

REDEO Project WORKSHOP

Bangkok, 30 June-1 July, 2005

Electrification in Vietnam

Present Situation

ENERGY - ECONOMIC INDICATORS

Indicators	1990	2002 (2003)
GDP (USD/capita)	114	407 (500)
Commercial Energy Consumption (KgOE/cap.)	63	208
Electricity Sale (KWh/cap.)	94	380 (435)
Energy Intensity (KgOE/1000 USD)	344	512
FEC Growth Rate (%/ann.)		10,1
Power Demand Growth (%/ann.)		13,9
Energy Elasticity		1,40
Electricity Elasticity		1,85



TYPE	NUMBER Of PPs	CAPACITY (MW)	%TOTAL
HYDRO	10	4,115	46.7
COAL	3	1,245	14.1
GAS&OIL	4	2,664	30.2
DIESEL	NA	122	1.4
IPP	10	672	6.8
TOTAL	27	8,817	100.00



CURRENT POWER PLANTS





TYPE	NUMBER Of PPs	GEN. (TWh)	%TOTAL
HYDRO	10	18,986	46.4
COAL	3	7,237	17.7
GAS&OIL	4	13,091	32.0
DIESEL	NA	47	0.1
IPP	9	1,564	3.8
TOTAL	27	40,925	100.00



ENERGY GENERATION (2003)



Power sales (MWh) in distribution companies



AREA	NUMBER Of PCs	SALES (MWh)	%TOTAL
NORTH	4	15.206	38.4
CENTRAL	1	3,953	10.1
SOUTH	3	20.43	51.5
TOTAL	7	39,596	100.00



Power load curve of the power system in period 1996-2004

- Generally, daily load curve changes by seasons
- Daily load curve in Vietnam currently has two peaks: daytime peak at around 11 am due to industrial demand and nighttime peak at 19 pm caused mainly by household use.
- Ratio between peak and off-peak (Pmin/Pmax) of the power system is approximately 50%.
- Nighttime peak exceeds daytime peak.
 However, difference between them tends to decrease due to the rapid growth of day peak.

Year	1996	1997	1998	1999	2000	2001	2002	2003	2004
(LF)	0.608	0.61	0.642	0.622	0.627	0.621	0.632	0.635	0.637





Power loss rate (%)



DISTRIBUTION

No.	Items	2002	2003
1	Medium voltage lines (km)	83,653	98,692
2	Low voltage lines (km)	70,686	85,980
3	Intermediary substations (MVA)	2,676	3,523
4	Distribution substations (MVA)	21,428	21,807

DISTRIBUTION

For historical reasons, the distribution system of Vietnam is still comprised of various voltage levels in both urban and rural areas and managed by the seven power companies and one single-share limited liability company under EVN.

With a view to improving the reliability of power supply to meet the increasing demand of customers for high quality power and to reduce overall system losses down to 10% by 2010, EVN continues to invest in expanding, upgrading and rehabilitating the distribution network across the country. According to the development plan, up to the year 2010, the distribution grid of EVN will be added with 282,714 km of the medium and low voltage lines and 19,010 MVA of distribution transformer capacity. The development of the distribution network in 2003 with comparison to 2002 is shown in Table:

Distribution network under the management of 8 distribution companies

Volume of management	PC1	PC2	PC3	PC Ha Noi	PC HCM	PC Hai phong	PC Dong Nai	PC Ltd. Ninh Bình	EVN
Medium voltage lines (km)	31,668	28,880	13,908	2,003	3,121	1,423	1,874	1,050	83,927
Low voltage lines (km)	21,619	12,896	5,498	4,200	6,672	667	1,501	276	53,329
Intermediary substations (MVA)	1,136	286	922	54	110	183	55	69	2,815
Distribution substations (MVA)	3,314	1,930	1,241	954	2,222	316	221	94	10,292

Under the close and continuing supervision and instruction of EVN, power distribution companies adopted a number of management methods in order to minimize losses as well as to enhance the quality of power supply and customer services.

RURAL ELECTRIFICATION

The continuous extension of national power grid to rural areas, particularly Northern mountainous provinces, Highlands and Mekong delta raises the rural electrification ratio of Vietnam higher than many other countries in the region and over the world.

By end of 2003, 511 out of 521 districts (or 97.7%) had access to the national power grid; 9 island districts and 1 mainland district had at site generation sources; 8339 out of 8999 communes (or 92.67%) were electrified, which increased by 258 communes compared to end of 2002, most of them were mountainous, remote areas, old bases of revolution and resistances; and 10,801,935 out of 12,934,090 rural households (or 83.52%) were connected to the national grid.

In 2003, EVN allocated VND 452.673 billion from basic depreciation fund to invest in rural electrification projects. The Rural Energy I project to which World bank provided a loan of USD 150 million has 668/902 communes electrified, the remainder is to be completed by 2004.

RURAL ELECTRIFICATION

The Rural Electrification in Southern Provinces which borrowed EURO 19 billion from AFD had 46/78 communes electrified, and the remaining communes would be energized by June 2004.

Due to various reasons e.g. procurement of goods and civil works, appreciation of EURO, the project saved a considerable amount of loan proceeds with which EVN determined to make more investment in additional 60 communes in Southern provinces, increasing the total communes of the project up to 138.

EVN has fulfilled the program for taking over and refunding investment cost of rural medium voltage network with the total cost refunded to localities up to VND 754,580 mill.

The number of communes that have applied retail tariff below or equal to the ceiling level of VND 700/kWh are 8,205/8,339 ones, representing 98,4% of the total electrified communes (328 communes higher than that of 2002). 48 out of 61 cities and provinces have tariff not higher than the ceiling in the whole country.

Rural Electrification Ratio



RURAL ELECTRIFICATION

By end of 2004, 525 out of 536 districts (or 97.9%) had access to the national power grid; 9 island districts and 1 mainland district had at site generation sources; 8524 out of 9008 communes (or 94.6%) were electrified, and 11.513mill out of 13.088 rural households (or 87.97%) were connected to the national grid. Power sales: 39.6 bill. kWh (1.994 Bill. USD)

Average: 5.036 US cent/kWh.

Growth rate: 13.71%

The loss rate is about 12.09%.

Planning in Vietnam

THE 5TH POWER MASTER PLAN

	2002	2005	2010	2020
SALES (TWh)	30.3	45.0	83.0	178.4
	35.8	53.0	93.0	201.4 GENERATION (TWh)
PEAK (MW)	6,500	9,405	15,740	32,553
	8,455	11,994	21,684	41,445 CAPACITY (MW)
500 KV	1,532 3,150	3,533 8,400	3,933 11,700	5,993 (Km) 20,900 (MVA)
<u>220 KV</u>	<mark>4,224</mark> 9,100	<mark>6,854</mark> 16,539	9,398 24,228	11,489 (Km) 46,416 (MVA)
110 KV	7,493 7,622	13,048 15,098	14,442 22,209	32,352 (Km) 46,082 (MVA)



Specific situation of the LaoCai province

Economic Situation

No	Sector	Share (%)					
NO		1995	2000	2003	2004		
1	Agriculture	52,6	44,5	37,54	35,6		
2	Industrial- Construction	17,3	21,5	23,21	24,8		
3	Service	30,1	34,0	39,25	39,6		

Current:

Average GDP growth rate in the period 2000-2005 is about 11.9% In2004, GDP growth rate is about 12.5%

Planning:

Average GDP growth rate in the period 2006-2010 is about: 11,5-12%;

Power grid Situation

Unit: MWh

Sector	2000	2001	2002	2003	2004	Growth rate (%) 2001-2004
Agriculture	48	7	158	163	140	30,62%
Industrial	60.214	65.307	73.041	76.611	92649	11,37%
Service	3.121	3.585	4.001	6.303	7646	25,11%
Household	37.074	40.462	45.499	52.008	58377	12,02%
Other	2.516	3.525	3.934	4.939	5513	21,67%
Sales	102.973	112.885	126.633	140.024	164.327	12,39%
Loss(%)	8,55	8,83	8,09	8,29	8,2	
Generation	112.600	123.818	137.780	152.681	178.229	
Pmax (MW)	28	30	34	37	42	

To the end of 2004, Laocai province have 100% of District, 120/164 communes (73,17%), and 60.708/112824 households (53.81 %) were supplied by Power grid.

Distribution grid Situation

Nama	Voltage	Cap.	Load	(KW)	
Name	(kV)	(KVA)	Pma x	Pmi	
TG Coc Leu – T1	35/10	4000	2950	1300	82%
T2	35/10	3200	1980	890	69%
TG Bao Thang	35/10	1800	900	390	59%
TG Bao Yen	35/10	1000	570	230	67%
TG Sa Pa – T1	35/10	1800	850	370	56%
T2	35/10	1000	510	218	60%
TGC3inh Duxen-	35/10	1000	650	250	76%
T1	35/6	1800	1 280	590	79%
T2	35/6	1800			Spare part
TG Mine No 1	35/6	4000			Customer
TG Khai truong	35/6	4000			Customer
TG Xi mang	35/6	4000			Customer
TG.Ngoi Phat	35/6	1000			Customer
Total		30400			

Distribution grid Situation

No		tupo	Length (km)			
INO	Lever	type	Power U.	Customer	Total	
I	Trans. line 35kV		688,6	17,4	706	
			688	17,4	705,4	
	Single circuit	AC- 95 70 50	632	17,4	649,4	
	Double circuit	AC-120	28,0		28,0	
	Cable	XLPE-120	0,6		0,6	
П	10kV		47,7	10,25	57,95	
1	W	AC-50	47,43	8,85	56,28	
2	Cable	XLPE-120	0,27	1,4	1,67	
Ш	10(22)kV	AC-50	3		3	
IV	6kV	AC-95, 70	18,58	9,58	28,16	
V	0,4kV	AV50, 70	579	280	859	

Planning Forecast

Unit: MWh

		2005		2010		Growth	
No	Sector	P max (KW)	A(MWh)	P max (KW)	A (MWh)	rate 2006- 2010	
1	Agriculture	330	225	601	448	14,76%	
2	Industrial	38.276	153.365	113.382	508.072	27,07%	
	Service	28.168	124.500	93.631	451.224		
3	Household	5.150	10.721	10.658	24.572	18,04%	
4	Other	28.174	65.531	41.790	105.341	9,96%	
5	Sales	5.050	9.089	9.594	19.436	16,42%	
	Loss(%)		238.932		657.869	22,45%	
	Generation		0,85		7,50		
	Pmax (MW)		240.980		711.209		
	Agriculture	56.042		151.321			

Planning Distribution grid

No	Name	unit	Capacity	Capital (Mill. VND)
I	Construction			
1	Trans. line 35kV	km	685	94.570,49
2	Trans. line 22kV	km	84	27.228,00
3	Trans. line 0,4kV	km	1.860	175.840,00
4	Sub TG 35/6kV	Mill/KVA	2 / 1.660	10.000,00
5	Sub 35/0,4kV	Mill/KVA	477 / 41.820	57.735,00
6	Sub 22/0,4kV	Mill/KVA	157 / 46.600	23.890,00
7	Sub. 22(10)/0,4kV	Mill/KVA	10 / 2.500	1.520,00
8	Meter	set	32.550	29.520,00
=	Upgrade			
1	Trans. line 10>22kV	km	18	2.160,00
2	Trans. Line 6>22kV	km	16	1.760,00
	Low voltage	km	200	13.000,00
3	Sub 10/0,4> 22/0,4kV	Tr/KVA	52 / 11295	6.040,00
4	Sub. 6/0,4> 22/0,4kV	Tr/KVA	17 / 3.990	2.100,00
	Total capital			445.363,49

Conclusion

Challenges of Rural Electrification in Vietnam

- Poor Quality of Power supply, especially in remote and mountainous areas.

- Reforming Rural Electrification & distribution grid institution in Vietnam.

- None – effective investment caused by Load curve in Rural areas is very "thin", especially in remote and mountainous areas

- The Rural Electrification in Vietnam is big burden of capital investment for Power Sector.

THANK YOU FOR YOUR ATTENTION



FINAL WORKSHOP ON

Rural Electrification Decentralized Energy Options (REDEO)

01 July 2005

AIT, Bangkok, THAILAND

Anousak PHONGSAVATH Deputy Chief, Rural Electrification Division (RED) Department of Electricity Ministry of Industry and Handicrafts

OUT LINE

- Country Background
- Objectives
- Status of Electrification in Lao PDR
- Power Sector Policy Priorities
- Policy Implementation Plan
- Target of Electrification
- Delivery Mechanisms Electrification
- Present Challenges: In Planning
- Comments on the REDEO model

Country Background

1. Country: Centrally located in GMR $Area = 236,800 \text{ km}^2$ Mountainous, land locked and tropical **18 Administrative Provinces 2. Population**: 5.6 million (2003) 80% in rural areas 2.2% annual pop. growth 3. Economy: Narrow base - resource exploitation GDP per capita of US\$ 380 (2003)

Objectives:

- Develop strategic planning for domestic electricity supply;
- Expand generation, transmission, distribution and off-grid development to increase the electrification ratio for the country;
- Poverty eradication, environmental sustainability; and
- Identify projects for grant and loan funding.

Status of Electrification in Lao PDR

In many years ago, Hydropower Generation has been expanded from 33 MW in 1975 to 662.4 MW in 2004, increasing 20 times and 5,000 households was accessed to electricity, but in 2004 has access to electricity by 44 % of households.

PRESENT FACILITIES



Off-Grid Electrified Villages




Solar Home System

(Off-Grid Project)



SHS is the most popular system for villagers, especially in the isolated areas.

Capacity: 20 – 50 Wp Use for lighting and TV

Rural Electrification Plan

GOL Electrification Target:

- Plan 2005 : 45%
- Plan 2010 : 70%
- Plan 2020: 90% (about 10% by Off-Grid)

On Grid EDL Electrified and Planning Villages



Electricity Statistics Consumption in Lao PDR

Year	Total		Accessed to Electricity						
	District	Village	НН	District	%	Village	%	НН	%
1995	136	11,456	754,265	45	33.1	879	7.7	110,229	15.0
1996	136	11,456	754,265	58	42.6	1,217	10.6	142,283	18.9
1997	141	11,456	754,265	82	58.2	1,545	13.5	196,998	26.1
1998	141	11,456	754,265	102	72.3	1,884	16.5	226,004	30.0
1999	141	11,058	768,142	109	77.3	2,507	22.7	254,610	33.1
2000	142	11,263	818,668	119	83.8	2,651	23.5	293.495	35.9
2001	142	11,231	866,277	116	81.7	2,811	25.0	303,690	35.1
2002	143	11,168	857,774	125	87.4	3,245	29.1	340,550	38.9
2003	143	10,866	883,355	128	89.5	3,776	34.8	379,109	42.9

Expanded of Medium Voltage, Low Voltage and Transformer in Lao PDR

Year	Length of Tr	Transformer No	
	22 kV, km	0.4 kV, km	
1996	2,748.6	2,347.9	2,073
1997	3,039.8	2,526.9	2,215
1998	4,013.0	3,353.8	2,724
1999	4,770.0	4,448.0	3,406
2000	5,516.5	5,110.5	4,013
2001	6,315.8	5,569.4	4,256
2002	7,333.8	6,459.3	4,889
2003	7,965.8	7,705.6	5,649

On Grid and Off Grid Rural Electrification Plan

- Northern Grid expansion (PTD) by Asian Development Bank.

- SPRE project expands to Southern part, loan from World Bank

- Estimated Plan for Off-Grid Project (WB)

Small and Micro-Hydropower Development

No.	Project Names	Inst. Capacity (kW)	Energy (Mill. kWh)
1	Nam Boune 2, Phongsaly Prov.	2,500	11.25
2	Nam Kai, Phongsaly Province	500	3.025
3	Tadsalen, Savannakhet Province	3,200	17
4	Nam Sim, Huaphan Province	3,000	12
	Total:	9,200	43.28

Power Sector Policy Priorities

Power Sector Policy Priorities

- 1. Maintain and expand an affordable, reliable and sustainable electricity supply in Lao PDR to promote economic and social development;
- 2. Promote power generation for export to provide revenues to meet GOL development objectives;
- **3.** Develop and enhance legal and regulatory framework to effectively direct and facilitate power development; and
- 4. Strengthen institutions and institutional structures to clarify responsibilities, strengthen commercial functions and streamline administration.

MAINTAIN AND EXPAND AFFORDABLE, RELIABLE ELECTRICITY SUPLY TO PROMOTE ECONOMIC AND SOCIAL DEVELOPMENT

- Expand and improve off grid supplies
- Increase energy self-sufficiency and security
- Implement power project for maximize long-term sustainability

DEVELOP AND ENHANCE THE LEGAL AND REGULATORY FRAMEWORK TO EFFECTIVELY DIRECT AND FACILITATE POWER SECTOR DEVELOPMENT

- Develop the legal framework for off grid development
- Review legislation governing the power sector
- Strengthen laws protecting the environment
- Develop legal framework to align with international investment practice

Strengthen institutions and structures to functions and streamline administration

 Create institutional arrangement to promote sustainable off grid electrification

Demand Forecast Development

- The national energy demand forecast has been developed utilizing the following basis:
 - MIH/EdL non-household energy development plan
 - MIH/EdL household energy development plan (ongrid and planned off-grid)
 - Additional household energy demand forecast to meet the 90% electrification target by the year 2020 (primarily off-grid)

Household Electrification Forecast

Additional Households to be electrified (beyond the present Edl electrification plan)

<u>Category</u>	<u>2000</u>	2005	2010	<u>2015</u>
Households	769,150	874,476	994,225	1,130,372
90% Electrification Plan	298,368	509,032	719,697	930,361
EdL/MIH Electrification Development Plan	273,478	358,139	447,471	447,471
Shortfall (to meet 90% target in 2020)	24,889	150,894	272,226	482,891

Household Electrification Forecast



Energy Demand Forecast

SUMMARY OF MIH/EdL DEVELOPMENT PLAN AND PSS DEMAND FORECAST

Item	2000	2005	2010	2015
Non-Household Energy (GWh /yr)	328	830	1,273	1,970
Household Energy (GWh/yr)	<u>319</u>	545	741	<u>958</u>
Total Energy (GWh/yr)	647	1,375	2,014	2,928
Additional Demand (GWh/yr) to meet the 90% goal by 2020	<u>3</u>	16	39	181
Total Demand Forecast (GWh/yr)	650	1,391	2,053	3,109

Energy Demand Forecast



Investment Requirements



Policy Implementation Plan

1. Maintain and expand an affordable, reliable and sustainable electricity supply in Lao PDR to promote economic and social development

Objective 1.1: Expand and improve Off Grid supplies

- Target key demand areas
- Strengthen Off Grid capacity within provinces
- Develop mechanisms for reliable Off Grid performance and expansion
- Mobilize financial resources for Off Grid activity
- Off Grid to complement other development priorities of localities

Objective 1.2: Increase energy selfsufficiency and security

- Reduce dependence on energy imports.
- Maintain secure domestic electricity supply.

Objective 1.3: Implement power projects to maximize long-term environmental sustainability

- Implement power projects in sympathy with environment and society
- Reduce use of carbon-based energy sources

3. Develop and enhance the legal and regulatory framework to effectively direct and facilitate power sector development

Objective 3.1: Review legislation governing the power sector(Off-Grid)

- Review and enhance legal framework as it relates to Off-Grid
- Introduce Regulations for Off-Grid legislation

Objective 3.3 Develop the legal and regulatory framework for Off Grid

- Examine Off-Grid components of Electricity Law and introduce Regulations
- Develop ownership and implementation modalities to encourage Off Grid expansion
- Adopt flexible pricing within the framework established by Regulations
- Introduce systematic and sufficient capital subsidy and tax incentives for Off Grid
- Prepare Regulations governing application of disbursements from Off Grid Fund

4. Strengthen institutions and structures to functions and streamline administration

Objective : Create institutional arrangements conducive for Off Grid developments

- Promote establishment of ESCOs
- Establish and manage the Off Grid Fund to promote self-sustaining Off Grid schemes
- Strengthen institutional capacity to oversee Off Grid fund disbursements and monitoring

Delivery Mechanisms Electrification (DOE/MIH)

- Primary would be a program to extend the demonstration and pilot off-grid programs into a national program of rural electrification.
- Secondary are pilot and/or demonstration programs, donor country assistance programs (also World Bank, Asian Development Bank, JICA and others), and provincial/district programs.

Public-Private Partnership

MIH

Provincial Electricity Service Company Pesco

Management Contractor VOPS

Village Electricity Manager VEM Province Department of Industry and Handicraft PDIH

> Village Electricity Committee VEAC

Consumer

Delivery system: "Rent-to-buy"

Pesco helps each village to choose a VEM and technology

VEM is a service provider, managing SHS installations and collecting revenues VEM is an investor and manages a hydro or gen-set elec retail business and makes rent-to-buy payments

Consumer makes rentto-buy payments Consumer pays monthly tariffs



There are Two Main Steps:

- Main Step For System Planning
- Main Step for Financial Analysis

MAIN STEPS FOR SYSTEM PLANNING



-Facility Standard

-Criteria for System Planning -Data from Site

Identify the facilities to be developed in future I.e. year of commissioning etc.

MAIN STEPS FOR FINANCIAL ANALYSIS



Present Challenges: In Planning

 We don't have the specific tools for planning.

 Still need additional training and understanding in rural electrification these aspect at the provincial level as well as central level.

Specific Situation at Provincial Level

Status Electrificatio n Planning in Oudomxay Province



Medium, Small, and Micro Hydro in Oudomxay Province



Existing Small and Micro Hydro in Oudomxay Province


Existing and Planning Solar Home system in Oudomxay Province



SOME COMMENTS

 Basically, REDEO is very useful tool for rural electrification planning;

 Still need additional training and understanding in rural electrification plan in these aspect at the provincial level as well as central level.





Thank you !



REDEO PROTOTYPE TOOL Scenario analysis

Pierrick Yalamas REDEO Final workshop AIT – Bangkok, 30 June and 1st July 2005



Logic of a sensitivity analysis





Clustering sensitivity analysis



- Default weighting: 1 health, 1 education, 2 roads, 2 employment
 - Min 250 population
 - 1086 from 1319 localities
 - Add when admin center
 - O as no info
 - 300 with highest IPD
 - > 300 out of 1319

- Min 500 population
- ▶424 from 1319 localities
- Add when admin center
- ▶0 as no info
- 300 with highest IPD
- >140 out of 1319







IPD 1.25 1.68 2.17 2.64 3.12 3.6

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Clustering sensitivity analysis



Contrasted weighting:7 education, 0 rest

- Min 500 population
- >424 from 1319 localities
- Add when admin center
- ▶0 as no info
- 300 with highest IPD
- >148 out of 1319







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<u> </u>	KExisting and planned grid (Clus)	ters A Localities Employment A UL	L - Uther localities (LHPD - Lenter	rs with High Potential for D	evelopment (Background 3)	Background 2/Background 1/Adm	iinist



High scenario for load forecast for Cambodia

Year	Year	Year	Year	Year	Year		
1	5	10	15	20	25		
500	750	1000	1400	1750	2000	egy	CHPD
0,2283105	0,31709792	0,3936388	0,51553984	0,60536876	0,65231572	pk	
25%	27%	29%	31%	33%	35%	LF	
200	300	400	450	500	550	egy	OL
0,0913242	0,12683917	0,15745552	0,16570924	0,1729625	0,17938682	pk	
25%	27%	29%	31%	33%	35%	LF	
500	750	1000	1400	1750	2000	egy	Small shops
0,19025875	0,2446184	0,28538813	0,35514967	0,44393709	0,456621	pk	
30%	35%	40%	45%	45%	50%	LF	
0,5	1,2	1,3	1,4	1,5	1,6	per 100 HH	
800	900	930	950	1200	1600	egy	Small industr
0,17906706	0,18024513	0,17403997	0,1694492	0,20145044	0,26092629	pk	
51%	57%	61%	64%	68%	70%	LF	
0,5	1,2	1,3	1,4	1,5	1,6	per 100 HH	



Prototype tool presentation Bnagkok, June 2006



Cambodia high load





Prototype tool presentation Bnagkok, June 2006







Low development scenario – Lao Cai

Category	Parameter	Year01	Year05	Year10	Year15	Year20	Year25	Unit
CHPD	Specific energy consumption	650	715	787	865	952	1047	kWh/unit/year
CHPD	Contribution to peak	0.2	0.21	0.22	0.23	0.24	0.25	kW/unit
CHPD	Penetration rate	0.3	0.5	0.55	0.58	0.61	0.64	Percentage
	load factor	37%	39%	41%	43%	45%	48%	
Small Shops	Average number of units per 100 HH	1	1	1	1	1	1	units/100 households
Small Shops	Specific energy consumption	500	550	600	650	700	750	kWh/unit/year
Small Shops	Contribution to peak	0.1	0.11	0.12	0.13	0.14	0.15	kW/unit
Small Shops	Penetration rate	0.8	0.8	0.8	0.8	0.8	0.8	Percentage
	load factor	57%	57%	57%	57%	57%	57%	
Street lighting	Specific energy consumption	3	3	3	3	3	3	kWh/year/unit
Street lighting	Contribution to peak	0.08	0.08	0.08	0.08	0.08	0.08	kW/unit
Street lighting	Penetration rate	0.5	0.5	0.75	0.75	0.9	0.9	Percentage
Street lighting	Average number of units per 100 HH	100	100	100	100	100	100	units/100 households
	load factor	43%	43%	43%	43%	43%	43%	



Prototype tool presentation Bnagkok, June 2006



Vietnam low growth







Vietnam high growth





High development scenario – Lao Cai

Category	Parameter	Year01	Year05	Year10	Year15	Year20	Year25	Unit
CHPD	Specific energy consumption	650	1000	1300	2050	2600	3300	kWh/unit/year
CHPD	Contribution to peak	0.2	0.3	0.37	0.55	0.65	0.75	kW/unit
CHPD	Penetration rate	0.3	0.5	0.6	0.7	0.75	0.8	Percentage
	load factor	37%	38%	40%	43%	46%	50%	
Small Shops	Average number of units per 100 HH	1	1	1	1	1	1	units/100 households
Small Shops	Specific energy consumption	500	550	600	650	700	750	kWh/unit/year
Small Shops	Contribution to peak	0.1	0.11	0.12	0.13	0.14	0.15	kW/unit
Small Shops	Penetration rate	0.8	0.8	0.8	0.8	0.8	0.8	Percentage
	load factor	57%	57%	57%	57%	57%	57%	
Street lighting	Specific energy consumption	3	3	3	3	3	3	kWh/year/unit
Street lighting	Contribution to peak	0.08	0.08	0.08	0.08	0.08	0.08	kW/unit
Street lighting	Penetration rate	0.5	0.5	0.75	0.75	0.9	0.9	Percentage
Street lighting	Average number of units per 100 HH	100	100	100	100	100	100	units/100 households
	load factor	43%	43%	43%	43%	43%	43%	
Big industries	Specific energy consumption	3,500,000	3,700,000	3,900,000	4,100,000	4,300,000	4,500,000	kWh/unit/year
Big industries	Contribution to peak	700	700	700	700	700	700	kW/unit
Big industries	Penetration rate	1	1	1	1	1	1	Percentage
	load factor	57%	60%	64%	67%	70%	73%	





Development scenario

(I)





101921-036' F 20933-684' N 1+1100000 Transverse Mercator

Doplaca



Electrification scenarios

- Grid extension, hydro analysis and biomass analysis are based on comparison with isolated diesels...
- ...whose average life-cycle cost is very depending on:
 - Evolution of fuel cost
 - Discount rate







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Thank you for your attention

Mr. Pierrick YALAMAS IED – Innovation Energie Development

The Government of the Philippine Republic



EXPANDED RURAL ELECTRIFICATION (The Philippine Experience)



Chief, Planning Division Energy Policy and Planning Bureau 01 July 2005

CARMENCITA A. BARISO





Outline of Presentation

- Vision Statement
- National and Sectoral Framework
- History and Program Management
- What is ER Program?
 - Current Institutional Framework and Mechanism
 - Electrification Solutions
 - Private Sector Support
- Barangay Energization, 2005-2008
- Barangay Energization Status
- Electrification Benefits
- Issues and Challenges
- Action Plans
- Relevance of REDEO Project to Philippine Setting



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Vision Statement

Within the next decade, by encouraging greater private sector participation and partnership with our stakeholders, we would have:

- achieved total and reliable energization and energy self-sufficiency
- developed indigenous and renewable energy resources

National and Sectoral Framework

President Gloria Macapagal Arroyo's Agenda No. 5

" Power and Water Supply throughout the Country "

Energy Plan Framework

FIVE-POIN	T	REFORM	PACKAGE	
ECONOMICANTI-CORRUPTIONGROWTH ANDTHROUGH GOODJOB CREATIONGOVERNMENT	E NDE	NERGY PENDENCE	SOCIAL JUSTICE AND BASIC NEEDS	EDUCATION AND YOUTH OPPORTUNITY
ENERGY SECTOR AGENDA		E	NERGY SECTO	R GOALS
 ENERGY INDEPENDENCE AND SAVINGS Aggressively develop renewable energy potential such as biomass, solar, wind and ocean resources Form strategic alliance with other countries POWER MARKET REFORMS Create an investment climate attractive to investors 	ve	 60% SEI Increas capacit FAIR AI PRICES 100% b Open a particip 	LF-SUFFICIENCY se renewable energy by 100% in ten yes ND REASONABLE S IN A COMPETITI parangay electrificat at least ten SPUG are pation	LEVEL BY 2010 r-based ars E ENERGY VE ENVIRONMENT ion by 2008 eas to private sector





History and Program Management

- Accelerated Barangay Electrification Program (ABEP) in 1999;
- O' Haw Program (Jan. 2000 to Mar. 2003); and
- Expanded Rural Electrification (ER) Program in April 2003




Historical Performance

- From 1986 to 1992, average number of barangays energized per month is 38.6 barangays;
- From 1993 to 1999, average number of barangays energized per month is 53.6 barangays;
- From 2000 to 2004, average number of barangays energized per month is 101 barangays.

From 9,718 unelectrified barangays in 1999, the remaining unelectrified barangays as of end 2004 is 3,148 barangays.





Annual Accomplishment 1999 - 2004

Year	No. of Barangays Completed / Electrified	Cumulative No. of Barangays Completed/Electrified	Equivalent Barangay Electrification Level
1999	755	32,281	76.96%
2000	1,355	33,636	80.19%
2001	1,242	34,878	83.15%
2002	1,699	36,577	87.20%
2003	1,218	37,795	90.11%
2004	1,002	38,797	92.49%

Note: Based on 2000 Census, Total Number of Barangays is 41,945

Sitios Electrified from January 2003 to April 2005 = 2,313





What is ER Program?

- ABEP and O'llaw Program focused only on BARANGAY electrification;
- **ER Program covers:**
 - Barangay electrification,
 - Household electrification,
 - Sitio electrification; and
 - Policy Formulation and Integration.





Current Institutional Framework and Mechanism

DOE

Policy Direction – Goal Setting, and Program Management and Coordination

ERC

Rate Design, Licensing, and **Determination of UC-ME**

SPUG

NEA

Project Identification and

Monitoring

Project Implementation and Petitioner of UC-ME

OTHER GOV'T. AGENCIES (e.q., DAR, DILG)

Financing and Project Implementation

Electrification

Rural/Missionary

DUs

Project Implementation and Operation

PRIVATE SECTOR

Financing, and Project Implementation and Operation

Electrification Solutions

OFF-GRID

Stand-alone Systems



"Solar Home System"



"Solar Battery Charging Station"

Average Cost/Barangay: Php 1.50 Million (At least 35 HH)

Mini-/Micro-grid Systems



"Small Wind Power"



"Micro Hydro"



"Diesel Genset"

Average Cost/Barangay: Php 3.50 Million (Generation, Distribution, At least 150 HH)

GRID





Average Cost/Barangay: Php 1.38 Million (For 3.3 Km Distribution Lines)





Support to Rural Electrification Program

DOE's Energy Regulations No. 1-94, as amended

50% of P0.01 per kWh financial benefits

Local Government Code of 1991 (Chapter II, Sections 289 to 294

 80% of the proceeds maybe used to construct distribution lines and lower the cost of electricity

Missionary Electrification-Universal Charge

- Subsidy to QTPs (alternative service providers)
- Government GAA for NEA/ECs and SPUG (if any)
- GEF under DOE's Rural Power Project

Available for household and community applications





Private Sector Support



IPPs	Commitment		Accom	nplishment	Balance (Target)	
1113	Brgys.	Sitios	No.	Year	CY 2004	CY 2005
/irant Philippines	1,500		1,000	2001-2004	300	200
(EPCO Phils. Corp.*	200		-		129	71
EPCO Ilijan Corporation	60		60	2001-2002	-	
Salcon Power Corp.	30		30	2002-2003	-	
oledo Power Corp.	10		10	2002-2004	-	
uzon Hydro Power Corp.	7		4	2004		3
San Roque Power Corp.		26	-			26
California Energy, Inc.	101		41sitios	2004-2005		
Power One		50				
State Power Dev't. Corp.	50					

* - Completion Ceremony on 22 June 2005, with PGMA in Badian, Cebu

Barangay Electrification Program/Schedule, 2005-2008

		2005		20	2006		2007		2008		TOTAL	
Implementing Agency/Office	Fund Source	# of Brgys.	PhP (Mn)									
NEA/ECs	GAA/ 5% Reinvestment Fund	221	305	200	276	200	276	200	276	821	1,133	
DOE	GAA (Barangay Electrification Program)	68	102		-		-		-	68	102	
DOE	Energy Regulations No. 1-94	73	101	30	41	30	41	30	41	163	225	
PNOC-EDC	Proceeds from Geothermal Service Contract	98	135	100	138	100	138	100	138	398	549	
IPPs	Private Funds	303	418	165	228	23	32			491	678	
NPC-SPUG	Internal Cash Generation/ Universal Charge	113	131							113	131	
QTPs/ NPC-SPUG	ODA Loan/ Universal Charge	179	412	563	2,793	200	460	184	423	1,126	4,088	
PIOUs	Internal Cash Generation	2	3		-		-		-	2	3	
-	TOTAL	1,057	1,607	1,058	3,476	553	947	514	879	3,182	6,908	
Energ	ization Level	94.	9%	97	.5%	98.	8%	100	.0%			

Barangay Electrification Situationer As of 30 April 2005



Barangay Electrification Level by Franchise Holder As of 30 April 2005

Franchise Holder	Coverage %to Cove	% to the Coverage	Electrified/ Completed		% Electrification Level		Challenge (01 May 2005 to 31 Dec 2008)
			March	April	M arch	April	Challenge
PHILIPPINES	41,945	100	38,844	38,850	92.61	92.62	3,095
119 ECs	36,018	86	33,031	33,037	91.71	91.72	2,981
MERALCO	4,317	10	4,243	4,243	98.29	98.29	74
24 PIOUs/LGUs/Others	1,610	4	1,570	1,570	97.52	97.52	40
Note: Total number of barangays is based on 2000 NCSO							

Electrification Level By Region As of 30 April 2005

Region	Accomplished for the Month of April 2005		Level of Electrification (As of April 30, 2005)				
	No.of Muns.	No.of Brgys.	No. of Muns.	Electrified/ Completed Barangays	Unelectrified Barangays	Electrification Level	
I	-	-		3,255	10	99.69%	
II	-	-		2,202	109	95.28%	
CAR	-	-		1,113	59	94.97%	
Ш	3	3		3,074	25	99.19%	
IV-A	-	-		3,931	78	98.05%	
IV-В	-	-		1,310	146	89.97%	
V	-	-		3,224	247	92.88%	
NCR	-	-		1,693	-	100.00%	
SUB-TOTAL (LUZON)	3	3		19,802	674	96.71%	
VI	1	1		3,885	165	95.93%	
VII	-	-		2,941	62	97.94%	
VIII	-	-		3,787	603	86.26%	
SUB-TOTAL (VISAYAS)	1	1		10,613	830	92.75%	
IX	1	1		1,551	352	81.50%	
Х	-	-		1,864	156	92.28%	
XI	-	-		1,094	64	94.47%	
XII	1	1		1,033	159	86.66%	
ARMM	-	-		1,650	795	67.48%	
CARAGA	-	-		1,243	65	95.03%	
SUB-TOTAL (MINDANAO)	2	2		8,435	1,591	84.13%	
TOTAL (PHILIPPINES)	6	6		38,850	3,095	92.62%	

Status of Implementation By Agency January to April '05

AGENCY	2005 Target	Completed/Energized Projects	Balance	Remarks
NEA/ECs	221	24	197	DBM has just released NEA's PhP246 Million
Doe (Bep)	68	5	61	29 projects are on-going; Others are still on pre-implementation stage (e.g. MOA signing, bidding)
DOE (ER 1-94)	73	7	66	Others are still on pre-implementation stage (e.g. MOA signing, bidding)
PNOC-EDC	98	1	97	19 projects are on-going; Others are still on pre-implementation stage (e.g. fund approval, on-going design, bidding)
IPPs	303	47	255	35 completed projects have not been reported, still subject to acceptance by the concerned ECs; 29 projects are on-going; Others are still on pre-implementation stage
NPC-SPUG	113	-	113	Awarded to contractors 103 projects, target completion 3Q 2005
QTPs/NPC-SPUG	179	2	177	DOE issued on March 2005 public notice (PN2005-03-001) declaring the remote and unviable areas for QTP participation
PIOUs	2		2	
TOTAL	1,057	86	968	





Timetable for 2005 Electrification Program

Agency	2005	Completed/ Energized	On-going Complet	Target	
	Taryet	Projects	3 rd Quarter	4 th Quarter	Accomplishment
NEA/Ecs	221	24	197	-	221
DOE (BEP)	68	5	29	34	68
DOE (ER 1-94)	73	7	50	16	73
PNOC-EDC	98	1	19	78	98
IPPs	303	82	29	192	303
NPC-SPUG	113	-	103	10	113
QTPs/NPC- SPUG	179	2		177	179
PIOUs	2			2	2
TOTAL	1,057	212	427	509	1,057



Electrification Benefits

- Provides economic opportunities;
- Provides cheaper energy cost (compared to kerosene);
- Enables labor-intensive equipment/tools saving time for more productive activities;
- Expand/improve water supply and sanitation;
- Improve farm productivity through mechanization by electricity;
- Improves security; peace and order situation;
- Improves educational activity and access to communication and information; and
- Better medical care facilities (such as preservation of medicines and vaccine refrigeration)





Issues and Challenges

- Significant number of target barangays are considered "last-mile areas;"
 - Harder to reach
 - Require more funding requirements
 - Conduct of extensive social preparatory activities needed (for off-grid electrification solutions)
- Delayed submission by project implementors of their annual work programs;
 - Delays the integration of the individual work programs
 - Delays the project implementation
- Delayed release of DBM of GAA funds;
- Existence of implementation problems such as ROW, TROs, stringent permitting and approval process for household connections; and
 - High demand for sitio electrification



The Government of the Philippine Republic



Action Plan

- Strengthen planning and social preparation activities:
 - Identification of target areas;
 - Preparation and submission of staking sheets; and
 - Conduct of Rapid Rural Appraisals for off-grid area electrification.
- Pursue commitments from the private sector;
- Implement subsidy rationalization particularly for solar electrification;
- Conduct fund sourcing maximization exercises;
- Review existing rules and procedures in implementing electrification projects; and
- Establishment of strong monitoring and feedback mechanism.





Applicability of REDEO to the Philippines

- No existing model on Rural Electrification Planning in the Philippines
- Promotion of renewable energy resources is a priority strategy to achieve energy independence
- Dearth in regional database
- The need to incorporate environmental and sustainable development concerns in the formulation of regional energy plans
- The need to identify areas (provincial level) with potential for renewable energy resources
- Needs institutional capacity building especially on Rural Electrification Planning
- Needs to strengthen existing mechanism for renewable energy development and overall planning, i.e., institutional framework and micro-financing

The Government of the Philippine Republic



Thank You and Mabuhay!



DEPARTMENT OF ENERGY AND MINERAL RESOURCES DIRECTORATE GENERAL OF ELECTRICITY AND ENERGY UTILIZATION

FINAL WORKSHOP ON RURAL ELECTRIFICATION DECENTRALIZED ENERGY OPTIONS (REDEO) PROJECT

30th JUNE - 1st JULY 2005 in AIT, Pathumthani, Thailand

Introduction

- Electricity is a vital ingredient for economic and social development. An adequate, reliable, safe, and affordable price is essential for the improvement of national welfare.
- Electricity ratio is about 52%, meaning that number of households having no access to electricity remain significant, especially in less developed regions and remote areas.
- Indonesia's energy reserves are limited in term of fossil energy reserve, e.g. oil.
- Domestic energy demand is increasing rapidly and more than 50% of the demand is met by oil.
- Indonesia has abundant renewable energy sources, e.g.; geothermal, hydro, biomass, wind and solar energy.
- The utilization of renewable energy is very small compared to its potential.
- Government of Indonesia gives very big attention to renewable energy development.
- Indonesia has issued laws and regulations to prioritize and promote renewable energy development.

Indonesia

Figure 1



••••• PLN Regional Boundaries



Indonesia is the largest country in Southeast Asia with a land area of over 1.9 million square kilometers; it is also the largest archipelago in the world comprising over 13,000 islands of which some 3,000 are inhabited. The population of over 200 millions is located on the five main islands of Java, Sumatra, Kalimantan, Sulawesi and Irian Jaya, and 70% of this population is concentrated on the islands of Java.

Legal Basis

Government regulations, which can be considered as promoting and developing utilization of renewable energy, especially for power generation, in Indonesia, are as follows:

- Law No. 15/1985 about electricity
- Government Regulation No. 3 / 2005
- The geothermal Law No. 27 / 2003
- Ministerial Decree on Energy and Mineral Resources No. 1122 / 2002 on Distributed Power Generation or PSK TERSEBAR.

Strategies

- Setting the energy price in accordance to its economic value;
- Encouraging the development of renewable energy infrastructures;
- Prioritizing the use of renewable energy;
- Increasing the role of stakeholders in renewable energy activities;
- Enhancing cooperation at the national, regional, and international levels, especially in the context of information access, financing, and transfer of technology;
- Improving the quality of human resources in the field of renewable energy;
- Improving renewable energy supporting ventures;
- Improving the society's access to energy;
- Formulating the priority scale of renewable energy development based on available potential and technology, financial, and social feasibility.

Rural Electrification Condition in Indonesia

- Amount of Villages : 66 thousands villages
- Electrified Villages : 78 % or 51 Thousands vllg.
- Not yet electrified villages
- Amount of Household
- **Electrification Ratio**
- Not yet electrified HH

- : 22 % atau 15 thousands vllg.
- : 38,5 millions HH
- : 52% atau 20,5 million HH
- : 48% atau 18 juta HH

Fossil energy reserves are limited, while renewable energy potentials are relatively abundant

A. Fossil Energy

Energy Type	Total Reserves	Proven Reserves	Production	Ratio (Reserves/ Production)
Oil	86,9 billion bbl	5 billion bbl	500 million bbl	10 year
Gas	385 TSCF	90 TSCF	2.9 TSCF	30 year
Coal	50 billion Ton	5 billion Ton	100 million Ton	50 year

B. Renewable Energy

	Potential	Installed Capacity
Hydro	75.67 GW	4200 MW
Geothermal	27 GW	802 MW
Mini/ Micro hydro	500 MW	84 MW
Biomass	49.81 GW	302.4 MW
Solar	4.8 kWh/m²/day	8 MW
Wind	3-6 m/sec	0.5 MW

The Policy on Renewable Energy Development and Energy Conservation

The policy on renewable energy development and energy conservation is a concept to realize a system of sustainable energy supply and utilization which could encourage the achievement of sustainable national development through an optimal utilization of renewable energy, the use of efficient energy technology, and the creation of energy saving culture.

Sustainable national development is the development that can fulfill national needs at the present time and can compromise the needs of future generations.

Government Regulation No. 3 / 2005

In article 4 state that in order to secure the availability of primary energy to electricity supply for public, prioritize to local energy resources with utilization of the renewable energy resources.

The Geothermal Law No. 27 / 2003

The objectives of the Geothermal Law no. 27 / 2003 are:

- To control the utilization of geothermal energy for supporting sustainable development and providing additional added value to the economy;
- To increase government revenue and to push economic development of the country.

Ministerial Decree on Energy and Mineral Resources No. 1122 / 2002 on Distributed Power Generator

This program mandates that electricity production developed under this scheme should be purchased by state utility company.

The system is limited only to the utilization of renewable energy resources with installed capacity up to 1 MW.

The aims of the Ministerial Decree on Energy and Mineral Resources No. 1122 / 2002 are:

- To increase renewable energy utilization such as micro hydro, solar PV, wind, biomass, small scale geothermal, agriculture waste for power generation;
- To encourage small scale enterprises and cooperatives dealing with renewable energy activities for electricity generation; and
- To develop domestic supporting industries in electricity sector.

The schemes of Distributed Power Generation are as follows:

- Each regional utility (PLN) declares the electricity production cost at the point of low voltage (LV) and medium voltage (MV);
- Small scale enterprises/individuals/co-operatives develop small-scale power generation to be connected to PLN grid at the point of LV or MV;
- The purchase price is 60% of production cost, if it is connected to LV grid and 80% of production cost, if it is connected to MV; and
- Selling electricity to this utility based on non-firm capacity (kWh).

Target

Target of the policy mandated by Electricity Law No 15 of 1985 includes:.

- Low Income Group, which is measured by a minimum level of income per capita (Pra Sejahtera, Sejahtera I) and/or connected demand 450VA;
- Less Developed Region, which is measured by total scores of indicators, i.e.: Regional Gross Domestic Revenue, Allocated General Fund, Population Percentage of Pra Sejahtera & Sejahtera I, Main Living Activities of Population, Population Density, Housing Density, Percentage of Permanent Housing, Electrification Ratio, Local Energy Resources, and Village Status; High total scores mean priority;

Target

- Remote Area, which is measured by total scores of indicators, i.e.: Regional Gross Domestic Revenue, Allocated General Fund, Population Percentage of Pra Sejahtera & Sejahtera I, Main Living Activities of Population, Population Density, Housing Density, Percentage of Permanent Housing, Electrification Ratio, Local Energy Resources, Village Status, Distance to District, and Distance of Load to Closest Network; High total scores mean priority;
- Rural Electricity Development, which is measured electrification ratio. Lower electrification ratio means high priority.
- To increase electrification ratio arround 95 % in 2025.
- The role of New and Renewable Energy increase 4.4 % in 2025.

Program for Remote Areas

- The objective of program for assisting Remote Area. The program is to support economic development and finally to reduce the level of remoteness.
- Program for Remote Area includes subsidy for operation and/or investment for expanding the infrastructure, and technical assistance. The development of electricity infrastructure will be based on the participation of local people beginning from planning, development, and operation, and utilization of local energy resources. Under this program, standard small scale electricity supply will be developed.



Program for Rural Electricity Development

- The objectives of Program For Rural Electricity Development is improve quality of life of rural people through increasing an access to electricity.
- The program includes subsidy for investment to expand low voltage network, expand medium voltage network, and/or install generation up to 1 MW, and subsidy for operation as well as technical assistance.


Financial Resources

Resources to finance the subsidy are originated from:

- National Budget Appropriation;
- Transmission Use Charge;
- Distribution Use Charge;
- Regional Budget Appropriation;
- Fund generated from Hydropower Generation dedicated for the low income group;
- Contribution.

Institution and Governance

Institution:

the implementation of Social Electricity Development in the future will be carried out by Agency for Social Electricity Development (separated from DGEEU but under Ministry of Energy and Mineral Resources).

Governance:

At national level: Policy and Financing decided by the government and the parliament.

At regional level: implementation by regional utilities and coordination by regional government. For the case financing resources coming from regional budget, the policy and implementation are up to the regional government and regional parliament. However, regional program is in coordination with national program.

PARADIGM NATIONAL ENERGY MANAGEMENT

To Support Integrated Sustainable Development



Conclusions

- The potential of renewable energy up to now has not been widely utilized. This is mainly due to the price of renewable energy which is not competitive compared to the price of fossil energy.
- The Government of Indonesia gives very big attention to renewable energy development. In policy level, Ministry of Energy and Mineral Resources has issued a decree called Policy on Renewable Energy and Energy Conservation that is called green energy development.
- To encourage development and utilization of renewable energy for electricity generation, the Government of Indonesia has made government regulation No. 03 / 2005; the Geothermal Law No. 27 / 2003 and Ministerial Decree on Distributed Power Generation or PSK Tersebar.

Thank You Terima Kasih