

# Lao Institute for Renewable Energy



ETC-LIRE Pico-hydropower  
Innovation and Capacity  
Building Programme

## Final Report Pico-hydropower Innovation and Capacity Building Programme

## Final Report Phase I

Thongsanti B. Vongsaly, Sopha  
Soulineyadeth and Mattijs Smits

Vientiane Capital

April 2009

Lao Institute for Renewable Energy

**LIRE**

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**REPORT # 1**

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**Final Report Pico-hydropower Innovation  
and Capacity Building Programme**

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## About us

LIRE is a non-profit organisation dedicated to the sustainable development of a self sufficient renewable energy sector in the Lao PDR. The institute offers agronomical, technological and socio-economic research services, and works to provide a free public resource of information and advice on the use of renewable energy technologies in Laos. LIRE strives to support the development of the country by exploring commercially viable means to establish renewable energy technologies in rural parts of the country, in areas without connection to the national grid and with little access to technical expertise.

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## 1 Introduction

This report summarises the efforts of LIRE in the First Phase of the Pico-hydropower Innovation and Capacity Building Programme. The report is split up in two main sections, a narrative report and a financial report. For more details into the programme, we would like to refer to the list of deliverables in Appendix II, many of which can be found on the LIRE website as well<sup>1</sup>.

## 2 Narrative Report

### 2.1 Project objectives

The first phase of the project aimed to build the institutional capacity of LIRE to engage in participatory innovation development for renewable energy technologies. Therefore, LIRE was the implementing partner for this project.

This learning-by-doing process was applied to learn lessons on how to 1) upscale the use of pico hydro and how to improve the 2) safety, quality and 3) efficiency and reliability of pico-hydropower technology in a target province in Laos. In the inception phase two distinct but interrelated projects were carried out.

### 2.2 People involved in the project

#### 2.2.1 LIRE staff

- **Thongsanti Vongsali, Project Manager**  
Main tasks: Project planning, financial administration and management, report writing, liaison with ETC, liaison with the governmental counterparts, advocacy for ETC/LIRE towards external organisations
- **Sopha Soulineyadeth, Technical Officer**  
Main tasks: Information collection, field measurements, data entry and analysis, supporting report writing, liaison with French speaking organisations
- **Mattijs Smits, Technical Adviser (supported through PSO)**  
Main tasks: Advising on strategic planning and methodology of the project, supporting report writing and liaising with ETC, providing short course on pico-hydro for NUoL students, creating linkages between LIRE-ETC and other projects (within and outside LIRE)

#### 2.2.2 Other people involved

- **Dr. Khamphone Nanthavong, Associate Professor at the Faculty of Engineering, National University of Laos; advisor to the pico-hydro program**  
Main tasks: Participating in setting up the ETC-LIRE pico-hydropower innovation and capacity building project, participating in discussion and brain storming meetings, liaison for LIRE student project on hydropower and PV, strengthening of LIRE contacts with the Faculty of Engineering, liaise for LIRE and its projects on Faculty level and during government meetings,

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<sup>1</sup> [www.lao-ire.org](http://www.lao-ire.org) → downloads

and providing capacity and resources for LIRE's research activities, specifically on pico-hydropower, (improved) cook stoves and PV solar.

- **Matthew Jordan, consultant specialised in user interactions (contributions almost entirely pro bono)**

Main tasks: developing the concept ranking methodology, advising on project strategy and methodology, supporting report writing, input on development of user manual

- **Teng Lee, student Electrical Engineering, Faculty of Engineering, National University of Laos**

Main tasks: taking measurements, analysing the technical installation of pico-hydropower and assisting the interviews with end-users

- **Jonathan Weitzel, internship student, Renewable Energy engineering, University of New South Wales, Australia**

Main tasks: Providing input on technical aspect pico-hydropower installation and functioning, taking measurements

### 2.2.3 ETC/EASE contact persons

- **René Magermans**

Direct contact person from October to December 2009

- **Tamara Flink**

Direct contact person from February to April (and beyond)

- **Frank van der Vleuten**

Official contractual contact person Pico-hydropower Innovation and Capacity Building Programme

## 2.3 List of activities

### 2.3.1 Activity 1: Participatory engineering

Objective: To identify the innovations in current pico-hydropower use related to upscaling, and improving quality, safety and efficiency and reliability of actual use of pico-hydropower technology in the field. LIRE used a participatory approach to study innovation development and as such worked on its own institutional capacity to implement participatory approaches. Specific focus was on those innovations that could be scaled up during the next activity.

#### Activities

- Starting up the pico-hydropower program to learn from local actors (local authorities concerned, importers/traders, shop owners, technicians and end users).
- Recruiting staff: project manager and technical staff member
- Involving students from the National University of Laos, Faculty of Engineering
- Identify bottlenecks by using participatory approaches during field trips (2) to Xieng Khouang and Luang Prabang Province, 'testing' different concepts with end-users and shopkeepers
- Build pico hydro expertise and institutional capacity within LIRE
- Provide inputs and ideas for the second activity

### 2.3.2 Activity 2: Expanding and strengthening entrepreneurship in the pico-hydro supply chain

Objective: To cooperate with entrepreneurs currently active in the pico-hydropower supply chain and promote innovations related to 1) upscaling and improving the 2) quality and safety and 3) efficiency and reliability for the end user. Additionally, once the main ideas for scaling up were identified, new market opportunities were explored through workshops with existing market players in the sector.

#### *Activities:*

- Finding existing pico-hydropower entrepreneurs and end-users (partly covered in activity 1)
- Defining additional entrepreneurial innovative activities related to 1) upscaling and improving 2) quality and safety and 3) efficiency and reliability of use of pico hydro in the pico-hydro supply chain
- Preparing and executing workshops for entrepreneurs and government staff to verify the information and obtain recommendations: one at provincial level (Xieng Khouang), one at district level (Kham district).
- Developing potential support schemes and activity plan for further support of pico-hydropower in Laos

### 2.3.3 Field trips

#### *Introduction and information collection trip in Xieng Khouang province*

Date: 28 December 2008 to 2 January 2009

Participants: Thongsanti, Sopha, Matthew, Teng Lee, Mattijs

#### *Activities:*

- Familiarise new LIRE-EASE team with pico-hydropower in Laos
- Collect information on market, installation, use and bottlenecks of pico-hydropower
- Test concept ranking methodology in the field
- Targeted (full interview): 9 end-users, 5 non-users, 6 shop owners

Output: Report "Pico-hydropower in Xiengkhuang Province" (see deliverable #2)

#### *Concept ranking and validation trip to Luang Prabang province*

Date: 18 to 24 January 2009

Participants: Thongsanti, Sopha, Matthew, Jonathan and Mattijs

#### *Activities:*

- Familiarise with pico-hydropower in a different province and different geographical circumstances
- Carry out improved concept ranking methodology for shopkeepers and end-users
- Visit shops providing additional services (welders)
- Verify and extent data collection from Xieng Khouang province

- Targeted (full interview): 9 end-users, 9 non-users, 9 shop owners, 5 village overviews

Output: Report "Pico-hydropower in Luang Prabang Province" (see deliverable #3)

*Workshop on findings and input from low-key stakeholders in Xieng Khouang province*

Date: 24 to 27 of February 2009

Participants: Thongsanti, Sopha

Activities:

- Present findings and creating support amongst stakeholders at provincial level and Kham district
- Discussion on proposed follow-up steps in the project and ranking
- Initial feedback on practical implementation of some suggested follow-up ideas
- Targeted (workshop participants):
  - Provincial level: 3 shop owners, 3 government representatives and 1 NGO (Helvetas)
  - District level: 4 shop owners, 6 government representatives

Output: Workshops in Xieng Khuang Province (see deliverable #4)

*ETC reconnaissance and photography trip to Xieng Khouang*

Date: 24 to 28 of March, 2009

Participants: Thongsanti, Sopha, Mattijs, Tamara (EASE) and Taku Mori (freelance photographer)

Activities:

- Introduce new EASE contact person to hydropower in the province: from the Sunlabob-Helvetas hybrid village grid (hydro, solar, diesel), to community-based pico-hydropower (World Bank) to market-driven household pico-hydropower
- Show the project results of the pico-hydropower programme and discuss the ideas for the next phase on the spot
- Creating actor profiles of stakeholder involved in the pico-hydropower supply chain
- Have professional pictures taken of the various energy technologies and the supply chain of pico-hydropower in particular
- Targeted: provincial and district governmental offices, various shops at provincial and district level, 4 villages and its end-users and non-users

Outcome: Professional photographs, actor profiles, proposal and budget for the second phase of the project, other documents to finalise the project



## 2.4 Results

### 2.4.1 ACCESS

#### Output:

The project has started a programme to support shop keepers (hardware suppliers) of pico-hydropower to increase their sales and provide more and better service and information to their customers. In this first phase of the project, the main target was to identify the needs of the shop keepers and to come up with a plan of how to support them. The two field trips, to Xieng Khouang and Luang Prabang, were carried out for this purpose. To validate the ideas and plans that came up after these field trips, two workshops in Xieng Khouang Province were carried out. In total, **15 hardware shops** were targeted in this way.

Another ACCESS related component was related to the end-users. By identifying the main bottlenecks in the use of pico-hydropower for the end-users, a programme for technical advisors has been developed. Eventually, these technical advisors will provide advice on better use of the existing locations, using higher quality turbines and increase the current sharing practices. All three strategies will lead to more access of end-users and will enable pico-hydropower to further extend amongst poor families in the North of Laos.

#### Outcome:

The outcome of the project has been limited in terms of sheer numbers, since the main objective was to develop a programme to implement in the second phase. However, shop keepers have been targeted and have shown interest in contributing to the goals of the project. This in itself will have an effect on the existing market for pico-hydropower in the target provinces. The number of households interviewed and confronted with the concepts for improvement of pico-hydro are 18, resulting in 108 people (6 per household). Moreover, the impact of the current activities related to the shop owners is estimated to be 10 households per shopkeeper, reaching 900 people in total (15 shop owners and 6 people/hh). The total outreach of the first phase of the project has thus been estimated at **approximately 1000 people**.

#### Sustainability and gender balance:

The project will prove to be sustainable, because it is building on an existing supply and demand. No subsidies were given nor envisioned to be provided in the Second Phase of the project. The gender balance has been taken into account while conducting questionnaires and executing the workshops. In general, most shops are run by a husband and wife, sharing equally in the work load. When it comes to electricity use, it's mostly the women who benefit from electricity from light during cooking hours. Entertainment, watching television or listening to music, is often a shared benefit, not just within the household but also outside. As such, it is an important social function as well.

#### Risk and mitigation:

The main risk to pico-hydropower uptake is grid expansion. Because this does not result in less access to energy, this risk can be mitigated by focusing on areas with limited or no grid expansion plans. In addition, villages more than a couple of kilometre away from main roads are unlikely to be electrified and will thus still benefit from pico-hydropower. Moreover, by focusing on quality and safety of pico-hydro, the gap between the comfort of the grid and pico-hydropower can be reduced.

### 2.4.2 CONTROL

#### **Output:**

A lot of aspects of the project relate to improved access as well as improved control. Specific output of control is the development of a manual for end-users and the introduction of load controllers into the market. Training for shopkeepers on customer support and correct and safe instalment, including the use of switchboards and electricity plugs, will also contribute to increased access. In this phase, the numbers for ACCESS and CONTROL are not separated and thus both amount to **15 shop owners** for this first phase.

#### **Outcome:**

The main outcome in terms of control is finding out the needs of end-users and shopkeepers and trying ways to get both groups involved in improving the quality and safety of pico-hydropower. The shopkeepers were also involved in two workshops to get their opinion and support for the project.

End-users satisfaction is an important issues of pico-hydropower usage in Laos. In general, people are happy with this cheap and often only available source of electricity, but the usage is labour intensive and can be frustrating because of broken parts or lights and devices. Again, by introducing more control over the technology, through manuals, load controllers and advice, the dissatisfaction is set to decrease, simultaneously making the technology more attractive to end-users.

#### **Sustainability and gender balance:**

Sustainability is largely covered under the ACCESS part. In terms of gender balance, it will be mostly the men who would benefit from increased control over pico-hydropower, because they are the ones checking and cleaning the turbines, which is a heavy and dangerous job.

#### **Risk and mitigation:**

The project has not given any subsidies and is not planning to do so in the second phase. Besides the already mentioned risk of grid extension, it might also be hard to change the existing market for two reasons. The first one is fact that the pico-hydropower sales have been going on for 15 to 20 years and not much has changed during that time. End-users and shopkeepers are used to the current quality and use of the turbines and might not be very open for new and complementary product. The mitigation measure is to win the trust of the shop owners by engaging them from the beginning in the project and by offering them support over an extended period of time. A second reason is the fact that many shops are owned by Chinese people, making the communication in Lao language difficult. The mitigation measure applied in this phase was to take a translator along.

### 2.4.3 SHARING

#### **Output:**

For this phase, the items to be shared are the toolkit, the report (four, including this final report) and the presentation made during the workshops. All these files can be found in the list of deliverables as well (Appendix II). In the next phase of the projects, there will be much more deliverables directly aimed at supporting market developers (shop keepers)

#### **Outcome:**

The outcome of the SHARING for this project is limited so far, given the short time frame. However, the reports are published on the website already and the project has been presented at several occasions (including a World Bank workshop on SMEs in rural electrification in Cambodia). The market developers themselves won't directly benefit from these achievements, but will from the resulting synergies created by linking up with other projects.

#### **Sustainability and gender balance:**

The sustainability of the SHARING aspect is guaranteed by focusing on the capacities of the shop keepers and improving those (mainly in the second phase though). Also, by promoting and institutionalising higher quality products, the existing market should be adapted sustainably. As mentioned before, the shopkeepers are well balanced when it comes to gender.

#### **Risk and mitigation:**

During the first phase of the project, not all deliverables have reached the end-users and the shopkeepers involved in pico-hydropower. We have mitigated this partly by making the report on the workshops available in Lao language so that at least the local government is updated on our progress. This report will also be translated and sent to them, as well as most parts of the proposal for the second phase, in exception to budget section.

## 2.5 Lessons learned

#### *Strengths:*

- The EASE team within LIRE is established and functioning well. Administrative tools have been put in place.
- Pico-hydropower is an established market-driven energy production activity, especially in the North of Laos. The market has a wide reach.
- The first phase of the project has unveiled some clear opportunities and strategic plan to achieve 1) upscaling and improving, 2) quality and safety, and 3) efficiency and reliability of use of pico hydro in the pico-hydro supply chain

#### *Weaknesses:*

- The quality and type of installations vary greatly from village to village and even within villages. To address all this diversity is difficult

- So far, not much access to energy have been achieved as the first phase was mainly focused on capacity building in LIRE, collecting information and developing plans for the second phase.

*Threats:*

- Grid expansion in some of the potential target areas makes pico-hydropower obsolete
- Some of the shopkeeper do not speak Lao language very well and are thus difficult to involve in capacity building or business development trajectories
- Lack of money or place to install pico-hydropower turbines limits the number of users
- The start of the project was delayed due to the need to recruit new staff members

*Opportunities:*

- Many districts will not have access to the main grid or only along the main roads
- Use of translators can target those shopkeepers who do not master the Lao language
- Use of higher quality turbines and installations and promotion of sharing will enable more users to benefit from pico-hydropower electricity at lower costs



## 3 Appendices

### 3.1 Appendix I: Testing questions

1. *How can the users be best involved to participate in the improvement of pico-hydropower safety, installation and use?*

The end-users are a key player in the pico-hydropower sector in the Lao PDR. Since there is virtually no support from the government or other organisation, the decision to invest and install pico-hydropower is entirely on the side of the end-users. All current adaptations and innovations have been introduced by end-users and the way to use and install the units has been spread by word of mouth. During the project, the team has visited many different villages and end-users. By taking them to the installation site and confronting them with potential solutions (some of which already in use by others), we have obtained valuable information on how to improve the current pico-hydropower users. The end-users should be involved by showing different ways of installation and better or additional products and let them spread those by word of mouth and copying. As many end-users are not educated on the use and dangers of electricity, awareness needs to be raised on those aspects. Unfortunately, end-users do not have strong influence on the type of turbines available at shops, because the quality differences are not easy to distinguish. Therefore, it is difficult to involve end-users to increase the quality without having support from the shopkeepers.

2. *What are the innovations within the pico-hydropower supply chain?*

For a detailed description, we would like to refer to deliverables 1 till 5. Following is a short overview:

- Extended shaft. One of the most important innovations is the extended shaft. This enables the end-users to install their units in a 'lying' position.
- Sharing units with several households. Most people share their unit with up to 5 other households. Usually, these people are related and do not pay for this. Instead, they often help with the maintenance. Sharing complicates the load controlling process and various solutions for this have been documented.
- Innovative civil works. The civil works consist of digging of canal, making a small weir, construction to support a 'standing' unit, a draft channel or a combination of these options. Most of the materials are locally available at zero or little costs to the end-user. Construction can take up to a few days and can be labour intensive to maintain. The different styles vary a lot between villages or even among individual installations.
- Extensive distribution network. Pico-hydropower units and related products (cables, light bulbs, switch boards) can be found in all district town visited for the project, usually in more than one shop. Shops buy their supplies from Vietnamese and Chinese traders, from larger shops at provincial level or directly across the border.
- Some 'branding' can be found amongst different units. However, it is still unclear for many end-users which units to buy.

3. *How can these innovations be exploited by local entrepreneurs? What kinds of support does this require?*

- Entrepreneurs can be the point of information to disseminate good practices and safe and quality installations. At the moment, shop owners hardly provide any information and manuals (in Chinese) are scarcely available. If shop owners would get business development support and would be provided with information, they could catalyse the spread of innovations in the pico-hydro supply chain. Simultaneously, they could sell additional products when deemed trustworthy by their customers and by selling complementary products that lead to safer and easier use (switchboards, better cables, load controllers).
- At village and district levels, people could be trained to provide help in setting up appropriate and quality civil works, such as been observed in some villages. For example, good draft channels/tubes and safe in-house installations can be part of small entrepreneurial activity as people would be willing to pay for more stable and additional electricity. In order to support this kind of development, trainers can be trained to actively disseminate these good practices and instruct people on how to improve their existing installations.

4. *Which tools and capacity building within LIRE are needed to facilitate supported pico-hydropower entrepreneurs?*

Over the past 6 months, LIRE has developed general capacity to run an EASE project and defined further capacity needs, linked to the second phase of the project. The base, project manager, technical staff and the necessary administrative tools, are in place, but more capacity will be needed in order to 1) provide training and support to shop owners and 2) to train technical advisors that can go out in villages. Besides the capacity to develop materials, it is also necessary to equip the LIRE EASE staff with more understanding of pico- en micro-hydropower installations, implementation models and operational models. A visit to Vietnam, to one of LIRE's partners, would be great to get this knowledge. Simultaneously, this trip can be used to visit the market in Hanoi and chase down Vietnamese traders. As the project gets bigger and LIRE might run more EASE projects, there will be a need for training of the project manager on topics, such as planning, human resource management, business development support, and other management skills. Moreover, the project will need additional staff to accommodate additional projects and expand the current one. The current project has been supported by someone from the Youth Zone program of PSO, who will not be there in the second phase of the project. Although there is some capacity now within LIRE to carry out the project, the team will need internal and external support to stay sharp and share the workload. Therefore, care has to be taken that there is enough interaction with the EASE team in the Netherlands. Another way to ensure enough support and 'fresh' ideas would be to find support for interns or, better, another PSO staff member.

5. *How can the experiences of the LIRE and ETC MFS Energy Access Programme be used for further work in 2009 and 2010?*

The first EASE project within LIRE was a great opportunity for LIRE to get familiar with the EASE way of working and to build capacity to support market-based energy solutions for the poor in developing countries. Apart from the EASE partner meeting in Tanzania, not much knowledge exchange has been going on. This should change in 2009 and 2010, when LIRE can share its information and methodologies within the network and give well-founded ideas and suggestions for adaptations of the EASE program. Support for or introduction of pico-hydropower as appropriate renewable energy technology for the poor seems worthwhile to try in other countries with hilly/mountainous terrain.

## 3.2 Appendix II: List of deliverables

#	Original list of deliverables	Deliverable name:	Type of document:	To be shared (yes/no):
1	LIRE pico-hydropower publication	1. Technography of pico-hydropower in the Lao PDR	Overview report	Yes
2	Participatory innovation development method	2A. Progress report Pico-hydropower innovation and capacity building programme	Progress report	Yes
		2B. Pico-hydropower in Xiengkhuang Province	Field trip report + recommendations	Yes
3	Report and evaluation project 1	3. Pico-hydropower in Luang Prabang Province	Field trip report + recommendations	Yes
4	Pico-hydropower publication and preliminary evaluation	4. Workshops in Xieng Khuang Province	Work shop report + recommendations and planning	Yes
5	ETC pico-hydropower toolbox	5. ETC pico-hydropower toolkit	Toolkit	Yes
6	Recommendation for go-no go decision after 6 months + follow-up plan and budget	6A. Second phase pico project proposal 6B. Second phase pico project budget (excel)	Proposal and budget	No
7	Input to monitoring protocol	7. Monitoring protocol pico-hydropower project	Monitoring protocol	Yes



### 3.3 Appendix III: Monitoring protocol

<b>Energy Access Programme (ETC-MFS) 2007 - 2010</b> <b>EASE components Monitoring Protocol</b> <b>Version: improvements 2008 v2.</b>		
<b>Pico-hydropower Innovation and Capacity Building Program Phase 1</b> Lao Institute for Renewable Energy (LIRE) 20 October 2008 – 20 April 2009		
General remark: where no baselines (or approaches for acquiring the proper baseline) have been indicated, the baseline is '0'		
<b>Goal:</b>	<b>Contributing to Poverty Reduction by providing Energy Access for the Poor</b>	
<b>Added value:</b>	EASE	1. Support given to the development of local markets for energy access products through market developers (NGOs, companies, local government...) Focus on expanding the existing market of pico-hydropower supply and demand, through knowledge sharing and local capacity building
		2. Developed mechanisms in local energy markets that give the customers control over their energy access Focus on improving the safety and quality of pico-hydropower, through knowledge sharing, introduction of better quality and complementary products and local capacity building
		3. Shared market development toolkits to promote learning and replication between markets and their developers. Sharing of information through EASE toolkit and network and LIRE network, both regionally and worldwide where appropriate



Strategy 1:	EASE ACCESS - Building local markets for energy access		
	Indicators	Targets 2010	Source of Verification
<b>Output:</b>	Number of supported - Market developers - Rural (Energy Access) suppliers - technicians per country <i>Hardware shops selling pico-hydro, welders providing supporting services</i>	Per country - 5 Market developers - 50 rural suppliers - 100 technicians  <i>Hardware shops: 15 Welders: 2</i>	Project reporting, reporting from field visits  <i>Deliverables:</i> <ul style="list-style-type: none"> <li>Progress report Pico-hydropower innovation and capacity building programme</li> <li>Pico-hydropower in Xiengkhuang Province</li> <li>Pico-hydropower in Luang Prabang Province</li> </ul>
<b>Outcome:</b>	Increase in number of people in poor households acquiring modern energy products. - <i>Number of interviewed households, affected by shop owners</i>	Per country: - 50,000 people for household, social and productive uses <i>(baseline to be established before the start of each project)</i> <i>People reached: 108 (18 hh * 6 people/hh) + 450 (15 shops * 30 people) = 558 people</i>	Sales information and/or client lists from supported suppliers, specified in household, productive and social use.  <i>Deliverables: idem</i>
<b>Sustainability:</b>	Dependence of energy access suppliers on short term subsidies for survival <i>(target 2010: 0)</i> <i>No subsidies given</i>		
<b>Gender balance:</b>	Percentage of women among energy access suppliers and technicians <i>(target 2010 40% for suppliers resp 30% for technicians)</i> <i>Most shopkeepers ran by man and woman, so 50%</i>		
<b>Risk:</b>	Number of market developers and players losing interest and abandoning the market <i>Lost of interest because of grid expansion in some areas</i>		
<b>Risk Mitigation:</b>	Sufficient diversity and competition in market actors who maintain interest when others abandon the market <i>(target 2010: 100%)</i> Market actors are self-propelling in the market <i>(target 2010: 100%)</i> <i>Focusing on many areas without grid expansion. Focus on more access in villages, by sharing and reducing cost of repairing and</i>		



	replacement
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<b>Strategy 2:</b>	<b>EASE CONTROL - Beneficiaries have control over their energy access to ensure 10year sustainability</b>		
	<b>Indicators</b>	<b>Targets 2010</b>	<b>Source of Verification</b>
<b>Output:</b>	Number of supported rural suppliers, trained and coached on customer management Hardware shops selling pico-hydro, welders providing supporting services	50 per country  7 (joining workshops)	Project reporting, reporting from field visits  Deliverable: • Workshops in Xieng Khuang Province
<b>Outcome:</b>	End-user satisfaction  Improve satisfaction due to maintenance and electricity output	80 percent ( <i>baseline to be established during inception of projects</i> ) Not established yet	Sample surveys, focus group feedback, complaint handling on market level -
<b>Sustainability:</b>	Number of rural suppliers who include targets and measurement of customer satisfaction in their normal business practice ( <i>target 2010: 50%</i> ) None up till now. To be included in the next phase of the project (through workshops)		
<b>Gender balance:</b>	Percentage of end-user satisfaction measurements taking into account both male and female end-users ( <i>target 2010: 100%</i> ) Idem		
<b>Risk:</b>	1. Other energy projects with conflicting approaches reduce opportunities for end-user control (e.g. using heavy subsidies in promotion of similar products obscure buying decision making process of end-users) No other projects on pico-hydropower yet. Threat of grid extension only. 2. Rural suppliers do not take up role in managing customer satisfaction No experience so far		
<b>Risk Mitigation:</b>	1. Promotion to these projects of end-user control as core value ( <i>target 2010: 100%</i> ) To be included in the next phase of the project (through workshops) 2. Mobilise local facilitators in role of managing customer satisfaction (e.g. CBOs, local government, ..) ( <i>target 2010: 100% of markets where suppliers do not take up this role</i> ) Local government already involved in the project and willing to take more responsibility		





<b>Strategy 3:</b>	<b>EASE SHARING - Practical and applicable knowledge base developed and shared</b>		
	<b>Indicators</b>	<b>Targets 2010</b>	<b>Source of Verification</b>
<b>Output:</b>	Number of market development toolkits developed and shared  EASE pico-hydro toolkit	1 per market developer (including end-user profile, product description, micro-franchise packages, lessons learned)  Pico-hydro toolkit under development	EASE toolkits available at ETC  Toolkit will be sent
<b>Outcome:</b>	Number of market developers that acquire the EASE toolkits	500 market developers worldwide	Sharing statistics on EASE toolkits; download-webstatistics;
<b>Sustainability:</b>	Number of (elements of) EASE toolkits embedded in external energy projects or promoted commercially in an expanding franchising operation ( <i>target 2010: 50% of market development projects and businesses in countries of operation</i> )		
<b>Gender balance:</b>	Toolkits make specific reference to gender issues ( <i>target 2010: 100%</i> ) Tools developed in the next phase will take gender balance into account		
<b>Risk:</b>	Target actors cannot access and apply toolkits Relevant parts of the toolkit will be spread through informational workshops, technical advisers and a manual		
<b>Risk Mitigation:</b>	Developed appropriate presentation forms ( <i>target 2010: 100% has been tested and improved to have appropriate form</i> ) Toolkits promoted through National Advisory Boards ( <i>target 2010: 100%</i> ) In the process of developing a manual and business development support tools fitted for the local context		