

ANNEX-6

***MINUTES OF MEETING
(THIRD SITE WORK)
BETWEEN***

THE MASTER PLAN STUDY TEAM

AND

***DEPARTMENT OF ENERGY
MINISTRY OF INDUSTRY***


NOVEMBER 16, 2004

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


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

THIMPHU


November 16, 2004



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



Mr. Jigme Tobgyel
Senior Manager
Planning & Monitoring Division
Bhutan Power Corporation

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 29, 2004 through November 17, 2004 as the third site work. On November 15, 2004, 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. **Progress Report** : The Team submitted twenty copies of Progress Report to DOE on September 30, 2004 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 within 2 weeks (By end of November 2004). However, the Team informed that the comments will be incorporated in Interim Report to be submitted in February 2005.

2. **Second Workshop** : The second workshop took place at Bhutan Chamber of Commerce and Industry Conference Hall, Thimphu on October 26, 2004. The agenda, list of participants and record of discussion are shown in the Attachment-1.

3. **Technical Standard** : The technical standards and design conditions of distribution lines for the master plan were decided as shown in the minutes of meeting of the second site work dated July 9, 2004. The team discussed again the standard and conditions with BPC and the following were revised.
 - Height of pole: Pole of 10 m height is applied for both 11 kV and 33 kV distribution lines. In original, 9 m for 11 kV lines and 10 m for 33 kV lines were adopted.
 - Ice loading: Ice loading conditions for distribution line design is proposed to be applied only for lines to be constructed at altitudes of 3000 meters and above. Previously, ice loading was applied to all the distribution lines. For the integrated Communication and Electricity lines using same poles, due consideration must be given for selecting the pole strength.
 - Covered conductors: It is proposed to use covered conductors in the environmentally protected areas. Previously, no standards existed.
 - Wind pressure to pole: 45 kg/m² of wind pressure with shape factor of 2/3 is applied to pole ($45 \times 2/3 = 30$).

4. **Formulation of Dzongkhag-wise Electrification** : The master plan of Dzongkhag-wise electrification will be formulated according to the flow-chart shown as Attachment-2.
5. **Institutional Framework** : The Team presented the idea of institution and organization for off-grid electrification in the second workshop. The matter was subsequently discussed with the Team, DOE and BPC including that for on-grid electrification. As the framework for the further discussion, the parties agreed to the following concepts:
- incorporate local participation to reduce the BPC's burden of operation and maintenance for on-grid and off-grid electrification.
 - realize off-grid electrification with local initiative and ownership for sustainability through a cost sharing mechanism.
 - make good use of private sector or incorporate public-private partnership for efficient realization of off-grid electrification.
 - leave the merit after grid extension to the local people who introduce off-grid system to enhance the motivation for the local people to introduce off-grid system.
6. **Demand Forecast** : The Team explained the demand forecasts for non-electrified villages and the electrified area. The forecasts were accepted for the master plan study. However, the BPC and DoE expressed the requirement to monitor and confirmed the results during next few years. Major figures of the forecasts are shown below.
- Average peak demand of non-electrified households (2020): 1.47 kW/HH
 - Average energy demand of non-electrified households(2020): 141 kWh/HH/month
 - Estimated Potential Peak demand of total non-electrified villages (2020): 58.6 MW
 - Projected Peak demand of total electrified area (2020): 368.1 MW
 - Projected National Peak Demand (2020): 427 MW
7. **Development Plan for Information and Telecommunication Network** : Coordination meeting was held on October 19, 2004 with the attendances from the Team, DOE, Bhutan Telecom (BT), Bhutan Communication Authority (BCA) and Department of Information Technology to coordinate the development plan for information and telecommunication network. The parties understood the concept of the development as shown in Attachment-3 and agreed to cooperate for realizing the

development plan.

8. **Coordination Committee** : The coordination committee will be held in the 4th site work in February 2005.
9. **Next Site Work** : The 4th site work is scheduled to be conducted from February 6 to 24, 2005.

End

Attachment

1. Agenda, List of Participants and Record of Discussion of Second Workshop
2. Flow-chart for Formulating the Master Plan of Dzongkhag-wise Electrification
3. Telecommunication Network for Internet/VoIP Telephone and Future Schedule



Japan International Cooperation Agency (JICA)
Department of Energy (DOE), Ministry of Trade and Industry

**The Integrated Master Plan Study for
Dzongkhag-wise Electrification in the Kingdom of Bhutan**

**Second Workshop
26 October 2004, in Thimphu**

Conference Hall, Bhutan Chamber of Commerce and Industry

Agenda

SP-1	9:30 - 9:40	Welcome and Introduction	Mr. Chhewang Rinzin Managing Director, BPC
SP-2	9:40 - 9:50	Greetings by JICA Bhutan Office	Mr. Mitsukuni Sugimoto Representative of JICA Bhutan Office
SP-3	9:50 - 9:55	Background of the Study, Introduction of JICA Study Members and Procedure of Workshop-2	Mr. Tomoyasu Fukuchi Team Leader, JICA Study Team
AD-1	9:55 - 10:00	Introduction of Study Members from DoE and BPC	Mr. Karma P Dorji National Project Manager, Planning and Coordination Division, DoE
AD-2	10:00 - 10:10	Status of Existing Power System	Mr. Bharat Tamang Head, Planning and Coordination Division, DoE
	10:10 - 10:30	<i>Tea Break</i>	
MP-1-12	10:30 - 13:00	Progress of Master Plan Study (details are as attached)	DoE, BPC and JICA Study Team
	13:00 - 14:00	<i>Lunch</i>	
AD-3	14:10 - 14:30	Question and Answers for Progress of Master Plan Study	
AD-4	14:30 - 14:40	Off-grid System and Institution	Ms. Yuka Nakagawa JICA Study Team
AD-5	14:40 - 15:25	Discussions of Actual Status of Rural Area and Request to Master Plan Study	Dzongkhag Representatives
	15:25 - 15:45	<i>Tea Break</i>	
AD-6	15:45 - 16:15 (Canceled)	Special Lecture on Renewable Energy	Prof. Izumi Ushiyama —Ashikaga Institute of Technology
AD-7	16:15 - 16:25	Possibility of Applying New Technology	Mr. Kiyoshi Hirata JICA Study Team
AD-8	16:25 - 16:30	Next Step of Master Plan Study	Mr. Tomoyasu Fukuchi Team Leader, JICA Study Team
AD-9	16:30 - 17:00	Distribution of Certificate	
SP-5	17:00	Closing Remarks	Mr. Chhewang Rinzin Managing Director, BPC

Attachment-I

10:30 - 13:00		Progress of Master Plan Study		
	Time			
10:30 - 10:40	10:00min	Overview of Study Methodology		Mr. Karma P, DoE
10:40 - 10:50	10:00min	Result of Village Survey		Mr. Karma P, DoE
10:50 - 11:00	10:00min	Methodology and Result of Demand Forecast		Mr. Jigme Tobgyal, BPC
11:00 - 11:15	15:00min	Distribution System Planning by GIS		Mr. Ujjwal, BPC
11:15 - 11:25	10:00min	Distribution System Analysis by Mi Power		Ms. Dechen Dema, BPC
11:25 - 11:40	15:00min	Applied Standard for Distribution system Planning		Mr. Sunil K. Rassaily, BPC
11:40 - 11:50	10:00min	Off-grid Model Plan-1: Small Hydro		Mr. Karma Tshewang, DoE
11:50 - 12:00	10:00min	Off-grid Model Plan-2: Solar		Mr. Satchi, DoE
12:00 - 12:20	20:00min	Financial and Economic Approach and Methodology On/Off-Grid Cut-off Point Decision		Mr. Jigme Tobgyel, BPC
12:20 - 12:30	10:00min	Telecommunication Development Plan along with Rural Electrification		Mr. Pema Chogyel, MoIC
12:30 - 12:40	10:00min	Policy of Strategic Environmental Consideration		Mr. K.C Nyedrup, NEC
12:40 - 13:00	20:00min	First Draft of Rural Electrification Master Plan and Option of Draft Master Plan		Mr. Karma P, DoE

Attachment-1

List of Participants for the 2st Workshop
Integrated Master Plan Study for Dzongkhag-wise Electrification in Bhutan

No	NAME	TITLE	ORGANIZATION	
DZONGKHAGS				
1	Mr. Y. K. Pradhan	Planning Officer		Bumthang
2	Ms. Tandin Lhamo	Planning Officer		
3	Mr. Kezang Jamtsho	Junior Engineer		Chukha
4	Mr. Singye Dorji	Dzongkhag Yargay Tshogdu Chairman		
5	Mr. Sangay Penjor	Planning Officer		Dagana
6	Ms. Ugyen Dema	Junior Engineer		
7	Mr. N. B. Tamang	Planning Officer		Gasa
8	Mr. G. B. Chhetri	Planning Officer		Haa
9	Mr. Norbu Tshering	Junior Engineer		Lhuntse
10	Mr. Pelden Norgay	Dzongkhag Engineer		Mongar
11	Mr. Daba	Junior Engineer		Pemagatshel
12	Mr. Tashi Dorji	Dzongkhag Engineer		Punakha
13	Mr. Tashi Tobgay	Junior Engineer		Sarpang
14	Mr. Tshewang Penjor	Junior Engineer		Samdrup Jongkhar
15	Mr. Lhapchu	Dzongkhag Engineer		Tsirang
16	Mr. Lhabula	Human Resource Officer		
17	Ms. Chhoki Wangmo	Junior Engineer		Wangduephodrang
18	Mr. Tashi Norbu	Junior Engineer		Zhemgang
			subtotal	18
OTHER ORGANIZATIONS				
19	Mr. Pema Chewang	Chief Program Officer	Dept. of Aid and Debt Management	Ministry of Finance
20	Mr. Ugyen Norbu	Chief Program Officer	Dept. of Aid and Debt Management	
21	Mr. Karma Dupchu	Assistant Planning Officer	Dept. of Planning	
22	Ms. Kinga Wangmo	Assistant Planning Officer	Dept. of Planning	
23	Mr. Pema Choejey	System Analyst	Dept. of Information Technology	Ministry of Information & Communications
24	Mr. Dorji Tshering	Head of Cadastral Information Division	Dept. of Survey & Land Records	Ministry of Agriculture
25	Mr. Raling Ngawang	Deputy Director	Nature Conservation Division	
26	Ms. Chemi Om	Engineer	Nature Conservation Division	Ministry of Works & Human Settlements
27	Mr. N. P. Katel	Executive Engineer		
28	Mr. Tashi Dendup	Junior Engineer	National Housing Development Corporation	
29	Mr. Karma C. Nyedrup	Deputy Director		National Environmental Commission
30	Mr. Thinley Dorji	EIA Officer		
31	Mr. R. N. Adhikari	Consultant		
32	Mr. Pema Norbu	Consultant		Norlha Associates
33	Ms. Yeshey Selden	Under Secretary	Policy and Planning Division	Ministry of Trade and Industry
34	Mr. Gunther Schwartzler	Project Coordinator		ACB
			subtotal	17
DEPARTMENT OF ENERGY				
35	Mr. Bharat Tamang	Head of Planning and Coordination Division	Planning and Coordination Division	Department of Energy
36	Mr. Karma P Dorji	National Project Manager		Department of Energy
37	Mr. Karma Tshering	Executive Engineer	Planning and Coordination Division	Department of Energy
38	Mr. Karma Yonten	Head of Bhutan Electricity Authority	Bhutan Electricity Authority	Department of Energy
39	Mr. Ngawang Choeda	Assistant Engineer	Planning and Coordination Division	Department of Energy
40	Mr. Satchi	Assistant Engineer	Renewable Energy Division	Department of Energy
41	Mr. Tashi Dorji	Hydropower Development Engineer	Planning and Coordination Division	Department of Energy
42	Mr. Karma Tshewang	Assistant Engineer	Planning and Coordination Division	Department of Energy
43	Ms. Dechen Wangmo	Junior Engineer	Planning and Coordination Division	Department of Energy
44	Ms. Wangmo	Junior Engineer	Planning and Coordination Division	Department of Energy
45	Ms. Beneta K. Gurung	Assistant Engineer	Planning and Coordination Division	Department of Energy
46	Mr. Gem Dorji	Executive Engineer	Planning and Coordination Division	Department of Energy
			subtotal	12
BHUTAN POWER CORPORATION				
47	Mr. Chhewang Rinzin	Managing Director		Bhutan Power Corporation
48	Mr. Tenzing Yonten	General Manager		Bhutan Power Corporation
49	Mr. B. B. V. Ramana Rao	Senior Consultant		Bhutan Power Corporation
50	Mr. Tshering Tenzin	Deputy Manager	Rural Electrification Division	Bhutan Power Corporation
51	Mr. Jigme Tobgyel	Senior Manager	Planning & IT Division	Bhutan Power Corporation
52	Ms. Dechen Dema	Engineer	Customer Service Department	Bhutan Power Corporation
53	Mr. Sunil Rasaily	Engineer	Customer Service Department	Bhutan Power Corporation
54	Mr. Suresh Nepal	Senior Manager		Bhutan Power Corporation
55	Mr. Ujjwal Deep Dahal	Deputy Manager	Planning and Monitoring Department	Bhutan Power Corporation
56	Mr. Dorji Namgay	Engineer		Bhutan Power Corporation
57	Mr. Ngawang Norbu	Engineer		Bhutan Power Corporation
58	Mr. Sonam Pelden	Deputy Manager		Bhutan Power Corporation
59	Mr. Ugyen Dorji	Senior Manager		Bhutan Power Corporation
			subtotal	13

Attachment-1

EMBASSY OF JAPAN			
60	Mr. Hiroyuki Terasaki	First Secretary	Embassy of Japan, New Delhi
			subtotal
			1
JBIC			
61	Mr. Mikio Hataeda	Director	JBIC Tokyo
62	Mr. Tomohide Ichiguchi	Deputy Director	JBIC Tokyo
63	Mr. Yoshibumi Bito	Representative	JBIC New Delhi
64	Mr. Nori Iai	Chief Consultant	Corporate Strategy Department UFJ Institute Ltd., Japan
65	Mr. Yoichi Hara	Chief Consultant	Policy Studies Department UFJ Institute Ltd., Japan
			subtotal
			5
JICA			
66	Mr. Mitsukuni Sugimoto	Resident Representative	JICA Bhutan Office
67	Mr. Yosuke Kubo	Project Formulation Advisor	JICA Bhutan Office
68	Mr. Junya Yamaguchi	JICA Expert	JICA (Bhutan Telecom)
69	Mr. Masami Kido		JICA Tokyo
70	Dr. Akira Niwa	Senior Advisor	Institute for Int'l Cooperation JICA Tokyo
			subtotal
			5
JICA STUDY TEAM			
71	Mr. Tomoyasu Fukuchi	Team Leader	Nippon Koei Co., Ltd.
72	Mr. Keiji Shiraki	Distribution System and Design Standard Planning	Nippon Koei Co., Ltd.
73	Mr. Kazunori Ohara	Power Transmission Planning	Nippon Koei Co., Ltd.
74	Mr. Ko Nakajima	Power Demand and Supply Planning	Nippon Koei Co., Ltd.
75	Mr. Toshiyuki Arita	Power Distribution Facility Planning	Nippon Koei Co., Ltd.
76	Ms. Kyoko Usuda	GIS/Database	Nippon Koei Co., Ltd.
77	Mr. Kiyoshi Hirata	Small Hydro Power / Power Demand and Supply Planning	Nippon Koei Co., Ltd.
78	Mr. Ryosuke Ogawa	Information and Telecommunication Planning	Nippon Koei Co., Ltd.
79	Mr. Hiroshi Nishimaki	Financial and Economic Analysis	Nippon Koei Co., Ltd.
80	Mr. Kazuhiko Dobeta	Socio Economic Study	Nippon Koei Co., Ltd.
81	Mr. Deepak Bista	Solar Power and Renewable Energies Planning	Nippon Koei Co., Ltd.
82	Mr. Takahiro Kamishita	Environmental Impact Analysis	Nippon Koei Co., Ltd.
83	Ms. Yuka Nakagawa	Coordinator/Biomass Energies Planning	Nippon Koei Co., Ltd.
84	Ms. Reiko Nobuhiro	Coordinator	Nippon Koei Co., Ltd.
85	Ms. Kesang Anayat Yaganegi	Assistant	Nippon Koei Co., Ltd.
			subtotal
			15
			Total
			85

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 Programme

Record of Discussions Second Workshop Held on October 26, 2004

Welcome and Introduction

Mr. Chhewang Rinzin
Managing Director, BPC

- Welcomed officials from JICA, JBIC, Representatives from Dzongkhags, other Officials from various Government and non-government agencies.
- Importance of power sector for socio-economic development of a country
- Overall importance of the Master Plan study
- Importance of participation of counterparts for success of technology transfer

Greeting by JICA Bhutan Office

Mr. Mitsukuni Sugimoto
Representative of JICA Bhutan Office

Since 1964 that Dasho Nishioka was assigned to serve for an agricultural development in the country, JICA has assisted the country for the last 28 years in agricultural, infrastructure, governance and power sectors and is currently contributing approximately 10% of development activities of the country.

While many things to be done to achieve an ambitious target of 100% electrification by 2020, the accessibility to electricity is a key development factor in the country.

Japan as well as ADB, the Indian government and other donors should consider each role to help the country achieve to provide electricity for each household in the country.

It was strongly addressed that a new technology of GIS that the Study used is important for DOE and BPC in locating identified non-electrified villages and planning distribution lines.

It is hoped that the Bhutan government shall utilize a report of the Study, which was prepared under the conditions that data necessary for planning is lacking in the country.

Background of the Study and Procedure of Workshop-2

Mr. Tomoyasu Fukuchi
Team Leader, JICA Study Team

It was explained that the Study had been promoted for a study of JICA because no master plan for electrification was identified in the country.

In the First Workshop (January 2004), the necessity of technical transfer was mentioned because a RE Master Plan shall be revised by DOE and BPC.

It was then decided that in the Second Workshop that almost all presentations will be done by DOE and BPC.

Status of Existing Power System

Mr. Bharat Tamang
Head, Planning and Coordination Division, DOE

His presentation covered the following items: (a) Energy Organization, (b) Hydro Power Outlook, (c) Salient Features of Bhutan Hydro Power Sector, (d) Power Supply and Demand Situation, (e) Status of Hydro Power Development, (f) Role of Hydro Power in Socioeconomic Development of the Country, (g) Planning and Policy Interventions to

Enhance the Role of Hydro Power, (h) Hydro Power Master Plan, (i) RE Master Plan, (j) Sustainable Tariff for Socioeconomic Development and (k) Hydro Power Development – Challenges and Opportunities.

Key Concerns raised during the presentation of Progress of Master Plan Study

Result of Village Survey

Clarification of the results of Village Baseline Survey on an averaged time to get to motorable roads by walking from non-electrified villages (6.1 hours), which is a concern of BPC in undertaking meter reading and tariff collection for the identified non-electrified villages. There was a concern that the figure may not be realistic with the remoteness of the unelectrified. The Study Team was requested to study the implementation strategies on how the meter reading and tariff collection process could be implemented keeping in view the remoteness of villages and opportunities of involving communities in carrying out these functions so as to reduce the costs of providing the rural electricity services.

Distribution System Planning by GIS

A concern was raised on the sustainability of GIS system created under the Study after the Study ends. The Managing Director, BPC assured that BPC and DOE would sustain the system and will coordinate with the Survey Department and other related departments and agencies. Also, the Dy. Director from Department of Survey, in particular informed the floor that the locations of those unidentified villages due to security reasons are available with them and we could avail those for completing the Master Plan. Furthermore, he also pointed out that his Department is still working on accurate base map for Bhutan and disadvantage of using WGS84 Datum he said is that it will lead to error of 200 to 300 meters on actual ground.

Distribution System Analysis using MiPower

The Managing Director, BPC informed that BPC will be carrying out GPS Survey for LV lines and asked if this could be of some use for the Study. Dechen Dem, BPC replied that the data would be of use in the study for carrying out 3 Phase & Single Phase load analysis.

Presentation on Applied Standard for Distribution System

Reliability of RE lines

The reliability of lines used for rural electrification will not be as high as the ones in the urban areas. RE lines are invariably long, sometimes pass through dense vegetation, have a single supply source and therefore are prone to more outages. Reliability can definitely be improved by investing more into the system by using covered conductors, UG cables, ARCBs, frequent preventive maintenance, etc but however it comes at a cost. There has to be a trade-off between cost and reliability.

However, reliability in rural areas is not a high priority as compared to urban areas simply due to factors such as customer base, quantum of energy sold, losses to the overall economy, etc. For the purpose of the master-plan study, we have collected feeder wise fault interruption reports from BPC's archives and analyzed this data. The output of this analysis will be used in the RE master-plan design.

Temperature range – What was the basis of assuming a minimum temperature range of -10 °C? A lower temperature threshold may be required.

This is in line with the past standards that have been adopted. However, in areas where lower temperatures are probable, special design and construction practices will be adopted. This standard (-10 °C) has been adopted as a general case and will be applicable to a large portion of the RE master-plan area.

Pole standard

We are presently in the process of pole selection and as of now, we have not yet adopted a particular standard. Adoption of a pole standard (such as strength of the pole, height of the pole, etc) has a bearing on the permissible span of the line and therefore has huge financial implications. It will therefore be prudent to do a more detailed analysis on this before a standard is adopted. Many factors have to be borne in mind. We are however in the process of study and a based the outcome of the study, a pole standard will be adopted.

Use of wooden poles

As directed by the RGoB, the use of wooden poles instead of steel tubular poles for the LV system is being studied and in due course will be adopted as feasible with due consideration to all aspects such as availability, cost of transportation, etc. Information from several countries has already been collected and is presently being analyzed.

Off-grid Model Plan 1: Small Hydro

On the presentation of Mini/Micro Hydel proposal as an off-grid option 1, the Managing Director, BPC mainly raised these two concerns;

1. He said that Master Plan Study Team (MPST) should look into the aspects of the willingness of the communities to pay the tariffs set and contributions in any form
2. He also said that from the BPC's observation, many of the off grid areas will be served with the grid so, MPST should look into this matter as well as what should be done?

Methodology and Demand Forecast

(i) Population of 44,000 by year 2020 - There was a concern that the figure may not be realistic with the present trend of rural to urban migration. The projected increase of about 14,000 HH from 30,000 HH in 2003 need to be further substantiated.

(ii) Energy consumption projected per HH in 2020 is about 219 kWh (if you divided 9623 MWh by 44000 HH). - There was a concern that this may be a bit low in the year 2020 considering that most of the rural houses can be expected to own and use many electrical gadgets. Now this 219 kWh is also including all other categories of rural consumers such as saw mills, shops, schools etc. If only rural houses are included the per HH demand projection is only 140 kWh in 2020 which indeed looks small.

(iii) The average peak load is 1.25 kW/HH for the 51 HH surveyed and the co-incident peak load is 0.81 kW/HH for the same 51 HH. The projected peak load in the year 2020 for domestic houses is 1.47 kW/HH. The concern here is again whether this is realistic or not.

There was also concern about the sample size of 51 HH surveyed whether it is statistically large enough. Moreover, these houses were picked from 13 districts with only 3 to 5 houses per district. Also, we need to substantiate 1.47 kW/HH projection in the year 2020.

There were no questions for the economic and financial portion but it is felt that the quantification of the economic costs and benefits when comparing the ON and OFF grid options in the MP studies must be convincing.

Telecommunication Development Plan along with Rural Electrification

On the presentation of proposed OPGW on the 132kV system in eastern Bhutan Transmission line, the Managing Director, BPC and Mr. Bharat Tamang, Dept of Energy pointed out that the assumption is not in the plan because of budgetary constraint. They also requested that the Team should revisit the assumption and Department of Information Technology should clarify the basis.

Policy of Strategic Environment Consideration

There were some concerns raised about the option 1 estimated cost, whether the increment cost of using insulated conductors so as to minimize the ROW for lines passing through environmentally protected areas have been incorporated. The consensus was that it is very important to identify the environmental cost and opt for the least cost option using the Life Cycle Cost approach.

Number of households

There was a concern raised on the definition of a household and doubted the figure of unelectrified households. However, the numbers will have to be updated simultaneously when the Master Plan is updated in future.

Feedback on RE Master Plan by Gasa Planning Officer and DYT Chairman, Chukha Dzongkhag.

- Establishment of hydro power at Khatoe (Gasa) and Khamae were not possible due to transportation problem and also suitable site for station were not found.
- Laya has the potential for establishing hydro power but transportation of turbine is a problem and budget constraint, though the villages are in cluster
- During the DYT, the members have expressed that the Vision 2020 of every house holds to be electrified may be completed at the earliest. As Gasa is the only Dzongkhag where neither vehicle road nor electricity has reached. Light will make life easier for heating, cooking and preserving environment.
- Chukha Chairman was satisfied with progress of the Master Plan and also pointed out the importance of not leaving those villages lying nearer to Hydropower stations as a priority to derive the immediate benefits.

Off-grid System and Institution

Regarding an off-grid power system in the country, Dr. A Niwa of JICA Tokyo mentioned that a master plan or policy for an off-grid power system might be required. He also pointed out that from the village baseline survey, other priorities like Road/Transportation, telecommunication etc. have been noted besides electricity and it is a vital step to consider other sectors while deciding ON and OFF grid potentials.

Possibility of Applying New Technology

Clarification was sought whether the proposed new technologies of renewable energy will be included in a RE Master Plan and the Mini Hydro Power Expert of the Study Team answered that these proposed technologies will be included in a RE Master Plan.

Closing Remarks

Mr. Chhewang Rinzin
Managing Director, BPC

Overall presentation – commended the jobs undertaken by the counterparts and the Study Team

Data Collection – the difficulty of getting accurate data at the same time costly and tedious job, and a need for further review and update.

Demand Forecast – to incorporate realistic demand so that the system design envisages no further upgradation in future.

Environment – 60% of the households in the country are still without electricity and desirable to provide access to electricity as early as possible. However, it is imperative to understand the environmental cost implication while carrying out electrification by different means and requested the study Team, DOE and BPC to work out to seek the best way and approach with National Environment Commission for implementation of a RE Master Plan.

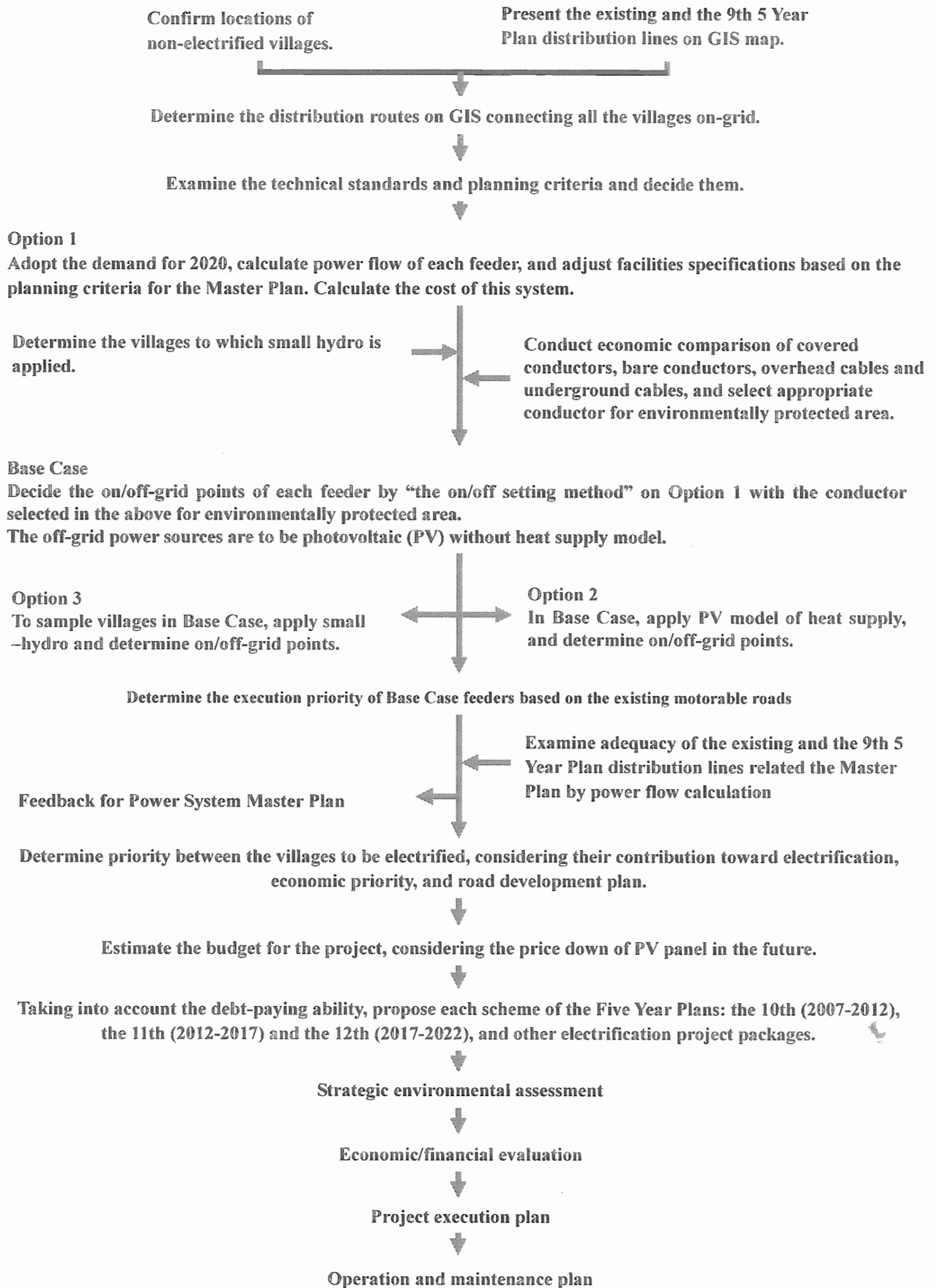
GIS – On the sustainability of GIS system, assured that the DoE and BPC will keep updating the system in coordination with Department of Survey and land Records, Ministry of Agriculture.

Off-grid System – While proposing for off-grid system, the Team must take into consideration that all the Mini/Micro Hydels will generally to come on grid in future.

Financing – proposal of plough back mechanism from the revenues earned through export of electricity looks promising. However, study team was requested to come up with detail financing strategies.

Dzongkhag – Appreciation to the Dzongkhag Representatives for participating and requested future coordination and further cooperation.

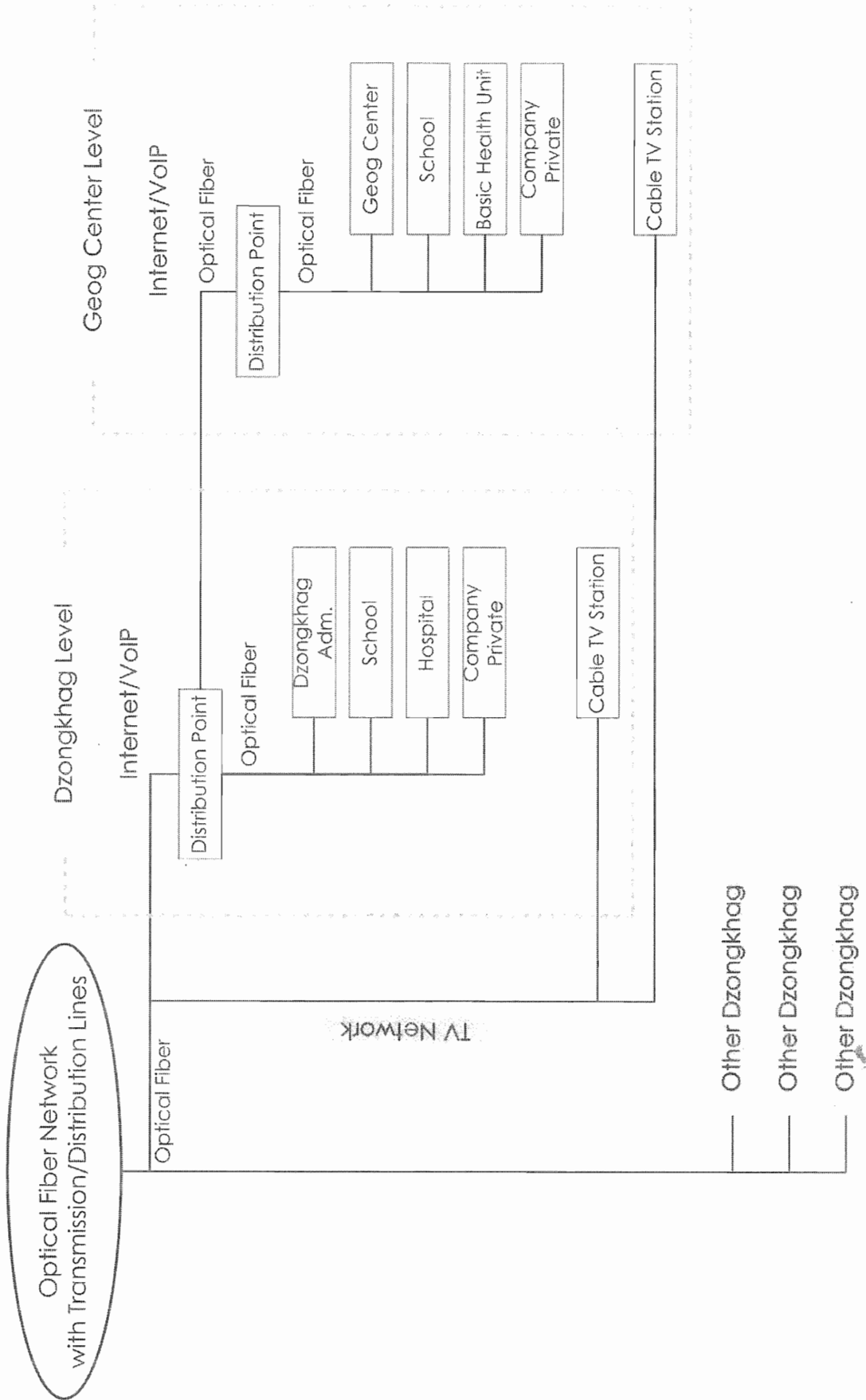
Thanked JICA for the funding, JBIC's presence appreciated in view of likely future request to be made by power sector for JBIC loans.



Flow-chart for Formulating the Master Plan of Dzongkhag-wise Electrification

2004/11/15

Telecommunication Network for Internet/VoIP Telephone



By JICA Study Team
15 November, 2004

Future Schedules
Concerned with Information and Communication Network

		2002	2007	2012	2017	2022	
		9th Five Year Plan	10th Five Year Plan	11th Five Year Plan	12th Five Year Plan		
Development Plan	Microwave Backbone Capacity Upgrading	34Mbps PDH	▶	155Mbps SDH	▶	Backup Network	
	Network Expansion of BBS TV	Digital Terrestrial Television Network (JICA Grant*)	Study	SDH, Optical Fiber and BBS's own network			
	Extension of Optical Fiber with Transmission Line	Satellite Rental (ITU)		▶	Backup Network		
	Installation of Optical Fiber with Distribution Line (JICA Proposal)		Western Network Only	▶		Nationwide Main Trunk Line	
	VoIP** Telephone			Half of Geog Center Level	▶	Almost All of Geog Center Level	▶
Available Services	TV Broadcasting			Half of Geog Center Level	▶	Almost All of Geog Center Level	▶
	Service Area of Same Time Broadcasting	Thimphu Town Area Only	Thimphu and Phuentsholing	Major Town Areas in All Dzongkhags		Geog Center Level	
	Broadband Internet Connection			Half of Geog Center Level	▶	Almost All of Geog Center Level	▶
	Remote Education Services by TV Network		By Optical Fiber Broadcasting Network	Half of Geog Center Level	▶	Almost All of Geog Center Level	▶
	Remote Health Services by Internet			Half of Geog Center Level	▶	Almost All of Geog Center Level	▶

Note: * It is high possibility to be realized by JICA Grant.
** Voice over Internet Protocol.

By JICA Study Team
15 November 2004

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

MEETING PARTICIPANT LIST

Date 11-Oct-04

Place : Meeting Room of BPC

Subject Kick-off Meeting on the Master Plan Study

No.	Name	Country/ Department	Title	Signature
1	Jigme Tobgyel	BPC	Sr. Manager	
2	Tshewang Jantsho	BPC	Engineer	
3	B B V Ramanakao	BPC	Sr. Consultant	
4	Tenzing Yonta	BPC	Gen. Manager	
5	Suresh Nepal	BPC	Engineer	
6	SUNIL RASMI	CSD, BPC.	ENGINEER.	
7	Tenpa Gume	RED	Sr Mgr.	
8	TSHERING TENZIN	RED	Dy. Manager	
9	Techen Wangmo	DOE	J E	
10	Sonam Tshering	BPC	Sr. Manager/PAO	
11	GEMPO JAMPAL	BPC	ENGINEER	
12	Deki Choden	DOE	Engineer	
13	Deken Dena	CSD, BPC	Engineer	
14	Kinga Tshering	PSD, BPC	GM-CSE	
15	Chhewang Rinchen	DOE BPC		
16	Ujjwal Deep Dahal	PRM, BPC.	Dy. Mgr.	
17	LARMA P. DORJI	PCD, DOE	P.M.	
18				
19				
20				


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New Energy Office, Emerging Business Division, Overseas Consulting Administration

JICA Study Team

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

Address: JICA Study Team, C/O Department of Energy, Ministry of Trade and Industry

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Office in Thimphu, Bhutan, TEL: (+975) 2-328 279 FAX: (+975) 2-328 278

E-mail : a4260@n-koei.co.jp

Your ref.

Our ref. FKL BHE-04-031 Date: September 30 2004

 Mr. Sonam Tshering
 Director General, Department of Energy,
 Ministry of Trade and Industry,
 The Royal Government of Bhutan

Subject : Submission of Progress Report

Dear Sir:

We, hereby submit twenty-(20) copies of our Progress Report on the "The Integrated Master Plan Study for Dzongkhag-wise Electrification in the Kingdom of Bhutan" in accordance with Article 5 of "Scope of Work" for this Study that agreed upon between Japan International Cooperation Agency (JICA) and Ministry of Trade and Industry on June 27, 2003.

In addition, we would like to inform you that the Study Team leader with other 4 team members arrived in Thimphu City on September 29th, 2004 for the 3rd Site Work.

Thank you for your time and cooperation.

Sincerely,

 Tomoyasu Fukuchi
 Team Leader, JICA Study Team

Attachment: twenty-(20) sets of Progress Report

c.c.:

- 1) Mr. Karma P. Dorji ((National Project Manager, Rural Electrification Project, Planning & Coordination Division, Department of Energy, Ministry of Trade and Industry)
- 2) Ms. Masami Kido (Electric Power Team, Group II, Economic Development Department, JICA)


 Nippon Koei Co., Ltd. Overseas Consulting Administration
 Registered in England and Japan No. 958024
 Registered Office: 2-5 Kojimachi, Chiyoda-ku, Tokyo

Received on 20th Sept '04

National Project Manager
 R.E.P. Project, Planning & Coordination Division
 Department of Energy, Thimphu

ANNEX-7

MINUTES OF MEETING

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

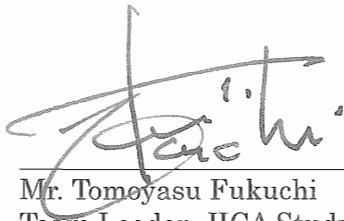
FEBRUARY 18, 2005

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

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

THIMPHU

February 18, 2005



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



Mr. Bharat Tamang
Oftg. Director General
Department of Energy
Ministry of Trade and Industry



Mr. Jigme Tobgyel
Senior Manager
Planning & Monitoring Division
Bhutan Power Corporation

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 February 6 through 24, 2005 as the fourth site work. On February 18, 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. **Interim Report** : The Team submitted twenty copies of Interim Report to DOE on February 8, 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 send the comments to the Team by March 4, 2005.
2. **Coordination Committee** : The coordination committee meeting was held on February 16, 2005. DOE is preparing the minutes of meeting and will send it to the Team after obtaining the signature of the key attendances by the end of February 2005.
3. **Draft Final Report** : The comments on Interim Report will be incorporated in the Draft Final Report which is to be submitted officially in September 2005. The Team, however, will present the major contents of Draft Final Report in the third workshop to be held in June 2005. The Draft Final Report includes the following chapters and sections in addition to the contents of Interim Report.

Chapter 15	Implementation Plan
15.1	Project Packages
15.2	Implementation Schedule
15.3	Funding Arrangement
15.4	Implementation Organization
Chapter 16	Operation and Maintenance Plan
16.1	Institution and Organization
16.2	Budget Planning
16.3	Rural Arrangement for Operation and Maintenance
16.4	Capacity Building
Chapter 17	Conclusion and Recommendation

4. **Institutional Framework** : Based on the concept mutually agreed in the third site work, which is shown below, the Team will prepare the institutional framework and guidelines for both on- and off-grid electrification and incorporate them into the Draft Final Report.:

(Agreed Concept)

- * incorporate local participation to reduce the BPC's burden of operation and

maintenance for on-grid and off-grid electrification.

- realize off-grid electrification with local initiative and ownership for sustainability through a cost sharing mechanism.
- make good use of private sector or incorporate public-private partnership for efficient realization of off-grid electrification.

5. **Third Workshop** : The third workshop will take place in Thimphu on June 9, 2005 at Bhutan Chamber of Commerce and Industry Conference Hall. The Team will prepare the draft agenda and send it to DOE by March 4, 2005. DOE will send the invitation to the members of coordinating committee, the official concerned, the representatives of each Dzongkhag (Planning Officers, DYT Chairman and other related representative to Power Sector), the related donors and NGO/NPO by April 8, 2005.

Together with the invitation, DOE will send the related Dzongkhag-wise electrification plan (drawing, table and briefing) and the environment document to the above personnel concerned of each Dzongkhag.

As the final milestone of the technology transfer, the presentation will be basically done by Bhutanese counterparts. Besides, the result of the counterpart training, which is scheduled to be conducted in Japan in May, 2005, will be presented by the trainees.

The Team has provision to provide budgetary support for the workshop such as conference hall charges and other associated logistic cost.

6. **Counterpart Training** : For the counterpart Training in Japan to be executed by JICA, the following five personnel will be nominated as trainees.

- Mr. Nawang Choeda, Asst. Project Manager, RE Master Plan Project, DoE
- Mr. Hari Prasad Sharma, Asst. Engineer, DoE
- Mr. Ujjwal D Dahal, Dy. Manager, Planning and Monitoring Div, BPC
- Ms. Dechen Dema, Dy. Manager, Customer Service Dept., BPC
- Mr. Shankar Sharma, GIS Expert, Dept. of Survey & Land Records

7. **Next Site Work** : The 5th site work is scheduled to be conducted from June 4 to 21, 2005.

End