ANNEX-8

MINUTES OF MEETING

AGREED UPON BETWEEN
JAPAN INTERNATIONAL COOPERATION AGENCY
AND
MINISTRY OF TRADE AND INDUSTRY

JUNE 15, 2005

MINUTES OF MEETING
FOR
THE INTEGRAGED MASTER PLAN STUDY
FOR DZONGKHAG-WISE ELECTRIFICATION
IN
THE KINGDOM OF BHUTAN
(FIFTH SITE WORK)

BETWEEN
THE JICA MASTER PLAN STUDY TEAM
AND
DEPARTMENT OF ENERGY
MINISTRY OF TRADE AND INDUSTRY

THIMPHU
June 16, 2005

Mr. Tomoyasu Fukuchi
Team Leader, JICA Study Team
Nippon Koei Co., Ltd.

Mr. Karma Yonten
Oftg. Director General
Department of Energy
Ministry of Trade and Industry

The Master Plan Study Team (the Team) of the Japan International Cooperation Agency (JICA), which is headed by Mr. Tomoyasu FUKUCHI, stayed in Bhutan from June 5 through 20, 2005 as the Fifth site work. On June 16, 2005, the Team had a wrap-up meeting with Department of Energy (DOE), Ministry of Trade and Industry and Bhutan Power Corporation (BPC), and the parties confirmed the followings.

1. **Third Workshop** : The third workshop took place in Thimphu on June 9, 2005 at Bhutan Chamber of Commerce and Industry Conference Hall and closed successfully.
   The agenda, list of participants and record of discussion are shown in the Attachment-1.

2. **Framework of Draft Final Report** : The draft final report will be submitted in the sixth site work in September 2005. The framework of the draft final report is shown in Attachment-2. DOE will review the framework and send the comments to the Team by 1st July, 2005.

3. **Institution, Off-grid Options, and Prioritization Criteria for On-grid Electrification** : The meeting was held for the captioned matters on June 15, 2005 at the DOE conference hall.
   The record of the discussion is shown in Attachment-3.

4. **Optimized Dzongkhag-wise Phased Plan** : The economic evaluation based Dzongkhag-wise phase plan was completed. The Team will prepare the optimized Dzongkhag-wise phase plan taking into account the following criteria:

   - Keeping EIRR of on-grid package in each Dzongkhag over 12 %
   - Equal electrification ratio of each Dzongkhag including off-grid electrification
   - Required consideration of the protected area
   - Prioritizing the feeders near motorable road (Based on data availability)

   The Team will complete the optimized Dzongkhag-wise Plan for 10th Five Year Plan before leaving Thimphu. The base year for the estimated number of households for the 10th Five Year Plan is 2007.

5. Information and Communication Development Plan : The Team had several meeting through the 2nd to this 5th site work with Ministry of Information and Communication and Bhutan Telecom on the development plan. These meetings could not reach the conclusion on the following matters:

   - Implementation body for installation and operation of the fiber optic cable
   - Schedule of installation (commencement of work in 10th, 11th or 12th Five Year Plan)

   The Team requested DOE to forward the issue to the high officials of Ministry of Information and Communication and ask the high officials to make decision on the matter (refer to the Attachment-4).

   DOE will take necessary action and will obtain the decision on the above as early as possible; maximum within 3 weeks.

6. Application for Feasibility Study : DOE will prepare the application for the technical cooperation by the government of Japan on the feasibility study for the rural electrification and related project packages in the 10th Five Year Plan. The Team will assist DOE in the preparation work.

7. Next Site Work : The 6th site work is scheduled from September 3 to 14, 2005.

End

Attachment

1. Agenda, List of Participants and Record of Discussion of Third Workshop
2. Framework of the Draft Final Report
3. Record of Discussion on Institution, Off-grid Options, and Prioritization Criteria for On-grid Electrification
4. The Team's letter LKLBHE-05-006 dated June 15, 2005

M/M June 16 2005: Attachment-1

The Integrated Master Plan Study for Dzongkhag-wise Electrificationin Bhutan

3rd Workshop

9 June 2005, in Thimphu

Conference Hall, Bhutan Chamber of Commerce and Industry

Agenda

Code	Time		Title	Presentator
	09:30 - 09:40	10:00min	Welcome Remarks and Introduction	Mr. Sonam Tshering Director General, Department of Energy
	09:40 - 09:50	10:00min	Greetings by JICA Bhutan Office	Mr. Mitsukuni Sugimoto Representative of JICA Bhutan Office
AD-01	09:50 - 09:55	05:00min	Study Schedule, Introduction of JICA Study Members and Objectives of Third Workshop	Mr. Tomoyasu Fukuchi Team Leader, JICA Study Team
	09:55 - 10:15		*Tea Break*	
			Draft Result of Master Plan Study	
MP-01	10:15 - 10:25	10:00min	Study Overview	Mr. Karma P. Dorji, DOE
MP-02	10:25 - 10:40	15:00min	Methodology of On/Off-Grid Cut-Off Point Decision	Mr. Ujiwal, BPC
MP-03	10:40 - 10:55	15:00min	Off-Grid Model Plan, Implementation and O&M	Mr. Satchi, DOE
MP-04	10:55 - 11:10	15:00min	Small Hydro Model Plan, Inplementation	Mr. Karma Tshewang, DOE
MP-05	11:10 - 11:30	20:00min	Draft Master Plan of Rural Electrification	Mr. Karma P. Dorji, DOE
MP-06	11:30 - 11:45	15:00min	Environmental Consideration in the Master Plan	Mr. Takahiro Kamishita, JICA Study Team
-	11:45 12:00	15:00min	Questions and Answers	
MP-07	12:00 - 12:15	15:00min	Telecommunication Development Plan	Mr. P.M.Pradhan, Bhutan Telecom Ltd.
MP-08	12:15 - 12:20	05:00min	Project Cost Estimation and Economic Evaluation	Mr. Karma P. Dorji, DOE
MP-09	12:20 - 12:30	10:00min	Implementation, Rural Operation and Maintenance Plan	Ms. Dechen Dema, BPC
MP-10	12:30 - 12:40	10:00min	Institutional Guidelines	Dr. Hiroshi Nishimaki, JICA Study Team
	12:40 - 13:40		*Lunch*	
AD-02	13:40 - 14:00	20:00min	Option Studies conducted in the Counterpart Training in Japan	Trainees of DoE, BPC and Department of Survey
	14:00 - 15:30	01:30hrs	Questions, Requests and Discussion on Draft Mater Plan	Dzongkhag Representatives and all the Attendances
	15:30 - 16:00		*Tea Break*	
AD-03	16:00 - 16:10	10:00min	Conclusion and Next Step of Master Plan Study	Mr. Tomoyasu Fukuchi Team Leader, JICA Study Team
	16:10 - 16:40		Distribution of Certificate	
	16:40		Closing Remarks	Mr. Sonam Tshering Director General, Department of Energy

List of Participants for the 3rd Workshop, 9 June 2005

The Integrated Master Plan Study for Dzongkhag-wise Electrification in Bhutan

No	NAME	TITLE	ORGANIZATION	
		Dzongkhags		
1	Mr. Sonam Rinchen	Junior Engineer		Bumthang
2	Mr. D.C. Dhimal	Dzongkhag Engineer		Chukha
3	Mr. Tashi Gyeltshen	Administrative Officer		Dagana
4	Mr. Jambay Dorji	Data Manager		Haa
5	Mr. Sherub Gyeltshen	Deputy Planning Officer		Lhuntse
6	Mr. Pelden Norgay	Dzongkhag Engineer		Mongar
7	Mr. Tshewang Peljor	Junior Engineer		Samdrup Jongkhar
8	Mr. Pema Wangyel	Junior Engineer		Samtse
9	Mr. Kumar Hingmang	Junior Engineer		Trongsa
10	Mr. Pema Tenzin	Deputy Planning Officer		Tsirang
11	Mr. Kinchho Norbu	Sr. Administrative Officer		Thimphu
12	Ms. Lekema Dorji	Assistant Planning Officer		Wangduephodrang
13	Mrs. Chhoki Wangmo	Junior Engineer		Wangduephodrang
14	Mr. Tashi Norbu	Junior Engineer		Zhemgang
			Subtotal	14
		OTHER ORGANIZATIONS		
1	Mr. Shiraishi Takao	International Network Group	Kansai Electric Power Co., Ltd, Japan	
2	Mr. Karma C Nidup	Dy. Director	EA Section	National Environment Commission, Thimphu
3	Mr. Thinley Dorji	EIA Officer	EIA	National Environment Commission, Thimphu
4	Mrs. Sita Giri	Assistant Resident Representative	UNDP	Thimphu
5	Dr. Maria-Christine Weinberger	Coordinator	Austrain Coordination Office	Thimphu
6	Mr. Sangay Dorji	Program Officer	Department of Aid & Debt Management	Ministry of Finance,Thimphu
7	Mr. Sonam Tobgyal	Planning Officer	Department of Planning	Ministry of Finance,Thimphu
8	Mr. Shankar Sharma	Dy. Survey Engineer	Department of Survey & Land Records	Ministry of Agriculture, Thimphu
9	Jigme Tobgyel	Consultant	United Nation Development Program	Thimphu
10	Mr. Karma Tshering	Conservation Officer	Nature Conservation Division	Ministry of Agriculture, Thimphu
11	Mr. Sangay Wangchuk	Deputy Director	Department of Information & Technology	Ministry of Information & Communication, Thimphu
12	Mr. P.M. Pradhan	General Manager	Bhutan Telecom	Thimphu
			Subtotal	12
		DEPARTMENT OF ENERGY		
1	Mr. Sonam Tshering	Director General		Department of Energy
2	Mr. Bharat Tamang	Head of Planning and Coordination Division	Planning and Coordination Division	Department of Energy
3	Mr. Karma P Dorji	National Project Manager	Planning and Coordination Division	Department of Energy
4	Mr. Karma Tshering	Executive Engineer	Planning and Coordination Division	Department of Energy
5	Mr. Karma Yonten	Head of Bhutan Electricity Authority	Bhutan Electricity Authority	Department of Energy

List of Participants for the 3rd Workshop, 9 June 2005

The Integrated Master Plan Study for Dzongkhag-wise Electrification in Bhutan

No	NAME	TITLE	ORGANIZATION	
6	Mr. Ngawang Choeda	Assistant Engineer	Planning and Coordination Division	Department of Energy
7	Mr. Satchi	Assistant Engineer	Renewable Energy Division	Department of Energy
8	Mr. Tashi Dorji	Hydropower Development Engineer	Planning and Coordination Division	Department of Energy
9	Mr. Karma Tshewang	Assistant Engineer	Planning and Coordination Division	Department of Energy
10	Ms. Dechen Wangmo	Junior Engineer	Planning and Coordination Division	Department of Energy
11	Ms. Wangmo	Junior Engineer	Planning and Coordination Division	Department of Energy
12	Mr. Nar Bahadur Khatiwora	Assistant Engineer	Planning and Coordination Division	Department of Energy
13	Mr. Gem Dorji	Executive Engineer	Planning and Coordination Division	Department of Energy
14	Mr. Hari Prasad	Assistant Engineer	Planning and Coordination Division	Department of Energy
15	Ms. Colleen Murphy	Research Student		Department of Energy
16	Mr. S.S Garud	Fellow, TERI	TERI	Department of Energy
			Subtotal	**16**
BHUTAN POWER CORPORATION				
1	Mr. K B Wakhley	General Manager	Dev. & Construction Department	Bhutan Power Corporation
2	Mr. Tenzing Yonten	General Manager	Customer Service Department	Bhutan Power Corporation
3	Mr. Gem Tshering	General Manager	Transmission Department	Bhutan Power Corporation
4	Mr. Kinga tshering	General Manager	Procurement Service Department	Bhutan Power Corporation
5	Ms. Dechen Dema	Engineer	Customer Service Department	Bhutan Power Corporation
6	Mr. Sunil Rasaily	Engineer	Customer Service Department	Bhutan Power Corporation
7	Mr. Ujjwal Deep Dahal	Deputy Manager	Planning and Monitoring Department	Bhutan Power Corporation
8	Mr. B. B. V. Ramana Rao	Senior Consultant		Bhutan Power Corporation
9	Mr. Sonam Tobjey	Senior Manager	Finance & Accounts Department	Bhutan Power Corporation
10	Mr. Norbu Tshering	Senior Manager	Planning and Monitoring Department	Bhutan Power Corporation
			Sub Total	**10**
JBIC				
1	Mr. Kikuo Nakagawa	Chief Representative		JBIC, New Delhi
2	Mr. Tomohide Ichiguchi	Deputy Director	Division 2, Development Assistance Department III	JBIC, Tokyo
3	Mr. Masanari Yanagiuchi	Deputy Director	Division 2 Development Assistance Department III	JBIC, Tokyo
4	Mr. Masahide Yamada	Deputy Director	Development Sector	JBIC ,Tokyo
			Subtotal	**4**

List of Participants for the 3rd Workshop, 9 June 2005

The Integrated Master Plan Study for Dzongkhag-wise Electrification in Bhutan

No	NAME	TITLE	ORGANIZATION	
JICA				
1	Mr. Mitsukuni Sugimoto	Resident Representative		JICA Bhutan Office
2	Mr. Emi Doyle	Resident Officer		JICA Bhutan Office
			Subtotal	2
JICA STUDY TEAM				
1	Mr. Tomoyasu Fukuchi	Team Leader		Nippon Koei Co., Ltd.
2	Mr. Keiji Shiraki	Distribution System and Design Standard Planning		Chubu Electric Power Co., Ltd
3	Mr. Kazunori Ohara	Power Transmission Planning		Chubu Electric Power Co., Ltd
4	Ms. Kyoko Usuda	GIS/Database		Nippon Koei Co., Ltd.
5	Mr. Kiyoshi Hirata	Small Hydro Power / Power Demand and Supply Planning		Nippon Koei Co., Ltd.
6	Mr. Ryosuke Ogawa	Information and Telecommunication Planning		Nippon Koei Co., Ltd.
7	Dr. Hiroshi Nishimaki	Financial and Economic Analysis		Exeidia
8	Mr. Kazuhiko Dobeta	Socio Economic Study		KRI International Co., Ltd
9	Mr. Deepak Bista	Solar Power and Renewable Energies Planning		Nippon Koei Co., Ltd.
10	Mr. Takahiro Kamishita	Environmental Impact Analysis		Nippon Koei Co., Ltd.
11	Ms. Yuka Nakagawa	Coordinator/Biomass Energies Planning		Nippon Koei Co., Ltd.
12	Ms. Kesang Anayat Yaganegi	Assistant		Nippon Koei Co., Ltd.
			Subtotal	12
			Total	70

BPC	: Bhutan Power Corporation
ESD	: Electricity Service Division
CSD	: Customer Services Department
DYT	: Dzongkhag Yargay Tshogdu
D&CD	: Development and Construction Depart
BEA	: Bhutan Electricity Authority
PCD	: Planning and Coordination Division
RED	: Renewable Energy Division
JICA	: Japan International Cooperation Agency
JE	: Junior Engineer
UNDP	: United Nations Development Programe

Record of Discussion on the 3rd & final workshop for "The Integrated Master Plan Study for Dzongkhag-wise Electrification"

Venue: BCCI Hall
Date: 9th June 2005

Welcome Remarks and Introduction

By Mr. Sonam Tshering, Director General, DoE.

In his opening remarks, he welcomed officials from JICA, JBIC, Representatives from Dzongkhags, other Officials from various Government and non-government agencies and highlighted the importance of power sector for socio-economic development of a country, the underlying objective of the Rural Electrification Master Plan Study and touched upon the importance of participation of counterparts for success of technology transfer. He also remarked on the importance of the participation of the stakeholders especially the Dzongkhag representatives to share their comments/feedbacks/views/consensus and expect them to disseminate the progress and output of the master plan to their respective Dzongkhags.

Greetings by JICA Bhutan Office

By Mr. Mitsukuni Sugimoto, Representative of JICA Bhutan Office

He appreciated the diligent efforts and progress made by the study team and the local counterparts to achieve a meaningful Rural Electrification Master Plan. He also remarked that Bhutanese Government will be able to utilize the report effectively and should validate the facts and figures with result of recent National Population Census data.

Draft Result of Master Plan Study

The underlying objective of the workshop is to seek consensus/feedbacks/views/comments and information dissemination and to keep all the stakeholders abreast with the development of the master plan study. Besides, it was intended to demonstrate the participation of counterparts for success of technology transfer. Hence, most of the presentation was made by the counterparts as follows:

1. *Study overview by Karma P, DoE*
2. *Methodology of On/Off grid Cut-Off point decision by Ujjwal, BPC*
3. *Off-Grid Model Plan, Implementation and O&M by Satchi, DoE*
4. *Small Hydro Model Plan, Implementation by Karma Tshewang, DoE*
5. *Draft Master Plan of RE by Karma P, DoE*
6. *Environmental consideration in the Master Plan by Kamishita, JICA Study Team*
7. *Telecommunication Development Plan by P M Pradhan, Bhutan Telecom*
8. *Project Cost Estimation & Economic Evaluation by Karma P, DoE*
9. *Implementation, Rural Operation & Maintenance Plan by Decehen Dema, BPC*
10. *Institutional Guidelines by Nishimaki, JICA Study Team*

The responses received from the participants were overwhelming and some of the opinions, issues, concerns, comments and feedbacks shared by the participants were pertinent. The discussions/issues/comments/feedbacks are summarized below:

1. On the concerns of priority village selection criteria with context to equity and efficiency issue, it was addressed that the village prioritization is based on regional approach not on the national basis. However, it was further elaborated that under current Integrated Master Plan Study for Dzongkhag-wise Electrification, GPS coordinates of all the unelectrified villages and number of households have been identified and mapped using GIS. Furthermore, preliminary network optimization has been carried out with MiPower software, and a bill of quantities and cost estimation are generated. So far the phased development plan is based on economic analysis (EIRR $\geq$ 12%) and budgetary constrains (USD 30 or 40 million) and there is a need to pay due attention for other factors such as equitable distribution, and environment aspects. The inclusion of multiple objectives does not allow simple ranking but more sophisticated approach. Instead of multiple criteria, the proposed approach herein employs "multiple minimum goals", in which phasing plans need to satisfy all the targets set forth.

2. A concern with respect to realization of RE Master Plan and recommendation of using Power System Master Plan as a baselines/guidelines to help initiate such Plans, the team responded that proposed distribution line plans are designed after giving due diligence such as system load flow analysis, availability of existing distribution lines, environmental aspects and in many cases existing transmission substation or proposed new transmission substation.

3. A representative from Samdrupjongkhar pointed out difficulty in obtaining spare parts, incapability of the trainees, support services and maintenance of solar system with context to solar sets distributed in ShingkharLauri. Further there was a concern raised with context to the sustainability of Solar PV system. The study team was requested to look into institutionalizing a system addressing policy framework, subsidy, ownership issues and technology intervention.

4. A technical comment concerning feasibility of Solar systems in higher altitude areas as well as in terms of costs in far remote areas like Laya/Lingzhi, it was recommended that option of Mini/Micro Hydel would be preferred over Solar system depending on the feasibility of potential sites.

5. In context with proposal of creation of a village power distribution company with a rational to enhance the management efficiency of rural power distribution, a concern raised was implication of overhead cost and replication of separate entities which may duplicate functions and derive no benefits in terms of synergies.

6. A representative from Nature Conservation Division commented with respect to duplication of efforts in provision of solar PV system in protected areas. In this regard, it was noted that adequate coordination amongst stakeholders is required in order to avoid duplication of works.

7. On the presentation of opportunity of promoting some of the RE projects under CDM mechanism for carbon trading, clarification was sought on application of baseline and whether the environment cost were considered. The Team responded that at master plan level, it would not be possible to assess the baseline information. On the issue of environment cost, it was clarified that environment impact mitigation cost was incorporated but would not be possible to ascertain the monetary value of environmental and social cost.

8. A representative from BPC commented that while biomass as source of electricity for RE is not feasible at present the opportunity for use of biomass should be reflected in the master plan, since it constitutes 78% of primary energy source of Bhutan with 72% forest coverage and has huge potential for biomass energy. He also emphasized that biomass like fuelwood can meet the heating requirements and this would lead to prudent electricity demand management and also increase export revenue.

9. The JICA study member raised an issue concerning the need for clear indication on implementation and ownership aspects of proposed integrated Telecommunication plan with RE Master Plan. It was responded that development of telecommunication is mandate of Ministry of Information and Communication and should be dealt with concern Ministry, although benefits of synergies have been indicated in the master plan.

Closing remarks by Director General, DoE

In his closing remarks, he appreciated the progress of the master plan study and their commendable work and requested the study team to incorporate/address the comments/feedbacks/concerns raised by the participants. He also thanked JICA for funding the workshop and all the participants for their valuable contribution. His final closing remarks focused on following points.

- The DoE is committed to meet the nations vision of electricity for all by 2020. We must find the most optimal solutions to reach this target.

- The RE Master Plan has to decide on the threshold to decide On-Off grid connectivity to unelectrified villages. The basis for such decision has to be justified

- He emphasized on the need to develop a sustainable implementation plan for solar. The Master Plan must address this aspect.

- In pursuit of electrification for all, environment plays a major role in the overall costs and the extra costs incurred by environmental considerations should not be loaded on RE. Instead such costs should be funded through other sources.

- With context to proposal of community participation and management, a pilot projects like Chendbji CDM Project and UNDP/GEF funded Sengor Micro Hydel Project will play role model for future community based projects.

- As a follow up to the workshop, he recommended to call for meeting involving senior members from BPC, DoE and the JICA Study Team to discuss and address some of pertinent issues raised during the workshop.

Summary of the Dzongkhag Comment

1. **If you have the priority village/Gewog/feeder for on-grid electrification in your Dzongkhag, please specify and describe the reason of it.**

   - Bichgaon village under Dunglegang geog and Tsholingkhor geog in Tsirang Dzongkhag. Villages are located nearby the road yet left unlectrified. (Chukha)

   - Tseza, Tashiding, Drugyelgang/Gozhi and Kana geogs.These falls in the centre of the Geog where so many development activities are coming and are resettlement areas.(Dagana)

   - Ney village. There are more than 50 households in the same geog.(Lhuentse)

   - Silambee, Gongdue, Kengkhar and Jurmey Geogs . They are in remote and deprived of development activities.(Mongar)

   - Gomdar and Martshala Geogs.There are lots of schools, lhakhangs and village households; in which your Department should be enforcing it as the investment cost would be soon recovered as shared above and availability of road facilities in which would reduce transportation cost. (Samdrup Jongkhar)

   - Grid extension till the interior part of villages is needed. Because still few villages near to Samtse town/substation do not have the electricity.(Samtse)

   - Those villages which are feasible within the targeted plan (Tshangkha, Bjezam and Langthel) etc. These villages are located nearby the road heads and have many institutes located. (Trongsa)

   - Nobding. There are no electricity and it is located near a major highway, through which a lot of people pass and a school is there and other facilities as well except for electricity and telecommunication. (Wangdue)

   - Nangkhor Geog. Because it is near to the Dzongkhag and central to the Geog. Has more households.(Zhemgang)

2. **If you have any comments for general approach of the formulation of the Rural Electrification Master Plan, please give us.**

   - Master Plan with future maintenance and support. Also to include all institutes which are in very remote areas. (Bumthang)

   - Prioritize the areas/villages/chiewogs for either on/off grid electrification those are located at far flung areas in the immediate future. (Chukha)

   - Concerned Dzongkhag will give a list of villages to be electrified.(Lhuentse)

   - We really enjoyed your warm presentation as nation wide policy concern on the achievement of "Gross National Happiness". (Samdrup Jongkhar)

   - As stated below, implementation of single phase dynamo.(Samtse)

   - Work more in providing on-grid (by grid extension) rather then by suitable off-grid to all the

villages by 2020. (Trongsa)

- We have learned that if the benefit is more than the investment, then we go for grid line and vise versa. But in case, if the benefit is marginally less than investment, we must consider and give grid line than going for alternative energy as gridline is considered sustainable. As discussed, villages which will not get gridline must be provided with the alternative energy-i.e solar, Pico Hydel, etc at the earliest.(Tsirang)

- Considering our climate and location, an off-grid option does sound feasible and practical. We are/were only concern regarding prioritization of villages, but that concern was cleared when Dzongkhag-wise efficiency and equitable distribution was mentioned. (Wangdue)

- Rural Electrification Master Plan : Regarding the Solar, spare part is needed to use efficiently in the geog/village.(Zhemgang)

3. **Please show specific request/comments for the Rural Electrification Master Plan from your Dzongkhag, if any.**

- Priority for on-grid electrification should be given even though it is expensive as it is very useful in all fields (multipurpose).(Bumthang)

- To include Metsho and Jarey geog in the Master Plan. Further, Singye Dzong & Romatay village.(Lhuentse)

- The Aja in the north of Shermung Geog in Mongar region, many people but noted that on-grid or off-grid RE not provisioned in that area. The Dzongkhag would appreciate if provisions be kept for that area.(Mongar)

- Yes, we accept your Master Plan Study, but we request for every implementation program should be backed by continuous effort for the continuity of long run sustainability program.(Samdrup Jongkhar)

- Since most of the villagers/households rear cattle, it would be very much benefited if your Master Plan could also introduce small power generation at each household by implementing single phase dynamo and biogas.(Samtse)

- The Dzongkhag may be taken as a tool for implementing every aspects and help needed by the team of JICA Study for Master Plan.(Trongsa)

- Would wind power or a study on it be feasible, as this alternative is particularly available in our Dzongkhag.(Wangdue)

- During implementation of RE project, if they provide the small kits to the poor people, those who cannot effort the internal hose wiring.(Zhemgang)

Attachmnet-2 (1/2)

FRAMEWORK OF DRAFT FINAL REPORT

PART I PRESENT SITUATION AND PLANING CONDITION

CHAPTER 1 INTRODUCTION

CHAPTER 2 OVERVIEW OF THE KINGDOM OF BHUTAN

CHAPTER 3 THE CURRENT STATUS OF THE POWER SECTOR

CHAPTER 4 EXISTING POWER FACILITIES

CHAPTER 5 DEVELOPMENT PROGRAM FOR THE POWER SECTOR

CHAPTER 6 THE PRESENT SITUATION OF THE INFORMATION AND COMMUNICATION SECTOR AND DEVELOPMENT PLAN

CHAPTER 7 PRESENT SITUATIONS OF NON-ELECTRIFIED VILLAGES

CHAPTER 8 PRACTICAL USE OF GIS IN MASTER PLAN

CHAPTER 9 ENVIRONMENTAL AND SOCIAL CONSIDERATIONS

PART II PLANNING METHODOLOGY AND ANALYSIS

CHAPTER 10 ON-GRID TECHNICAL STADARDS FOR POWER FACILITIES

CHAPTER 11 OFF-GRID ELECTRIFICATION PLANNING

CHAPTER 12 POWER DEMAND FORECAST

APPENDIX

APPENDIX III MASTER PLAN AND IMPLEMENTATION STRATEGY

Record of Discussion
on
Institution, off-grid options and prioritization criteria for on-grid electrification.

Date: 15th June 2005
Venue: DoE Conference Hall

Members Present;

BPC:

1. Mr. Kinga Tshering, Oftg. Managing Director, Bhutan Power Corporation (BPC)
2. Mr. Tenzin Yonten, General Manager, Customer Services Department, BPC
3. Mr. K B Wakhley, General Manager, Construction & Development Department, BPC
4. Mr. Norbu Tshering, Manager, Planning Division, BPC
5. Mr. Ujjwal D Dahal, Dy. Manager, Planning Division, BPC

DOE:

6. Mr. Karma Yonten, Oftg DG, Dept. of Energy
7. Mr. Karma Tshewang, Project Manager, NORAD-II, Dept. of Energy
8. Mr. Satchi, Oftg. Head, Renewable Energy Division, Dept. of Energy
9. Mr. Karma P Dorji, Project Manager, RE-MP, Dept. of Energy
10. Mr. Nawang Choeda, Asst. PM, RE-MP, Dept. of Energy

JICA Study Team:

11. Mr. Tomayasu Fukachi, Team Leader
12. Mr. H Nishimaki, Economist/Financial
13. Mr. K Hirata, Hydropower
14. Mr. T Kamishita , Environment
15. Ms. K Usuda, GIS
16. Ms. Y Nakagawa, Biomass
17. Mr. Ogawa, Telecommunication/ICT
18. Ms. Kesang A Yaganegi, Project Assistant

Discussion:

1. Adoption of Agenda

The Oftg. Director General, DoE, gave the opening remarks and welcomed the members to tne follow-up meeting session of the 3rd and Final Workshop on the "Integrated Master Plan Study for Dzongkhag wise Rural Electrification in Bhutan held on 9th June, 2005.He mentioned that this meeting was basically to seek consensus and recommendations finalizing on various issues pertaining to the Master Plan.

He than requested for adoption of annotated agenda circulated and all members agreed to adopt the agenda.

2. Selection Criteria for the 10th Plan Rural Electrification Households (HHs).

The Project Manager briefly presented the following and requested for general consensus/comments/suggestion.

Rural Electrification Programme is considered as Basic Infrastructure Development Programme for the socio-economic development of the country and is given ***highest priority*** for the sustainable development and poverty alleviation especially in the rural areas of Bhutan.

The overall rural electrification strategy is to achieve 100% coverage by 2020 through an equitable, phased, radial grid expansion, based on techno-economic feasibility/Dzongkhag priority criteria for inclusion in successive 5 year programmes.

DoE proposes to electrify 25,000 rural households in the 10th Five Year Plan Rural Electrification Program in 20 Districts. The proposal is to electrify 20,000HHs mainly through sustainable grid extension and 2000HHs through sustainable off-grid systems such as Solar PV and Micro Hydro Power. It is also proposed to include the balance 3000 HHs of the 9th Plan target within the 10th Plan RE Program since the funding for the 3000 households under 9th Plan Rural Electrification Program is yet secured mainly in 5 Dzongkhags viz. Bumthang, Dagana, Tsirang, Trongsa and Wangdue. ^ to be

Currently, under the Integrated Master Plan Study for Dzongkhag-wise Electrification, GPS coordinates of all the unelectrified villages and number of households have been identified and mapped using GIS. Furthermore, preliminary network optimization has been carried out with MiPower software, and a bill of quantities and cost estimation are generated. So far the phased development plan is based on economic analysis (EIRR $\geq$ 12%) and budgetary constrains (USD 30 or 40 million) and there is a need to pay due attention for other factors such as equitable distribution, and environment aspects. The inclusion of multiple objectives does not allow simple ranking but more sophisticated approach. Instead of multiple criteria, the proposed approach herein employs "multiple minimum goals", in which phasing plans need to satisfy all the targets set forth.

On setting 10th Plan RE target as 20,000 Households

The Project Manager informed the prospects of JBIC and ADB loan for the 10th five year plan RE and indicated possibility of securing grants for off-grid electrification. He also pointed out that usually a lot of time in a plan period is spent mobilizing funds and a very little time is left for implementation during the plan period, whereas, with current planning method the funds are more or less identified so there would be more time for implementation.

The General Manager, CSD, BPC sought clarification of the electrification numbers which had changed from 15,000 Households to 25,000 Households in the 10th FYP.The two main issues are that implementation of the increased households would be the fund availability and the capacity of BPC. If the ongoing RE-III Project is successfully completed, then the increased numbers should be possible.

In the same line, the Oftg. Managing Director, BPC mentioned that in pursuing electrification of the targeted households, it was not much of a problem provided that there was commitment and availability of funds in hand. He stressed on the fact that if funds were available upfront, it would ease the work resulting in no delays but on the other hand, if it was not available upfront, adhoc funds caused a huge delay since a considerable amount of administrative work was involved.

The consensus reached was that realization of electrifying the target areas was entirely based on fund availability.

Adoption of base year for identifying 20,000 unelectrified households for 10th Plan RE.

Mr. Nishimaki explained the table in the Master Plan Study reflecting the projected number of un electrified households Dzongkhag wise and did mentioned that the survey was done in 2003 and the figures for that year were the real case whereas other years till 2020 are projected figures using population vis-à-vis household growth rate. It was emphasized that the base year needs to be selected and 20,000 HH for the year 2007 was a very ambitious target. The target should be set at a more realistic level. After discussions it was decided that the base figure of 2007 would be a better option than 2003, or 2020 to better understand the cost implications. This was of course dependant on updating the data, as and when required (e.g. updated Census data)

Therefore, **it was decided that base figure of 2007 be taken as the benchmark for identifying the 10th plan target** to derive advantages of having more realistic figures rather than basing 2020 projected figures with more uncertainties. It was also agreed that projected figures should be validated with recent figures of National Population Census and Household Numbers.

Selection criteria

The Project Manager highlighted that currently, under the Integrated Master Plan Study for Dzongkhag-wise Electrification, GPS coordinates of all the unelectrified villages and number of households have been identified and mapped using GIS. Furthermore, preliminary network optimization has been carried out with MiPower software, and a bill of quantities and cost estimation are generated. So far the phased development plan is based on economic analysis (EIRR $\geq$ 12%) and budgetary constrains (USD 30 or 40 million) and there is a need to pay due attention for other factors such as equitable distribution, and environment aspects. The inclusion of multiple objectives does not allow simple ranking but more sophisticated approach. Instead of multiple criteria, the proposed approach herein employs "multiple minimum goals", in which phasing plans need to satisfy all the targets set forth.

The Oftg. Managing Director, BPC commented that the specific household and village identification should probably be left to the implementing agency. He said that there is a possibility that the ground realities may be left out which otherwise the implementing agency may be able to address given the advantages of access they have.

The Project Manager responded that detail field survey will be conducted with technical assistance from JBIC and ADB. He also said that final approval of the identified villages and households will have to be finalized by consultative process with the Dzongkhag people.

The study team pointed out that how they should treat the provision of grid electricity to those villages and households lying within protected areas/national parks. They also pointed out that JBIC and ADB requires full blown EIA for those projects located in parks which will lead to delay in project implementation.

The General Manager, CSD, BPC commented that in order to save environment protected areas, so many restrictions were imposed thereby indirectly making the beneficiaries residing in such areas deprived from socio-economic activities. He stressed on the fact that taking grid supply to such areas would result in one time environmental impact although in the long run, the benefits would be greater as electricity will be substituted for fuel wood etc.

After elaborate discussion on same issue, it was agreed that a detail feasibility study for provision of grid options for such areas should be included for the consideration. However, those projects which requires EIA should undergo full blown EIA because the communities in those areas require power supply and in some cases there may be positive environment impacts which need to be justified. In the event if JBIC/ADB is reluctant to fund such projects, there is a need to look for other source of funding.

The JICA Study Team Leader informed the floor that the study team is approaching the stage of compiling the Final Report and a more practical selection criterion was crucial for possible 10th FYP electrification. He also mentioned that JBIC's opinion was to push the electrification of feeders crossing environmental areas into 11th FYP.

With reference off-grid prioritization, the General Manager, DCD, BPC recommended that villages that were not feasible to be electrified by Grid Supply or Mini/Micro Hydel, a Solar PV system should be provided with priority. He also mentioned that the Park Managements were also actively involved in supplying Solar sets for residents residing in such areas and hence in order to avoid duplication of works, a kind of documentation/feedback was deemed necessary from their side.

The members also agreed upon and recommended to the Consultants based on above discussion the fundamental criteria in identifying priority villages/households for phased development plan should adopt following procedures

a) *The Rural Electrification program has to be framed based on the equitable distribution of development benefits to all the citizens. The consultants will have to work out an appropriate minimum level of rural electrification in each district for the 10th five year plan based on the existing electrification ratio.*
b) *Economic Internal Rate of Returns of investment should be either equal to or higher than 12% of each sub projects*
c) *For the provision of solar PV systems in the off-grid villages/households, the some improvements package should be included to enhance the energy welfare.*
d) *The final draft output should be consulted and sought for consensus at Dzongkhag levels before August 2005 and the feedback will be include in the RE Master Plan Report.*
e) *Break-even point (Threshold)*
f)

However, the meeting conceded that if donors insisted on their requirement of the EIRR and environment requirements, the prioritization may change.

3. *Establishment of Village Power Distribution Company*

The write-up on this proposal is appended as Appendix-1.

Mr. Nishimaki briefly explained rationale for establishment of village power Distribution Company. He said in order to attain the goal of achieving 100% rural electrification by the year 2020 and improving the management efficiency of rural power distribution, separation of assets and management is needed to create transparent accounting system and increase efficiency in construction and operation. A new holding company tentatively called "Bhutan Rural Power Supply Holding Company" will own and manage the assets related to rural power distribution. BPC will continue to offer its expertise in construction and OM by providing management services. At village levels, where possible, village power distribution companies run by villagers will operate and maintain LV lines to household interior wirings.

The General Manager, CSD, BPC commented that BPC is also considering out sourcing billing and collection and have no problem in terms of operation and maintenance. He also said that replication of separate entities may duplicate functions and there won't be any benefits in terms of synergies.

The Oftg. DG, DoE further supplemented that DoE made similar proposal to Ministry of Finance (MoF) with few scenarios on how the RE activities could be carried out. One of scenarios proposed was similar to the proposal being made by Mr. Nishimaki where all the RE assets were to be transferred to a MoF Holding Company and the BPC was only to manage, operate and maintain the assets. Discussions were held with the Ministry of Finance on these scenarios but they did not seem responsive to the proposals being made. They were of the view that BPC should continue to own the RE assets and also manage, operate and maintain the assets. They felt that cross subsidies provided to BPC through other areas such as transmission wheeling charges would offset the losses made through the RE activities.
A consensus was reached that while there may not be a need to create separate rural asset management/entities the proposal for the creation of the separate entity could be kept within the Masterplan and could remain as one of the recommendations of the Masteplan. BPC would like to address the concern through integrated approach such as cross subsidizing from lucrative operation to inefficiencies generated through rural electrification.

4. Marketing and O&M Schedule for Solar System

The study Team pointed out that the experience in the promotion of Solar Systems shows that the success or failure strongly hinges on the existence of strong institutional backups for this decentralized power system. The misconception that the solar is a maintenance free system and each user attends its maintenance has led to many failures, thus has undermined the credibility of the system. However, the solar system requires more servicing and marketing to capture its full service capacities

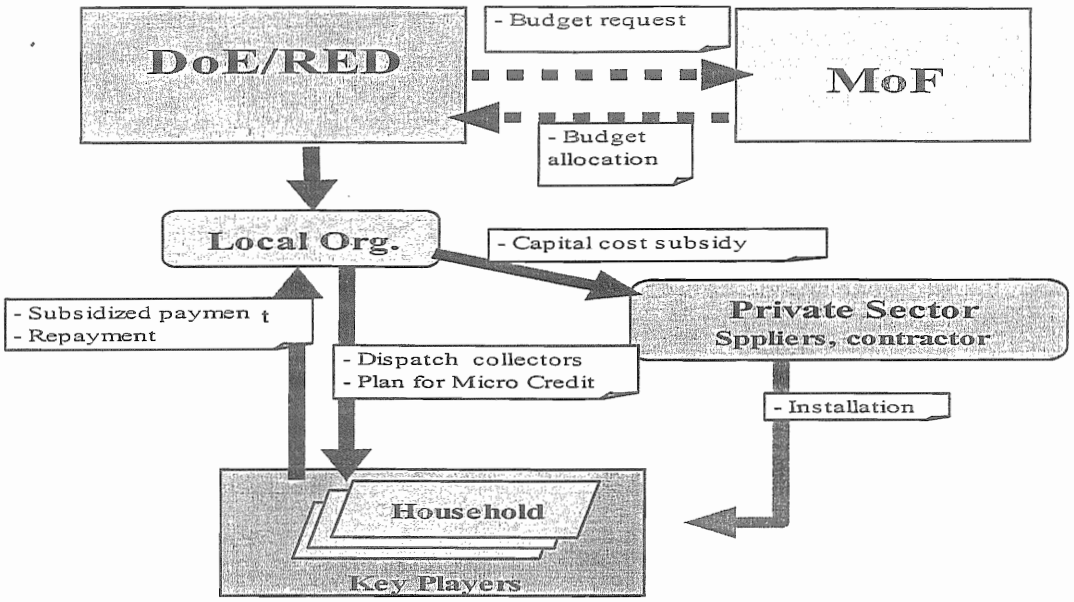
The General Manager, CSD, BPC commented that sustainability of Solar PV Programs was adjudged by two factors 1. Ownership and 2. Institutional Setup on continuous basis. He remarked that the best way to deal with such issues was to contract out to private ESCO (electricity supply company services) where Government contribute certain percentage and beneficiaries contribute remaining to these ESCO.

In the same line, Mr. Nishimaki commented that rendering the services of such ESCOS was a better option for better ownership and maintenance, by which such ESCOS would be fully encouraged to participate with better incentives.

The Oftg. DG, DoE commented that some sort of pricing was deemed necessary to make Solar Systems more sustainable and the question of equity was a major concern taking into comparison the costs for Grid connection and Solar system connection. In terms of quantification of benefit, there was no doubt that Grid edged over Solar Systems and a more rationale integrated approach was needed to explore into such issues in order to have a comparable basis (bench mark).

In the same line, the General Manager, CSD, BPC commented that setting of such a bench mark was difficult since costs of having no electricity and having electricity had some benefit and when viewed from a practical approach, even if solar systems connection was free, the issue of non-sustainability crept in.

On the presentation made by Ms. Yuka Nakagawa on the proposed solar institutional framework, some of the specific comments made by the members are;



i. The Oftg. MD, BPC commented that role of local Org. may not be required in the event if private ESCO entities are institutionalized. While Mr. Nishimaki commented that there should be local organization that monitors the performance of the private sector so as to hear the complaints from the users. The complaints are difficult to reach to Thimphu.

ii. The Oftg. DG, DoE remarked that a proper generic model at this stage could be designated as the exterior organization in the institutional setup for Solar Scheme (BPCL/Pvt Sector). Depending on developments in the sector, the BPC or private operators could fill in as the exterior organization.

iii. The GM, CSD, BPC also remarked that options of using BPC as implementing agency for solar program may not be feasible from sustainability point of view. He mentioned that BPC is going to outsource non-core activities and in the event solar program is given to BPC, might as well better out source directly by DoE rather than involving middle party i.e. BPC.

iv. Further, the Oftg. MD, BPC mentioned that the Private Sector may not address issues like Monitoring/Technical issues and the main issue was the unheard complaints from beneficiaries using Solar Systems. He also mentioned that certain clear defined Solar Policies was needed in order to address such issues. He also stressed that the ongoing RE Master Plan should bring out some guidelines/indicative measures for tackling with various issues like Subsidy/Private participation/Solar Policy etc.

v. The Oftg. DG, DoE responded that an Awareness Campaign was seen necessary in order to cater to issues related to unheard complaints from the beneficiaries of Solar Systems.

It was agreed that for solar to become successful some policies were required to ensure sustainability. Some issues to be addressed would be the amount of subsidies required, how to ensure ownership of the solar sets, how to ensure sustenance in operation and maintenance, and how to ensure service quality standards to the solar recipients

5. *Project identification, financing and implementation for Mini/Micro Hydels*

JICA Study team briefly presented the status of the Mini/Micro Hydel desktop studies and high lighted 13 sites which have been identified. They emphasized that all these sites indicated positive EIRR unlike other Mini/Micro Hydel Projects. However, after cost benefit analysis, it was found that grid extension is better alternative when compared to cost of Mini/Micro Hydel Project including distribution infrastructures. Nevertheless, in order to minimize the loan amount for grid extension, the alternatives of Mini/Micro Hydel is found feasible provided if grant aid could be secured.

The following table indicates the detail cost and EIRR calculation for identified sites for Mini/Micro Hydels.

No	Dzongkhag	Name of Proposed MHP	Installed Capacity (kW)	Total HH (2020)	Total Investment Cost (MHP) (US$)	US$/kW	US$/HH	EIRR (MHP) (%)	Annualized Investment Cost (MHP) (US$/year)	Annual O&M Cost (MHP) (US$/year)	Total Annualized Investment Cost (Grid) (US$/year)	Total Annual O&M Cost (Grid) (US$/year)	Comparison (Grid - MHP) (US$/year)	MHP vs Grid
1	Trashigang	Sakten	500	363	2,603,000	5,206	7,175	4.6%	287,000	27,000	63,872	17,874	(232,254)	GRID
2		Sakten - Merak	890	669	4,284,000	4,813	6,400	5.4%	472,000	54,000	129,792	33,936	(362,271)	GRID
3	Samdrup Jongkhar	Shingkhar - Lauri	540	421	2,403,000	4,450	5,703	3.4%	265,000	31,000	96,938	27,878	(171,184)	GRID
4		Lauri	720	569	3,130,000	4,347	5,502	4.6%	346,000	39,000	111,879	33,722	(239,399)	GRID
5		Zangthi	360	283	2,300,000	6,389	8,125	1.7%	253,000	23,000	47,516	11,649	(216,835)	GRID
6		Kashiteng (Shingkhar-Lauri)	910	715	4,458,000	4,899	6,233	3.2%	491,000	55,000	162,777	49,691	(333,532)	GRID
7	Samtse	Upper Tendu	1,120	943	3,359,000	2,999	3,560	6.3%	372,000	65,000	110,981	34,062	(291,957)	GRID
8		Majuwa (Namgyeltchholing)	230	212	969,000	4,213	4,563	1.5%	108,000	17,000	27,689	10,278	(87,033)	GRID
9		Chingu (Bara upper)	70	363	260,000	3,714	3,428	3.1%	33,000	6,000	13,290	6,859	(18,851)	GRID
10		Sangbay	400	317	1,984,000	4,960	6,259	1.8%	220,000	35,000	79,951	32,328	(142,721)	GRID
11		Denchhukha	1,000	881	3,755,000	3,755	4,261	4.7%	416,000	63,000	143,549	43,942	(291,509)	GRID
12	Chukha	Metapkha	470	351	1,871,000	3,981	5,323	4.6%	208,000	34,000	61,321	17,874	(162,804)	GRID
13		Papali	110	70	618,000	5,618	8,791	-1.9%	69,000	11,000	19,539	8,734	(51,726)	GRID

The General Manager, CSD, BPC commented that BPC's view is not in favor of mini/micro hydels mainly because O&M cost is always higher than revenue generated through its generation. He also mentioned that if grid extension is found techno-economically feasible comparing to Mini/Micro hydels, BPC would prefer grid extension.

A consensus was reached that selection of feasibility of Mini/Micro Hydel sites should b based on following criteria:

- **Grid extension not at all feasible**
- **Villages with lowest EIRR (Mini/Micro is preferred over Solar PV)**
- **Considering grant financing.**

6. *Promotion of Biomass Energy.*

The Oftg. Managing Director, BPC pointed out that while Biomass as source of electricity for RE is not feasible at present the opportunity for use of biomass should be reflected in the Master Plan, since it constitutes 78% of primary energy of Bhutan with 72% forest coverage and has a huge potential for Biomass energy. He also mentioned that even in urban areas, people are not switching over LPG to electricity for cooking where they have access to electricity, thereby saving energy which could be exported. Similarly Biomass like fuelwood

can meet the heating requirements and this would lead to prudent electricity demand management and also increase export revenue.

A consensus was reached that the RE Master Plan will reflect and address the opportunities of innovative bio-mass and bio-gas technology.

7. Conclusion

The Oftg. Director General concluded the meeting by thanking all the members for actively participating in a very fruitful discussion. He also mentioned that Mr. Nishimaki will provide detail working sheet for evaluating economic benefits which will be circulated to all the members for further review. This will help in assessing the threshold of either going for an on-grid connection or a solar connection.

(Karma Yonten) (Tenzin Yonten) (K B Wakhley) (Kuenga Tshering)

(T Fukachi) (H Nishimaki) (K Hirata)

(Y Nakagawa) (Karma P Dorji)

Appendix-1

Institutional Arrangement of Grid Power Distribution

2005/02/23 Hiroshi Nishimaki/ JICA RE Master Plan

Outline

In order to attain the goal of achieving 100% rural electrification by the year 2020 and improving the management efficiency of rural power distribution, separation of assets and management is needed to create transparent accounting system and increase efficiency in construction and operation. A new holding company tentatively called "Bhutan Rural Power Supply Holding Company" will own and manage the assets related to rural power distribution. BPC will continue to offer its expertise in construction and OM by providing management services. At village levels, where possible, village power distribution companies run by villagers will operate and maintain LV lines to household interior wirings.

Background

It is widely recognized in Bhutan that rural power supply is closely related to poverty reduction where the majority is concentrated and at the same time. Also rural power supply is not financially feasible. Currently BPC owns and manages the entire facilities related to rural power distribution. BPC also owns entire transmission lines of Bhutan. BPC cross-subsidizes rural electricity consumers by the profits made from wheeling charges on the sales of power to India. In the year 2003-04, BPC recorded a loss of 68 million Nu. However, it is not known how much of the loss is attributable to the operation and maintenance of rural power distribution since power tariff in general is under-priced than the cost of delivery across board,. In our estimate of rural power distribution operation alone, BPC receives roughly 50 million NU per year and spends 35 million Nu on operation and maintenance, incurring a deficit of 25 million Nu per year. The cost for rural power distribution operation does not include the cost of power generation or transmission, let alone the opportunity of cost of power sales to India. If the cost for generation and transmission is added, the deficit would increase to 50 million Nu per year[1]. Given the level of rural electrification and future expansion which adds around 2400 km of MV lines, the OM cost alone will increase by around 100 million Nu per year, not speaking of assets depreciation. In any case, BPC will not be able to shoulder all the costs in the future. Therefore there is a consensus that the government needs to give a subsidy. Excess subsidy provides little incentives to improve efficiency and Inadequate subsidy could lead to poor maintenance and poor quality of

[1] The costs are estimated on the numbers of rural consumers and total consumers, length of LV lines and estimated marginal cost of operation and maintenance of BPC.

service, at worst, to disinvestment. Therefore, accurate accounting information is necessary to determine the level of subsidy or tariff levels.

Another problem in rural electrification from now on is the expanse of coverage in remote areas. Already in ESD, cost of metering reading and bill collection exceed the collected revenue. This type of situation will become more prominent in the future rural electrifications.

Methodology for Separation of Accounts

Separation of accounts can be achieved in several ways. There are three possibilities;

1) Strict Cost Accounting Just for Rural Power Distribution
2) Establishment of Dedicated Division for Rural Power Distribution
3) Separation of Entities

As the option descends from 1 to 3, the level of separation rises. Strict cost accounting requires disiplines within BPC to adhere to a certain set of billing and payment procedure rules. A dedicated division could be held more easily held accountable for specialized task. However, separation of staffing could lead to inefficiency due to overlapping functions between personnel. Third option of separation of entity will attain the highest transparency in accounting but could lead to over-redundancy if a full-fledged organization in dealing with rural power distribution should be created. Hence the proposal here is to incorporate the merits of both sides of transparency and efficiency.

Decentralized Power Distribution System

To reduce the cost of meter reading and bill collection one way is to leave the operation to village levels. A village level means a cluster of villages in a vicinity that entail economic efficiency in operation. It is definite that the cost of administration will be reduced; the system should be structured in such a way that the local management is fully aware of the risks and consequences of poor management and lack of technical skill enhancement. One way is to transfer the entire responsibility to a village entity. However, it is a questionable when some disaster happens, a small village level entity can withstand the consequences.

Proposed Institution

1) Rural Power Distribution Holding Company

One recommendation here is to establish a small-sized holding company that owns all the facilities related to rural power distribution but only deals with financial aspects of the business. A holding company staffed with capable financial experts can manage the asset and instill management efficiency for the construction and

2) BPC

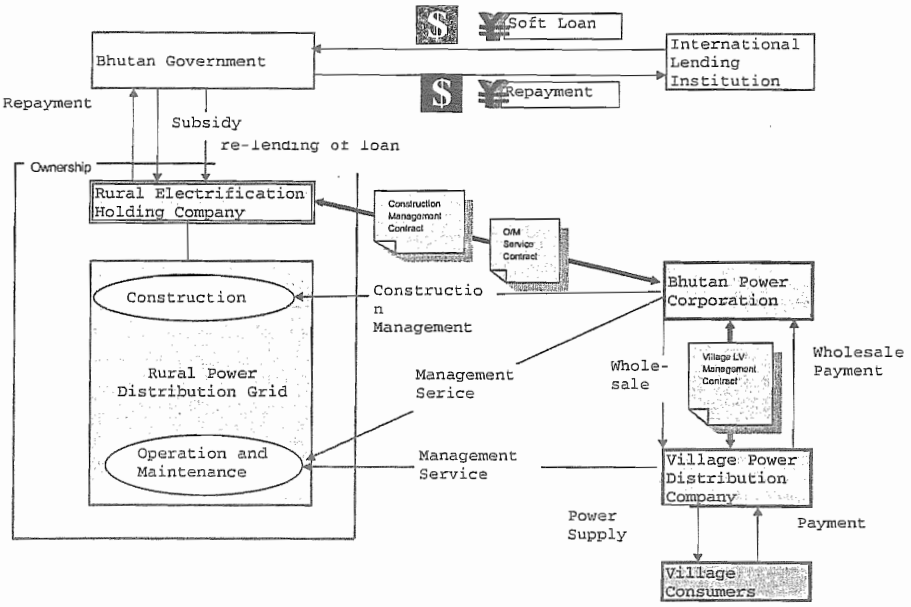
BPC becomes a service provider in this model. It provides construction management services at the initial period of erecting poles and installing lines. It might bear the risk in procurement and cotractor selections at this stage. After the completion of grid feeders, BPC will undertake operation and maintenance services of MV lines and LV lines where VPDC cannot provide the service.

3) Village Power Distribution Companies

Village Power Distribution Companies (VPDCs) assumes the responsibility up to the MV transformers on MV lines. The responsibility includes meter reading, billing, LV line maintenance and house internal wiring. Technical capacity of the operators need to be improved by the assistance of BPC and DOE to cope with the increased responsibilities To provide a cushion for some unexpected events and consequent needs for replace of major spare parts, An insurance for repair and maintenance pooled and managed by BPC should be envisaged. One incident could incur some phenomenal amount of replacement expenditure. If this happens when the savings by a local entity is not adequate, the result would be total abandonment of the local grid system

Appendix-1

Figure 1 Institutional Setup



Appendix-1

Table 1 Profit and Losses for BPC and Village Power Distribution Company (In the case of 100 household consumers)

BPC estimated profit and loss for a 100 HH village

	Unit: thousand Nu	
BPC	Future	Present
Revenue	104	242
Annual Maintenance Cost	0	190
Profit/Loss	104	52

VPDC estimated profit and loss for a 100 HH village

	Unit: thousand Nu
Revenue	242
Wages	96
Payment to BPC	104
Material Cost	36
Profit	6

Assumptions

Item	Unit	Amount
NO of HH	nos	100
Annual Energy Demand	kWh	172,800
Tariff	Nu/kWh	1.4
Wholesale Price	Nu/kWh	0.6
LV distance	km	10
LV investment	thousand Nu	1,200
Annual Replacement Cost	thousand Nu	36

NIPPON KOEI CO.,LTD. Consulting Engineers

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New Energy Department, Overseas Consulting Administration

Japan International Cooperation Agency (JICA) Study Team
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Your ref. Our ref. :LKLBHE-05-006 Date : 15th June 2005

Mr. Karma P Dorji
National Project Manager,
Rural Electrification Project, Planning & Coordination Division,
Department of Energy,
Ministry of Trade and Industry,
The Royal Government of Bhutan

Subject : Implementation Body and Schedule of Information Network

Dear Sir,

In our master plan study, we prepare the communication network expansion plan by installing fiber optic cables with the distribution lines. In order to make it more tangible plan in our master plan, we need your Government decision on the following matters.

1) Implementation body for installation and operation of the fiber optic cable
2) Schedule of installation (commencement of work in 10th, 11th or 12th Five Year Plan?)

We have had several meetings with the organizations concerned on the matter, but we couldn't reach the conclusion. The points of discussion on the installation schedule are shown as attached.

We understand that this kind matter can be decided only by Government high officials. Therefore you are kindly request to ask the Ministry of Information and Communication to make decision on the matter.

Your cooperation on the above is highly appreciated.

Sincerely yours,

Tomoyasu Fukuchi,
Team Leader, JICA Study Team

Attachment: Points of Discussion on Installation Schedule

NIPPON KOEI CO.,LTD.
Consulting Engineers

Attachment

Points of Discussion on Installation Schedule

Suggestions by Department of Information Technology (DIT), Ministry of Information and Communication (MoIC) are following:

a) According to Bhutan Information and Communication Technology Policy and Strategies (BIPS), all geog centers will be connected to information network by 2010. (BIPS says, "Extend Government-wide intranet to all Geogs" and "Establish multipurpose telecentres in every Geog" by 2010.)

b) Facilities of Rural Telecommunication Project can't meet future demand within a few years. 10 lines per Geog will be too less and capacity of line also too less for future demand especially when they get stable power supply. Same problem that we are facing with B-Mobile will happen. (BTL can't provide enough capacity of equipment and then can't provide proper services to customer.)

c) Fiber optic cable in rural area should be installed along with RE Master Plan to reduce installation cost.

Suggestions by Bhutan Telecom Limited (BTL) are following:

a) BTL is going to finalize Rural Telecommunication Project by 2007. It will be duplication if BTL goes for fiber optic cable with RE master plan. As long as there are poles, BTL can install fiber optic cable on the poles later and pay reasonable rental fee of poles.

b) Fiber optic cable network with RE master plan is expected to be replacement facilities of Rural Telecommunication Project by 2007. Since life span of facility is around 10 years therefore BTL wants to use fiber optic cable in rural area from 2017 (12th Five Year Plan) only.

Suggestion by the study team is following:

The study team recommend that fiber optic cable be installed with RE from 10th Five Year Plan, because:

I. Facility of Rural Telecommunication Project is not broadband connection and can't be accept much demand that will be coming up, which means that the Government target, BIPS, can not be achieved.

II. Royal Government of Bhutan (RGoB) can largely reduce the installation cost by the sector coordination.

MINUTES OF MEETING
FOR
THE INTEGRAGED MASTER PLAN STUDY
FOR DZONGKHAG-WISE ELECTRIFICATION
IN
THE KINGDOM OF BHUTAN
(SIXTH SITE WORK)

BETWEEN

THE JICA MASTER PLAN STUDY TEAM

AND

DEPARTMENT OF ENERGY

MINISTRY OF TRADE AND INDUSTRY

THIMPHU

September 8, 2005

Mr. Tomoyasu Fukuchi
Team Leader, JICA Study Team
Nippon Koei Co., Ltd.

Mr. Sonam Tshering
Director General
Department of Energy
Ministry of Trade and Industry

The Master Plan Study Team (the Team) of the Japan International Cooperation Agency (JICA), which is headed by Mr. Tomoyasu FUKUCHI, stayed in Bhutan from September 4 through 11, 2005 as the Sixth site work. On September 8, 2005, the Team had a wrap-up meeting with Department of Energy (DOE), Ministry of Trade and Industry and Bhutan Power Corporation (BPC), and the parties confirmed the followings.

1. **Draft Final Report :** The Team submitted twenty copies of Draft Final Report to DOE on September 5, 2005 and discussed the contents with DOE and BPC. The Team was informed that the DOE will be consolidating the comments from different agencies and will be submitted by end of September 2005.

2. **Presentation of Draft Final Report :** The study Team made presentation on the Draft Final Report on September 7, 2005 at the DOE conference hall. Elaborate discussion was held based on the presentation made by the Team. The officials from DoE, BPC, NEC and JICA Bhutan Office attended the discussion. The record of discussion is attached as Attachment-1.

3. **Draft TOR for EIA :** The Team discussed on a draft TOR for the Environmental Impact Assessment of a selected sample feeder of the grid extension plan of Master Plan with National Environment Commission (NEC) on September 6 and 8, 2005. NEC gave comments on the draft TOR, which is shown in the Attachment-2.

4. **Submission of the Final Report :** The Team will finalize the Report by incorporating comments to be received from Department of Energy and submit the Final Report to JICA and DoE in November 2005.

End

Attachment

1. Record of Discussion on Explanatory Meeting on Draft Final Report
2. Comments by NEC on the draft TOR for EIA of RE project

Records of Discussion **Attachment-1**

Presentation of Draft Final Report
"the Integrated Master Plan Study for Dzongkhag-wise Electrification"

Venue: Department of Energy Conference Hall, Thimphu
Date: 7th September 2005.
Time: 10.00 – 12.00 AM

Members present:

JICA

1. *Mr. Kozuki Mansanori, JICA Tokyo*
2. *Ms. Emi Doyle, JICA Bhutan Office*

Other Agencies

3. *Mr. Yeshey Penjor, Sr. Environment Officer, National Environment Commission*
4. *Mr. Sonam Tshering Dorji, Policy Analyst, Policy & Planning Division, Ministry of Trade and Industry*

Department of Energy:

5. *Mr. Sonam Tshering Director General*
6. *Mr. Bharat Tamang, Head, Planning & Coordination Division*
7. *Mr. Karma Yonten, Bhutan Electricity Authority, Department of Energy.*
8. *Mr. Karma Tshering, Executive Engineer, Planning & Coordination Division*
9. *Mr. Tashi Dorji, Executive Engineer, Planning & Coordination Division*
10. *Mr. Karma Tshewang, Assistant Engineer, Planning & Coordination Division*
11. *Mr. Ngawang Choeda, Assistant Engineer, Planning & Coordination Division*
12. *Mr. Karma P Dorji, Project Manager, Planning & Coordination Division*
13. *Mrs. Wangmo, Junior Engineer, Planning & Coordination Division*
14. *Ms. Thukten Wangmo, EIA Officer, Bhutan Electricity Authority*

Bhutan Power Corporation

15. *Mr. Chhewang Rinzin, Managing Director*
16. *Mr. Tenzin Yonten, General Manager, Customer Service Department*
17. *Mr. Ugyen Dorji, Manager, Customer Service Department*
18. *Mr. Norbu Tshering,Manger*
19. *Mr. Ujwal D Dahal, Dy. Manager*
20. *Mrs. Dechen Dema, Engineer*
21. *Mr. Tshering Tenzin, Dy. Manager*

Study Team:

22. *Mr. Tomoyasu Fukachi, Team Leader*
23. *Mr. Hiroshi Nishmaki, Economist*
24. *Mr. Kiyoshi Hirata, Micro Hydro Power Expert*

25. Mr. Takahiro Kamishita, Environmentalist
26. Mr. Ryosuki Ogawa, Information and Communication Expert
27. Mrs. Kyoko Usuda, GIS Expert
28. Ms. Yuka Nakagawa, Coordinator

Background

The meeting was held in order to consult and seek consensus on the final findings of the Integrated Master plan Study for Dzongkhag-wise Electrification.

Discussion

The Director General gave the opening remarks wherein he welcomed the representative from JICA Headquarter, Tokyo and other representatives from various stakeholder organizations and the study team. He mentioned that the output of the study would steer the country to foresee and realize the overall national goals of nation wide electrification by 2020.He further mentioned that the study had been conducted in a participatory manner which was an important component in capacity building for the Department of Energy and Bhutan Power Corporation Limited. He expressed his sincere gratitude to the Study team members for sharing their expert knowledge and experience with their respective counterparts. He further stressed on the fact that the final Master Plan Report should be distributed to the respective Dzongkhags since the major decisions are to be taken by the Dzongkhag themselves in line with the decentralization policy. He further informed the members that feedbacks/comments will be provided within a month's time in order for the study team members to incorporate the comments and submit the final report.

The Team Leader, JICA study Team gave a brief presentation on the overall framework of the Rural Electrification Master Plan Study beginning from the conceptual stage and highlighted the major findings of the study as seen through a more optimized approach. He also proposed a possible methodology for pursuing On-grid electrification with assistance from JBIC and ADB. He also mentioned that as per the forecasted ratio of achieving the target of "Electrification for All by 2020", the works are expected to be completed within 2017 and have a safe comfortable margin of three (3) years.

The Director General commented that one needed to look at the institutional capacity of the implementing agency in achieving the laid out target. He further mentioned that such issues were of prime importance since laying targets was possible provided there was availability of funds, but the implementer's capacity needs to be assessed.

The Team Leader suggested turn-key based contract for implementing RE works and further strengthening of the Supervising and Management section dealing in RE Construction related works.

The Managing Director, BPCL, commented that BPC was presently procuring all RE material departmentally and actual executions of RE works were being taken up by Bhutanese contractors under BPC's supervision. As RE did not involve highly technical issues, BPC was capable of implementing RE within the same framework or a new

framework which should be a better alternative to the present system. A turnkey concept of implementation would greatly increase the cost of RE. This was the experience of BPC with the high voltage transmission and substation projects that BPC was undertaking on a turnkey basis. He also mentioned that training of BPC staff (assistance in its HRD) would be much more beneficial and cost effective in the overall RE execution rather than to adopt a turnkey concept for RE implementation

The Director General remarked that there were certain advantages as well as disadvantages in implementing projects under turnkey basis and stressed upon the fact that a more in-depth feedback from the study team members is required.

The Executive Engineer, PCD raised a concern on the font size of the report and suggested that the font size be increased and maps and excel sheet attachments could be printed on the A3 size paper to make it more legible. He further mentioned that data which were in PDF file format needed to be made into editable by the counterparts for making necessary revisions in the future or as and when required.

The Team Leader and the National Project Manager clarified that such provisions to make the data user friendly was available since in the future the Master Plan was to be reviewed by the counterparts.

The Head, Planning and Coordination Division enquired whether any provision/guidelines had been made to cater to electrification of additional sprouting houses in the vicinity of electrified areas.

The Team Leader clarified that as far as Investment Planning was concerned; such aspects were not looked into, but in case of Demand Forecast Planning, suitable recommendations have been provided to cater to growth of households and population, increased demand for electricity etc.

The General Manager, CSD, BPCL sought a clarification whether the set-up of the Information and Communications Network(ICT) as proposed in the study was not contradicting with the Rural Telecommunications Development program being initiated by Bhutan Telecom Ltd. He further enquired whether the set-up of the ICT network would be made available through a loan or a grant component.

The Team Leader, JICA study team clarified that JBIC/Delhi and JICA/India were particularly interested in cross sectoral integrated works according to the information of JICA/India and therefore ICT network could be availed through JBIC loan and/or Japan's grant. He further mentioned that as far as Communication Services was concerned, feasibility study and design aspects were possible through a grant aid and supervising works through a loan component. He further mentioned that Rural Telecommunications was only concerned with telecommunication facilities whereas ICT network involved certain aspects like transmission of news services, telecommunications, distant education, telemedicine etc.

The Executive Engineer mentioned that as per the recommendations of the study team, implementation plan for the 10th FYP works was donor specific (JBIC and ADB) and

questioned if plans should be donor specific and avoidance of lines falling under sensitive areas. He further remarked that exploring opportunities under Clean Development Mechanism (CDM) for funding off-grid electrification were not addressed in the Master Plan Study.

The National Project Manager clarified that avoidance of the sensitive areas was not a hard and fast rule of JBIC but since power feeders passing through such areas needed to undergo a full blown EIA and keeping in mind the time constraints, hence, such areas were being sidelined for JBIC loan.

The Team Leader, JICA Study Team mentioned that the Study Team evaluated the possibility of CDM applications positively as much as possible in the Draft Final Report, however, large scale of green house gas mitigation could not be expected according to the feedback from CDM specialists in Japan. He further mentioned that necessary follow-up would be done to ensure that CDM applicable projects would materialize from Off-grid projects under the feasibility study.

The Study Team Member gave a brief outline of the Proposed Micro Hydro projects which was compiled on the basis of a desktop study by the Study team members and the counterparts.

The Head, BEA commented that a consolidated information incorporating number of villages, households and cost of electrification in environmentally protected areas should be highlighted.

The Director General remarked that the major issue was to see whether provision of electricity was detrimental to the environment keeping in mind issues like curbing felling of tress for firewood, controlling green house gas emissions etc.

The EIA Officer, NEC also supplemented that the identification of villages and households under protected areas is crucial information for conducting IEE and in determining requirement of full blown EIA as per EIA Act.

Mr. Kozuki Mansanori gave the concluding remarks wherein he expressed his satisfaction on the smooth conduction of the Rural Electrification Master Plan study. He also expressed his gratitude to the involved stakeholders and mentioned that the report would be very fruitful one for achieving the goals of the country.

Finally, the National Project Manager thanked all the participants for making the discussion lively and informative. Further, he expressed gratitude to JICA for supporting the study and study team for building local capacity in addition to conducting a meticulous and detailed study for the Master Plan.

Attachment -2

08 September, 2005

Comments by National Environment Commission (NEC) on the draft Terms of Reference (TOR) for Environmental Impact Assessment (EIA) of Rural Electrification (RE) project

1. Since this draft TOR is going to be a sample for the implementation of the RE projects and it can not be approved by NEC at this stage according to legal procedure of environmental assessment in Bhutan, the title needs to clearly show that "Sample TOR for EIA".

2. The format of TOR that was given by NEC should be mentioned at the beginning of TOR.

3. In Section 3, "the Area to be covered in the EIA" should include other infrastructures like roads, footpath and trials for transportation needed for construction.

4. In Section 4, the conservation areas that are still under discussion to decide definite area between the concerned agencies should be paid attention in "Collection of Existing Data and Information" as well as "Field Work".

5. In Section 4.6, "Development of EMP (Environmental Management Plan)" should mention the cost for mitigation.

6. In Section 4.8, "the Format of EIA Report" should include "the training for EIA findings to the staff of organization responsible for EMP".

7. "Work Camp Sanitation" specifically for the laborers to be employed in the RE project should be included as item that impact to be predicted and assessed in EIA.

Comments given by,

Thinley Dorji
EA Officer
National Environment Commission