

The background of the slide is a photograph of a natural landscape. It shows a wide, calm body of water in the foreground, reflecting the sky and the surrounding greenery. The middle ground is dominated by a dense forest of tall, thin trees with lush green foliage, situated on a slightly elevated bank. In the far distance, blue-toned mountains are visible under a clear, bright blue sky. The overall scene is peaceful and scenic.

Context Study Review Lao PDR

By Assoc. Prof. Korakanh NUOL

Energy Resources

- Laos lacks of conventional energy resources such as oil, natural gas
- But Laos is abundant of several renewable energy:
 - Biomass
 - Hydropower
 - Solar Energy
 - Wind

Energy Consumption

- In 2002 **Electricity** generation was 3,804 GWh, of which 2,798 GWh (~74%) exported to Thailand
- **Petroleum** mainly used in transportation but for electricity generation is very low
- **Wood fuel** remains the most important and annual consumption is about 0.67 m³ per capita

(Source: Department of electricity, DOE).

| Type of Energy | (%) |
|------------------------|-------|
| Coal | 9.26 |
| Electricity | 8.46 |
| Petroleum | 15.56 |
| Gas | 0.21 |
| Biomass (Wood fuel) | 66.5 |

Big Hydropower

| Hydropower | Province | Kw | Year |
|---------------|------------|---------|-------------------|
| Namgnum | Vientiane | 150,000 | 1971- <u>1984</u> |
| Sexet | Saravanh | 45,000 | 1991 |
| Selabum | Champasack | 5,005 | 1970- <u>1994</u> |
| Theun-Hinboun | Khammouan | 210,000 | 1998 |
| Houayhor | Attopeu | 150,000 | 1999 |
| Namleuk | Xaisomboun | 60,000 | 2000 |

Total : 620,000Kw

Source: MIH statistic 2003

Small Hydropower by province

| Province | No of Dam | Kw | Remark |
|---------------|-----------|-----------------|----------------------|
| Oudomxai | 2 | 1,650 | |
| Luangprabang | 3 | 1,086 | |
| Phongsaly | 4 | 1,320 | 2dams are not in use |
| Luannamtha | 3 | 126 | 2dams are not in use |
| Houaphanh | 12 | 436 | 3dams are not in use |
| Xaiyabouri | 1 | 180 | |
| Xiankouang | 11 | 410 | 9dams are not in use |
| Savanaket | 1 | 75 | |
| Champasack | 1 | 40 | 1dam is not in use |
| Xaisomboun | 1 | 200 | 1dam is not in use |
| Total: | 39 | 5,375 Kw | |

Source: MIH statistic 2003

Diesel Engine Generator by Province

| Province | Quantity | Kw | Remark |
|------------------------|----------|-------|------------------|
| Vientiane Capital City | 1 | 8,000 | |
| Phongsaly | 12 | 420 | |
| Luangnamtha | 4 | 550 | 1 is not in use |
| Oudomxai | 3 | 300 | |
| Borkeo | 6 | 508 | 5 are not in use |
| Luangprabang | 9 | 1,931 | |
| Sayabouri | 9 | 1,380 | 1 is not in use |
| XiangKuang | 2 | 635 | |
| Vientiane | 2 | 505 | |
| Savanaket | 1 | 1,000 | |
| Saravanh | 3 | 5,50 | |
| Xekong | 1 | 400 | |
| Champasack | 1 | 240 | |
| Attopeu | 2 | 364 | |
| Xaisomboun | 2 | 230 | |

Total: 58 17,008 Kw

Solar Home System by province

| Province | No. of Village | Power (w) |
|------------------------|----------------|----------------|
| Vientiane | 29 | 46625 |
| Bolikhamsay | 6 | 10,400 |
| Saravanh | 8 | 12,168 |
| Sekong | 3 | 768 |
| Oudomxai | 7 | 6,450 |
| Luangnamtha | 12 | 1230 |
| Sayabouri | 4 | 5700 |
| Vientiane Capital City | 4 | 3800 |
| Savanaket | 7 | 12,150 |
| Xiengkhuang | 6 | 84,00 |
| Khammouan | 6 | 6900 |
| Champasack | 8 | 11,830 |
| Borkeo | 3 | 2,400 |
| Phongsaly | 4 | 2,400 |
| Houaphanh | 1 | 600 |
| Attopeu | 3 | 1800 |
| Total | 123 | 178,041 |

Source: MIH statistic 2003

Summary of Energy Generation

| No | Type of Electricity Generator | Power (kW) | % |
|----|-------------------------------|------------|--------|
| 1 | Big Hydropower | 620,004 | 96.48 |
| 2 | Small Hydropower | 5,375 | 0.84 |
| 3 | Diesel Engine | 17,008 | 2.65 |
| 4 | Solar Energy System | 178.04 | 0.03 |
| | Total | 642,565 | 100.00 |

Source: MIH statistic 2003

ESCOs Background

- About 6 ESCOs are running business on service of electricity in Lao PDR
- All 6 ESCOs are licensed under off grid division of MIH
- When a company signs agreement, it is called Electricity Service Company or Esco

ESCOs Background

- Over the next 4 years, the number of Esco is expected to grow up to 10 or 15
- From 195 to 1,249 customers (Families) per ESCO
- More than 4,000 customers (families) were using electricity. Another 1,700 had signed contracts and were waiting for equipment

1. Luang Namtha Electricity service

- Location: Luang Namtha Province
- No. of Village: 32 Villages
- Customers : 901 Families

2. Oudomxai Trainee Esco

- Location: Oudomxai Province
- No. of Village: 44 Villages
- Customers : 1,133 Families

3. Alek Electricity Co. & Bolikhamxai Electricity Co.

- Location: Sayabori Province
- No. of Village: 6 Villages
- Customers : 346 Families

4. Sengsavanh Off- Grid Service Co.

- Location: Vientiane Province
- No. of Village: 22 Villages
- Customers : 867 Families



5. Champasack Trainee Esco

- Location: Champasack Province
- No. of Village: 19 Villages
- Customers : 1,249 Families

6. Diamond Electricity Service Co

- Location: Xiengkhouan Province
- No. of Village: 2 Villages
- Customers : 195 Families

ESCO

| ESCO | Location | No. of Villages | No. of Customers |
|---|------------|-----------------|------------------|
| LuangNamtha Elect. Sevice | LuangNatha | 32 | 901 |
| Oudomxai trainee Esco | Oudomxai | 44 | 1,133 |
| Alek Elect. Co. & Bolikhamsay Elec. Co. | Sayabouri | 6 | 346 |
| Sengsavan off- Grid service Co. | Vientiane | 22 | 867 |
| Champasack Trainee Esco | Champasack | 19 | 1,249 |
| Diamond Elec. Service Co. | Xiankhouan | 2 | 195 |
| | | Total | 125 |
| | | | 4,691 |

Technology

Three types of technology are currently offered :

1. Solar Home Systems (SHS)
 2. Village Scale Hydro (VH)
 3. Engine-Generator set or Gen-Set (GS)
- Currently the Engine fuel is Diesel.
 - In the Future the bio diesel will be replaced.

SOLAR HOME SYSTEM

- A solar Kit Consists of:
 1. Solar array or Panel
 2. Frame for array
 3. Cable and Controller
 4. Ventilated wood box
- A House Kit
 1. Interior Cable
 2. 12V DC Switch and socket
 3. 12V DC Lamp
 4. 12V DC auto battery



VILLAGE SCALE HYDRO

- VHGS consists of :
 1. Turbine-Generators
 2. Pressure Pipe
 3. Cable, Switchgear
 4. Household intake boxes
- A House kit consists of:
 1. Switches and socket
 2. CFL lamps
 3. Fuse holders

Price for SHS

| Solar Panel Size | Installation fee Includes House kit price (Kip) | Payment for 5 years Kip/month | Payment for 10 years Kip/month |
|------------------|--|----------------------------------|-----------------------------------|
| 20w | 160,000 | 20,000 | 10,000 |
| 30w | 190,000 | 30,000 | 15,000 |
| 40w | 220,000 | 40,000 | 20,000 |
| 50w | 250,000 | 50,000 | 25,000 |

Price for VHGS

| VHGS | Installation fee Including House kit (kip) | Payment minimum Kip/month | Payment Maximum Kip/month |
|--|--|---------------------------------|---------------------------------|
| Two 7w CFL lamp | 150,000 | 12,000 | 16,000 |
| Ditto plus cassette-radio | 150,000 | 18,000 | 22,000 |
| Ditto plus 30w audio CD | 150,000 | 24,000 | 28,000 |
| Four 7w CFLs and 30w CD or B&W TV | 150,000 | 30,000 | 34,000 |
| Six 7w CFL, one 30w CD or 48w colour TV | 150,000 | 36,000 | 40,000 |
| One 7w CFL, one 48w colour TV, 30w satellite receiver | 150,000 | 42,000 | 46,000 |
| One 7w CFL, one 48w colour TV, one 50w VCD | 150,000 | 48,000 | 52,000 |
| One 7w CFL, one 48w colour TV, 30w satellite receiver | 150,000 | 54,000 | 58,000 |

ESCO technical Capacity

- About 85% of ESCO have finished High School and some of them were trained on the job training (one or two day training) organized by RED (Rural Electricity Division EDL)
- Experience on service is over 3 years
- They can all read and write in Lao, but very few of them can read and write in English.
- They all can not use computer.

ESCO technical Capacity

- Some have trained by RED in technical and management subject but for a very short time
- All of them prefer to have on the Job-training
- The training will help them improve their knowledge and best quality of service provided to customers

Training Institutions

- National University of Laos
- Lao –Germany Technical school
- Pakpasack Technical School
- Vientiane Technical School
- Training center of EDL
- Sunlabob Co.
- Technology Research Institute (TRI)
- Vientiane Vocational training School

Potential Students

- Staff from existing ESCO
- Graduates and higher diploma students of Departments of EE and ME who need to improve their practical work in REE equipment
- Student from technical schools
- Technical Staff from EDL
- Technical staff of NGO

Procedure

To start a new training course in Lao PDR, the following steps have to be performed:

- Context study (The need assessment of the course)
- Proposal writing with specific curriculum
- Submit the proposal to Department of Education in provincial level
- Approval by Department of Vocational school
- Approval by Ministry of Education
- The training course can be started

Thank you for your attention!

¢ ð ¢ ° ® ã ¥ !