vegetable farmers.

All his machines run on electricity and Mr. Singha cannot imagine his life without grid power. “Electricity is the beginning of every business”, he says. He made three connections for clear administration; the bill for the furniture shop is $ 25, for his house and the rice mill are both around $ 5.

He is worried about the construction of a dam upstream of the small river Hinboun that flows into the Mekong in Ban Hoong Moon. On his wall there is a line about one meter above the floor. He points at it and says: “this high is where the water will come”. This afternoon there is a meeting in the village about compensation for the harmed by the dam.

Besides his work he owns the 18 pigs, about 20 ducks and some chicken.

Ban Hinboun Village:

Village	Ban Hinboun
District	Hinboun
Name	Mrs Pan and Mr. Oud
Date	6 October 2007

Even before we finish our introduction, Mrs. Pan starts complaining about the electricity bill. She shares the connection with the neighbour, but the average bill of $ 4.5 is very high for her. She fears to be disconnected and to reconnect is about $ 100 and therefore she is not connected to EdL. She shows the wick lamp that they will have to use if they will be disconnected. Diesel for it costs about $ 0.80 per litre.

She shares her house with her brother and her husband Mr Oud. They have 5 children, of which the oldest is 36 and still not married. The youngest is 14 years old. They struggle a lot, her husband is deaf and she cannot work because of a tumor under her armpit. It cannot be removed because the doctor said that an operation would be fatal for her. They depend fully on the labour of the children, who do slash & burn agriculture on a 1200 m^2 piece of land. Only the youngest is going to school. When the children work as labourer for others they receive $ 2 per day. They cannot afford to eat rice daily, but sometimes Mr. Oud and his son catch some fish with their cast net to add some protein to their meals.

They own 2 pigs, but no ducks or chicken.

Village	Ban Hinboun
District	Hinboun
Name	Mrs Phonsy and her father
Date	6 October 2007

Mrs Phonsy lives in a relatively small house with her husband, Mr. Pian, her daughter and her parents. The grandfather explains that he is one of the three people in the village still making traditional fish baskets. It takes two days to prepare the bamboo material, two days to assemble and another full day to finish the decorations. He sells a fish basket for $1.50 a piece. No young people are doing this kind of profession any more. His wife practices weaving and sells her produce to a local merchant. She is not connected to the group of 20 women that are organised by a Red Cross microfinance project. Only a limited number of women could join.

Mrs Phonsy is 27 years old and sells noodles in a small restaurant under the house. It is not such a good business, because on average only six people come to eat. The ingredients for her shop can be bought in the market along the main road, just one kilometre from the village. The household keeps 2 ducks, 9 chicken and one pig. She just started keeping the pig ($18), with the intention to sell piglets. She feeds the pig rice husk, which costs $8 per month.

Her husband does paddy rice farming on their plot of one hectare. Although this is the average size of plot in the village, the harvest is just enough for four months of rice for the family. The village has a problem with their low-level paddy that is flooded in the rainy season. It can thus be used only in the dry season. The deputy village leader says he would like an irrigation project to improve the yields of their paddy rice fields.

The village has been electrified for a long time. The household uses electricity for comfort and safety (4 lamps), to keep food fresh (refrigerator) and for entertainment (black and white TV, cd-player and speakers). In case the power goes down, there is still an old kerosene lamp. Their electricity bill is about $ 2.50 a month. Mrs Phonsy would like to have a colour TV, motor bike and a tractor, but she does not have a concrete timeframe and ideas to finance these expenditures.

The Nam Theun II (1080 MW dam, expected to be finished in 2009) project team has visited the village already three times to predict the rise of the water and to assess the necessary compensation. They did not, however, come to the house of Mrs Phonsy yet.

Village	Ban Laokha
District	Hinboun
Name	Mr. Peo and Mrs. Souay
Date	6 October 2007

On the main road, at the junction to Ban Thana Neua, lies Village Ban Laokha. Mr. Peo (29) runs a battery charging shop there, but it is quiet. We first meet his wife Mrs. Souay and she explains that nowadays they run the generator every other day. 4 Years ago they bought the business for $ 800 and later they added a 60A battery charger for $ 100. By then the charging shop was visited by 60 clients a day, now 18 every other day from 8 am to 5 pm. Mrs. Souay can think of two reasons why business went down. First of all the grid is extended through the province and reaches until 14 km from the village now. It is planned to be electrified in 2009. More importantly many people hire a solar system in the neighborhood. People charge their own batteries with the solar systems and don't need to come to the charging shop of Mr. Peo and Mrs. Souay anymore.

Battery charging Tariffs:
50 – 120Ah = 4,000 Kip
Smaller than 50 = 3,000 Kip

Their main income now comes from farming. Mr. Peo has a rice paddy of 2 ha which can be used only in the dry season. In the rainy season it is flooded. His piece of land is in the area of Thananeua village, where there is an irrigation system. Furthermore he has a rice mill, a fish pond, several ducks and his wife runs a bar. The bar is connected to the generator from the charging shop and they use it from 6 p.m. to 10 p.m. daily, so the customers can eat in the restaurant with electric lights.

Also the electrical equipment in their house is connected to the generator. They have a color TV, a CD-player with stereo, 2 lights and a fan. On the days that the charging shop is not operating they use a battery and an inverter to power those appliances during day time. Inverters are widely available from the Chinese shops and are very affordable.

When we discuss what he would do with all the equipment he invested in, the village leader suggests using the generator in the rice paddies for irrigation and Mr. Peo agrees.

Village	Ban Laokha
District	Hinboun
Name	Mr. Phadt
Date	6 October 2007

Mr. Phadt comes from Savannakhet province, but came to Khammouan to work. Here, he found his wife, Mrs. San, married and stayed at Ban Laokha ever since. They now have five children, the oldest being 15 years old and the youngest just a month. His wife stays at home most of the time to take care of the children and to make bamboo walls. She does not use an improved cook stove, because it cannot be used with the big lumps of firewood. The oldest son could not go to school for financial reasons, but the others are going. There is a primary school in the village, the first three classes of secondary school are at 10 km distance and to finish secondary school children have to travel to the district capital.

The main source of income of the household is slash-and-burn farming. Mr. Phadt has a plot of about 3 ha, divided into three pieces. He can work each piece of land for two sequential years, before he moves to another piece. Hence, it takes about six years for soil to become fertile enough to cut the vegetation and burn to fertilize. He does not own the land, but he has a temporary permission from the district authorities to use it. Although this permission does not have an ending date, there is no possibility of getting ownership over it. As a secondary activity, the family makes woven bamboo walls, like many other people in the village.

Since one year, the household has a solar home system installed by the Sunlabob franchise in Ban Thana Neua. Mr Phadt first heard about this possibility from someone in the neighboring village and there was also a demonstration of the solar home system in the village. The installation of the system was about $15.00 and every month the family has to pay a monthly fee of $3.50 to the franchise taker. All equipment, wires, service and maintenance are included in the monthly fee. The downside of the system is that no-one is allowed to move or touch the system except the franchise taker. This means, for example, that the battery cannot be brought to the charging station when the weather is rainy for a few days. On sunny days, the family can light the house and watch black and white TV for some three hours.

Before the installation of the solar home system, the family used a kerosene lamp and a battery. Back in the days, Mr Phadt paid $15 dollar for the battery, but it turned out to be really old and always empty at the end of the day. Because the village battery charging station is only open every other day, this meant that they could use it only half of the time. According to him, the situation is better now, because before it was less safe, less reliable and more expensive ($0.40 for one charge, which equals, given his use, $6 a month). However, there is less flexibility, since the family has to pay every month or the system will be removed and re-installing would come with re-paying the installation fee. In their previous situation, the family could decide not to recharge the battery. Mr. Phadt sold his old battery for $1.

The biggest dream of Mr Phadt would be to buy a tractor and of course he would like to have more electricity, for e.g. a color TV, but he does not have the means.

Village	Ban Laokha
District	Hinboun
Name	Mr. Tung and Mrs. Siew
Date	6 October 2007

Mr. Tung is 28 years old and lived his whole life in Ban Laokha village, just as Mrs. Siew who he married 5 years ago and got two children with. They live in a simple house that they inherited from her parents. Their TV is broken and so is the tube light that they have. Unfortunately they don't have money yet to repair the TV or buy a new tube. A new tube, including the holder and ingition would cost 30,000 Kip and can be bought in several shops in the village. So their 70Ah hour battery stands unused next to the TV.

Mr. Tung & Mrs. Siew has a license for a meager 3 acres of land that he uses for slash & burn rice growing. They both work on the land and when time allows they produce bamboo mats. They can make 21 m^2 of mats per day. It involves bamboo cutting, flattening, cleaning and weaving. A normal working division is 6 days for slashing the land, then wall making, burning the land, one month of cultivating the land and then wall making again. All of this work is done together, however Mrs. Siew also has to raise the children and do the household tasks. The rice they produce is enough for three months of feeding in a bad year, up to five months in good years. He sometimes supplements the rice with fish that he catches himself.

Mr. Tung dreams of buying a nice new house for his wife and children, but that is far beyond reach now. More feasible would be to invest some money in proper lighting in the house. Even if the village receives grid electricity (it is planned for 2009) Mr. Tung doubts whether he can afford the bill. He hopes he can sell his labor more often so that they can save money to pay the connection fee and the monthly bill.

"Currently it is hard to build up a good life in Ban Laokha," he explains, "there is no land available for buying and raising animals is difficult too. Since 6 years ago many animals die of diseases. Even strong and healthy looking cows just drop dead in front you." One of the neighbors tells us that he had 50 chickens that died within a week. Even the district veterinary doesn't know what diseases are among their cattle and chickens.

Mr. Tung hopes that the future will bring better times.

Village	Ban Na Bouab
District	Thakhek
Name	Mrs. Paalidaa (biogas user) and Mr. Khampoi (PSTEO Khammouane)
Date	8 October 2007

The farm of Mrs. Paalidaa, her husband and two children is situated at about 5 km from the provincial capital. Their blue-roofed house is big and there are several other small sheds that belong to the farm. In June of this year, people of Provincial Science, Technology and Environment Office (PSTEO) installed a biogas digester in the back of the farm land that provides gas to cook and for one light. Immediately, the biggest problem of the system can be noticed: the smell of the gas during cooking. Another problem, according to Mrs. Paalidaa, is that the pots she uses turn black.

The biogas is generated by what is also the main income generating activity of the household: a pig farm. There are about 280 pigs at the farm, making it an average size pig farm in the surrounding. There are some farms with thousand pigs and the smallest has about one hundred pigs. In total approximately 50 pig farms are situated in the district.
The piglets (12 kg) are bought for $12 and after four months sold for about $148. In the meantime the farmers have to invest, besides their labor and one employee, about 210 kg of fodder, which equals $62 or more and is bought in Thakhek.

The construction of the biogas installation took three days by Vietnamese engineers and masons. The PSTEO was also closely involved and was taught by the Vietnamese about biogas. The investment costs in total were about $1900 of which 20% is supposed to be contributed by the family. The dome has a volume of 7 m^3, which is very small for the amount of animals on the farm. This could easily be seen by the fact that there was gas bubbling out of the digester. The digester was built next to the pig shade and far away from the house (about 70 m).

Before the installation of the biogas system, Mrs. Paalidaa used both firewood and natural gas. In this way, her gas consumption was only one bottle (for $15) per two or three months. On firewood, also bought in town, the family used to spend about $6 per month. Ever since they have the biogas installation, they can use plenty of gas and their usage of firewood is about half of what it was before.

This is the first biogas system in the province of Khammouane, built as a demonstration system. The future of biogas systems in Khammouane province is still unclear. Mr. Khampoi, of PSTEO, explains that his organization can only help with advice. The people in the province have the responsibility to make the investment. Because of the high involvement of the Vietnamese in this project, it is uncertain whether there are people to be found who can construct the domes. Mr. Khampoi explained that the masonry of domes is rather specialistic work, the Vietnamese would be willing to give more assistance if needed.

Facts & Figures:

Pig farm

Buy piglet:	1,200 baht (average 12 kg) → 100 baht/kg
Sell pig:	5.040 baht (average 105 kg) → 48 baht/kg
Fodder:	210 kg/pig
Price:	550/300 baht per 30 kg
Period:	3.5-4 months
Employee:	1,500 baht per month

Household

Gas (past):	150,000 KIP per bottle (2-3 months)
Firewood (past):	120,000 KIP per month
Firewood (now):	60,000 KIP per month

Biogas installation

Investment:	19,000,000 KIP

Village	Ban Song Hong
District	Hinboun
Name	Mr. Lahsy
Date	8 October 2007

On the main road from Thakhek to Vientiane in Ban Song Hong -the capital of Hinboun district- is the business of Mr. Lahsy (age 55). He repairs dynamos and charges batteries and while interviewing he is playing with some bank notes in his hand. His fancy home-made battery charger block is nearly empty. There are less then a dozen 6V batteries on it and two bigger 12V batteries (70 and 100Ah).

Charging:
6V – 1000 Kip
70Ah – 3000 Kip
100Ah – 5000 Kip

He tells that in the good times he charged up to 60 batteries a day, but with the widening availability of electricity his charging business went down to the current 5-6 batteries a day. Only once every 15 days (Buddhist day) it's a villager's relaxation day. On that day the villagers bring around 50 batteries to charge with Mr. Lahsay. Electricity is, except for the rainy season (typhoons), stable.
"People charge batteries at home," he explains, "there is no business in battery charging anymore. My competitors have already stopped their businesses." Mr. Lahsy can only continue because it is just a small side-business.
When he started he invested 6000 Bath in his battery charger.

His main business is thus his dynamo repairs. He learned it when he was working for a French mining company. He worked there since 1968, but resigned when his wife needed him more at home. In 1990 he started his business at home. The dynamos are used for water pumping, small generators and rice mills.
He repairs one or two dynamos per week and charges 800 Bath per PK. He has enough work, but now that he is getting older he has to let some jobs pass. Because of his age and the lack of successors (his only son is married and lives out of town), he does not have plans for expansion. There is only one competitor in the district, who does dynamo repairs as a secondary business. Otherwise, people will have to go to Thakhek to get their dynamos fixed.

His daughter uses the other half of the big garage where Mr. Lahsy has his business for her fruit shake business. With her own money, she bought four blenders and all kind of flavor powders two months ago. The business for these modern-city products seems big as we see several people buying the shakes and we enjoyed the shakes too in the warm weather it was that day. In addition, there were some tires for motorbikes and a few other products for sale. There are only normal light bulbs, because there is no demand for energy-saving lamps, according to Mr. Lahsy.

Village	Ban Phovatay
District	Mahaxay
Name	Mr. Kii Tomahawong
Date	9 October 2007

Situated in a small strip with a few other buildings along a road we find Mr. Kii in front of his small business were he repairs machines, such as motorbikes and tractors. The place is very modest, but he also has a house a few miles further up the road where he lives with his wife and three children. With his repairing business he can earn about $10-50 a day (100,000 – 500,000 Kip). He learned how to do this in his previous job as a driver and assisting mechanics. After having worked for some time in a shop in Thakhek, he returned to his home village 12 years ago to start up his own business. If he has a lot of work, he hires an employee for some $2 a day.

Next to his main occupation, Mr Kii is also exploiting a battery charger. He bought a new charger in Thakhek in February of this year for 9,500,000 Kip, but he does not have a lot of clients. His client base has been decreasing from 50-60 a day to about 50 a week when the grid entered the village. This is because electricity is not scarce anymore in the surrounding. People use the small 6 Volts battery with a headlight for catching frogs at night. With this side-business he earns about $1-2 a day.

Battery charging tariffs:
120 Ah – 10,000 kip
70 Ah – 5,000 Kip
6V batteries – 1,000 Kip

For his electricity he pays 8,000 Kip per kWh. This tariff is higher than the tariff charged for households. For his own house, he pays about 20,000 Kip a month on his electricity bill for a fridge, 2 lamps, a water pump, color TV and a CD-player. The use of the water pump has a lot of impact on his energy bill.

Mr. Kii also owns a plot of land of 3 ha on which he grows rice. Unfortunately, the rice field is flooded at the moment. Normally, the yield of the paddy is about 4,500 kg of which he needs 300 kg for himself and his family. The rice that is left after own consumption is used (partly) to pay his 15 workers that assist him. Last year he tried to use fertilizer, but because of the flooding the costs of whole operation were higher than the extra yield. The land is flooded every year and therefore he doesn't want to use fertilizer again.

Land is easy to get in the surrounding, according to Mr. Kii, but the profit is not very certain, because of the flooding. He says it is possible to buy land for $500-600 per ha (5-6 million Kip). In general, he feels more like being a mechanic than being a farmer and also likes the direct income that he can generate in this way. His wife, Mrs. Petnapan is selling gasoline next to the workshop.

The plans for growth are severely limited by the amount of taxes that Mr. Kii has to pay. At the moment, he pays 300,000 Kip a year for his license and another 30,000 Kip per month on taxes. If he would expand he would go up in another tax tariff and pay much more he says. This makes investments more risky.

In the back of the house, we find an electrical water pump that is used for village irrigation. The pump is paid out of donor money, but operated by the local department of agriculture. The equipment itself comes from China and appears to be in a very bad condition. This also counts for the electrical wires that are running to it.

Village	Ban Phovatay
District	Mahaxay
Name	Mrs. Kiu Wang Sai Sen Chang
Date	9 October 2007

If you are looking for a place to drink a hot coffee, you are likely to end up at the restaurant of Mrs Kiu, in her home town Phovatay. In total, there are 600 households in North and South Phovatay. The restaurant looks neat and clean and her 'employees', some of her 11 children, are friendly and know how to cook. She turns out to be an out-of-the-ordinary entrepreneur, with a long a diverse history of different activities.

Her first step as being an entrepreneur was to open a market in the Southern part of the village across the river. In those days the village was still small and offered mainly a base to a military camp. After that she bought a generator, initially to amplify the equipment of the band of her husband that used to go around villages to play. She found out that she could also sell electricity to neighbors and so she did. She provided electricity to 10-20 people. She simply divided the gasoline cost through the number of users to calculate the tariff. When Phovatay received grid electricity in 1986, she gave up the business. After she divorced from her first husband, she moved away back to this side of the river in Northern Phovatay.

After 1986 Mrs. Kiu worked for a while as a saleswoman of food products she slowly moved into the collection of Chinese herbs for medical purposes. Through this work, she got in contact with a lot of people involved in logging and decided to move into the wood business in 2006. Two years earlier, she already opened her own small restaurant in Northern Phovatay. Only three months ago, she had to move her wood factory, because of the flooding.

The wood factory, now located at a short distance from the restaurant, provides employment for some 40-50 workers. She initially started hiring cheap Lao laborers, but these turned out to be unreliable. Now, she has recruited immigrants from Vietnam that she pays 6 to 14 mln. Kip per month. The factory produces wood for export and furniture that is being sold in shops in Thakhek and Vientiane. Mrs. Kiu has a yearly quota from the provincial forestry department (Ministry of forestry), so her wood supply is ensured. According to her, the profit of the factory is about 4-5 mln Kip. Her clients are people from Laos who order furniture on demand and people from Vietnam who mainly order wood.

The investment costs for the wood factory were about $ 100,000 and were spent on construction and tools, such as circle cutter, drilling machine, small hand tools etc. This 50 PK circle cutter and the remaining machinery come with an electricity bill of about 20,000 Bath (much businesses pay in Thai Bath) per month. The bill of July was 783,000 Kip. For her restaurant, she pays about 600,000-700,000 Kip per month to EdL for lamps, a fridge, TV and a cd-player. Next to that, she uses about 30-40 bags (12 kg) of charcoal a month that cost 12,000 Kip/bag and also a monthly bottle of gas (15 kg) of 150,000 Kip.

She used to do good business with her restaurant, because people had to wait for a boat to cross the river. Now, that since three months a bridge over the river has been finished, her clientele has declined drastically. To counter this development, she has decided to start a small market and a bus stop a few hundred meters from the restaurant. She is still discussing and applying with the authorities to find a good place for this, but if she gets a plot, she hopes to rent small shops to people to sell food and other products to people passing by.

When asking her about the Nam Theun II project, Mrs Kiu replies that it mainly scares her. She did not see anyone of the project team to inform her about the consequences of the dam for her current businesses and future plans.

Village	Ban Phonsaat
District	Mahaxay
Name	Mahaxay Hospital
Date	9 October 2007

At km 6 is the district Hospital. It was founded in 1997 and in those days Phonsaat was already electrified. The hospital has three permanent doctors and 14 nurses and 15 beds. It serves as a referral for six health care centers in the Mahaxay district. It receives patients from three other neighbouring districts. The facilities are sufficient to handle small accidents, treatments for TB and also has a village function for mother and child care. Fractions and simple surgical operations, like for the appendix cannot be done in Phonsaat Hospital. Complicated cases are referred to Thakhek where most surgical operations can be done, except for brain surgery.

The Phonsaat Hospital is reasonably well equipped with all kinds of electrical appliances like sterilization equipment, incubator for premature babies, centrifuge for blood tests, two microscopes and surgical lamps. Further the hospital has storing space for vaccines which are distributed once per month to neighboring health centers. These fridges are equipped with UPS's continuous cooling of the vaccines. Over the last year there was only one major power interruption of twelve hours. In case electricity or power cuts are longer the personnel has ice as a backup cooling system. The main reason for the UPS's however is to provide a more stable voltage to the sensitive engines of vaccine fridges. Next to the medical equipment the hospital also had about 10 PC's, printers, fans, lights, TV and satellite receiver and a large photo-copier. The equipment is maintained by the technical division (one technician). He studied at Savannakhet Medical School, where he obtained an intermediate diploma. Moreover he worked in the surgery room of Thakhek provincial hospital before.

According to the technician the hospital has an electricity bill of about 1 million Kip. The hospital pays a special tariff 694 Kip per kWh, which is cheaper than an ordinary household tariff. In the month of August the hospital part used 723 kWh. The hospital has no special energy policy to reduce electricity consumption.

Village	Ban Phonsaat
District	Mahaxay
Name	Mr. Nuan Tong and Mrs La (25)
Date	9 October 2007

Mr. Nuan Tong (36 years) lives with his wife Mrs. La (25) and two children in a small house in Phonsaat, one of the seventy villages in Mahaxay district. He is already working eleven years for the government and his most recent function is Vice chairman of National Revolutionary Association. The NRA has a function to stimulate solidarity among the villagers. Mrs. La is a cook for traditional ceremonies. On those occasions she sells sticky rice, chicken, fried vegetables and drinks to the villagers. She is so good in cooking that they consider opening a restaurant one day.

In their house they have a color TV, fan, CD and one lamp for the living room and one lamp in the kitchen. In the future he would love to buy a fridge, which would be very useful if they open the restaurant. Mrs. La is such a good cook that they are convinced that the restaurant will be a success.

Mr. Nuan Tong is born in Nalay district, where he was a teacher. He came to live in Phonsaat in 2004. Their house is situated along the road to Nam Theun II, which is a large 1080 MW hydro-power dam that is expected to be completed at the end of 2009. The road is quite new; however a lot of dust remains in the air when the big cement trucks pass. Initially the population was promised that the road would be moistened three times a day; in fact they moister it only once per day. Further the villagers received (for free) 100 young Jatropha trees each to protect their houses from the dust and to sell the Jatropha seeds to the agriculture department of NT II. According to the discussions they had with Nam Theung Power Company (NTPC) they will receive a fixed price of 2,000 Kip per kilogram seeds. The seedlings were planted one year ago. Mr. Nuan Tong does not know when the trees will start giving fruits. He understood that he would also receive fertilizer needed to make them grow faster, but has not seen the officials anymore.

Most villagers did not know Jatropha and preferred fruit trees to enable them to sell fruits on the market. However these fruit trees were not provided and therefore some families refused to accept the gift.

Next to his government function Mr. Nuan Tong also has a rice field of two hectares. Last year he was able to produce 450 kg of rice which was enough for home consumption.

After work and in his free time Mr. Nuam Tong also catches fish and frogs. Moreover he has a small fish pond where he grows a species similar to catfish. He says the pond contains over 200 fish.

Mr. Nuan Tong uses ordinary water which he boils as drinking water. He doesn't make use of bottled water. "It is a waste of money," he says, "and I don't trust that the quality of the bottled water can match boiled water".

His water bill from the Lao Water Company is 25,000 Kip per month, the electricity bill 15,000 Kip per month.

Mrs. La uses mostly firewood which they collect themselves. Sometimes she uses charcoal. A small 6 kg bag of charcoal costs 5,000 Kip and lasts one week.

Village	Ban Phonsaat
District	Mahaxay
Name	Mr. Sijan and Mrs. Sithan
Date	9 October 2007

The rice that could be saved from the flooding is drying under the simple, but very solid and new looking house of Mr Sijan. His 1.5 ha of land is almost completely covered in water. He just managed to save half of his yield from the unusual high level of water that brings many problems to the surrounding. Some of it was even harvested by diving under water. He thinks that the flooding is caused by the closing of the canal for NT II.

The 5-6 ton rice that is produced should normally be enough to support him (they eat 4,000 kg), Mrs. Sithan and their 7 children and even to sell the rest at the market at 30 mln Kip per ton of rice. He hires a tractor and a rice mill from someone in his surrounding, paying 10% of the yield.

Before coming to the Mahaxay district in Khammouan, Mr. Sijan served in the army and was stationed in the province of Singkuan. Now that he is retired from the army, he has just his rice field to watch over. He doesn't really know what to answer to question whether he is happy or not with his rice field. Now that he is here, he should just make the best out of it. The fact that he had to move his house some 5 m back and that his shed is inaccessible might give an indication. He stores his rice at his son's house that is big enough.

Everyday Mr. Sijan wakes up at 3.30 AM, turns on the light (3 in total) and starts working in and around the house. He also recently got a box with a fancy LED-flashlight and a reading light when he opened a new bank account. When the sun has risen, he starts working on the field until it is dark. The family has a few sources of entertainment, such as a color-TV and a CD-player. He manages to keep his electricity bill down at only 5000 Kip/month, by consciously turning off all his equipment after having used it.

Since Mr. Sijan does not have new plans, he invested a lot but didn't see much return on investment. He can only pray that the floods don't come more than every 5-6 years.

Village	Ban Phonsaat
District	Nhommalath
Name	Mr. Somphet
Date	16 October 2007

Just after the point where we see SWER line splits of towards the North, we turn on a dust road also North and after about 4 km we reach the quiet village Phonsavang. We meet Mr. Somphet, the village chief, at the village pagoda. They warmly welcome us and he takes us to his home.
Mr. Somphet is village chief since 1981. Every three years he got re-elected because he takes good care of the villagers.

When we tell about our interest in the electricity supply he starts right away with telling that they have 1-phase electricity since 1998 and got 3-phase in 2002 for irrigation purposes. All the 22 houses in the village are running on the 1-phase electricity.

The village is small, with only 118 inhabitants and 38.8 ha of rice fields. Because of the irrigation system they can use 3 ha of the rice fields also in the dry season. The harvest is just enough to sell a small bit of the rice in Thakhek, but it is primarily for consumption. The village used to have a lot of cows and some pigs as well. Since two years cows are dying of an unknown disease and every year pigs die too.

There are only two people with a rice mill, but they are not available for others besides their families. Commercial rice mills are in the next village. People normally de-husk by hand.

Phonsavang shares a primary school with Na Ghor village and Bane Thok. The school is in between these three villages and is on 800 m. distance from Phonsavang. Lower classes of secondary school is in Na Sae village, on 8 km from Phonsavang and other secondary school namely in Na Laow village is on 6 km distance. In the rainy season children in secondary school have to go partly by boat to Na sae secondary school and it takes more than an hour. In the dry season they can go on bicycle.

The village lacks commercial enterprises, the most business-like activities are the people who sell small goods and Pepsi at home. There is no restaurant/bar, no furniture builders, no commercial rice millers, nothing.

All houses are connected to the single phase electricity line. It was organized as a community fund. Each household will get 150,000 kip, richer paid more than poorer families for the connections (depended on house's size).

The village chief would like normal 3-phase electricity to reach Phonsavang village soon. If 3-phase electricity would come, Mr. Somphet would know three people with the skills to start a furniture business and for himself he would consider to buy a serious rice-mill. Those cost about 30,000 – 40,000 Baht.

Mr. Somphet is married and has 8 children. Four of them and a niece are living with him and his wife. Downstairs their floor is tiled and looks very neat. A big sound system for the karaoke and satellite TV set are used daily. Further they have a small water pump, a refrigerator, a hotpot, a fan and some lamps. All these appliances have an average bill of 20,000 Kip, but last months he has been using a small electric saw and his electricity bill is now 37,000 Kip.

He has 2.5 ha of land, which takes all of his labor capacity.

Electricity tariff
0 - 25kWh: 154 Kip/kWh
> 26 kWh: 284 Kip/kWh

After a long morning of work, we are invited to share lunch with him, his family and some other villagers. The welcoming is hearth-warming and the lunch is very elaborate and delicious.

Village	Ban Phonsavang
District	Nhommalath
Name	Mrs. Somngam
Date	16 October 2007

Mrs. Somngam (49) has two children. The youngest is 18 and only one month after her birth the father passed away. Her son left home and Mrs. Somngam now just lives with the youngest. Her son lives with his parents-in-law and she has hardly any contact anymore with him.

Her daughter is selling her labor by working the land at the moment, just as Mrs. Somngam normally does herself. They don't have their own land. Today Mrs. Somngam feels sick, she is already old. Working on the land gives an earning of 50,000 Kip/day/person, which they normally save to buy small goods to sell at home. Her balcony hangs full of plastic bags with candy, tobacco, toothpaste and other small things.

Mrs. Somngam can not live on her own anymore, so her daughter can not leave the house to work for more money in Thakhek and with her current life she can never build up anything. It makes her stressed and sad sometimes and then she cries.

She is trying to improve her life a bit. Between her vegetables in the garden there are concrete poles for a new house and she has bought already some construction poles and planks for it too. Bit by bit she is collecting the materials.

Mrs. Somngam has 7 chickens and yesterday bought 4 ducks. She only eats meat once a week and sometimes just once a month.

She was very happy with the electricity that came in 1998. She had to pay only 120,000 Kip in the village fund instead of the average 150,000 Kip. The village fund was installed to help the whole village to get an electricity connection. She has 2 lamps and a fan. She keeps her electricity bill as low as possible, but lately it increased from 1,000 Kip to 2,000 Kip/month.

Village	Ban Phonsavang
District	Nhommalath
Name	Mr. Boumny Phiemmason
Date	16 October 2007

The pagoda in Phonsavang village is a very simple building; actually from outside it looks like a normal house. There is only one monk and one young monk. The young monk expects to be monk permanently. Monk Bounmy explains that in the other two villages in the neighborhood there are no monks at all anymore and he is thus servicing all three temples. On average there are about four men per year who spend time as a Monk during one week.

The activities done in the temples here are thus limited to ceremonies only. Whereas in many villages the temple is used for public meetings, in Phonsavang village the public meetings take place at the village chiefs' house. However this morning we find the village chief at the temple where they are working on an alphabetization examination. The alphabetization program takes place in the temple complex.

Recently, in August and September, two of the most important ceremonies have taken place in which people offer food in the temple to their relatives who passed away. In 10 days (25 October), end of Buddhist Lent will be celebrated (in which the monk only concentrates on Buddha), then the wedding season starts.

Every morning Monk Bounmy hits a wooden bell so that the villagers know that the Monks will do a procession through the village. The villagers come outside to offer food to the monks. In the afternoon a similar ceremony takes place, but the monk will hit the big drum that he has in the pagoda. Monks don't eat dinner.

The temple has several electrical appliances such as speakers that are used in ceremonial speeches and prayers, an electrical boiling pot, a fan, four lamps and cassette-tape. The average electricity bill is about 25,000 Kip/Month. The bill is paid by all the villagers together. The village chief is in charge of the financial issues, so that the Monks can concentrate on religious work.

On the temple complex the villagers are building a new pagoda. The foundation has already been laid and on celebration days people give donations to complete the construction.

Village	Ban Na Gnor & Ban Laow
District	Nhommalath
Name	Ban Na Gnor Primary school & Ban Laow Secondary School
Date	16 October 2007

The children from Phonsavang village do not have to go very far to go to primary school. Between the three neighboring villages Phonsavang, Na Gnor and Ban Thok is the primary school, which has 77 pupils in the age 6 to 12. The head teacher works there since 1968 and can't remember when it was built.

On the compound there is an abandoned health post. The only nurse who was stationed here has been shifted to Bane Phin, 6 km away. There is no electricity on the compound, so vaccines only came during vaccination programs, and the nurse had very limited options for treatment. We are told that the facilities are a bit better now, but also in the new health post there is no electricity.

Every morning the school starts with raising the Lao flag and singing the national anthem. After that they go to class. There are 5 classrooms, but only 4 teachers. Class two and three are combined. They have class from 8 to 11.30h in the morning and then the children go home for lunch. In the afternoon lessons are from 14.00h – 16.30h. Then the flag is lowered. Every Wednesday, pupils clean the school's area together at 15:30h.

In 2004 the Provincial Department of Education gave the school a small library, but termites have eaten all the books. Children bring their own books, if they have them. The poorest families can apply for a scholarship (donated by the Japanese Minsay Center) for the children, so that they can buy a uniform. The uniforms are only worn in the mornings. The school fee is normally 5,000 Kip/year, but was increased this year to 7,000 Kip by the provincial and district government. Normally, all children go to the primary school.

Electricity is not connected because it cannot be paid by the school or the parents. It is also not seen as a priority. It would only serve for urgent meetings and ceremonies. The bigger needs of Ban Na Gnor Primary school are benches, tables, a well and teachers manuals.

Enrollment in secondary school is more difficult. Out of the 40 children that finished primary only 15 go to the secondary school. The school fees are higher and children who live too far to go daily cannot go at all. Children form Phonsavang village go to Ban Phin village (6 km away) for the lower classes of secondary school and to Bane Laow (8 km away) for the higher classes. In the rainy season the children have to go partly by boat and partly by foot. In the dry season they can go by bicycle. They bring lunch from home. Because distance is an obstacle
Bane Laow is interested in housing boarding facilities, but there is no space or money for that.

It is only since this year that Bane Laow secondary school has the upper classes. It started with 4th grade, where 11 children are enrolled now. Next year 5th grade will be added. To provide the growth the school is looking for a new location. It is difficult to find one, because the new cement factory in the village spoils the fresh air with fine particles. The 6 ha that the province has suggested would still be too close to the factory, says head teacher Mr. Bounmy Thammavong. The plans include 9 classrooms.

In Bane Laow Secondary School there are 193 children who follow classes from 7.30 to 16.00h. The school has chosen to start this early so that the children don't have to go home in the dark.

The inscription fee for the secondary school is 5,000 Kip, which is used for maintenance and repairs. It cannot afford electricity; it has bigger needs of blackboards, bookshelves and desks for the teachers.

The location at the new road for the Nam Theun Dam construction and its supporting cement factory in the village has some positive, but also negative effects:

Positive	Negative
More income through sales of fish, chickens and vegetables to the Thai and Lao laborers in the cement factory	Pollution by the factory: noise, small particles and other air pollution
More trade with the districts further inland (Mahaxay and Gnomalat)	Increased traffic risks
	Only three people from the village found employment in the cement factory

There was no compensation from Nam Theun Project or the cement factory for the school. The school has now addressed a request to the factory to help them provide a new location for the school.

Village	Ban Thana Neua
Date	17 October 2007

Thana Neua village -or Thana in short- cannot always be reached easily. At Ban Laokha a dust road branches off East towards Thana. The flat parts of the road are in good condition, but the road goes through 4 streams which are too deep for our 4x4 pick-up in a rainy week.

A full week of sunshine later, we try again and we manage to cross the streams and pass another 12 km until we reach Hinboun River. The Hinboun river is wide and has to be crossed by boat. Those last 12 km took us at least an hour without significant problems. For Thana-people there is no other way to reach the 'civilized' world.

For such a remote village Thana looks very fresh and rich. In general the houses are big and solidly constructed. The temple that divides Thana into Thana-North and Thana-South is in good shape and the whole village looks astonishing. Thana-North has 80 households and South only 20.

One of the reasons why Thana looks so nice is the 280 MW Theun Hinboun hydropower plant that was installed in 1998. With the construction of the dam there was a lot of attention for the downstream communities and Thana was involved in several projects. The fertilizer-project was not a big success. The price of the new fertilizer is cheaper than the old one, but the yields are also lower. However, still the yields are big enough for some surplus. There was also a project in trainings to improve the yields of vegetables and cattle keeping and cattle vaccination projects. All-in-all the village is better off since the dam and the negative impacts (less and smaller aquatic life) were nicely compensated.

The soils around Thana are very fertile and rice can be harvested two times a year. Only in some years bad weather destroys the rice.

The village has a primary school and a secondary school. There is however no health post; for medical issues they will have to go to Song Hong (16 km away).

Village	Ban Thana Neua
District	Hinboun
Name	Mr. Bounlong and Mr. Bounmi
Date	17 October 2007

In 2005 Mr. Bounlong and his cousin Mr. Bounmi heard from Sunlabob in Thakhek at a ceremony in one of the temples. They responded enthusiastically to the call for solar dealer. After agreement from both sides, Sunlabob gave training for 24 days and a follow-up training of 7 days. They even received a compensation for their missed working days. The training included a lot of technical knowledge and some business administration.

The business they do is to rent of 20Wp solar systems in the wide area around Thana. They have 245 clients in radius of 15 km around Tana. The cost of the system is 35,000 Kip/month, of which 2% can be kept by Mr. Bounlong and Mr. Bounmi and the rest is transferred to Sunlabob. From this money they have to pay their own transport costs and all their labor. The clients are about 15km far from Mr. Bounlong and Mr. Bounmi. They spend a lot of time going around collecting money. Sometimes they go only once per two months and spend nights in other villages. It is hard work for little money they say and are trying to negotiate better conditions with Sunlabob.

Besides renting it is also possible to buy from them, but so far they sold only one system to the temple.

Mr. Bounmi's house serves as the stores for spare systems. In general the spares consist only of systems removed from old customers. The house at the moment is full of panels, wires, batteries and charge controllers. They are the only sellers of DC-lights in the area, which cost 80,000 Kip.

There are no credit facilities in Thana for villagers to buy solar systems.

When we talk about the future Mr. Bounmi says that expansion of the business is difficult. They will start soon with providing systems in Ban Khen, Ban Wangdao, Ban Phontiew and Ban Bounglou. It is impossible to go much further than those villages, because the roads are bad. People are also not willing to buy systems, because they expect the grid to come soon. Maybe if Sunlabob reduces the price there will be more people in the area interested in renting systems.

Village	Ban Thana Neua
District	Hinboun
Name	Mr. Keota and Mrs. Suay
Date	17 October 2007

The family of Mr. Keota and Mrs. Suay consists of themselves, 7 children and a niece and nephew. Right now in the house they are together with 5. The others are studying in Vientiane.

Short business profile:
Max 60 baskets/day
Min 10 baskets/day
1 basket = (16 kg)
1 basket = 4,000 Kip
Diesel 12 liters/ day for 10,000 Kip/liter in Thana (at the gas station 8,000-9,000 Kip)
Husk is used as fertilizer

Mr. Keota learned to operate rice mills from his father. He started his business some 20 years ago with a small rice mill. 10 Years ago he imported a big rice mill from Thailand for 50,000 Baht (about $1,500). The maintenance costs are about 3,000 – 5,000 Baht per two months depending on whether you use the original Thai parts or you buy Chinese from the Thakhek market. Mr. Keota uses the cheaper Chinese parts.

Mr. Keota owns 6 ha of rice fields, but uses only 3 ha. On his land he works with three children and hires 6 other workers. The cost of labor used to be 15,000 Kip/day/person last year, but this year it has increased with 5,000 Kip.

Mr. Keota has 5 pigs and 12 goats.

He has a 100Wp solar panel on his nice blue roof, which he ordered from the Phakse branch of Sunlabob. The Thana branch only sells panels below 50Wp. Mr. Keota shows us his previous 60Wp solar panel, which is broken he says. The 100Wp panel was 8,500 Baht and he is happy with it, because it saves diesel. Still it doesn't produce as much electricity as he would like, but also doesn't have the money to upgrade the system.

The solar system provides power to his color TV, 4 lights, fan, CD-player and sound system. He also charges his small 6V battery on it and his mobile phones. The signal in Thana is rather poor, so some people, like Mr. Keota have put an antenna on the roof and a device to connect the antenna to the mobiles.

There are 4 more commercial rice mills and several private run mills. Expanding his business is not very interesting to him, competition is strong and he already has a pleasant quality of life.

Village	Ban Thana Neua
District	Hinboun
Name	Mrs. Ladsamy
Date	17 October 2007

Mrs. Ladsamy has a shop with several goods, like candies, soft drinks and also children clothing. She also has a sound system, consisting of a black white TV, CD-player and a big speaker set. It is running on a 33 Ah battery that is being charged by a 20Wp solar panel. Mrs. Ladsamy would like to have more electricity so she can buy more entertainment equipment and a fridge.

In the corner of the shop stands a rusty battery charger, which was used by her father from 1993 – 1997. It was a good business, but because too many people started a battery charging service her father stopped.

She lives with her husband and two children along the river Hinboun. Their main activities are their 0.8 ha of rice fields (2 harvests/year) and their livestock. They have 10 cows, 16 pigs, 20 chicken and 11 ducks.

Recently Mrs. Ladsamy and her husband started a 1 ha rubber plantation, like many others in the village. Mrs. Ladsamy doesn't know much of rubber, but she heard that the field gives rubber in 7 years. There is thus no plan to who they can sell the rubber. She bought her 400 rubber trees from a nursery in Thailand for 25 Baht each (10,000 Baht in total).

Village	Ban Thana Neua
District	Hinboun
Name	Mr. That and Mrs. Tao
Date	17 October 2007

Mr. That (58) and Mrs. Tao (60) have 5 children. They rent 1 ha of rice paddy every dry season which has to be paid to the owner with 60kg of rice, which he finds a reasonable price because he harvests about 200 bags of 12 kg. The rice season for him starts somewhere between the end of December and February, depending on the weather. Sometimes the harvest is enough to feed the whole family the whole year, sometimes not.

In the wet season the paddy is flooded, so now he works on his vegetable gardens on the slopes of Hinboun river. He has three fields of 20 m^2 where he grows, cabbage, corn, beans, cucumber, onions and several local vegetables.

In June, July and November he goes fishing. In the other seasons there is hardly any fish to catch.

Mr. That has no money for a solar system and he finds that kerosene lamps give too little light for the money the kerosene costs. Therefore he often goes into the forests to tap oil from trees. With the oil and a kind of leafs he makes torches of about 40 cm long. He has constructed a wooden holder for the torches and a big bright light comes from it. There is however a lot of smoke coming from it, which sometimes makes his whole nose black, he tells laughing.

He also sells the torches for 1,000 Kip/piece. Other people often cut the torches in smaller blocks to easily start a fire for cooking. Depending on the season he can make up to 40,000 Kip/month.

The only electricity he has in his house is his 6V battery, which he uses to catch frogs. He charges it at neighbors with solar for 2,000 Kip. Such a battery cost new 200 Baht.

A 12V battery is too expensive for Mr. That, he estimates it to be 1,200 Baht.

Village	Ban Pha Huang
Date	18 October 2007

Not far from Gnomalat town, where more than 1,000 construction workers have settled for the Nam Theun II hydropower plant, lies the quiet village Pha Huang. 400 people (245 with the right to vote, 130 female) live there in 85 households. Rice fields separate the village in 4 quarters.

Average households have 2 ha of rice fields and in this area the rice can be harvested only in the rainy season. There is only 1 person with a commercial rice mill and some others do it themselves with the engine of their iron buffalo.

The primary school in the quarter only has year 1 and 2. For year 3 to 5 the children have to walk 2 km to Phon Bok school in another quarter. For secondary school the children have to go to Gnomalat town. Out of 40 pupils only 15 go to secondary school.

There is no pagoda because people here are not Buddhists. They are animists.

There is little trade between Pha Huang and other villages, just some chickens and vegetables. The surplus of rice is only about 200kg that is sold in Gnomalat town. They can get 150,000 Kip/50 kg bag.

The village uses two streams. Nam Bo river is only 100m from the village and is used for washing and the laundry. Nam Houy is 200m in the other direction and is used for drinking only.

The village has experienced several major improvements during the last couple of years. First of all in the year 2000 EDL electrified the village and the development organization SIDA built a good road to the village to support EDL. Villagers had to contribute to the road construction by participation. Before the road was built, the villagers had to go through the rice fields to Gnomalat, which was almost impossible in the rainy season. Children could thus not go to school, trade was more difficult and sick people could not go to the hospital.
Since the introduction of electricity people go to bed later, because they sit in their rooms at night with comfortable lights and people were able to buy entertainment, like TV, CD and karaoke. The electricity not so much used for productive purposes, only some people have bought small tools to work on wood.

Another economic improvement is that, teenagers from the village work as construction workers at the NT II dam and in Thakhek. Much more money is flowing into the village and Mrs. Keo, the deputy village chief is exited to tell us that the number of entertainment systems is increasing. In the past there was only household with a black & white TV, where the whole village gathered to watch, now almost everybody has a TV.

Village	Ban Pha Huang
District	Xaybuathong
Name	Mrs. Keo
Date	18 October 2007

Mrs. Keo (47, deputy village chief) has a small pharmacy, which consists of mainly one cabinet with pills. She explains how she started: “Firstly there was a UNICEF project for village pharmacies and I joined on behalf of the village. When the project ended,” she says, “I requested to continue on my own.” Mrs. Keo received training to do basic identification of diseases and invested 500,000 Kip in a small supply of pills. She earns between 100,000 and 200,000 Kip per month with her business and expects to earn more when she can buy more and different kinds of pills. Also her husband has some knowledge of first aid. He is a retired soldier, who learned in the army how to give injections, for example.
Most often it suffices to give vitamins and calcium to weak people, but there are also regularly cases of malaria, fever and diarrhea. TB is not so common.

She and her husband have 5 children, of which three are still living at home. Also one daughter-in-law, her grandson and a niece live in their house. They own 1.2 ha of rice fields, on which they all work. The harvest has started, so the son of Mrs. Keo is splitting bamboo which they use to tie and wind around the freshly cut rice. Besides that they own 5 cows.

Before the village was electrified in 2000 there was only one person who had a TV on a battery. She used wick lamps and went to bed early. Now she owns a color TV with satellite receiver, a CD player and a sound system. She goes to bed much later, because the family likes to enjoy the Thai movie channels. The satellite receiver cost 800, 000 Kip and her electricity bill is usually 28,000 Kip/month.

Furthermore she has a small 6V battery, which she charges with her own battery charger. She paid for her battery charger 30,000 Kip, some years ago. Nowadays they must be at least 50,000 Kip, she thinks.

Village	Ban Pha Huang
District	Xaybuathong
Name	Mrs. Hak
Date	18 October 2007

Mrs. Hak is a 50 year old woman, whose husband left her and her only child passed away. She is taking care of one neighbor-child.

Mrs. Hak (Hak means Love) has a small shop which is completely stuffed with goods. She buys her goods in Thakhek on credit. A return ticket to Takhek cost 40,000 Kip. There are people in Thakhek that know her for long time and trust that she will pay when she has sold the goods. Her income from the shop is between 50,000 and 100,000 Kip per month, while food costs 50,000 Kip per week. She cannot afford to buy more than 1 kg of meat in a week.

She used to help neighbors on the rice fields. She did not negotiate any wage, people just supported her when she needed it. Because she is too old to work, she stopped with the work on the field about two years ago.

She is one of the very few in the village without an electricity connection. Her neighboring relatives were so kind to pull a electric wire to the shop to hang a light bulb there for her. Every once in a while Mrs. Hak pays their electricity bill, which is 17,000 Kip.

Village	Ban Pha Huang
District	Xaybuathong
Name	Mr. Wan
Date	18 October 2007

Mr. Wan (48) is married and has 3 children. His two boys help him on his 1 ha rice paddy, which can only be worked in the rainy season. His young daughter is going to school. Now some small harvest of green rice has started and we see the little girl coming home with a heavy load of rice, which she had to carry for 1 km. The green rice is a delicacy and very expensive. It can only be de-husked by hand, because it is too soft for mechanical rice milling. It is quite sweet and mainly used in deserts.

Mr. Wan owns a 18 horsepower rice mill. Everybody in the neighborhood can use it for free in the rainy season, and for 2,000 Kip/bag (bag sizes vary, but all are 2,000 Kip) in the dry season. It is a very profitable business he tells; this way is gets all the fodder for his pigs (the rice husk) for free! When he has some excess of husk, he sells it for 700K/kg.
Running the diesel generator is a cheap and easy way to get the fodder. He buys the diesel in relatively big quantities: 20 liter for 120,000 Kip and that lasts 8 days.
Piglets cost 100,000 Kip and weighs 3 to 4 kg. Four months long they eat 3 times a day 5 kg of rice husk. After that the pigs weigh between 15 and 20 kg and are sold for 12,000 Kip/kg.

Mr. Wan learned to do engine maintenance and repairs as an apprentice for a technician at road construction company Nancy. Three years ago he bought his rice mill for 4.3 Million Kip. He has tried to run the mill on the grid but it had poor performance. He rather sticks with the diesel.

If he could save some more money, he would like to buy a bigger mill. It would increase his output, so that he can raise more pigs.
He owns a fridge, a color TV, fan, 3 lights and a CD-player. The electricity bill is between 17,000 and 20,000 Kip per month. The grid has increased his productivity, because he has light at the mill and now he only mills at night. Furthermore, he can use some small woodwork tools that he borrowed to help his neighbor to build a new house.

ANNEX C2

BIOMASS AND PICO HYDRO VILLAGES INTERVIEWS

Mr. Souchong
October 25, 2007 (8:45 am)
Ban Chomcheang in Meung District, Bokeo Province

General information of Mr.Souchong

Mr. Souchong is 32 years old (Akha ethnic) and he is the Chomcheang's chief. He has three children and lives with his family of five people. He and his wife are farmers. For his education, he just studied at primary school and then he stopped to study, because he had to help his parents to work in the farm. Another thing is that his village doesn't have a big school; just a small primary school far from the city.

Characteristics of house

Mr. Souchong's house is almost entirely made out of bamboo and some wood. The materials are easy to find. One can just go into the forest and cut it for free, because there is a lot of bamboo on the mountain. The house is quite big, compared to other houses in his village, and has two stories.

Property

Mr Souchong's property is one house, the land for his agriculture, one tractor (tock tock) which runs by diesel, four buffalos, five cows and some equipment in house. There is no electric equipment, because he uses a diesel lamp and torch.

Income and payment

The main income of Souchong is selling rice and livestock for about 4000-5000 Baht per year and his secondary income comes from selling crops for 2000-3000 Baht per year. This means that he has quite a good income. In addition, the daily expenses of his family are 5000 kip and occasion payments are 10,000 kip per day. He does not spend much, because he just goes into the forest where he can find some food for his family (animals, plants).

Current energy use

In the village and the village nearby only small hydro power is used, because village is so far and grid electricity would be hard to install. The village does not have enough water, which is why they can't install as much small hydro power like villages in the surrounding. Only one household has a pico hydro system and one battery for the village activities. Pico hydro is not expensive they cannot use it because the water level problem. Moreover, he can buy a solar panel but he does not have time to buy it because the place to buy is far away. Now he uses a small diesel lamp that he made it by himself and he uses wood for cooking. The price of diesel is 35 Baht per liter.

Problem of Mr. Souchong

In general, Mr. Souching doesn't have problems but he mentions he wants to buy electric equipment/tools in order to have a better life .Now he uses a diesel lamp using by small can or bottle instead of electricity. He has to be careful while using it because of the smoke and other accidents from using it. For example, when you start to use it, it will bring a bad smell with smoke and when you sleep or forget to turn off it, it can burn the house. Moreover, using diesel lamp is quite dirty while you put diesel into the bottle or can.

Reflection

He wishes to use electricity, not diesel lamp because electricity will bring more benefit to his family and his farm. And he's willing to pay for electricity about 10,000 kip per month and he quite interested in electricity that uses bamboo or other agricultural waste because there is a lot of bamboo in his village.

Primary source of income	4000 – 5000 Baht / year
Secondary source of income	2000 – 3000 Baht / year
Daily expenses	5000 Kip / day
Occasional payments (e.g. festival)	10,000 Kip /event
Price of diesel (for lamp)	35 Baht / litter
Willing to pay for electricity	10,000 Kip / month

Mr. Picjer
October 25, 2007 (9:15 am)
Ban Chomcheang in Meung District, Bokeo Province

General information of Mr.Picjer

Mr. Picjer is 28 years old (Akha ethnic), is the Chomcheang village's deputy and he has two children. He lives with family of four people and is a farmer, just like his wife. He just studied at primary school and then he did not keep study anymore because he did not have the chance to study. The village doesn't have a big school, only small primary school. Money to study in the city is not available.

Characteristics of house

Mr. Picjer's house is made out of bamboo with two stories. He can go into the forest to collect the material, because there is a lot of bamboo on the mountain. The house is quite small compared to the chief's house.

Property

Mr. Picjer he has a house, agricultural land, two buffalos, some pigs and one car battery for village activities. The battery can be charged at the house that uses small hydro power of which there is only one generator in the village.

Income and payment

The main income of Mr. Picjer comes from selling rice and livestock for about 2000-3000 Baht per year and he doesn't have additional income. This means his income is rather low. Daily expenses of his family are 5000 kip per day, and occasional payments are 12,000 kip per day.

Current energy use

In the village and the village nearby only small hydro power is used, because village is so far and grid electricity would be hard to install. The village does not have enough water, which is why they can't install as much small hydro power like villages in the surrounding. Only one household has a pico hydro system and one battery for the village activities. Pico hydro is not expensive they cannot use it because the water level problem. Moreover, he can buy a solar panel but he does not have time to buy it because the place to buy is far away. Now he uses a small diesel lamp that he made it by himself and he uses wood for cooking. The price of diesel is 35 Baht per liter.

Problem of Mr.Picjer

Mr. Picjer has a little problem about money, but he mentions that the main problem is electricity because he wants to buy electric equipment/tool in order to have a better life than he has now. Now he use a diesel lamp made of a small can or bottle instead of electricity. Thus, he has to be careful while using it because of its smoke, and accidents that can happen from using it.

Reflection

Mr. Picjer wishes to use electricity, but not diesel lamps as others in the village, because he believes that electricity will improve the life of his family. He is willing to pay about 10,000 kip per month for electricity.

Primary source of income	2000 – 3000 Baht / year
Daily expenses	5000 Kip / day
Occasional expenses (e.g. festivals)	12,000 Kip /event
Price of diesel for lamp	35 Baht / littre
Willing to pay for electricity	10,000 Kip / month

Mr. Mailar
October 23, 2007 (11:30 am)
Soybean mill office (Bean mill factory) in Houaysay District, Bokeo Province

General information on the soybean mill

The soybean mill has been set up with funding of the World Food Program.WFP was providing free meals for school children using imported food from neighboring countries. The soybean mill made it possible to produce these meals domestically. The mill has been expanding and is now at a point that they are thinking about exporting their produce. However, the soybean mill is still dependant on donor money and could not survive without it.

General information of Mr.Mailar

Mr. Mailar works on marketing of soybean mill factory. He lives in Ban Oudom, Houayxay District, Bokeo Province. In absence of the owner of the mill, he answers the questions.

Essential data

Worker's time

At the soybean mill factory, there are about ten workers and some freelance workers. Their working day is from 6:00 am -14:00 am and 14:00 am- 10 pm. If they have more orders that have to be finished they also work from 10:00 pm until 6:0 am.

Electricity payment

In this factory, there are 20 or 30 power generate motors that use about 40-50 W and just only one big power generator of 100 kW. They spent about 12- 13 million kip per month for electricity and more or less than this depending on the order.

Electricity Problem

They do not have any backup systems which mean that they have to stop working when there is an electricity cut. When the electricity is cut; the machine burns itself into the soy beans and it takes about 1 hour to clean it. The problem is so big that they actually considered stopping production, because of the frustrating loss of productivity.

Bean Waste management

After bean milling, the bean wastes were sold to the farmers who feed livestock, they sell bean waste 40-50 kg per day /one kg per 1000 kip.

Opportunities for biomass gasification

Biomass gasification might be an interesting option for the soybean mill if it could provide more reliable power than the current grid does. Although there is not enough waste production, the factory is sufficiently big and organized to be able to collect rice husk from the farmers in the surrounding. More data about this is needed to find out whether this is a real option or not.

Mr. Maiyod
October 24, 2007 (13:25 am)
Ban Phadam in Meung District, Bokeo Province

General information of Mr.Miayod

Mr. Maiyod is 40 years old, he is the Phadam's deputy, and he has two children .Now he lives with his family of about four people and two relatives. He is a farmer and his wife's also a farmer and merchant (grocery shop). He studied at primary school only.

Characteristics of house

Mr. Maiyod's house mostly is made out of wood with two stories because he is quite rich. His house is not small like others houses in the village.

Property

Mr. Maiyod's property consists of a house, land for agriculture, and some livestock, tractor (tock tock) which runs by diesel, motorbike, small rice mill and small shop. In addition, he has a small hydro power generator. His electrical devices are a radio, two televisions and two CD players.

Income and payment

The main source of income of Mr. Maiyod is selling rice and livestock, for about 10,000-15,000 Baht per year and his additional income is 5000 Baht per year. In addition, daily expenses of his family are 10,000 Baht, and occasion expenses are about 400 – 500 Baht per day.

Current energy use

Currently, he uses small hydro power (3 kW; 3200 Baht) and he allows his relative to use energy. There are about 4 households that do so for free. Moreover, they have to help to maintain the small hydro power instead of paying.

Problem of small hydro power

- Water level (fluctuating much : 'always up and down')
- canal (often need to fix it whenever the water up and down)
- cable (always broken because they use tree as a electricity pole)
- small animal or garbage
- its system inside (low standard of some part inside)
- no guarantee and any warranties or after sale service
- lamp always broken

Reflection

He wishes to use electricity, but not a small hydro power because he wants to use more energy for his house, shop, rice mill and for his other electrical equipment. Moreover, electricity will bring more benefits to his family and more income. He is willing to pay about 41 Baht per month for electricity and he quite interested in electricity which uses bamboo or other biomass, because there is a lot of bamboo around his village.

Income from main occupation	10,000 – 15,000 Baht / year
Income from additional occupation	5000 Baht / year
Daily payment	10,000 Baht / year
Occasion payment	400- 500 Baht /day
Price of diesel	35 Baht / liter
Price of small hydro power (3 kW)	3200 Baht / one
price of rice mill	10 Baht / 10 kg
Willing to pay for electricity	10,000 Kip / month
price of saving lamp	25 Baht / one

Mr. Mayinkham
October 24, 2007 (17:15 pm)
Ban Phadam in Meung District, Bokeo Province

General information of Mr. Mayinkham

Mr. Mayinkham is 57 years old, and is a deputy chief of Phadam party. He has 9 children, but now there are 5 people in his family. His son is also a teacher. Mr.Mayinkham is a farmer and his wife's also a farmer. He didn't study anywhere, because in the past there was no school. However, he uses all his experience in order to support his family.

Characteristics of house

Mr. Mayinkham's house is mostly built from wood with two stories, the same as other houses in the village; it's quite big with a traditional kitchen that uses woods for cooking.

Property

Mr. Mayinkham's property is a house, farming land, two cows and a tractor (tock tock) which runs by diesel and small rice mill. In addition, he has a small pico hydro power generator (1 KW). His electric equipment consists of a color television, one CD player and fan. He is afraid that if he uses a lot of electric equipment, that there would not be enough energy.

Income and payment

The main income of Mr. Mayinkham is selling rice and livestock about 15,000 Baht per year and his additional job is selling sugarcane and livestock for about 2000 – 3000 Baht per year. For daily expenses, he spends some 300 - 500 Baht per month and occasion payments are about 500 Baht up per month.

Current energy use

Currently, he uses small hydro power (1 KW; 2200 Baht) for three years. He does not share this electricity with anyone else. Moreover, he also uses wood for cooking, but no gas.

Problem of small hydro power

- Water level (always up and down)
- canal (he often has to fix it when the water goes up and down)
- cable (always broken, because they use trees as a electricity poles)
- small animal or garbage
- its system inside (low standard of some part inside)
- no guarantee and any warranties or after sale service
- lamps break often

Reflection

He wishes to use electricity, not a small hydro power which provides low energy (now, he cannot use a cooker, for example). However, he wants to use more energy for his house and also other electric equipment in the near future. Moreover, electricity will bring more benefits to his family and more income. He is willing to pay about 10,000 KIP per month for electricity and

he hope new electricity which uses bamboo or other biomass will make his dream come true. And he really does not like problem from small hydro power that does not give a stable electricity output.

Income from main occupation	15,000 Baht / year
Income from additional occupation	2000-3000 Baht / year
Daily payment	300-500 /month
Occasion payment	500 Baht up /month
Price of diesel	35 Baht / liter
Price of small hydro power (1 kW,China)	2200 Baht / one
Willing to pay for electricity	10,000 Kip / month

Mr. Maytoon
October 24, 2007 (17:30 pm)
Ban Phakhao in Meung District, Bokeo Province

General information of Mr. Maytoon

Mr. Maytoon is 49 years old, and is the chief of Phakhao village, he has five children, but now there are only three people in his family. Mr.Maytoon is a farmer, just like his wife. He studied in primary level at the small school in the village.

Characteristics of house

Mr.Maytoon's house is built from wood with two stories as many other houses in the village. It is quite big with a traditional kitchen that uses wood for cooking.

Property

Mr. Maytoon's property consists of a house, land for agriculture, 15 cows and buffalos and a tractor (tock tock, running on diesel) and also small rice mill. In addition, he has a small hydro power generator (1,5 KW). His electric devices are a color television, one CD player and a battery.

Income and payment

The main income of Mr. Maytoon is selling rice and livestock which generates about 30,000-40,000 Baht per year. His second source of income is a small shop and he also buys things that other people collect from the forest, like crops and others for about 10,000 Baht or more per year. In addition, daily payment of his family is 40 – 50 Baht per day and occasional payment are about 500-700 Baht per day.

Current energy use

Currently, he uses pico hydro power (1,5 KW; 3000 Baht) for two years now. The electricity wires are also connected to his relatives to use energy from his pico hydro power. These are about 7 households (total 19 bulbs; two 20 w and 17 energy saving bulbs). Moreover, he also uses wood for cooking, but no gas.

Problems of pico hydro power

- Water level (always up and down)
- canal (he often has to fix it when the water goes up and down)
- cable (always broken, because they use trees as a electricity poles)
- small animal or garbage
- its system inside (low standard of some part inside)
- no guarantee and any warranties or after sale service
- lamps break often

Reflection

Mr. Maytoon wishes to use more electricity and not only small hydro power which provides low energy output . He wants to use more energy for his house and the rest of the village and also want other electric equipment in the near future. Moreover, electricity will bring more benefit to his family and people in his village in order to get more income. He is willing to pay for electricity about 10,000 KIP per month and he hopes that new energy sources which use bamboo or other wastes will make his dream come true. He really dislikes the problem of small hydro power.

Income from main occupation	30,000 -40,000 Baht / year
Income from additional occupation	10,000 Baht up / year
Daily expenses	40-50 Baht /day
Occasion expenses	500-700 Baht /month
Price of diesel	35 Baht / liter
Price of small hydro power (1,5 kW, China)	3000 Baht
Willing to pay for electricity	10,000 Kip / month

Mr. Noy
October 26, 2007 (9:00 am) at Rice mill
Ban Pakhao Neua, Houaysay District, Bokeo Province

General information of Mr. Noy

Mr. Noy lives in Ban Pakhao Neua, Houaysay District, Bokeo Province. He has three children; he is a farmer and rice miller. Mr. Noy lives with his family in a small house that is mostly made from bamboo.Moreover; He has one rice mill, a vegetable garden and one diesel engine (tock tock).

Rice mill data

The rice mill is built in 2003; Mr. Noy's sister brought him this mill in order to run it instead of her because she is very busy. Every day, farmers come to the rice mill with their rice. In total, he processes about 2 tons, especially rice from soldiers. This amount equals 3 to 4 Tractors (tock tock) per week. The rice milling cost 50 kg is 10,000 kip.

Electricity bill and income

Mr. Noy spends about 6- 8 million kip per month for Electricity .His income that he gets from this is about 1 million kip per day, if he works in the morning until the evening.

Current energy

He uses public electricity to power an electric motor for his business. He pays 700 kip per kWh. There are no other energy sources.

Rice husk management

The rice husk that is left over from the milling is mostly burned in order to make fertilizer. If he does not have fee time, he will burn it without making fertilizer. The price of fertilizer is 3000 kip per bag (50 kg). He burns it, because they don't know how to make money from the husk and sometimes gives it to people for free.

Reflection

Mr. Noy was interested in using biomass gasification using rice husk to make electricity. Maybe he can get make money with gasification and/or use the electricity himself.

Remark

We forgot to ask information on power using that he uses for his rice mill. The other problem was that we could not ask farmers because of the boat racing festival in Bokeo province.

Mr. Saenglong
October 24, 2007 (18:15 pm)
Ban Phadam in Meung District, Bokeo Province

General information of Mr. Saenglong

Mr. Saenglong is 37 years old and he has one daughter .There are three people in his house. He is a farmer and his wife's also a farmer. His educational background is primary school only.

Characteristics of house

Mr.Saenglong's house is quite big, mainly built of wood and has two stories.

Property

Mr Saenglong's has a house, land for his agriculture, three cows and some chicken, tractor (tock tock) which runs on diesel, and also a small rice mill. In addition, he has a small hydro power generator (3 kW). His electric equipment consists of a color television, one CD player, a radio and one fridge (nobody have a fridge like him that why we are lucky to drink a cold water in Phadam village).

Income and payment

The main source of income of Mr. Saenglong is selling rice and livestock for about 20,000 Baht per year and he does not have an additional job. In addition, daily expenses of his family are 200 Baht per day and occasion expenses are 1000 Baht per day.

Current energy use

At present, he uses small hydro power (3 kW; 5000 Baht) since six years and he allows his relatives to use energy from his small hydro power (about 6 households for free). Moreover, they have to spend their time to maintain the small hydro power instead of electricity payment.

Problem of small hydro power

- Water level (always up and down)
- canal (he often has to fix it when the water goes up and down)
- cable (always broken, because they use trees as a electricity poles)
- small animal or garbage
- its system inside (low standard of some part inside)
- no guarantee and any warranties or after sale service
- lamps break often

Reflection

He wishes to use electricity, not only small hydro power which provides low energy, because he wants to use more energy for his house and also for other electric equipment in the near future. Moreover, electricity will bring more benefits to his family and more income. He is willing to pay about 50,000 KIP per month for electricity and he hopes new electricity which use bamboo or other wastes will give them a better future.

Income from main occupation	20,000 Baht / year
Daily payment	200 Baht / day
Occasion payment	1000 Baht /day
Price of diesel	50 Baht / liter
Price of small hydro power (3 kW)	5000 Baht / one
Willing to pay for electricity	50,000 Kip / month

ANNEX D

NATIONAL STAKEHOLDERS CAMBODIA

Name	H.E Tun Lean
Organisation	Ministry of Industry, Mines and Energy
Function	General Director of Energy
Country	Cambodia
Date of interview	16 February 2008

1. What is your opinion of the situation with regard to rural electrification in Cambodia?

Presently, there is not enough electricity supply in rural areas of Cambodia. The population is using wood and charcoal as their main energy sources. As for places where mini-grid is available, invested by the private electricity entrepreneur, the electricity tariff is really so expensive that the rural people have difficulties to afford it.

2. What are the most urgent problems with regard to rural electrification?

Considering to current situation, I think that there are two main urgent problems which are:

- Big lacking of power supply in rural areas.
- Price of electricity is still expensive for rural people.

3. What do you see as the Government's role in rural electrification?

The Government plays a role to prioritise rural electrification sector as one of the main sectors to be developed following the rectangular strategy of Cambodia Government in order to participate in the poverty reduction of Cambodian population, especially those in rural areas. Therefore, it is necessary that the Government prepares a rural power development strategy and planning, which will be used as guideline for the rural energy development sector in the country.

4. In your opinion, what is the role of national entrepreneurs in rural electrification?

The national entrepreneurs like EDC shall prepare its own development planning on rural power supply service in rural areas complying with Cambodian Government Policy. Furthermore, it shall extend the power transmission and distribution systems to the rural areas and develop potentially electrification projects reducing environmental friendly affect.

5. And how do you see the role of local entrepreneurs in rural electrification?

The rural electricity entrepreneurs (REE) shall provide adequate electricity supply service and sell at acceptable price to the rural population. They shall improve their mini-grid to avoid significant losses complying with technical standard of the Ministry of Industry, Mines and Energy.

6. How do you envisage rural electrification over the next ten years?

The Government of Cambodia will:

- Encourage the private sector participation in developing the power sector in rural areas of Cambodia.
- Promote and disseminate the energy saving in rural areas.

- Promote the uses of energy sources such as Solar Home System, Biomass, Hydro electricity and wind, etc.

7. Do you have a message related to Rural Electrification that you wish to bring forward?

- We should prepare effectively the rural electrification planning in accordance with the Government Policy.
- Poverty reduction through provided electricity supply with cheapest price.
- Provide rural electricity services with acceptable quality.

Name	Chan Sodavath
Organisation	Electricity du Cambodge
Function	Director of corporate planning & Projects
Country	Cambodia
Date of interview	29 January 2008

1. What is your opinion of the situation with regard to rural electrification in Cambodia?

According to the policy of the Cambodian Government at the present time, 70% of the rural population in the country will access to quality grid electricity by 2030. On the contrary, if I look back to the efforts being done presently by the Cambodian Government, I think that it will not take such a long time to make them access to the quality grid electricity. Nowadays, EAC plays a very important role in promoting private sector participation as they are the main actors supplying electricity in rural Cambodia where the public grid will not be able to be reached.
I would rather to say that these people will access to the quality grid electricity supply within 10 years. But the question is that the electricity tariff supplied by such private sectors in rural areas is surely higher compared with the public one.

2. What are the most urgent problems with regard to rural electrification?

There are two main urgent problems with regard to this rural electrification:

- ***Supply side****:* the electricity supply in rural areas is mostly made by the private entrepreneurs. According to the EAC, nearly none of them have bought the brand new diesel generators to install in order to produce electricity for the rural population. This is due to the fact that the brand new diesel generators are expensive and need to be ordered from the manufactories which are times consuming, and they are still reluctant to invest on the expensive diesel generators because they do not know clearly that when the public grid extension will be done passing their places which, as obligation, they must buy electricity from the public grid and resell then to the end users based on a tariff set by the EAC. In that case, they shall abandon their existing diesel generators.

  On the other hand, some of them are not good enough at the technical skills. Apparently, their distribution systems have been installed on the trees without poles which are dangerous when the trees broke down. The connection made between electric wires is not well done which provokes a lot of power losses.

  Some of these private entrepreneurs have limited capacity to finance the electricity business. They went to get loan from the commercial bank such as ACLEDA, etc with a quite high interest rate (15% to 28% per year) and short term loan (1-2 years max). As procedure requirement of the Bank, they need to put plans of their houses, lands, etc as their collaterals in the bank in order to get that loan.

- ***Demand side:*** the users in rural areas are mostly domestic (around 80%), and only 20% are business customers consuming quite a lot electricity. The domestic customers consume around 3-5 kWh/month/HH while around 10 to 20 kWh/month/HH are made by the business customers.

Therefore, the rural people are mostly poor and medium. The electricity supply business in rural areas is thus a long term business.

3. What do you see as the Government's role in rural electrification?

The Government shall play role to find the cheaper electricity sources so that the users will also get the cheaper electricity consumption. For the poor people, the subsidised connection should be offered as currently done by the REF (Rural Electrification Fund). By doing so, the poor people can also access to quality grid electricity.

The Government shall continue to promote private sector participation in investing in the sector, particularly in rural areas where the public grid could not be reached.

4. In your opinion, what is the role of national entrepreneurs in rural electrification?

The national entrepreneurs like EDC plays role as a battery. The EDC should expand its areas of supply as much as possible in order to reach the rural areas. In that case, EDC shall sell whole electricity to the existing private entrepreneur, and the existing entrepreneur shall resell then to the end users in his areas based on the agreed tariff. It is surely that the electricity tariff will be much cheaper than the electricity supplied from the existing private stand alone diesel generators.

5. And how do you see the role of local entrepreneurs in rural electrification?

Two main roles for the local entrepreneurs in rural areas:

- ***In the place where there is public grid extension***: they should play role as a main electricity retailer by buying electricity from the public grid and sell then to the local population. By doing so, the local people will have access to cheaper electricity consumption.
- ***In the place where there is no public grid extension***: they should improve their electricity system particularly the distribution system in order to (1) minimise power losses due to incorrectly selected cables to install, (2) meet the EDC's requirement so that EDC will accept to sell electricity to them as electricity retailers once there will be public grid extension in place.

6. How do you envisage rural electrification over the next ten years?

At least 80% of rural population will access to quality grid electricity supply.

7. Do you have a message related to Rural Electrification that you wish to bring forward?

We should support, encourage and promote those private entrepreneurs in rural areas to access to cheaper loan and make them feel that no body will come to takeover their current places in the future. Therefore, they will be confident and strongly participate in the sector together with the public state owned company (EDC) in order to achieve MDG of Cambodia.

Name	Theng Marith
Organisation	Electricity Authority of Cambodia (EAC)
Function	Director regulation department
Country	Cambodia
Date of interview	28 September 2007

1 What is your opinion of the situation with regard to rural electrification in Cambodia/Laos?

Last 4 years the picture has changed. First year the infrastructure had to change. In 2007 the rural network increased with 70%. Recently in Kampong Cham 22kV medium voltage is introduced.
The first target is the expansion of rural grids by giving existing REE's licenses for new zones. Integration of the small ones into bigger ones to create bigger zones (different ways possible).
Over 5 years trying to build big zones only (22kV has to become standard) connected to EDC along the road. EDC is planned to own all the transmission lines over 5 years, which will be EDC's role. Tariffs will be regulated and thus price differences between provincial towns, district towns and villages will be smaller. Independent Power Suppliers will be able to sell to EDC.
Away from the national roads will be isolated grids. There tariffs may be differentiated.

2 What are the most urgent problems with regard to rural electrification?

Technical Problems: The feasibility to build an efficient and safe grid of standardized network. The experience is that the rural area networks cannot follow the national standards. Because at one hand the investment for medium voltage lines is typically $ 8000 per km, whereas the consumption in a rural village might not be higher than 2000kWh per month.
By law there is no differentiation between the national grid and small rural grids. In reality EAC accepts other technical standards for the small rural grids, which have not been confirmed by law. Provincial Department of Industry Mines and Energy (DIME) provides licenses to those rural electricity suppliers. If there would be a new legal standard with distinction between the main grid and small rural grids, then we have to review the policy.
Financial point: Funds are needed. In the example where one has to invest $ 8,000 for an acceptable standard of LV-lines, an entrepreneur might be willing to invest only $ 4,000 to reach an acceptable rate of return, then subsidy from the Rural Electrification Fund is needed for the other $ 4,000 to meet the standards.

3 What do you see as the Government's role in rural electrification?

Primordial. The government has set the masterplan, the question is who will implement the master plan? There is a plan by the Ministry of Industry, Mines and Energy (MIME), but if EAC does not follow the plan it doesn't work. Coordination is needed between MIME, EAC and DIME. Example: DIME issues the right to invest in generation of electricity, and EAC issues the right to supply electricity. They sometimes choose not to give a license, for example when the company wants to ask higher prices than the neighbour or when the planned infrastructure is not up to standard.
Furthermore the government gives away exclusivity for supply in certain areas, but this is different from investments.

For big investments, first there is a need for a letter of will from government. This letter is sent to MIME. MIME issues a process, which includes MIME's decision and (if positive) is an authorization to invest. EAC considers the plans and can issue a license to generate/distribute electricity with conditions. This license can for example be temporary (e.g. for 1 year).
For small investment (less than 120 kW) only DIME authorization is needed.

4 In your opinion, what is the role of national entrepreneurs in rural electrification?

Their role is also important, because without national entrepreneurs we can not grow. In the past they were not able to upgrade to the quality standard set by EAC and they did not understand the power sector. Now we might expect some conflicts between entrepreneurs who want licenses and EAC who wants to follow the procedures.
With growth and consolidation of license areas, two neighbouring enterprises might ideally

merge to handle larger investments, but might get conflicts over tasks and responsibilities of each individual entrepreneur in the merge-company. Alternatively one might buy out the other with consequent stress.

5 And how do you see the role of local entrepreneurs in rural electrification?

It depends on the economic growth of an area. Local entrepreneurs are the base of development. The question is whether their client-base will be sufficient enough to grow further and deeper into rural areas.

6 How do you envisage rural electrification over the next ten years?

We expect expansion and consolidation of grids. Eventually the largest will be connected to EDC (must be standardized), only big licenses. Further the transmission will be 22 kV between connected areas. The energy sources are mentioned in the EAC book: Report on Power Sector of the Kingdom of Cambodia for the Year 2006.

7 Do you have a message related to Rural Electrification that you wish to bring forward?

My message to licensees would be: “Cooperate to survive, growth doesn’t kill you! But you have to cooperate and invest to survive.” However my experience is that Cambodians don’t like to cooperate. If they don’t it will be a threat to their investment.
My message to smaller REE’s would be: “Try to understand and cooperate!”

Name	Mr. Loeung Keosela M. Eng
Organisation	Rural Electrification Fund
Fuction	Managing Director
Country	Cambodia
Date of interview	2 October 2007

The Masterplan Rural Electrification has been made in close cooperation with the Japanese development organization JECA. It states the ambition to electrify all villages before 2020 and 70% of the households before 2030. The Government of Cambodia receives a WorldBank loan and a GEF grant for the implementation, which is coordinated by the newly installed (April 2007) Rural Electrification Fund (REF)

The first phase is to design an electrification mechanism for 50,000 new household connections through rural energy entrepreneurs (REE's). The criteria for REE's to be eligible for partnership is that they have a 5 year (consolidated) license from the Electricity Authority of Cambodia (EAC). The subsidy to REE's will be $ 45 per extra connection in grid expansion. Up to now there are 4 agreements signed with REE's reaching 2,000 households. Most REE's are aware of the REF, as there was a promotion at yearly EAC seminar for REE's on 15 Dec 2006 with about 100 licensees present. According to EAC has 40-50% of the licensees a 5 year license.

There is a World Bank fund called ESMAP for technical and managerial trainings. The trainings are divided in two areas. The eastern zone will be covered by training centre CKN (Chrom Kom Noy) and the western part by Education Development Centre (EDC).

The REF further gives subsidy of $ 100 for every solar home system bigger than 40 Wp and has the ambition to support the installation of 12,000 systems in the coming three years. There is a list of 10 eligible companies. There is potential for solar. Sometimes there is no other choice in remoter areas where it is too expensive to expand the grid. In the future also solar lanterns should receive subsidy.

The private sector is showing more interest in investing in pico and micro hydro projects. To stimulate these investments gives subsidy of $ 400 per kW installed capacity. On average the estimated costs of such projects is about $ 2,000 per KW, so it comes down to subisdy of 25%. Micro average 50 kW (def. tot 850kW). Mini between 75kW – 5MW (def. tot 6MW).

Also the subsidy for biomass and biogas will be the same ($ 400 per kW installed capacity) which is also about 25% of the investment.

Feasibility study showed that hydro is not possible everywhere in Cambodia, therefore we have to advertise the potential sites and find co-financing potential if location is feasible.

In the end we want to create a situation where EDC generates electricity and organises imports/exports. EDC should own the transmission lines and REE purchase the electricity for EDC and distribute.

Name	Chea Kim Long
Organisation	Ministry of Health (MoH)
Function	Deputy Director Inspection General
Country	Cambodia
Date of interview	21 February 2008

1. What is your opinion of the situation with regard to rural electrification in Cambodia?

Actually, there is electricity supply, but only in some places of the rural Cambodia. Most of the places are lacking electricity supply. People rely on kerosene lamp, battery, etc. For the places electricity supplied by local private sector is really expensive.
Considering such a kind of situation, the referral and national hospitals built under the support from the Ministry of Health are equipped with the following power supply sources:

- Vaccine conservation is powered by either solar PV or gas. (Gas is mostly used as it is cheaper).
- Surgery is powered by a standby genset as it needs a lot of power electric in order to do it.

2. What are the most urgent problems with regard to rural electrification?

There are two main urgent problems with regard to this rural electrification:

- Lacking electricity supply in rural Cambodia
- the price of electricity is expensive to which rural people can not afford at some places where electricity is invested and operated by the local energy entrepreneur (REE).

3. What do you see as the Government's role in rural electrification?

Of course, it is the role of the Ministry of Industry, Mines and Energy (MIME). MoH has no any roles involving in developing policy to be used to improve rural electrification sector. However, i think that MIME, EAC should consider and control deeply this situation, particularly with private sectors supplying electricity in rural places (they increase electricity tariff when they want due to the increasing fuel price happening at the present time, but they never decrease it when the fuel price is decreased).

Moreover, MIME should find and realise the cheaper power sources such as hydro power, biomass, etc so that Cambodian people will get cheaper electricity tariff like in neighboring countries- Vietnam, lao PDR and Thailand.

4. In your opinion, what is the role of national entrepreneurs in rural electrification?

The national energy entrepreneur such as EDC should go further than what it is at the present time, supplying only in the main bourg such as in provincial and capital towns, by extending the supply network to reach rural areas where there are even already local private entrepreneurs supplying electricity to local population. A PPA agreement should be made between EDC and Local private entrepreneurs indicating clearly the whole and retailed sales of electric power. By doing so, the rural people can access to cheaper electricity tariff to which they can afford.

5. And how do you see the role of local entrepreneurs in rural electrification?

Idems, local private energy entrepreneurs should corporate closely with the national energy entrepreneurs like EDC and also with local end-users. They must respect the agreement without increasing electricity tariff when they want.

I think that it is good to have the rural private energy entrepreneurs involve in investing the power supply systems in rural areas where EDC's network could not reach. But, their busniness should be controlled and regulated by the regulator either MIME or EAC in order to avoid any conflicts possibly happened with end-users particularly during such a kind of exceptional case happening (influstion of fuel price).

6. How do you envisage rural electrification over the next ten years?

According to MDG set, 70% will access to the quality grid extension. But I think that it will be difficult to achieve because the government will not have enough capacity to invest in rural places. Therefore, private sector participation will be only way of course to bring electricity until those areas of Cambodia, but the government should works closely with them.

7. Do you have a message related to Rural Electrification that you wish to bring forward?

The Government should work together with the private sectors to offer power supply service in rural Cambodia and find an affordable electricity tariff for the rural end-users.

Name	Mr. Hel Tony
Organisation	Ministry of Planning
Function	Deputy Director
Country	Cambodia
Date of interview	20 March 2008

1 What is your opinion of the situation with regard to rural electrification in Cambodia?

Presently, the Government of Cambodia has not strongly made yet effort to improve development of the rural electrification sector in Cambodia.

2. What are the most urgent problems with regard to rural electrification?
There are 2 main points:

- Possibility of the rural population is still limited in terms of capacity to pay for quality electricity.
- Local authorities, particularly the commune councils, do not have their own incomes from local taxation collection, so attraction of private investors to invest in the communes are limited, especially in isolated communes where the private investment alone is not really suitable that also needs some contribution from the public investment.

3. What do you see as the Government's role in rural electrification?

The role of the Government in rural electrification sector is very important in improving socio-economic development in rural Cambodia through micro finance scheme put in place with the agricultural-industrial SMEs.

4. In your opinion, what is the role of national entrepreneurs in rural electrification?

The national entrepreneurs like EDC shall prepare a good development planning, strategy and policy in order to attract the private investor to invest in the power sector in rural Cambodia, so the business development of rural population is also increased.

5 And how do you see the role of local entrepreneurs in rural electrification?

The rural electricity entrepreneurs (REE) shall improve and strengthen their investment to fit the capacity to pay of the rural population so that they can afford to it.

6 How do you envisage rural electrification over the next ten years?

The population in rural Cambodia will have enough electricity for their uses and enable to pay to it.

7 Do you have a message related to Rural Electrification that you wish to bring forward?

- Consideration of current situation of the rural population, of their needs, and defining electricity tariff to which they can afford.

Name	Mr. Meas Vanthon
Organisation	Ministry of Education
Function	Planning Department
Country	Cambodia
Date of interview	21 March 2008

1 What is your opinion of the situation with regard to rural electrification in Cambodia?

Electricity supply exists only in some rural places of Cambodia. Most of places do not have electricity supply yet. People rely on few types of energy sources such as Kerosene lamp, battery, etc.
However, in the places where there are electricity supply, the electricity is notably very high, up to 1 US$/kWh.

2. What are the most urgent problems with regard to rural electrification?

Rural population are poor, but the electricity tariff in rural places is expensive.

3. What do you see as the Government's role in rural electrification?

Three main points should be considered by the Government of Cambodia:

- The Government should develop rural electrification policy.
- The electricity tariff in rural places should be well regulated so as to make rural people afford to it.
- The Government should find other types of electricity sources to replace the electricity supplied by the diesel generation.

4. In your opinion, what is the role of national entrepreneurs in rural electrification?

The national entrepreneurs like EDC should support and expand the distribution system until rural places where it can. By doing so, the rural people can have a quality electricity supply and cheaper electricity tariff.

5. And how do you see the role of local entrepreneurs in rural electrification?

The local entrepreneurs such as REEs should get strong support from the Government, not only the regulation framework, but also the technical and financial support when needed.

Therefore, they should improve their business to make it more profitable with affordable electricity tariff made by rural population who are end-users.

6 How do you envisage rural electrification over the next ten years?

All rural population in rural Cambodia should access to electricity with affordable tariff.

7 Do you have a message related to Rural Electrification that you wish to bring forward?

- Electricity supply in all rural Cambodia, not only in the town.
- Electricity tariff should be correct and acceptable.

Name	Mr. Chan Kheang
Organisation	EDC Training Centre
Function	Director
Country	Cambodia
Date of interview	24 February 2008

It is interesting to have an idea on rural electrification in Cambodia from EDC Training Centre institution as it has been involving not only in training electricians from EDC, but also now in providing management and technical trainings to selected licensed REEs in Cambodia with support from ESMAP program of the World Bank. The interview was made with director of the Centre. The following is the results of the interview done:

1. What is your opinion of the situation with regard to rural electrification in Cambodia?

I think that the government has already thought about it. The price of electricity in Cambodia is the most expensive if compared with that in neighbouring countries because we do not have many hydro power stations, gas stations or charcoal stations like in Vietnam, Thailand, Lao PDR, Indonesia or others.

Most of the communes, the villages, electricity supplies are made from small gensets functioning with diesel consumption while the diesel price is more than $ 100 per barrel. Therefore, the cost price of electricity sold is expensive.

To develop the country, it needs electricity, water supply and roads. People living in the country side also need such three elements. So, it shall be found out possibilities to develop this sector. Rural electrification is important and necessary and can be classified as medium priority.

2. What are the most urgent problems with regard to rural electrification?

The price of kWh in rural areas is so expensive that we need to make it reasonably. Therefore, multiple numbers of investors in this sector is necessary, and they should orientate their power sources toward micro-mini hydro power, solar PV, wind and biomass, etc.

3. What do you see as the Government's role in rural electrification?

The government shall orientate the sector encouraging local or external private investors to invest in renewable energy sources such as solar PV, hydro power, biomass, wind or other sources of energy and provide more subsidies basically on taxes assumption, facilitation of licenses and long term loan accessibility for private investors if needed, training for engineer, technicians and skilled workers.

4. In your opinion, what is the role of national entrepreneurs in rural electrification?

The national entrepreneurs like EDC should corporate closely with the Government in encouraging the local entrepreneurs to invest in rural Cambodia, especially where the national grid can not reach.

5. And how do you see the role of local entrepreneurs in rural electrification?

The local entrepreneurs should demonstrate that they are able to manage such works because they have enough skilled staffs, materials and financial capacity. But, it shall not forget that the training of technical staffs and bureaucratic are necessary.

6. How do you envisage rural electrification over the next ten years?

The rural electrification in rural areas in Cambodia will rapidly be developing because there will be more electricity supplies coming from the hydropower sources producing cheap electricity which are under construction done by the private investors. This electricity will be sold to EDC in the form of a wholesales. The EDC will resell then to the local existing entrepreneurs in rural areas based on a fixed tariff which must be cheaper then that made by the diesel generators.

7. Do you have a message related to Rural Electrification that you wish to bring forward?

To develop the sector rapidly as we wanted, we should support REEs through:

- Providing staff training,
- Modernising technical materials,
- Applying modern techniques,
- Monopolising their areas of electricity supply. No one else will come to start the same business in the same areas.

Name	Mr. Mao Sam Ngat
Organisation	Khmer Solar Company Co., Ltd
Function	Sales Manager
Country	Cambodia
Date of interview	05 February 2008

1. **What is your opinion of the situation with regard to rural electrification in Cambodia?**

At the present situation, I think that it lacks strongly of electricity in rural area for rural people. Electricity is mainly presented mainly in urban areas such as provincial town.

Of course, there are a lot of rural energy entrepreneurs generating and supplying electricity in rural areas of Cambodia. They sell electricity with a quite high tariff, from 2000 R/kWh up to 4000 R/kWh ($1) due to the significant increased diesel price. Some of them, he has met, wanted to stop their business because they could not increase electricity tariff easily as there will be strong resistance from the users if they decided to increase it.

On the user's side, they really need electricity for their families, especially for their entertainment as they usually have a TV (either Black & White or Colour) and few lights.

2. What are the most urgent problems with regard to rural electrification?

Two main types of problems:

- No enough electricity supply in rural areas
- If there is, the electricity tariff is very expensive (we can say that the poor people pay electricity more expensive than the well-off people).

3. What do you see as the Government's role in rural electrification?

The Government shall play role:

- To find the cheaper electricity sources such as from Hydro Electricity like in neighbouring countries (Laos, Vietnam) so that the users will also get the cheaper electricity consumption.
- To provide subsidy for the new connections, particularly for the poor families, like what has currently been done by REF (Rural Electrification Fund).

4. In your opinion, what is the role of national entrepreneurs in rural electrification?

The national entrepreneurs like EDC should expand its areas of supply as much as possible in order to reach the rural areas and sell then electricity to the existing local private entrepreneurs already supplying electricity in the area. The local entrepreneurs play role as retail sellers reselling afterwards electricity from EDC to the end users in his areas based on the agreed tariff. By doing so, the electricity tariff will be much cheaper than the electricity supplied from their own stand alone diesel generators.

5. And how do you see the role of local entrepreneurs in rural electrification?

They should play role as a main electricity retailer by buying electricity from the EDC grid and sell then to the local population rather than they produce and supply electricity from their own gensets which is not possibly profitable and not sustainable.

6. How do you envisage rural electrification over the next ten years?

The rural population will have electricity for their uses through three main energy sources – Extension of EDC grid, decentralised diesel generators and Solar Home System. I include SHS based on the significant speed of SHS sale I made on behalf of Khmer Solar Company as a private company selling and installing SHS for the rural people approximately 1000 systems per year.

7. Do you have a message related to Rural Electrification that you wish to bring forward?

Rural people should be aware of interest of having SHS because it is also an option to help them in remote areas have electricity for their uses.

ANNEX E

PROVINCIAL STAKEHOLDERS CAMBODIA

Name	Mr. Poun Run
Organisation	DIME
Fuction	Chief Energy Officer
Country	Cambodia
Date of interview	28 September 2007

1 What is your opinion of the situation with regard to rural electrification in Cambodia?
Most people in Cambodia don't have enough money to use electricity. The presence of electricity is low, because it is up to the living standards.

2 What are the most urgent problems with regard to rural electrification?
Factories produce their own electricity and sell cheap to neighbours. Electricity companies cannot grow because of that. TTY in Memot district for example.
Can we use that as an opportunity in planning? Yes

3 What do you see as the Government's role in rural electrification?
The gov. should do the best, not like now, to find money for the investments. The ministry is open to private investment, but the gov. to search proactively.

4 To your opinion, what is the role of national entrepreneurs in rural electrification?
The big entrepreneurs like IPP they should extend their networks.

5 And how do you see the role of local entrepreneurs in rural electrification?
in KPC there are 23 licenses for RE and in total there are 36 (so 13 non-licensed). Those non-licensed have no money to invest more, but are around for long time. They have no options to grow. Some places have double grids, one licensed, one non-licensed. He proposed that the licensed REE can negotiate prices with the non-licensed and sell power.

6 How do you envisage rural electrification over the next ten years?
Following the government planning, the prices will drop and availability will grow. He is confused by the CAP-REDEO project. He hopes that there is also a fund for investments. By 2020 70% will have quality grid electricity.

7 Do you have a message related to Rural Electrification that you wish to bring forward?
He wishes that there will be a clear a detailed RE-planning that he –as government employee- can follow.

Name	Ros Kim Thorn
Organisation	Department of Public works and transport
Fuction	Deputy Director
Country	Cambodia
Date of interview	28 September 2007

1 What is your opinion of the situation with regard to rural electrification in Cambodia?
People need electricity to watch TV, start a business, so big need of electricity

2 What are the most urgent problems with regard to rural electrification?
Far from the road, business men have to go far for buying petrol for their generator. End user price is thus high.

3 What do you see as the Government's role in rural electrification?
Government should discuss the end-user price with the companies

4 in your opinion, what is the role of national entrepreneurs in rural electrification?
Need to provide big generators and provide to far away places

5 And how do you see the role of local entrepreneurs in rural electrification?
Maybe the investment itself is affordable, but they can't afford the running costs.

6 How do you envisage rural electrification over the next ten years?
Electricity will be everywhere

7 Do you have a message related to Rural Electrification that you wish to bring forward?
Need for cheap electricity for the farms.

Name	Leng Seng Hong
Organisation	Provincial Department of Planning
Fuction	Deputy Director
Country	Cambodia
Date of interview	28 September 2007

1 What is your opinion of the situation with regard to rural electrification in Cambodia?
Electricity contributes to poverty reduction. Electricity should improve especially in the countryside

2 What are the most urgent problems with regard to rural electrification?
The prices are too high.

3 What do you see as the Government's role in rural electrification?
Government has not enough money to change the situation. Government has plans and ability but no to invest. That should be the role of the Government.
He follows the plans of others.

4 in your opinion, what is the role of national entrepreneurs in rural electrification?
in the province there is only one big company. in city towns like KPC-town big national companies needed.

5 And how do you see the role of local entrepreneurs in rural electrification?
They can work with EDC and EAC.

6 How do you envisage rural electrification over the next ten years?
He expects better developed infrastructure

7 Do you have a message related to Rural Electrification that you wish to bring forward?

Name	Kim Sour Phirun
Organisation	Provincial Department of Health
Fuction	Deputy Director
Country	Cambodia
Date of interview	28 September 2007

1 What is your opinion of the situation with regard to rural electrification in Cambodia?
Town centres don't have electricity.

2 What are the most urgent problems with regard to rural electrification?
Because of the bad roads, electricity can't reach. The little money from the farms is not sufficient for electricity.
How many hospitals are there? 10 of which …electrified
Health centres? 135

3 What do you see as the Government's role in rural electrification?
They want a nationwide grid, which they can't build.

4 in your opinion, what is the role of national entrepreneurs in rural electrification?
Add generators in the busy places

5 And how do you see the role of local entrepreneurs in rural electrification?
They should build small generators for small villages.

6 How do you envisage rural electrification over the next ten years?
We should have electricity in the countryside, especially around the hospitals. From the poles along the roads, they should draw lines to the hospitals.

7 Do you have a message related to Rural Electrification that you wish to bring forward?
Hospitals, schools and markets urgently need electricity.

Name	Chhuy Mong Sreng
Organisation	Department of education
Fuction	Chief Administrator
Country	Cambodia
Date of interview	28 September 2007

1 What is your opinion of the situation with regard to rural electrification in Cambodia?
All businesses need electricity, so all people need electricity. Need electricity to transport water to the farms.
How many schools are electrified? 4or 5 school have electricity out of 876. About 30 have generator

2 What are the most urgent problems with regard to rural electrification?
Electricity is expensive and even generator and petrol are expensive

3 What do you see as the Government's role in rural electrification?
They don't have the ability to provide to the countryside, so maybe they can import electricity.

4 in your opinion, what is the role of national entrepreneurs in rural electrification?
They should invest in places where it is needed.

5 And how do you see the role of local entrepreneurs in rural electrification?
REE's ask high price, people can't pay, and then they will lose businesses. Please give reasonable price.

6 How do you envisage rural electrification over the next ten years?
in 10 years the countryside most will be electrified, schools too and children have computers at school.

7 Do you have a message related to Rural Electrification that you wish to bring forward?
The price needs to go lower.

ANNEX F – VILLAGE PROFILES CAMBODIA

Name: Mr. Sren
Village: Spean Thmey
Commune: Kien Chrey
Occupation: Electrical entrepreneur

After the Pol Pot regime fell in 1979 Mr. Sren started his business in repairs of electrical appliances, like TV's. He learned his profession as an apprentice in Kampong Cham Town. Ten years ago he bought his first generator for battery charging. At first he also sold batteries until the battery producer started to sell in the province. He couldn't compete with that.

Three years ago he invested in two big sound systems, including 5kVA mobile generator. He rents the systems during the wedding season –from December till July- which is currently he his most profitable business. However, because competition has grown and he also had to sell his old car, his competitive position has weakened.

Generator cost $ 800 and lasts 2 -3 years

Business hours are from 8 a.m. to 4 p.m.

The battery charging is his business with the least risk. He is the biggest and best charger in the area. He charges upto 80 batteries at a time with his 6.5 kVA generator. His competitor is deep in the village and can charge only 30 to 40 batteries. Sren's customers tell him that they can use their batteries twice as long when they charge with him compared to his competitor.

Business is starting to become boring, he is over 60 and looks forward to his retirement. The batteries are heavy and he currently sees no opportunities for new businesses. He trained his son in repairing electrical appliances and they run the business together now. His son started three months ago with expanding business by selling CDs and VCDs.

Name:	Mr. Hoeum & Mrs. Te
Village:	Spean Thmey
Commune:	Kean Chrey
District:	Kampong Siem
Date	29-9-2007

Mr Hoeum lives since his infancy in Spin Tonai village, in Kampong Cham Province. He is 36 years old and is married with Mrs Te and has two children. He lives in a house next to the main road and is considered to be well of.

He is living in a large traditional house with a cement kitchen and three rooms.
His brother has a dentist practice in the house. Mr Hoeum himself lives from agriculture and horticulture production. He grows rice in the wet season and potatoes and cassava and vegetables in the dry season. He cultivates a piece of land of about half a hectare.

At his house he has a 3 kW generator which he uses at night to watch TV. In the rainy season he takes his generator to the place where he grows his vegetables for the irrigation of the land. The generator will consume about 2 litres of diesel a day or about $ 1.5. In the past people used to irrigate the land with buckets. He uses a pump which costs money but also saves time. In the dry period he charges a battery to have electricity at home. He uses a black and white TV to reduce his electricity consumption. The fan is also used in the rainy season.

There is one pagoda, a health post and a primary and secondary school in the village where Hoeum is living. Te pagoda also has a generator which is used for ceremonies like plum been, the festival for the dead and with “sour sdey chhnam thmey” the new year similar to the Chinese new year in April. The pagoda’s generator also caters the police station and the health post. The village has over 100 inhabitants and no connection to the grid.

Mr Hoeum would love to be connected to the grid and pay for it. He would be willing to pay a connection fee of $ 10 and also pay a monthly tariff of $ 10. He would buy more appliances like a washing machine.

Name: Mrs. Yoeun Choeb & Mr. Pom Bunmy
Village Spean Thmey
Date 29-9-2007

Mrs Choeb lives in a very moderate one room house at about 500 meter from the main road of the village. She is 25 years old and lives in the house with her mother and her daughter. She has no land for agriculture. Her husband used to work as a fisherman but found it hard to find fish. He has left the village for Phnom Penh to work in a brick factory.

He will now earn more money up to $ 50 a month which is more compared to his income as a fisherman which would be closer to $ 1 a day. Costs will also increase because living in Phnom Penh is not cheap. She hopes that with this new income and with the income of the boat they are now renting to another person, their lives will improve. Ms Choeb makes an effort to feed her family with 2kg of rice a day. She makes soup out it and can do that for about half a dollar.

In the past the family had borrowed a car battery to use for her TL light. Her husband had returned it before he went to Phnom Penh. Now she can not use batteries anymore for recharging her flashlight either. She used this flashlight to catch small frogs which her husband used as bait. She recharged her battery for 500 Riel or $ 0.10 and could use it for ten days. Nowadays she only uses kerosene, which also costs 500 Riel and which she uses for 2 to 3 days.

Mrs Choeb hopes that with the earnings from her man she will be able to buy small car battery herself in the future. It would cost about $ 7-8. It would improve her life inside the house and she would be able again to catch frogs for her husband when he would come from Phnom Penh.

Name:	Mr. Ung Sokheng & Mrs Te Mom
Village :	Preychakrey
Commune:	Osway
District:	Kampong Siem

Mr. Ung Sokheng and Mrs. Te Mom run a small grid and a battery charging shop in Preychakrey village not far from Kampong Cham Town. Mr. Ung Sokheng is actually a teacher and does the electricity business mainly for supporting the community.

The business is relatively small: they supply electricity to 35 households and charge about 20 batteries per day. He started the business in 1990 and is now using his second generator. He bought the 18hp engine for $ 350 and the 15kW dynamo for $ 500. Mr. Ung Sokheng received a license from the provincial Department of Industry, Mines and Energy (DIME) in 2001.

Battery charging tariffs:
Small 500R
70Ah 1200 R
100Ah 1500R

Electricity supply tariff:

Mr. Ung Sokheng has done only small investments, besides the generator he built the main line himself with wooden poles and simple wires. The customers pay the real costs of connection, consisting of the wires from the main line to the sockets and lights and a meter. The total investment of the whole system was only $ 1,000. He has no growth plans. Expansion doesn't make much sense, the main road (route 7) is only 2km away and from there the closest grid connection is only another 3km. It will not take very long before the 300 households in Preychakrey village will be electrified by the big companies. On the main road lives the technician that helps Mr. Ung Sokheng with repairs on his generator.

Running costs:
Diesel 260 l/month (2,900 Riel/l)

Income:
- 800,000 Riel/month for grid (average 7.6 kWh/customer/month)
- 180,000 Riel/month for battery charging
- 190,000 Riel/month salary as teacher

When it is pay day, he writes all the names on a page in his notebook and checks them off when they have paid. When all customers have paid, he tears out that page of his notebook.

He lives quite nice in the house he owns. He paid $ 7,000 to build the house which consists of 1 room downstairs and one upstairs. He has all the modern comforts that he could wish: 5 lamps, a fan, a radio, a TV and a CD/DVD set. They have a good life and are happy they can offer that to their daughter as well.

Name:	Mrs. Mean Vaunak & Mr. Pav Taysreng
Town:	Prey Toteung
Occupation:	Battery charging

Mrs. Mean Vaunak and Mr. Pav Taysreng are a couple that run a small family business in battery charging. They have three children for who they could afford to raise their children well. His oldest son is now car mechanic in Phnom Penh.

In 1979 Mr. Pav Taysreng started to charge batteries on the battery of a rice mill. While the number clients for the mill slowly reduced the number of clients for battery charging increased. In 1985 they stopped with milling and they focused on battery charging only.

Charging costs:
Small 6V battery: 500 Riel ($ 0.10)
70Ah battery: 1500 Riel ($ 0.30)

Since they bought a bigger generator in 1997 they are now the biggest battery charger in town. With the current setup they can charge about 110 batteries a day and they almost run at maximum capacity. However, with some modifications the engine could be upgraded to double that amount.

Mrs. Mean Vaunak is the client manager, doing all the business with the customers. She has an employee for carrying the heavy batteries. Mr. Pav Taysreng does the technical work and maintenance.
Mrs. Mean Vaunak does not see any competition in the coming of the grid. They serve different customers and power different products.

Using the grid for battery charging would be more expensive than by the current generator, she thinks.

Name: Mr. Hourn
Village: Sleng (Prey Toteung)
Date: 30-09-2007

Mr. Hourn is married to Mrs. Chan Tho and they have 3 children. They live on route 7, just outside Prey Toteung village. Houses are a bit expensive here. His house cost $ 5,000 and the empty plot next to him is for sale at $ 7,000. The high value of the land is caused by the strategic position at the road, and vicinity of the busy centre of Prey Toteung, the availability of electricity does not influence the value of the plots.

Although the grid has been around for some time already Mr. Hourn only received a connection last year. Connection was 320,000 Riel for the materials (cable, meter) and a $ 10 registration fee. The family uses about 16kW per month, which used to cost 2780 Riel/kWh. Last April or May the customers protested against the high price and then the price was reduced to 2200 R/kWh. The payment is done every other week by invoice, MR. Hourn visits the office of the electricity company by motor. If he doesn't pay within a week he will be disconnected and has to pay 10,000 Riel for re-connection.

It is no problem for Mr. Hourn to go to the office by motorbike, because his motorbike is his business. He drives around with a wagon behind his motorbike and hiring his transportation services makes him earn on average 10,000 Riel/day, with some seasonal variations. The motorbike consumes 30 litres petrol per month and the price is 4,000 Riel/litre.

Besides that he grows rice on his 12 Acre paddy and some fruits in the garden. His wife stays home and in front of their house they have a stall for sales of fruits, candies and drinks. Their niece from the opposite side of the street is using the stall during the day. In the night there are no customers.

Although Mr. Hourn is now using grid electricity for his fan, color TV, a lamp and to charge his mobile phone, he also still uses a battery downstairs. He used to have a nice karaoke business: for 150 Riel people could sing a song. Now many people have electricity and bought their own karaoke system. Now the 12V karaoke system is not used that much anymore: the batttery lasts 10 days and is charged for 1500 Riel. A 220V karaoke system stands next to the 12V system.

The rice-straw can be sold for 10,000 R per half month
Cooking-gas is 16,000 R (4kg) and lasts a month.

Name: Mrs. Thay Laynith
Village: Sleng (Prey Toteung)
Date: 30-09-2007

Mrs. Thay Laynith is married to Seng Chenltong and together they have 6 children. Both are from this village and are happy here. They live just outside the reach of the electricity grid, but that doesn't matter to Mrs. Thay Laynith as she sees no use for it. She thinks that the battery they are using now is cheaper, although she isn't sure about that. They use their 70Ah battery for a black & white TV, a cassette player and two lamps. They charge the battery once a week and pay 1,300 Riel for it.

One of Mrs. Thay Layniths' activities is the cakes that she buys on the market and sells in her stall in front of the house. She also sells petrol, which costs 4,000 Riel/litre for super, while she buys it herself for 3,500 Riel/litre.

Her husband is a rice farmer with 1 ha of land. They own a rice mill which is a profitable business. The rice mill produces a lot of waste-rice powder, which can be sold as pork food. The milling of 100 kg rice produces 20 kg powder that can be sold for 3,000 - 4,000 Riel. She also uses it herself to feed the ducks.

Name: Mr. Khun Sambo
Town: Prey Toteung

When we come to the power company on quiet Sunday morning, Mr. Gnem Cheng is working with his small team of technicians on improving the air filters of a biomass gasifier. He explains that the filling of the filters are too heavy because you have to lift baskets of wood over your head. So they decided to weld new air filters that are lower but wider.
Mr. Gnem is the senior technician and like all the other technicians he just learned the technique of biomass gasification on the job. There are no schools around where you can learn these things.

Since they are now modifying the gasifier, the engine runs completely on diesel. Normally they use 30 bags of wood at once and it burns for 12 hours. The wood is turned into charcoal, which is cooled by water. The water also washes the charcoal out of the tank. The charcoal is sold to a metal workshop.

Biomass Gasification:
- Wood (or other biomass) is burned with less oxygen than normal burning;
- Gas comes off and is cooled and filtered;
- It is mixed with diesel and can be used in most regular generators.

One of the nice things of biomass gasification is that the wood can be replaced by any other type of biomass. That's why the company transports corn-residues from Bos Knor town to the gasifier. It is much cheaper than wood and Mr. Bo tries to run as much as possible on corn-residues.

When the company started in 1989, there were only about 50-60 customers, which were connected by second hand cables that were bond together and hung in trees. The company grew quite fast to the current 1500 customers. All the old cables and accessories were replaced in 2005 by high quality materials. The company is growing at a huge pace; it bought two other companies in neighboring villages last year (Bos Knor and Trent) and another one this year (Min). Now the domain of Mr. Bo consists of four adjacent areas. The engines in Bos Knor and Trent do not run on gasified biomass, but Mr Bo hopes that he can install a new gasifier in Min. The company vision is to connect all the four grids together and run on one generator only.

The market for electricity is huge, but depending on the size of the grid mainly. In

Prey Toteung the price is 2200 Riel ($ 0.55) per kWh and Mr Bo wants to increase it, due to increasing diesel prices. In his other villages people even pay 2800 Riel ($ 0.7) per kWh. His strategy is keeping the price high, so that there is a lot of investment money for expanding the grid. Mr Hey Bo does not believe that lowering the price will increase the number of connections within the current coverage much.

Name: Kuy Sour
Village: Suong
Occupation: MD Electricity Suong

The power company of Mr Kuy Sour is now quiet. Between the diesel generators that were once producing loud noise, bad fumes and several kilowatts now are the beds of employees. The power plant has stopped, because a 5 MW coal power plant has been opened in 2005. The opening of the power plant however did not kill his business, he now buys the power from the plant and only distributes.

When Mr Kuy Sour started in 1987 with power supply he had 400 clients and was competing against 8 other small power suppliers. The costs for maintenance and repairs were high and in the beginning it was difficult to give good quality power. “I produced 240V, but at the end of the lines there was only 100V,” he says with a smile. Now he has no worries about the generation and can focus on quality and expansion. His costs for electricity have decreased with 30% because of the power plant.

He has the exclusive license for the Suong commune and his grid expanded to 2400 clients in an area within 5 km distance of his company. He is busy expanding the grid to all inhabited areas with Suong commune and has the wish to get a license for the commune south of Suong. Mr. Kuy Sour builds the concrete poles for the transmission lines himself. He has seen how others do that and copied the technique.

He sells his electricity for 1500 R per kWh now and hopes he can sell even cheaper next year, when the establishment of the import power line from Vietnam. Also the grid will be upgraded from the 24kV lines now to 115kV from Vietnam.

The company that owns the 5MW power plant is Kampong Cham City Power and produces the energy for three different distributors.

Name: Mr. Map
Village: Next to Suong
Date: 1-10-2007

Mr. Map has a wife and 2 daughters and lives some km south of the grid. In this area Mr. Kuy Sour wants to buy a license.
To reach the village we had to follow a road on a dyke between rice fields. All the houses are centered along this (bad) road and his house is just past a big pagoda and the people work on the big lands behind their houses. The houses look relatively good and gave the impression that people can afford electricity.

Mr. Map has a small shop with cakes and candies, he rents CD's (500R), he has hens, 10 pigs and a boar. With his motorbike and his wagon he brings the boar to other pig farmers for reproduction. Furthernore he has 1ha of land for rice.
His wife is working on the land and goes to Suong market for buying goods to sell.

He has karaoke for his own parties, a fancy colour TV and 2 DC light bulbs. They can be bought in Suong. He has a 70Ah battery which is charged next door.
There are two other battery charging shops in the area and the pagoda you can do it as well.

"If grid would come here, I would take it right away" he says. He would buy more lights and an AC karaoke system. He thinks $ 12.5 would be a fair price for connection and also $ 12.5 for monthly payment.

The battery charging shop of the neighbour is decorated with some rusty bombs in the front garden which have been found in the rice fields. It reminds of the hard days. For Mr. Map it is very convenient that the charging is done next door.

Name: Mr. Keo Kchly and Mr. Som Toulos
Village: Preak Bak
Commune: Stueng Trang
District: Steung Trang
Date: 23-10-2007

On the road from Kam pong Cham to Stueng Trang, some kilometers after Spean Thmey is the village Preak Bak. It is a muslim community of 621 households (2828 inhabitants). Preak Bak is the biggest of the six muslim communities in Stueng Trang district.

Preak Bak village lies on the shores of the Mekong river and its main activities are rice farming and fishery. They produce about 50 trucks of 5 ton rice for export to Vietnam, the rest they mill and eat themselves or they sell it at Stueng Trang Town. Thetre are 9 rice mills in town, running on diesel engines.

Today is a holiday, so the village is very lively and many children are playing in the streets.

“Three years ago we built street lights so that traffic is easier on the main road and for comfort at night”, says Mr. Keo. The stree lights are sponsored by the relatives in Phnom Penh, Malaysia and Thailand and managed by the community. Every night it gives light for about two hours (from 6 to 8 pm), then one container of fuel is finished.

The street lighting is 500 meters long, with a energy saving bulb after every 20 to 40 meter. If someone wants a light in front of their house, they have to pay for it themselves.

The generator produces 3kW of power as built with the engine of an iron buffalo. If more funds are coming they think they need a 10kW generator to provide street light to the whole village.

Small repairs can be done by the battery charger and the rice millers, but for bigger repairs they need to get a technician from Stueng Trang Town.

The mosque in Preak Bak has its own generator for lighting and a third generator runs for battery charging. There is no electricity in town, so people light their houses with kerosene lamps and lamps on batteries. Some people also have a TV connected to the battery. Today it is not running, because of the holiday, but normally it charges about 60 batteries per day.

Charging tariffs:
100 Ah – 1500 Riel
70 Ah – 1200 Riel
50 Ah – 1000 Riel

Mr. Keo stresses that the village really needs electricity at home. Two years ago a business man came to the village to assess the potential. The villagers told that they could afford 10,000 Riel per month for electricity. The man did not come back yet to tell whether he will install a village grid or not.

Name:	Mrs. Kong Leaw
Village:	Mesorchrey
Commune:	Mesorchrey
District:	Steung Trang

Mrs. Kongleo (79) lives with her husband and four grandchildren (8, 10, 14, 20 years) next to the market. The father of the grandchildren has passed away and the mother left to the United States.

They have a small piece of land, which they rent because they are too old to work on it themselves and the children are all still in school. The renter pays 30% of the yield for it. The family has no other income than support from family. Another daughter and her man use the storage room under the house for their soy-harvest.

Mrs. Kongleo is one of the first in the village that was connected in 1983. Before that she was using kerosene lamps and batteries. Now they have 4 lamps, a colour TV and a VCD-player. The electricity bill is about $ 25, which is paid by her relatives too.

Every month Mrs. Kongleo is worried that she can't pay the bill and sometimes thinks of using kerosene again. Although she really likes the electricity suppliers in person, for her the price is not fair. There is no way of not paying. When you don't have the money, they get a week to find the money to pay the bill.

Name: Mr. Lim Sokhun & Mrs. Eam Sreng
Village: Mesorchrey
Commune: Mesorchrey
District: Steung Trang
Occupation: Rural energy supplier

The business of Mr. Lim Sokun and Mrs. Eam Sreng seemed to have reached the limit of their capacity. To further grow they have hire specialised personnel and get long term loans. Mr. Lim Sokun is used to know and do everything himself. To be dependent on others is scary. Nevertheless, the business has an amazing 510 customers and is still growing. He is very eager to learn and regularly goes to trainings at EAC. Collection of money is still done by going around and the computer for accounting and administration is little used.
The standardisation process by EAC is perceived to be very hard: for billing instead of money collection he needs computer specialists and to replace the current wiring and poles up to standard requires big investments, while he depends on his own capital only. He never borrowed money for investments.

Starting his business
A friend of Mr. Lim Sokun had a generator for powering sound systems at weddings and that gave him the idea to buy a generator too. He hired his tractor to other people and from the money he saved with that (and some help from his brother) he bought his first 5kW generator. The investment was done in gold, as the money system was not very reliable under the Pol Pot regime. He connected one light bulb in 100 households. He mainly learned by doing. In 1996 they bought 280HP (160kW) generator and added in 1997 a 80HP (60kW) generator. He doesn't know how much it cost, as different parts were bought at different places and he connected everything himself.

Business now

The diesel engines run on 60kW during daytime and 160kW during night time. It consumes 180 liters of diesel/day for 492,000 Riel. The machines produce 380V 3-phase electricity which is distributed to 510 customers. The customers pay $ 0.8 per kWh. Their customers are mainly households, the small businesses often have their own generator.

Mr. Lim Sokun is the manager, his wife Mrs. Eam Sreng does the accounting and administration and a technician works full time for them for $ 50 a month plus food for him and his family.

They have 2 daughters and 3 sons. One of the daughters is married, the other plus two sons are studying in Phnom Penh. One son is still in school. The studying children are good with computers and help with computer problems and accounting.

EAC has given them a 2-year license and extend that every time. Mr. Lim Sokun has a very good relation with EAC and regularly follows technical trainings organised by them.

Problems
The number of customers is growing, while their administration can't handle that well. Luckily their daughter helps sometimes with the computers. If they could get an expert for one day, it would be an accountant who can help them with organising their accounting on the computer.

Furthermore, the customer care is a problem. Many customers don't trust the meters and are reluctant to pay. They don't understand that the meter doesn't make errors. He asks me for tips how to cope with that.

Also the government is building big obstacles with their rural electrification strategy. The strategy does not work at all. Regulations are strickt and require expensive investments, he can't decide his own tariffs, the ministry doesn't understand the technical problems in the field and are not helping to reach the poorer people in the village. Some of the civil servants are just interested in their own power.

Investing

Mesorchrey has 2,000 households, but only 510 have electricity. Mr. Lim has the ambition to power the whole village but it will take long as he requires big investments. Especially because he should meet the EAC standards, which requires a professional billing system instead of money collection and all his poles and wires have to be replaced by the so-called ABC standard (35 mm^2 for distribution lines, and 70 mm^2 for the 220V transmission lines and 95 mm^2 for the 380V main line.) It is interesting though to meet the standards, because he will get a 5-year license then.

In Mesorchrey is a branch of Acleda Bank. He puts his money there, but cannot do bank transfers. For that he has to go to Steung Trang. He doesn't take loans there, because they only have loans up to 1 year with an interest rate of 3% per month. Mr. Lim Sokun doesn't know where he can get long term loans with acceptable interest and he also doesn't feel good about it as he can't be sure that he can repay the loan.

Now he is growing slowly, but in the coming 12 months he hopes he can replace the main lines and make 70 new connections. With EAC's help Mr. Lim Sokun wrote a business plan, but cannot guarantee what's in it so he doesn't take it to banks for requesting loans.

Other technologies
He knows about other technologies, such as biomass gasification. He is not interested at all,

because he prefers to use the technology that he knows. That is much easier and he can do that himself.

Battery charging
Furthermore they charge about 60 batteries per day.

Charging tariffs:
100 Ah – 1,700 Riel
70 Ah – 1,500 Riel
50 Ah – 1,300 Riel
40 Ah – 1,000 Riel
6Volts – 500 Riel

Name:	Mrs. Bwon Kom Sou
Village:	Don Toh
Commune:	Tuorl Prey Kleng
District:	Steung Trang
Date:	24-10-2007

Mrs. Bwon Kom Sou has four children, 3 go to school, one is still too young.

She has 0.5 ha of land, 1.5 ha of soy and 3 ha of cashew.

She has a commercial rice mill:
She pays 1,500 R per 72kg bag to the customer, so that she kan keep the husk and other waste. The husk is sold as pig fodder for 100 Riel/kg and the waste as input for cake and wine for 900 Riel/kg.

They have a battery to power 1 lamp and a black & white TV. The 50 Ah battery lasts a week and it costs 900 Riel to charge it.
She also spends 500 Riel/week on kerosene for lighting.

She would be very interested in grid electricity.

Name:	Mr. Srey Meng (50)
Village:	Don Toh
Commune:	Tuorl Prey Kleng
District:	Steung Trang
Date:	24-10-2007

After hearing about solar technology on TV Mr. Srey Meng decided to buy a solar system. He contacted the Provincial Department of Industry, Energy and Mines (DIME) and they helped him to find Khmer Solar Company. He bought a system with an 85Wp panel and a 100Ah gel battery for $ 780. It is really convenient that he never has to go to charge his battery anymore, although the energy supply in the rainy season is not enough for watching TV. Mr. Srey Meng thinks with one more 85Wp panel he can meet his entire energy demand. Perhaps he can watch TV during daytime then, get a fan and connect a water pump to it.
Lightbulbs and other electrical items, such as antenna's have to bought from Mesorchrey town or Kampong Cham town.

There are 10 other people in the village with solar systems, but no technician for technical support. "If something break," says Mr. Srey Meng, "I will call DIME to assist me."

He and his family (his wife, 3 children and a grandson) have 2 ha of rice fields and 6 ha of cashew fields. Especially the cashew is profitable. Their harvest of 1 ton of cashew nuts can be sold for 800,000 Riel ($ 200). Both the rice and the cashew are sold to merchants who then sell the food to food processing factories.

Mr. Srey Meng has tried some businesses in electricity before. 20 years ago he has tried to supply electricity to some neighbouring houses, but it was difficult doing business during the Pol Pot time. Last year he ran a battery charging shop, but that gave too much work and too little profit, so he stopped that too. His neighbour is now running a battery charging shop, but is also planning to stop because of lack of profit.

If he would get technical support, he would be interested in starting a small grid. There are at least 50-60 households that can afford $ 5 per month and some of them can easily pay $ 10 too. He thinks that if he gets good support he would be willing to invest in such a grid.

Name: Mr. Uhn Ohn
Village: Chamkar Andoung
Commune: Chamkar Andoung
District: Chamkar Leu
24 October 2007

It is very busy in front of the small shop of Mr. Uhn Ohn. Apparently his neighbor is giving birth and everybody is anxiously waiting for the baby. Nevertheless he is very willing to share a few minutes to tell about his electricity use.

Behind the counter of his shop starts his house, where he lives with his wife and three children. They only run the shop and do not have land. One of the main things he sells is petrol and diesel, which he buys for 3,000 Riel/litre and sells for3,200 Riel/Litre.

He got connected last year and consumes aobut 5 – 6 kWh per month for two lights, a black & white TV and a radio.

Before he got connected he used a battery to power his lights and some candles. Nowadays expenses have gone up, because he still uses the battery as much as before. There is no battery charging in the village, so they make use of a collect and return service from the battery charger in Rum Long village, which is 7km away and in Kampong Thom province. Charging his two 100Ah battery cost 1300R.

He lets us make some pictures of his house and then we decide to give him time to join the excited crowd.

Name: Mr. Teok Hong
Village: Chamkar Andoung
Commune: Chamkar Andoung
District: Chamkar Leu
Date: 24-10-2007

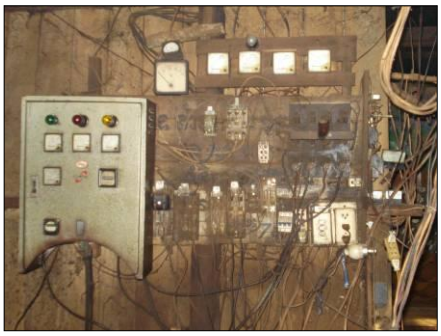
When Mr. Teok Hong was young he was operating a ferry until he borrowed his boat to someone that never returned. With the help of his nephew he started a village grid in Bosknor village in 1997, but in 2004 he sold it to the same nephew.

He moved to Chamkar Andoung to start the same type of business. He invested $ 10,000 to start a grid for 60 households and one year later he extended it to another 40 households.
He chose this village because there is a customer base that can afford the electricity, while it was not there. The village chief of Chamkar Andoung even insisted that he start a grid there.

Consumption:
30 litre diesel/day
3,200 Riel/litre

Tariff:
3,000 R/kWh

Avg. use:
5kWh = 15,000 Riel



For the grid he bought 3 second hand generators in Phnom Penh and he produces 20 – 30 kW, but runs it only 5 hours a day (from 6pm to 11 pm). He has experimented with a 24 hour supply, but it appeared not profitable.

The main line of the grid is 2km long. The potential growth for his grid is 4km and 300 households. To serve so many customers he need a 50kW engine.

The business is run by himself and his two children. His son helps with the accounting and administration, his daughter collects the money from the customers.

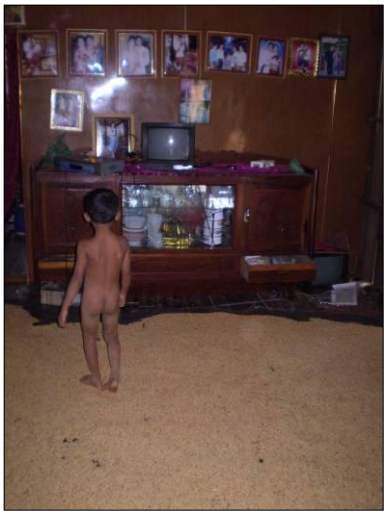
The nice thing about starting this new grid is that he learned from the previous grid and could now invest in a system that has no technical problems. It generates 3-phase electricity at 220V.

Because diesel is getting expensive, he would like to have a biomass gasifier. However that would be a too big investment. That is a pity, because in this area there is a lot of biomass potential like corn, cocos, rubber, cashew nuts and peanuts.

To serve his customers he tried to sell lamps, but the customers preferred the lamps from the a specialist shop in the bigger town Chamkar Leu.

Name: Mrs. Srun Lun Eng
Village: Khma Pun
Commune: Khma Pun
District: Prey Chhor
Date: 25-10-2007

While her husband is working at his banana, soy and corn plantations, Mrs. Srun Lun Eng is working around the house. She takes care of 3 children, her grandson and two son-in-laws, all living under the same roof. Besides the 3 ha they own, they also rent for the price of $ 500 2 ha extra for soy farming. The soy is sold in bags of 110 kg for 165,000 Riel and they harvest 3 to 4 ton of soy per harvest. The merchant who buys the soy sells it in Vietnam or China, MRs. Srun Lun Eng is not very sure.



Three years ago they got connected to the village electricity grid which was of great comfort to them. Electricity is however still expensive and did not reduce any costs in kerosene and battery. The grid is working only five hours a day and they only use it for 1 lamp and their colour TV and they consume about 2.5 kWh per 14 days at a rate of 3,200 Riel/kWh. For the rest of the time they use kerosene lanterns and a battery. The battery can be used for 4-5 days on one charge of 2,500 Riel.

Mrs. Srun Lun Eng is not very eager to receive electricity for more hours per day. “It would increase our bill, while we are trying to save some money to buy more land,” she says.

Name: Mrs. Thon Chim
Village: Khma Pun
Commune: Khma Pun
District: Prey Chhor
Date: 25-10-2007

When we enter the house of Mrs. Thon Chim she is very busy making rice cakes with chicken and black pepper to sell on the market. She sells different kind of dishes on the market and it makes some extra income to the farming activities of her husband. The have three children at home and one out of the house. Two of the children help in the food sales business and the third is truck driver. The husband has a 2ha banana farm, where they can harvest every two weeks. At the moment business is not so good due to insect plague in the bananas.

The family was one of the first with an electricity grid-connection ten years ago. They run 2 lamps, a color TV and a fan. It consumes 2-3 kWh /2 weeks and it costs between 7,000-9,000 Riel.

Electricity from the grid comes only 5 hours and is really expensive. For this price Mrs. Thon Chim is not interested in more hours. It can easily be substituted with more hours of battery use, kerosene lamps and flashlights.

Costs per two weeks
Grid:
2-3 kWh = 7,000 – 9,000 R

Battery:
100Ah = 1,500 R

Kerosene:
0.5 l = 1,500 R

AA batteries for flashlight:
2 batteries = 1,000 R

Name:	Mr. Oung Kimsien
Village:	Khma Pun
Commune:	Khma Pun
District:	Prey Chhor
Date:	25-10-2007

Because his profession as a teacher is not generating enough money Mr. Oung Kimsien has a banana plantation and in 1996 he started a village grid. He did not have any knowledge about it, but just learned-by-doing. His first generator consisted of an engine from an iron-buffalo with a small dynamo. It produced 5 kW which he distributed to 70 households. It was a tough start, because the generator was often broken and at the end of the line there was too little voltage left. He knew a bit about electricity from school and he got a lot of assistance from his brother-in-law in Phnom Penh. Mr. Oung Kimsien also profited a lot from the great assistance he got from the provincial department of energy (DIME).

In May 2002 he bought a second hand 40kVA Perkins generator for $4,300 which works perfectly. It has broken down only 2 times since he bought it. In 2004 he replaced the main wires for bigger ones and now the grid works much better than at the start.

He now distributes 220V 3-phase electricity to 206 customers, who are mainly farming households. They consume on average 6 kWh per 2 weeks for 3,200 Riel/kWh. Then his wife collects the money by going around on her bicycle. With the two of them they do the administration and accounting.

Mr. Oung Kimsien provides only 5 hours of power at night, from 6pm-11pm. “The only time during the day that customers need electricity is in the weekends to watch Thai Boxing, so in the weekends I run from midday to 11pm.”

If someone wants to start a business like his, he would advice to start with a big investment to meet the EAC-standards. In the end it will save you money on troubleshooting.

Although there are no seasonal differences in income in this area, sometimes people cannot pay. Often it is a matter of wrong priorities, so then you have to be strict to the customers. “When someone has serious short-term problems, we sometimes let them pay the next month.”

Mr. Oung Kimsien tells that his main worry is the fuel consumption. He has big losses and especially with the rising diesel prices it is getting quite expensive. He would like to have technical assistance to see how he can reduce the consumption of the engine.

He also heard about biomass gasification, but with his technical knowledge it is useless to buy a gasifier. He thinks it would cost about $ 10,000.

Firstly, he wants to replace his 2km of main line for the standardised cables. It costs $ 30,000 to hire a company

to do that (including the concrete poles). He expects to do that before Khmer New Year in April. Then he will ask DIME to assist him in getting a license from EAC.
After that he want to buy a second hand Japanese 100 kVA generator for $ 16,000.

When I ask him for advice to the government planning, he suggests that the government provides more technical assistance and help entrepreneurs with accessing long term loans with acceptable interest rates. For example five year loans with 7.5% interest per year. My question whether 15% interest would be acceptable, he responds negatively.

Name: Mrs. Sok Kheng and Mr. Sok Chhin
Village: Baty District Town
Province: Takeo Province

Although Mrs. Sok Kheng is the manager on paper, in reality it is her son Mr. Sok Chhin who is running the electricity company in Baty District Town. Her husband and 5 employees do the technical work in the company.

In 2004 Mrs. Sok Kheng borrowed a 50kW Perkins generator to start an electricity grid for 40 customers. They gradually expanded with 10 – 20 new customers every month. Baty District Town is quite big and has many potential customers, so growing is not very hard. When business was more safe they gave back the generator and bought a second hand generator themselves. It was a the same type of generator and cost $ 30,000. The money for that they got from selling land. All the investments were made with own money and money they borrowed from family members.

Technically they have some challenges, such as voltage drop over long lines and the energy losses, which is now about 20%. They would like to have an expert for a day to help them reduce those losses.

They now have over 500 customers, which have different tariffs. The fees are collected by going around on a bicycle, but Mr. Sok Chhin is installing a billing system. For continued expansion Mr. Sok Chhin wants to buy a license for adjecent areas as well.

Government: 1,500 Riel/kWh
Telecom antenna: 2,000 Riel/kWh
Other companies: 2,500

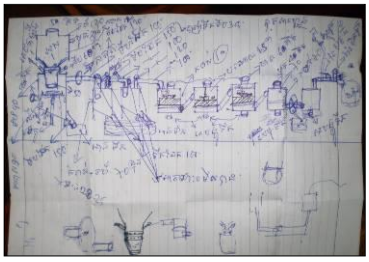
Because there is little biomass around, they do not consider biomass gasification as a serious option for their business.

Name: Mr. Srey Sokhom
Village: Samrong Yong town
Province: Khum Trapaing Sab,
Baty district, Takeo Province

Mr. Srey Sokhom and his son Mr. Prey Sok Cheat run an electricity company as well as water supply company. The electricity company was started in 1994 with 80 customers and was expanded in phases: after the first expansion phase they had 280 customers, the second expansion resulted in 500 customers and recently they reached 700 customers. For the near future big expansions are planned as well: they want to go to 1,500 customers next year and contacted EAC for the licenses of 4 other villages, with a combined customer base of 1,100.

Next year the distance will reach 4 km from the 4 90kW generators. During the day there is only one generator running, at night two or three. From 11pm to 4 am there is no power. The 3-phase power that is generated has 380V. Technically running the business is a big challenge, the energy losses are big, diesel is expensive and on the end of the lines there is too much voltage drop. To reduce the voltage drop, Mr. Srey Sokhom has put one extra generator on the other side of town. If they could hire an expert for a day for sure it would be a technician to look at the generators and the cables.

Also the money collection is getting rather hard. Going around by bicycle to 700 customers is time consuming. Mr. Prey Sok Cheat wants to follow a course in using Microsoft Access for administration purposes. Although he has graduated in a B.Sc. in 2005 at the moment it would still be too difficult to do the administration by computer without the course.



Mr. Srey Sokhom has visited the biomass gasifier of Mr. Khun Sambo and together with a partner in Sihanoukville they are building similar gasifiers. It is a challenge, because at the site of Mr. Khun Sambo they were allowed to look, but for advice they have to pay. So after looking around they draw the system and are now welding their own. Mr. Srey Sokhom expects that building one himself needs an investment of $ 5,000 instead of buying one for $ 15,000. The plan is to ask villagers to grow trees as input for the gasifier and to use rice waste as well.