第 7 章

技術移転概要

第 7 章　技術移転概要

7.1　技術面の技術移転

技術移転セミナーおよび現地調査を通じて太陽光・風力発電について技術移転を実施した。技術移転の主要項目を以下に示す。

(1) 太陽光発電

・実証試験施設の据付

・　実証試験施設の維持管理

・　実証試験の日射量データおよび発電実績の分析

・　気象庁データと実証試験における日射データの比較

・　太陽光発電に適したソムの選択基準

・　太陽光発電に適したサイトの選択基準

・　太陽光発電の最新情報

(2) 風力発電

・　実証試験施設の据付

・　実証試験施設の維持管理

・　実証試験の風況データおよび発電実績の分析

・　気象庁データと実証試験における風況データの比較

・　風力発電に適したソムの選択基準

・　風力発電に適したサイトの選択基準

・　風力発電の最新情報

7.2　運営・維持管理面の技術移転

運営管理組織に関する技術移転項目

・発電所の運営管理組織のありかた（人材、管理・監督体制、研修）

・経営原則の確立（自立、自己責任制）

・経理・記録・帳票類の整備

・資金管理（維持管理資金、減価償却費）

維持管理体制に関する技術移転項目

・技術的維持管理

・維持管理費用の積み立て

・維持管理体制（人材、組織、中央・県との連携）

資　　料

資料－１　打合議事録

MINUTES OF MEETING FOR THE MASTER PLAN STUDY FOR RURAL POWER SUPPLY BY RENEWABLE ENERGY IN MONGOLIA

The Master Plan Study Team (the Team) of the Japan International Cooperation Agency (JICA), which is headed by Mr. Yoshitomo WATANABE, visited Mongolia from October 3, 1998 and had meeting with the officials concerned of the Energy Department, Ministry of Infrastructure Development (MOID) for the captioned study on October 5 and 6, 1998.

In the meeting, the Team and MOID confirmed the following matters.

1. **Objective Sum Centers :** The objective sum centers for the Master Plan Study for Rural Power Supply (the Study) to be 171 sum centers stated in the attached list.

2. **Pilot Plants Installation :** The pilot plants consist of solar and wind power generators are to be installed in the following sum centers.

    - Tariat (Arkhangai aimag)
    - Bayan-undur (Uvurhangai aimag)
    - Adaatsag (Dundgovi aimag)

    Only in the case that the above sum centers have concrete plan to tap distribution line to the grid and receive power from that in three years, the candidate sum center for the pilot plants will be re-considered.

3. **Operation and Management of Pilot Plants :** MOID take full responsibility for supporting the sum centers about operation and maintenance of pilot plants. Considering the future operation and maintenance after the Study, the Team recommended that an appropriate organization concerned, if necessary, be participated in operation and maintenance work during and after the study period.

October 6, 1998
Ulaanbaatar, Mongolia

Mr. Yoshitomo Watanabe
Team Leader
Nippon Koei Co., Ltd.

Mr. Gendensuren Yondongombo
Director General
Energy Department
Ministry of Infrastructure Development

Attachment

List of Sum for Master Plan Study

Number	Name	Number	Name	Number	Name
I	UMNUGOVI	V	SUKHBAATAR	XI	ARKHANGAI
1	Bayandalai	58	Ongon	115	Khangai
2	Bayan-Ovoo	59	Dariganga	116	Tariat
3	Bulgan	60	Naran	*117	Tsakhir (Chuluut)
4	Gurvantes	61	Bayandelger	XII	ZAVKHAN
5	Mandal-Ovoo	62	Erdenetsagaan	118	Shiluustei
6	Manlai	63	Sukhbaatar	119	Durvuljin
7	Noyon	64	Tumentsogt	120	Yaruu
8	Nomgon	65	Tuvshinshiree	121	Erdenekhairkhan
9	Sevrei	66	Uulbayan	122	Zavkhanmandal
10	Khanbogd	67	Munkhkhaan	123	Urgamal
11	Tsogt-Ovoo	68	Burentsogt	124	Santmargats
12	Khurmen	VI	DORNOD	125	Tsetsen-Uul
13	Tsogttsetsii	69	Matad	126	Ider
II	GOVI-ALTAI	70	Sumber	127	Ikh-Uul
14	Erdene	71	Khalkh gol	128	Tes
15	Tsogt	72	Khulunbuir	129	Tsagaanchuluut
16	Chandmani	73	Tsagaan-Ovoo	130	Tsagaankhairkhan
17	Altai	74	Chuluunkhoroot	131	Telmen
18	Delger	75	Bayan-Uul	132	Tudevtei
19	Taishir	76	Bayandun	133	Songino
20	Bugat	VII	KHENTII	134	Otgon
21	Tseel	77	Gurvanbayan	135	Numrug
22	Tugrug	78	Bayan-Adraga	136	Asgat
23	Sharga	79	Binder	137	Bayankhairkhan
24	Tonkhil	80	Batshireet	138	Bulnai
25	Darvi	81	Norovlin	XIII	BULGAN
26	Khaliun	82	Burenkhaan	139	Teshig
27	Biger	83	Dadal	XIV	UVS
28	Khukhmorit	VIII	DUNDGOVI	140	Undurkhangai
29	Bayan-Uul	84	Ulziit	141	Tsagaankhairkhan
30	Jargalan	85	Undurshil	142	Zuunkhangai
31	Guulin	86	Bayanjargalan	143	Khyargas
III	BAYANKHONGOR	87	Adaatsag	144	Baruuntruun
32	Shinejinst	88	Erdenedalai	145	Malchin
33	Bayan-Undur	IX	UVURKHANGAI	146	Zuungovi
34	Bayanlig	89	Bogd	147	Bukhmurun
35	Bayangovi	90	Baruunbayan-Ulaan	148	Zavkhan
36	Bogd	91	Guchin-Us	149	Tes
37	Jinst	92	Bayan-Undur	XV	KHOVD
38	Baatsagaan	93	Khairhandulaan	150	Myangad
39	Bayantsagaan	94	Nariinteel	151	Zereg
40	Khureemaral	95	Bayanteeg	152	Darvi
41	Gurvanbulag	X	KHUVSGUL	153	Altai
42	Jargalant	96	Jargalant	154	Uyench
43	Galuut	97	Galt	155	Bulgan
44	Erdenetsogt	98	Shine-Ider	156	Tsetseg
45	Bayan-Ovoo	99	Tumurbulag	157	Must
46	Bayanbulag	100	Burentogtokh	158	Munkhkhairkhan
47	Buutsagaan	101	Tsetserleg	159	Mankhan
48	Bumbugur	102	Arbulag	160	Chandmani
49	Ulziit	103	Bayanzurkh	161	Khovd
50	Zag	104	Chandmani-Undur	162	Buyant
IV	DORNOGOVI	105	Tsagaan-Uur	163	Durgun
51	Erdene	106	Tsagaan-Uul	XVI	BAYAN-ULGII
52	Delgerekh	107	Ulaan-Uul	164	Tolbo
53	Zamiin-Uud	108	Renchinlkhunbe	165	Tsagaannuur
54	Mandakh	109	Tunel	166	Bulgan
55	Saikhandulaan	110	Tosontsengel	167	Deluun
56	Khatanbulag	111	Alag-Erdene	168	Altai
57	Khuvsgul	112	Khatgal	169	Buyant
-	-	113	Tsagaannuur	170	Bayannuur
-	-	114	Erdenebulgan	171	Altantsugts

MINUTES OF MEETING

FOR

THE MASTER PLAN STUDY FOR RURAL POWER SUPPLY BY RENEWABLE ENERGY

IN

MONGOLIA

The Master Plan Study Team (the Team) of the Japan International Cooperation Agency (JICA), which is headed by Mr. Yoshitomo WATANABE, visited Mongolia on October 3, 1998. The team executed the study in the sites and had meetings with the officials concerned of the Energy Department, Ministry of Infrastructure Development (MOID) through the study period.

As the results of the study, the Team and MOID confirmed the following matters.

1. **Objective Sum Centers :** The objective sum centers for the Master Plan Study for Rural Power Supply (the Study) have been modified from the original ones to the new ones as indicated in the Attachment. The number of objective sum centers is 173.

2. **Consideration of Hydro Power Potential :** According to the data collected, it is difficult to much expect a viable generation plan by solar and wind energy in northwest region. Hydro power is further promising in this region compared with solar and wind. MOID requested the Team to give a priority to consideration of hydro potential especially in the region.

3. **Potential of Geothermal:** Based on the past study, geothermal potential is not sufficient for power generation. MOID requested the Team to explore the way to harness geothermal potential in the field of heating.

December 14, 1998
Ulaanbaatar, Mongolia

渡辺芳知

Mr. Yoshitomo Watanabe
Team Leader
Nippon Koei Co., Ltd.

Mr. Gendensuren Yondongombo
Director General
Energy Department
Ministry of Infrastructure Development

List of Sum for Master Plan Study

Serial No.	Original No.	Name	Serial No.	Original No.	Name
I	I	UMNUGOVI	45	48	Bumbugur
1	1	Bayandalai		49	Ulziit
2	2	Bayan-Ovoo		50	Zag
3	3	Bulgan	IV	IV	DORNOGOVI
4	4	Gurvantes	46	51	Erdene
5	5	Mandal-Ovoo	47	52	Delgerekh
6	6	Manlai	48	53	Zamiin-Uud
7	7	Noyon	49	54	Mandakh
8	8	Nomgon	50	55	Saikhandulaan
9	9	Sevrei	51	56	Khatanbulag
10	10	Khanbogd	52	57	Khuvsgul
11	11	Tsogt-Ovoo	53	New-1	Ulaanbadrakh
12	12	Khurmen	V	V	SUKHBAATAR
13	13	Tsogttsetsii	54	58	Ongon
II	II	GOVI-ALTAI	55	59	Dariganga
14	14	Erdene	56	60	Naran
15	15	Tsogt	57	61	Bayandelger
16	16	Chandmani	58	62	Erdenetsagaan
17	17	Altai	59	63	Sukhbaatar
	18	Delger	60	64	Tumentsogt
18	19	Taishir	61	65	Tuvshinshiree
19	20	Bugat	62	66	Uulbayan
20	21	Tseel	63	67	Munkhkhaan
21	22	Tugrug	64	68	Burentsogt
22	23	Sharga	VI	VI	DORNOD
23	24	Tonkhil	65	69	Matad
24	25	Darvi		70	Sunber
25	26	Khaliun	66	71	Khalkh gol
26	27	Biger	67	72	Khulunbuir
27	28	Khukhmorit	68	73	Tsagaan-Ovoo
28	29	Bayan-Uul	69	74	Chuluunkhoroot
29	30	Jargalan	70	75	Bayan-Uul
	31	Guulin	71	76	Bayandun
III	III	BAYANKHONGOR	VII	VII	KHENTII
30	32	Shinejinst		77	Gurvanbayan
31	33	Bayan-Undur	72	78	Bayan-Adraga
32	34	Bayanlig	73	79	Binder
33	35	Bayangovi	74	80	Batshireet
34	36	Bogd	75	81	Norovlin
35	37	Jinst		82	Burenkhaan
36	38	Baatsagaan	76	83	Dadal
37	39	Bayantsagaan	77	New-2	Galshar
38	40	Khureemaral	78	New-3	Bayan-Ovoo
39	41	Gurvanbulag	VIII	VIII	DUNDGOVI
40	42	Jargalant	79	84	Ulziit
41	43	Galuut	80	85	Undurshil
42	44	Erdenetsogt	81	86	Bayanjargalan
	45	Bayan-Ovoo	82	87	Adaatsag
43	46	Bayanbulag	83	88	Erdenedalai
44	47	Buutsagaan	84	New-4	Saikhan-Ovoo

Notes

1) Shaded sum is canceled sum.

2) "New-" means newly added sum.

List of Sum for Master Plan Study

Serial No.	Original No.	Name	Serial No.	Original No.	Name
85	New-5	Khuld	131	131	Telmen
86	New-6	Delgerkhangai	132	132	Tudevtei
IX	IX	UVURKHANGAI	133	133	Songino
87	89	Bogd	134	134	Otgon
88	90	Baruunbayan-Ulaan	135	135	Numrug
89	91	Guchin-Us	136	136	Asgat
90	92	Bayan-Undur	137	137	Bayankhairkhan
91	93	Khairhandulaan	138	138	Bulnai
92	94	Nariinteel	139	New-9	Bayantes
93	95	Bayanteeg	140	New-10	Aldarkhaan
X	X	KHUVSGUL	XIII	XIII	BULGAN
94	96	Jargalant	141	139	Teshig
95	97	Galt	XIV	XIV	UVS
96	98	Shine-Ider	142	140	Undurkhangai
97	99	Tumurbulag	143	141	Tsagaankhairkhan
98	100	Burentogtokh	144	142	Zuunkhangai
99	101	Tsetserleg	145	143	Khyargas
100	102	Arbulag	146	144	Baruuntruun
101	103	Bayanzurkh	147	145	Malchin
102	104	Chandmani-Undur	148	146	Zuungovi
103	105	Tsagaan-Uur	149	147	Bukhmurun
104	106	Tsagaan-Uul	150	148	Zavkhan
105	107	Ulaan-Uul	151	149	Tes
106	108	Renchinlkhunbe	XV	XV	KHOVD
107	109	Tunel		150	Myangad
108	110	Tosontsengel	152	151	Zereg
109	111	Alag-Erdene	153	152	Darvi
110	112	Khatgal	154	153	Altai
111	113	Tsagaannuur	155	154	Uyench
112	114	Erdenebulgan	156	155	Bulgan
113	New-7	Khankh	157	156	Tsetseg
XI	XI	ARKHANGAI	158	157	Must
114	115	Khangai	159	158	Munkhkhairkhan
115	116	Tariat	160	159	Mankhan
116	117	Tsakhir	161	160	Chandmani
117	New-8	Chuluut		161	Khovd
XII	XII	ZAVKHAN		162	Buyant
118	118	Shiluustei	162	163	Durgun
119	119	Durvuljin	163	New-11	Duut
120	120	Yaruu	164	New-12	Erdeneburen
121	121	Erdenekhairkhan	XVI	XVI	BAYAN-ULGII
122	122	Zavkhanmandal	165	164	Tolbo
123	123	Urgamal	166	165	Tsagaannuur
124	124	Santmargats	167	166	Bulgan
125	125	Tsetsen-Uul	168	167	Deluun
126	126	Ider	169	168	Altai
127	127	Ikh-Uul	170	169	Buyant
128	128	Tes	171	170	Bayannuur
129	129	Tsagaanchuluut	172	171	Altantsugts
130	130	Tsagaankhairkhan	173	New-13	Nogoonuur

Notes
1) Shaded sum is canceled sum.
2) "New-" means newly added sum.

MINUTES OF MEETING

FOR

THE MASTER PLAN STUDY FOR RURAL POWER SUPPLY BY RENEWABLE ENERGY

IN

MONGOLIA

The Master Plan Study Team (the Team) of the Japan International Cooperation Agency (JICA), which is headed by Mr. Yoshitomo WATANABE, arrived in Mongolia on February 26, 1999, and will leave on March 12, 1999. During their stay in Mongolia, the Team submitted Progress Report No.1 to the Ministry of Infrastructure Development (MOID) and explained the contents of the report. The Team also executed the seminar No.1 for technology transfer and had meeting about the Master Plan Study in the next stage.

This minutes records the result of the meeting.

1. **Acceptance of Progress Report No. 1** : The Team submitted Progress Report No.1 to MOID and MOID accepted the report.

2. **Surveyed Sum Centers of Inventory Study** : The Team and MOID confirmed the modification of surveyed sum centers as given below;

    - ID No. 45 Bayan-Ovoo sum of Bayankhongor aimag is deleted.
      This sum was deleted in the minutes of meeting dated December 14, 1999. However, the sum submitted the questionnaires of inventory study, then the sum was examined in the Progress Report No.1.
    - ID No. 50 Zag sum of Bayankhongor aimag is included.
      This sum was deleted in the minutes of meeting dated December 14, 1999. The data is available because the sum submitted the questionnaires of inventory study.
    - ID 68 Burentsogt sum of Sukhbaatar aimag is deleted.
      The sum was merged into Munkhkhaan sum (ID 67) and data is combined with that of Munkhkhaan sum.

    One sum is newly included and one sum is deleted from the originally counted sums, thus the total number of surveyed sum is same as the previous one, 173.

3. **Candidate Sum Centers of Sample Survey** : The Team and MOID agreed to the candidate sum centers as shown in the attachment. The Team will prepare the schedule of the sample survey and show it to MOID later.

4. **Operation and Maintenance Cost of Plot Plant** : The Plot Plant sums, Tariat, Bayan-Undur and Adaatsag will save the operation and maintenance cost of Pilot Plant based on the actual consumed energy measured by energy meter at the following rate.

   Tg100/kWh in winter (October 1 to March 31)
   Tg50/kWh in summer (April 1 to September 30)

5. **Management of Operation and Maintenance Cost for Pilot Plant** : The Plot Plant sum centers will be responsible for the way and execution to collect and save the operation and maintenance cost for the Pilot Plant. The expenditure for the operation and maintenance will also be managed by the Pilot Plant sums and will be monitored by the Team during the Master Plan Study period.

6. **Preparation of Pilot Plant Installation Work** : The Pilot Plant sums shall be responsible for the preparation of Pilot Plant installation such as mentioned below;

   - To keep the transported Pilot Plant equipment from any damage and pilferage loss before installation.
   - To shift the existing fences in Bayan-Undur and Adaatsag.
   - To remove firewood in Tariat.
   - To prepare accommodation for seven Japanese and four local persons.
   - To make arrangement to cooperate on the installation work like wiring in the hospital.

7. **Establishment of Operation and Maintenance Group for Pilot Plant** : The Pilot Plant sums will establish an operation and maintenance group for Pilot Plants consisting of manager, operator and accountant.

March 10, 1999
Ulaanbaatar, Mongolia

渡辺 芳知

Mr. Yoshitomo Watanabe
Team Leader
Nippon Koei Co., Ltd.

Mr. Gendensuren Yondongombo
Director General
Integrated Policy and Strategic Planning Department
Ministry of Infrastructure Development

Attachment

Candidate Sum Centers of Sample Survey

No.	ID	Sum Name	Aimag Name
1	164	Tolbo	BAYAN-ULGII
2	36	Bogd	BAYANKHONGOR
3	124	Santmargats	ZAVKHAN
4	91	Guchin-Us	UVURKHANGAI
5	9072	Bayan-Ovoo	KHENTII
6	65	Tuvshinshiree	SUKHBAATAR
7	88	Erdenedalai	DUNDGOVI
8	54	Mandakh	DORNOGOVI
9	153	Altai	KHOVD
10	115	Khangai	ARKHANGAI
11	26	Khaliun	GOVI-ALTAI
12	5	Mandal-Ovoo	UMNUGOVI
13	112	Khatgal	KHUVSGUL
14	69	Matad	DORNOD
15	8	Nomgon	UMNUGOVI

MINUTES OF MEETING

FOR

THE MASTER PLAN STUDY FOR RURAL POWER SUPPLY BY RENEWABLE ENERGY

IN

MONGOLIA

The Master Plan Study Team (the Team) of the Japan International Cooperation Agency (JICA), which is headed by Mr. Yoshitomo WATANABE, arrived in Mongolia on May 12, 1999, and will leave on July 10, 1999. During their stay in Mongolia, the Team carried out the sample survey, installation of the Pilot Plants and had meeting with the officials concerned of the Ministry of Infrastructure Development (MOID).

Regarding the study, the Team and MOID confirmed the following matters.

1. **Target Sum Centers of the Master Plan :** ID No. 138 Bulnai sum of Zavkhan aimag was merged into Tosontsengel sum. The inventory study data of Bulnai sum originally includes the data of Tosontsengel sum. Thus the Name of Bulnai is simply replaced by Tosontsengel.

   The latest list of the target sum centers is attached as Attachment-1. Further revision will be made and the final target sum centers for the Master Plan will be decided in the next site study in September 1999.

2. **Other Donors' Activities :** MOID shall coordinate the other donors' activities concerning renewable energy application in the target sum centers with this Master Plan Study.

3. **Operation and Maintenance for Pilot Plant :** MOID takes full responsibility for supporting the three sum centers: Tariat, Bayan-Undur and Adaatsag, for operation and maintenance of the Pilot Plants.

4. **Key and Manual of Pilot Plants :** The keys and operation manuals in Mongolian language of the Pilot Plants are distributed as follows.

   Key (One set consists of two pieces)

Three sum centers	6 sets (two sets each)
Energy Consulting Co., Ltd.	2 sets
MOID	2 sets
Nippon Koei Co., Ltd.	4 sets

Operation Manual

Three sum centers	3 sets (one set each)
Energy Consulting Co., Ltd.	2 sets
MOID	2 sets
Renewable Energy Corporation	1 set
Nippon Koei Co., Ltd.	1 set

5. **Tools and Spare Parts of Pilot Plants** : The maintenance tools, measuring instrument and spare parts of the Pilot Plants are kept as shown in the Attachment-2.

6. **Damaged Battery of Pilot Plant in Bayan-Undur Sum** : One battery was found damaged during the installation period. That seems to be damaged in transportation. Due to this damaged one, other one battery cannot be used in order to level the voltages of system A and B, which are operated in parallel. JICA will apply the transportation insurance to replace these batteries.

July 9, 1999
Ulaanbaatar, Mongolia

Mr. Yoshitomo Watanabe
Team Leader
Nippon Koei Co., Ltd.

Mr. R. Bud
Director General
Integrated Policy and Strategic Planning Department
Ministry of Infrastructure Development

List of Sum for Master Plan Study

Serial No.	Original No. (ID No.)	Name
I	I	UMNUGOVI
1	1	Bayandalai
2	2	Bayan-Ovoo
3	3	Bulgan
4	4	Gurvantes
5	5	Mandal-Ovoo
6	6	Manlai
7	7	Noyon
8	8	Nomgon
9	9	Sevrei
10	10	Khanbogd
11	11	Tsogt-Ovoo
12	12	Khurmen
13	13	Tsogttsetsii
II	II	GOVI-ALTAI
14	14	Erdene
15	15	Tsogt
16	16	Chandmani
17	17	Altai
	18	Delger
18	19	Taishir
19	20	Bugat
20	21	Tseel
21	22	Tugrug
22	23	Sharga
23	24	Tonkhil
24	25	Darvi
25	26	Khaliun
26	27	Biger
27	28	Khukhmorit
28	29	Bayan-Uul
29	30	Jargalan
	31	Guulin
III	III	BAYANKHONGOR
30	32	Shinejinst
31	33	Bayan-Undur
32	34	Bayanlig
33	35	Bayangovi
34	36	Bogd
35	37	Jinst
36	38	Baatsagaan
37	39	Bayantsagaan
38	40	Khureemaral
39	41	Gurvanbulag
40	42	Jargalant
41	43	Galuut
42	44	Erdenetsogt
	45	Bayan-Ovoo
43	46	Bayanbulag
44	47	Buutsagaan
45	48	Bumbugur
	49	Ulziit
46	50	Zag
IV	IV	DORNOGOVI
47	51	Erdene
48	52	Delgerekh
49	53	Zamiin-Uud
50	54	Mandakh
51	55	Saikhandulaan
52	56	Khatanbulag
53	57	Khuvsgul
54	9041	Ulaanbadrakh
V	V	SUKHBAATAR
55	58	Ongon
56	59	Dariganga
57	60	Naran
58	61	Bayandelger
59	62	Erdenetsagaan
60	63	Sukhbaatar
61	64	Tumentsogt
62	65	Tuvshinshiree
63	66	Uulbayan
64	67	Munkhkhaan
	68	Burentsogt
VI	VI	DORNOD
65	69	Matad
	70	Sumber
66	71	Khalkh gol
67	72	Khulunbuir
68	73	Tsagaan-Ovoo
69	74	Chuluunkhoroot
70	75	Bayan-Uul
71	76	Bayandun
VII	VII	KHENTII
	77	Gurvanbayan
72	78	Bayan-Adraga
73	79	Binder
74	80	Batshireet
75	81	Norovlin
	82	Burenkhaan
76	83	Dadal
77	9071	Galshar
78	9072	Bayan-Ovoo
VIII	VIII	DUNDGOVI
79	84	Ulziit
80	85	Undurshil
81	86	Bayanjargalan
82	87	Adaatsag
83	88	Erdenedalai
84	9081	Saikhan-Ovoo

Notes
1) Shaded sum is canceled sum.
2) "9＊＊＊" means newly added sum.

List of Sum for Master Plan Study

Serial No.	Original No. (ID No.)	Name	Serial No.	Original No. (ID No.)	Name
85	9082	Khuld	131	131	Telmen
86	9083	Delgerkhangai	132	132	Tudevtei
IX	IX	UVURKHANGAI	133	133	Songino
87	89	Bogd	134	134	Otgon
88	90	Baruunbayan-Ulaan	135	135	Numrug
89	91	Guchin-Us	136	136	Asgat
90	92	Bayan-Undur	137	137	Bayankhairkhan
91	93	Khairhandulaan	138	138	Tosontsengel
92	94	Nariinteel	139	9121	Bayantes
93	95	Bayanteeg	140	9122	Aldarkhaan
X	X	KHUVSGUL	XIII	XIII	BULGAN
94	96	Jargalant	141	139	Teshig
95	97	Galt	XIV	XIV	UVS
96	98	Shine-Ider	142	140	Undurkhangai
97	99	Tumurbulag	143	141	Tsagaankhairkhan
98	100	Burentogtokh	144	142	Zuunkhangai
99	101	Tsetserleg	145	143	Khyargas
100	102	Arbulag	146	144	Baruuntruun
101	103	Bayanzurkh	147	145	Malchin
102	104	Chandmani-Undur	148	146	Zuungovi
103	105	Tsagaan-Uur	149	147	Bukhmurun
104	106	Tsagaan-Uul	150	148	Zavkhan
105	107	Ulaan-Uul	151	149	Tes
106	108	Renchinlkhunbe	XV	XV	KHOVD
107	109	Tunel		150	Myangad
108	110	Tosontsengel	152	151	Zereg
109	111	Alag-Erdene	153	152	Darvi
110	112	Khatgal	154	153	Altai
111	113	Tsagaannuur	155	154	Uyench
112	114	Erdenebulgan	156	155	Bulgan
113	9101	Khankh	157	156	Tsetseg
XI	XI	ARKHANGAI	158	157	Must
114	115	Khangai	159	158	Munkhkhairkhan
115	116	Tariat	160	159	Mankhan
116	117	Tsakhir	161	160	Chandmani
117	9111	Chuluut		161	Khovd
XII	XII	ZAVKHAN		162	Buyant
118	118	Shiluustei	162	163	Durgun
119	119	Durvuljin	163	9151	Duut
120	120	Yaruu	164	9152	Erdeneburen
121	121	Erdenekhairkhan	XVI	XVI	BAYAN-ULGII
122	122	Zavkhanmandal	165	164	Tolbo
123	123	Urgamal	166	165	Tsagaannuur
124	124	Santmargats	167	166	Bulgan
125	125	Tsetsen-Uul	168	167	Deluun
126	126	Ider	169	168	Altai
127	127	Ikh-Uul	170	169	Buyant
128	128	Tes	171	170	Bayannuur
129	129	Tsagaanchuluut	172	171	Altantsugts
130	130	Tsagaankhairkhan	173	9161	Nogoonuur

Notes
1) Shaded sum is canceled sum.
2) "9＊＊＊" means newly added sum.

Attachment-2

List of Materials Kept by Energy Consulting Co., Ltd.

1.	IC memory card	3 nos.
2.	IC memory card reader with RS-232C cable	3 nos.
3.	Data collection program (Disk1 and Disk2)	1 set
4.	Daily & monthly table compiling program (Disk1 and Disk2)	1 set
5.	Measuring condition data file in one diskette	1 set
6.	Photovoltaic panel for spare	3 pieces
7.	Damaged battery and unused battery due to the damaged one	2 nos. (one each).

List of Major Materials Kept by each Sum Center

1.	Maintenance tool	1 set
2.	Digital tester	1 no.
3.	Analog tester	1 no.
4.	Handle for winch of the wind turbine	1 no.
5.	Handle for furling of the wind turbine	1 no.
6.	Power cable XLPE 35 sq.mm 3 cores (delivered later)	90 m
7.	Power cable XLPE 25 sq.mm 2 cores (delivered later)	60 m
8.	Power cable XLPE 38 sq.mm 3 cores (for Bayan-Undur)	80 m
9.	Power cable XLPE 22 sq.mm 2 cores (for Adaatsag & Tariat)	80 m

end

MINUTES OF MEETING

FOR

THE MASTER PLAN STUDY FOR RURAL POWER SUPPLY BY RENEWABLE ENERGY

IN

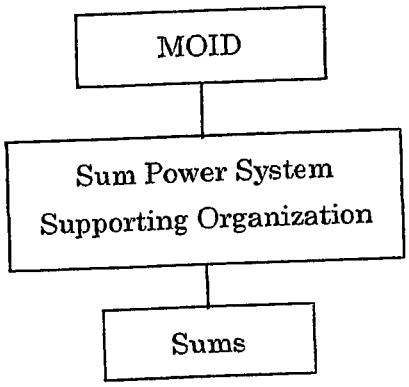
MONGOLIA

The Master Plan Study Team (the Team) of the Japan International Cooperation Agency (JICA), which is headed by Mr. Yoshitomo WATANABE, arrived in Mongolia on October 15, 1999, and will leave on October 29, 1999. During their stay in Mongolia, the Team submitted the Progress Report – 2 to the Ministry of Infrastructure Development (MOID), hold technology transfer seminar at the three Pilot Plant sum centers and had the meeting with the officials concerned of MOID on the Progress Report – 2.

In the meeting, the Team and MOID confirmed the following matters.

1. **Target Sum Centers of the Master Plan** : The final target sum centers for the Master Plan Study were decided as indicated in Attachment-1, which are the same sum centers mentioned in the minutes of meeting dated July 9, 1999.

2. **Management System** : Regarding the management system for the power supply in the sum centers mentioned in the Section 5.8.4 of Part I, MOID proposed the following conceptual structure and the Team agreed with that.



Regarding MOID functions mentioned in the Section 5.8.5 of Part I, the following functions are transferred to the functions of the Sum Power System Supporting Organization.

1) Policy making for electricity tariff
2) Construction of facilities

3. **Privatization** : MOID briefed the Team on the draft privatization plan and its policy, and explained that it took a long time for this privatization to affect the power supply of the sum centers.

4. **Power Supply System** : The basic concept of power supply system for the sum centers in the stages of year 2005, 2010 and 2015, which is mentioned in the Section 5.4 of Part I and its image is shown in the Fig. I.5.4-1, was agreed by MOID.

5. **Communication System** : The basic concept of communication system for the management of power supply in the sum centers in the stages of year 2005, 2010 and 2015, which is mentioned in the Section 5.8.11 of Part I and its image is shown in the Fig. I.5.8-2, was agreed by MOID.

6. **Distribution System** : The basic concept of distribution system of the sum centers in the stages of year 2005, 2010 and 2015, which is mentioned in the Section 5.7 of Part I and its image is shown in the Figs. I.5.7-1 to I.5.7-3, was agreed by MOID.

7. **Sum Centers for Grid Connection** : The following sum centers are excluded from the potential sum centers for transmission line extension listed in the Section 5.5 of Part I and they are examined as sums with isolated power source. Then, the total number of potential sum centers for transmission line extension is twelve.

ID No.	Sum Name	Aimag Name
41	Gurvanbulag	Bayankhongor
42	Jargalant	Bayankhongor
50	Zag	Bayankhongor
71	Khalkhgol	Dornod
74	Chuluunkhoroot	Dornod
101	Tsetserleg	Khuvsgul
9101	Khankh	Khuvsgul

Note: There is no possibility for connection to the central grid from the sum centers of ID No. 41, 42 and 50.
It is difficult to import the power from Russia or China to the sum centers of ID No. 71, 74, 101 and 9101.

8. **Mimi-hydro Power Generation** : Mimi-hydro power generation is studied and planned at Munkhkhairkhan of Khovd Aimag and Baruuntruun of Uvs Aimag as mentioned in the Section 5.6.4 of Part I.

9. **Demand Forecast** : MOID will inform the team, if they have, of their comments on the demand forecast stated in the Chapter 4 of Part I by November 10, 1999.

10. Others : MOID requested the Team to submit the Interim and Draft Final Reports one month before their arrival in Ulaanbaatar to keep the time for detailed examination on the reports.

MOID will prepare the place and necessary arrangement for the technology transfer seminar No.2 to be held by the Team in Ulaanbaatar in the next site study period, February 25 to March 10, 2000, and also send the invitation for the seminar to the person concerned.

October 27, 1999
Ulaanbaatar, Mongolia

渡辺芳知

Mr. Yoshitomo Watanabe
Team Leader
Nippon Koei Co., Ltd.

Mr. R. Bud
Director General
Integrated Policy and Strategic Planning Department
Ministry of Infrastructure Development

List of Sum for Master Plan Study

Serial No.	Original No. (ID No.)	Name	Serial No.	Original No. (ID No.)	Name
I	I	UMNUGOVI	45	48	Bumbugur
1	1	Bayandalai		49	Ulziit
2	2	Bayan-Ovoo	46	50	Zag
3	3	Bulgan	IV	IV	DORNOGOVI
4	4	Gurvantes	47	51	Erdene
5	5	Mandal-Ovoo	48	52	Delgerekh
6	6	Manlai	49	53	Zamiin-Uud
7	7	Noyon	50	54	Mandakh
8	8	Nomgon	51	55	Saikhandulaan
9	9	Sevrei	52	56	Khatanbulag
10	10	Khanbogd	53	57	Khuvsgul
11	11	Tsogt-Ovoo	54	9041	Ulaanbadrakh
12	12	Khurmen	V	V	SUKHBAATAR
13	13	Tsogttsetsii	55	58	Ongon
II	II	GOVI-ALTAI	56	59	Dariganga
14	14	Erdene	57	60	Naran
15	15	Tsogt	58	61	Bayandelger
16	16	Chandmani	59	62	Erdenetsagaan
17	17	Altai	60	63	Sukhbaatar
	18	Delger	61	64	Tumentsogt
18	19	Taishir	62	65	Tuvshinshiree
19	20	Bugat	63	66	Uulbayan
20	21	Tseel	64	67	Munkhkhaan
21	22	Tugrug		68	Burentsogt
22	23	Sharga	VI	VI	DORNOD
23	24	Tonkhil	65	69	Matad
24	25	Darvi		70	Sumber
25	26	Khaliun	66	71	Khalkh gol
26	27	Biger	67	72	Khulunbuir
27	28	Khukhmorit	68	73	Tsagaan-Ovoo
28	29	Bayan-Uul	69	74	Chuluunkhoroot
29	30	Jargalan	70	75	Bayan-Uul
	31	Gaulin	71	76	Bayandun
III	III	BAYANKHONGOR	VII	VII	KHENTII
30	32	Shinejinst		77	Gurvanbayan
31	33	Bayan-Undur	72	78	Bayan-Adraga
32	34	Bayanlig	73	79	Binder
33	35	Bayangovi	74	80	Batshireet
34	36	Bogd	75	81	Norovlin
35	37	Jinst		82	Burenkhaan
36	38	Baatsagaan	76	83	Dadal
37	39	Bayantsagaan	77	9071	Galshar
38	40	Khureemaral	78	9072	Bayan-Ovoo
39	41	Gurvanbulag	VIII	VIII	DUNDGOVI
40	42	Jargalant	79	84	Ulziit
41	43	Galuut	80	85	Undurshil
42	44	Erdenetsogt	81	86	Bayanjargalan
	45	Bayan-Ovoo	82	87	Adaatsag
43	46	Bayanbulag	83	88	Erdenedalai
44	47	Buutsagaan	84	9081	Saikhan-Ovoo

Notes
1) Shaded sum is canceled sum.
2) "9＊＊＊" means newly added sum.

List of Sum for Master Plan Study

Serial No.	Original No. (ID No.)	Name
85	9082	Khuld
86	9083	Delgerkhangai
IX	IX	UVURKHANGAI
87	89	Bogd
88	90	Baruunbayan-Ulaan
89	91	Guchin-Us
90	92	Bayan-Undur
91	93	Khairhandulaan
92	94	Nariinteel
93	95	Bayanteeg
X	X	KHUVSGUL
94	96	Jargalant
95	97	Galt
96	98	Shine-Ider
97	99	Tumurbulag
98	100	Burentogtokh
99	101	Tsetserleg
100	102	Arbulag
101	103	Bayanzurkh
102	104	Chandmani-Undur
103	105	Tsagaan-Uur
104	106	Tsagaan-Uul
105	107	Ulaan-Uul
106	108	Renchinlkhunbe
107	109	Tunel
108	110	Tosontsengel
109	111	Alag-Erdene
110	112	Khatgal
111	113	Tsagaannuur
112	114	Erdenebulgan
113	9101	Khankh
XI	XI	ARKHANGAI
114	115	Khangai
115	116	Tariat
116	117	Tsakhir
117	9111	Chuluut
XII	XII	ZAVKHAN
118	118	Shiluustei
119	119	Durvuljin
120	120	Yaruu
121	121	Erdenekhairkhan
122	122	Zavkhanmandal
123	123	Urgamal
124	124	Santmargats
125	125	Tsetsen-Uul
126	126	Ider
127	127	Ikh-Uul
128	128	Tes
129	129	Tsagaanchuluut
130	130	Tsagaankhairkhan
131	131	Telmen
132	132	Tudevtei
133	133	Songino
134	134	Otgon
135	135	Numrug
136	136	Asgat
137	137	Bayankhairkhan
138	138	Tosontsengel
139	9121	Bayantes
140	9122	Aldarkhaan
XIII	XIII	BULGAN
141	139	Teshig
XIV	XIV	UVS
142	140	Undurkhangai
143	141	Tsagaankhairkhan
144	142	Zuunkhangai
145	143	Khyargas
146	144	Baruuntruun
147	145	Malchin
148	146	Zuungovi
149	147	Bukhmurun
150	148	Zavkhan
151	149	Tes
XV	XV	KHOVD
	150	Myangad
152	151	Zereg
153	152	Darvi
154	153	Altai
155	154	Uyench
156	155	Bulgan
157	156	Tsetseg
158	157	Must
159	158	Munkhkhairkhan
160	159	Mankhan
161	160	Chandmani
	161	Khovd
	162	Buyant
162	163	Durgun
163	9151	Duut
164	9152	Erdeneburen
XVI	XVI	BAYAN-ULGII
165	164	Tolbo
166	165	Tsagaannuur
167	166	Bulgan
168	167	Deluun
169	168	Altai
170	169	Buyant
171	170	Bayannuur
172	171	Altantsugts
178	9161	Nogoonuur

Notes
1) Shaded sum is canceled sum.
2) "9＊＊＊" means newly added sum.

MINUTES OF MEETING

FOR

THE MASTER PLAN STUDY FOR RURAL POWER SUPPLY BY RENEWABLE ENERGY

IN

MONGOLIA

The Master Plan Study Team (the Team) of the Japan International Cooperation Agency (JICA), which is headed by Mr. Yoshitomo WATANABE, arrived in Mongolia on February 25, 2000, and will leave on March 10, 2000. During their stay in Mongolia, the Team submitted the Interim Report to the Ministry of Infrastructure Development (MOID), visited the three Pilot Plant sum centers, held Technology Transfer Seminar-2 and had the meeting with the officials concerned of MOID on the Interim Report.

In the meeting, the Team and MOID confirmed the following matters.

1. **Target Sum Centers of the Master Plan** : The following Sum centers were excluded from the target Sum centers for the Master Plan Study. So the number of target Sum centers is 167.

ID No.	Sum Name	Aimag Name
88	Erdenedalai	DUNDGOVI
9081	Saikhan-Ovoo	DUNDGOVI
92	Bayan-Undur	UVURKHANGAI
9101	Khankh	KHUVSGUL
116	Tariat	ARKHANGAI
9152	Erdeneburen	KHOVD

Note: Khankh was already connected to the grid of Russia. The other Sum centers are to be connected to the grid by the Government of Mongolia. The budgetary arrangement for the transmission lines has been taken in the national budget of the year 2000.

The final target sum centers for the Master Plan Study were decided as indicated in Attachment-1.

2. **Demand Forecast** : The Team explained the method and result of the demand forecast which are mentioned in the Chapter 8 in the Interim Report. MOID basically agreed with the method and result of demand forecast.

3. **Power Supply System** : The basic concept of power supply system for the Sum

centers in the stages of year 2005, 2010 and 2015, which is mentioned in the Section 10.4 through 10.7 of Part I, was agreed by MOID.

4. **Distribution System :** The basic concept of distribution system of the sum centers in the stages of year 2005, 2010 and 2015, which is mentioned in the Section 10.8 of Part I, was agreed by MOID.

5. **Communication System** : The basic concept of communication system for the management of power supply in the sum centers in the stages of year 2005, 2010 and 2015, which is mentioned in the Section 10.9.2 of Part I, was agreed by MOID.

6. **Operation and Maintenance** : Proposal for the operation and maintenance of power supply in the Sum centers, which is mentioned in the Section 12.3 of Part I, was basically accepted by MOID.

7. **Pilot Plants after Taking Over :** The Team requested MOID to carefully take care the Pilot Plants and continue the meteorological observation after the Pilot Plant would be taken over in July 2000.

8. **Comments on Report :** The comments made by MOID in the meeting on the Interim Report shall be incorporated in the Draft Final Report. Further examination of the Interim Report will be made by MOID and MOID will send the comments to the team by the middle of April 2000, if any.
   The points that the Team want to ask MOID to check or confirm are mentioned in the Attachment-2.

9. **Others** : Zamiin-Uud (ID No. 53) is connected to the grid of China via 10 kV line. However, the transmission capacity of the line in not sufficient for the winter load. Then the power supply system of Zamiin-Uud is re-planned and shown in the Draft Final Report.

March 9, 2000
Ulaanbaatar, Mongolia

渡辺芳知

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Ministry of Infrastructure Development

List of Sum for Master Plan Study

Serial No.	Original No. (ID No.)	Name	Serial No.	Original No. (ID No.)	Name
I	I	UMNUGOVI	45	48	Bumbugur
1	1	Bayandalai		49	Ulziit
2	2	Bayan-Ovoo	46	50	Zag
3	3	Bulgan	IV	IV	DORNOGOVI
4	4	Gurvantes	47	51	Erdene
5	5	Mandal-Ovoo	48	52	Delgerekh
6	6	Manlai	49	53	Zamiin-Uud
7	7	Noyon	50	54	Mandakh
8	8	Nomgon	51	55	Saikhandulaan
9	9	Sevrei	52	56	Khatanbulag
10	10	Khanbogd	53	57	Khuvsgul
11	11	Tsogt-Ovoo	54	9041	Ulaanbadrakh
12	12	Khurmen	V	V	SUKHBAATAR
13	13	Tsogttsetsii	55	58	Ongon
II	II	GOVI-ALTAI	56	59	Dariganga
14	14	Erdene	57	60	Naran
15	15	Tsogt	58	61	Bayandelger
16	16	Chandmani	59	62	Erdenetsagaan
17	17	Altai	60	63	Sukhbaatar
	18	Delger	61	64	Tumentsogt
18	19	Taishir	62	65	Tuvshinshiree
19	20	Bugat	63	66	Uulbayan
20	21	Tseel	64	67	Munkhkhaan
21	22	Tugrug		68	Burentsogt
22	23	Sharga	VI	VI	DORNOD
23	24	Tonkhil	65	69	Matad
24	25	Darvi		70	Sumber
25	26	Khaliun	66	71	Khalkh gol
26	27	Biger	67	72	Khulunbuir
27	28	Khukhmorit	68	73	Tsagaan-Ovoo
28	29	Bayan-Uul	69	74	Chuluunkhoroot
29	30	Jargalan	70	75	Bayan-Uul
	31	Guulin	71	76	Bayandun
III	III	BAYANKHONGOR	VII	VII	KHENTII
30	32	Shinejinst		77	Gurvanbayan
31	33	Bayan-Undur	72	78	Bayan-Adraga
32	34	Bayanlig	73	79	Binder
33	35	Bayangovi	74	80	Batshireet
34	36	Bogd	75	81	Norovlin
35	37	Jinst		82	Burenkhaan
36	38	Baatsagaan	76	83	Dadal
37	39	Bayantsagaan	77	9071	Galshar
38	40	Khureemaral	78	9072	Bayan-Ovoo
39	41	Gurvanbulag	VIII	VIII	DUNDGOVI
40	42	Jargalant	79	84	Ulziit
41	43	Galuut	80	85	Undurshil
42	44	Erdenetsogt	81	86	Bayanjargalan
	45	Bayan-Ovoo	82	87	Adaatsag
43	46	Bayanbulag		88	Erdenedalai
44	47	Buutsagaan		9081	Saikhan-Ovoo

Notes

1) Shaded sum is canceled sum.

2) "9＊＊＊" means newly added sum.

List of Sum for Master Plan Study

Serial No.	Original No. (ID No.)	Name	Serial No.	Original No. (ID No.)	Name
83	9082	Khuld	126	131	Telmen
84	9083	Delgerkhangai	127	132	Tudevtei
IX	IX	UVURKHANGAI	128	133	Songino
85	89	Bogd	129	134	Otgon
86	90	Baruunbayan-Ulaan	130	135	Numrug
87	91	Guchin-Us	131	136	Asgat
	92	Bayan-Undur	132	137	Bayankhairkhan
88	93	Khairhandulaan	133	138	Tosontsengel
89	94	Nariinteel	134	9121	Bayantes
90	95	Bayanteeg	135	9122	Aldarkhaan
X	X	KHUVSGUL	XIII	XIII	BULGAN
91	96	Jargalant	136	139	Teshig
92	97	Galt	XIV	XIV	UVS
93	98	Shine-Ider	137	140	Undurkhangai
94	99	Tumurbulag	138	141	Tsagaankhairkhan
95	100	Burentogtokh	139	142	Zuunkhangai
96	101	Tsetserleg	140	143	Khyargas
97	102	Arbulag	141	144	Baruuntruun
98	103	Bayanzurkh	142	145	Malchin
99	104	Chandmani-Undur	143	146	Zuungovi
100	105	Tsagaan-Uur	144	147	Bukhmurun
101	106	Tsagaan-Uul	145	148	Zavkhan
102	107	Ulaan-Uul	146	149	Tes
103	108	Renchinlkhunbe	XV	XV	KHOVD
104	109	Tunel		150	Myangad
105	110	Tosontsengel	147	151	Zereg
106	111	Alag-Erdene	148	152	Darvi
107	112	Khatgal	149	153	Altai
108	113	Tsagaannuur	150	154	Uyench
109	114	Erdenebulgan	151	155	Bulgan
	9101	Khankh	152	156	Tsetseg
XI	XI	ARKHANGAI	153	157	Must
110	115	Khangai	154	158	Munkhkhairkhan
	116	Tariat	155	159	Mankhan
111	117	Tsakhir	156	160	Chandmani
112	9111	Chuluut		161	Khovd
XII	XII	ZAVKHAN		162	Buyant
113	118	Shiluustei	157	163	Durgun
114	119	Durvuljin	158	9151	Duut
115	120	Yaruu		9152	Erdeneburen
116	121	Erdenekhairkhan	XVI	XVI	BAYAN-ULGII
117	122	Zavkhanmandal	159	164	Tolbo
118	123	Urgamal	160	165	Tsagaannuur
119	124	Santmargats	161	166	Bulgan
120	125	Tsetsen-Uul	162	167	Deluun
121	126	Ider	163	168	Altai
122	127	Ikh-Uul	164	169	Buyant
123	128	Tes	165	170	Bayannuur
124	129	Tsagaanchuluut	166	171	Altantsugts
125	130	Tsagaankhairkhan	167	9161	Nogoonuur

Notes

1) Shaded sum is canceled sum.

2) "9＊＊＊" means newly added sum.

The Issues That Require Special Attention

Location:
Part I Chapter 7
7.6 ..... Power Demand and Tariff System I.7-15
7.6.3 ..... Impact of Meter Rated Tariff Collection on Power Demand I.7-17

In this section, we stresses the importance of meter rating to encourage energy saving and also establish a fair financial burden on every user. Though some argues that the small energy consumption under meter-rated tariff is due to power theft, we believe that the energy saving is much larger. In any case, it is not possible to measure the loss of power without complete installation of meters to the users.

Location: CHAPTER 8 .....POWER DEMAND FORECAST FOR SUMS I.8-1

It is necessary to understand that there is lack of current demand data. Therefore, we had to estimate the current demand first. The demand is divided into household, BHN sectors and others. The household demand is estimated by the demand function which was calculated from a statistical analysis of the sampled households. The function includes the ownership of electric appliances for two reasons. First, the statistical analysis proved these variables are the only significant variables. Other variables such as income, ownership of cattle, family size, etc did not show any significance. Second, the data obtained through the Inventory Survey on income is not as reliable as the data on the ownership of electric appliances.

The demand estimate is based on the use of wattmeters. This should lead to the reduction in power demand. Such reduction in power demand will improve the evaluation of the Project because the required capacity will be reduced accordingly while the benefits will remain the same.

Please refer to the attached sheet used for our presentation for the brief summary of the impact of wattmeters and also the demand estimation.

Location: 8.2.4 Estimation of Load Factor (Load Curve) I.8-5

We believe that 0.2 for the estimated load factor is justifiable.

PB.

Location: CHAPTER 12 .....MANAGEMENT AND MAINTENANCE PLAN I.12-1

Here we emphasize the importance of the self-reliance principle of the sum management to improve the efficiency and effectiveness of the power supply management. However, the sum needs to rely on subsidies or grants to install new power supply capacities. Thus the privatization is not a viable option, either. The way we suggest is to screen the sums for the installation of new capacities as described "pre-qualification" in 12.3.3. This will not only test the resolve of the sums to improve management but also encourage competition among the sums. Since the year 2005 program includes the installation of wattmeters to every user, the investment will be wasted without the introduction of the meter system, which is the core of the pre-qualification.

Location:

It is necessary that there will be an independent organization to assist and supervise the isolated sum power supplies.

CHAPTER 13 ECONOMIC AND FINANCIAL ANALYSIS I.13-1

The financial evaluations all show negative returns on the investments except for the mini-hydro project. The economic returns on the investments should be positive to justify even a grant-based project. However, the present analysis of the year 2005 program shows negative returns, we except that the returns on the investments will be all positive after correcting some mismatches of the cost allocations and further refinements of the proposed systems. Some of such improvements are;

1) Exclusion of meteorological measurement, data communication from evaluation of the year 2005 program since they serve all other stages and other purposes.

2) Exclusion of wattmeters from the evaluation of BHN targeted programs of the year 2005.

3) Evaluation of surplus energy generated by the renewable energy sources to be applied for water heating or pumping.

Check List for PV power generation

1. Selection criteria and classification for PV system
   (From page I.10-22 to page I.10-26)

2. From the point of View of Project evaluation (Section 10.14-1)
   To select the applicable Sum centers for year 2010 and 2015 require more detail data for this meteorological observation system be recommended.

3. As the TACIS has established the three Pilot Plants at School and Hospital (Except Sum office) as below which will over lap the power supply plan of JICA for year 2005.

(a) ID No. 33, Bayan-Undur of Bayanhongor Aimag
(b) ID No. 36, Bogd of Bayanhongor Aimag and
(c) ID No. 91, GuchinUs of Uvurkhangai Aimag.

Check list for wind generation

1. Selection criteria and classification criteria for wind system.
   (p I.10-25 to p I.10-27)

2. 10.14 Project Evaluation
   (2) From wind power generation system of view.
   The 2010 and 2015 projects will have to be reexamined on the basis of the monitoring results obtained using precision weather monitoring system until 2005. (p I.10-59 (2))

MINUTES OF MEETING
FOR
THE MASTER PLAN STUDY FOR RURAL POWER SUPPLY BY RENEWABLE ENERGY
IN
MONGOLIA

The Master Plan Study Team (the Team) of the Japan International Cooperation Agency (JICA), which is headed by Mr. Yoshitomo WATANABE, arrived in Mongolia on July 29, 2000, and will leave on August 9, 2000. During their stay in Mongolia, the Team submitted the Draft Final Report to the Ministry of Infrastructure Development (MOID), held Technology Transfer Seminar-3 and had the meeting with the officials concerned of MOID on the Draft Final Report.

The Team and MOID mutually confirmed the following as the result of meeting.

1. **Submission of Drat Final Report:** The team submitted ten sets of the Draft Final Report, which consists of Summary, Main Report and Data Book, to MOID on July 31, 2000. MOID acknowledged receipt of the Report. The team explained the contents of the Report and which was basically accepted by MOID.

2. **Comments on Report :** The comments on Draft Final Report made by MOID in the meeting shall be incorporated in the Final Report. Further examination on the Report will be made by MOID and MOID will send the comments to the Team by August 24, 2000 through FAX or E-mail, if any.

3. **Final Report :** The Team will prepare the Final Report, incorporating the comments of MOID, and submit it to JICA Tokyo headquarters by September 12, 2000. JICA forward 30 sets of the Final Report to MOID, or the competent authorities in case of reorganization, by September 29, 2000.

4. **Disclosure to Public :** MOID confirmed that the Final Report can be treated as "Disclosure to Public".

5. **Transfer of Pilot Plants and Equipment :** The Team handed over to MOID a letter signed by JICA Managing Director informing of JICA's acceptance of transfer of the Pilot Plants and equipment used for the Study; the transfer had been requested by MOID.
   Following the principle mentioned in the letter, the Team transferred to MOID three Pilot Plants and all the equipment listed the attachment (MOID's letter for the acceptance).

6. **Pilot Plants after Transfer** : The Team requested MOID to take care of the Pilot Plants and continue the meteorological observation after this transfer. MOID agreed with the request.

7. **Disposal of Exhausted Battery** : A huge number of batteries will be used in the Sum Centers to which a renewable power source is applied in the stages of 2005 and 2010. The disposal of these batteries after being exhausted will become serious problem from an environmental point of view if the Government of Mongolia doesn't impose any legal control on such disposal. The Team requested MOID to take necessary arrangement for the legal regulation on disposal of exhausted batteries. MOID agreed with the request.

8. **Management Organization** : MOID understood and agreed with the proposal for the management organization of power supply to Sum center.

9. **Title of Final Report** : MOID requested the Team to change the title of Final Report so as to include the words like "Power Supply in Sum Centers". The Team will convey this request to JICA Tokyo headquarters.

August 7, 2000
Ulaanbaatar, Mongolia

渡辺 芳知.

Mr. Yoshitomo Watanabe
Team Leader
Nippon Koei Co., Ltd.

Mr. R. Bud
Director General
Integrated Policy and Strategic Planning Department
Ministry of Infrastructure Development

МОНГОЛ УЛСЫН
ДЭД БҮТЦИЙН
ХӨГЖЛИЙН
ЯАМ

MINISTRY OF
INFRASTRUCTURE
DEVELOPMENT
MONGOLIA

Date: 09.08.2010
№ .....

Ulaanbaatar-210646
Phone: 310603
Fax: (976-1) 310612

To: Keisuke MIHIRA
Managing Director
Mining & Industrial Development Study Department
Japan International Cooperation Agency
TOKYO, JAPAN

Dear Sir,

Subject: MASTER PLAN STUDY FOR RURAL POWER SUPPLY BY RENEWABLE ENERGY IN MONGOLIA
Acceptance of Pilot Plants and Equipment

With reference to the above, we are please to accept the transfer of the Plot Plants and the study equipment upon the completion of the Draft Final Report. The Pilot Plants and the equipment were used by the Study Team, the Sums and the Mongolian counterparts during the study period. The list of the confirmed details of the transfer is attached herewith.

Finally we would like to extend our heartfelt thanks to JICA for your cooperation and assistance given to us and we look forward to the continued cooperation in the future.

Yours sincerely,

R.SUNDUI
Deputy Director
Integrated Policy and Strategic Planning
Department

Attachment: As stated above

LIST OF EQUIPMENT PROVIDED BY JICA

No.	Items	Qty
	Pilot Plants	
1	Photovoltaic Generation Unit	3 units
	(1) Photovoltaic cell module	3 units
	(2) Array protection unit	6 nos.
	(3) Base frame	3 units
2	Wind Generating Unit	3 units
	(1) Wind generator	3 sets
	(2) Steel tower	3 units
3	Inverter Unit	3 units
	(1) Inverter	3 nos.
	(2) Control panel	3 nos.
4	Outdoor Cubicle	3 units
	(1) Outdoor type cubicle	3 nos.
5	Data Processing Unit	3 units
	(1) Data acquisition unit	3 units
	(2) Data processing unit	3 units
6	Battery Unit	3 units
	(1) Battery	3 units
	(2) Base frame	3 units
7	Meteorological Observation Unit	3 units
	(1) Wind vane and anemometer	3 sets
	(2) Pyranometer	3 sets
	(3) Sunshine hour meter	3 sets
	(4) Barometer	3 sets
	(5) Thermometer	6 sets
8	Distribution and Wiring Materials	3 sets
	Materials and Equipment for Site Investigation	
1	Global Positioning System (GPS)	2 sets
2	Walkie-talkie with 12V DC adapter	2 sets
3	Laptop computer with data base software	2 sets
4	Printer	2 set
5	Tent	5 sets
6	Sleeping bag	12 nos.
7	Cooking sets	2 sets
8	Copy machine	1 sets

資料－２　調査団員

調査団員名簿
Member of the Study Team

モンゴル国再生可能エネルギー利用地方電力
供給計画調査
The Master Plan Study for Rural Power Supply
by Renewable Energy in Mongolia

1. 総括 ／ 電力供給計画 ／ ディーゼル発電 ： 渡辺 芳知
Team Leader / Power Supply Planner : Yoshitomo WATANABE

2. 需要想定 ／ 電力供給システム ／ 送配電 ： 福地 智恭
Demand Estimator / Power Supply System Specialist : Tomoyasu FUKUCHI

3. 太陽光発電 ： ディパック ビスタ
Solar Power Planner : Deepak B. BISTA

4. 風力発電 ： 出井 努
Wind Power Planner : Tsutomu DEI

5. 電気料金分析 ／ 経済財務評価 ： 西牧 宏
Tariff Analyst / Economic and Financial Analyst : Hiroshi NISHIMAKI

6. 社会調査 ／ 組織制度 ： 田中 清文
Social and Organization Analyst : Kiyofumi TANAKA

7. 業務調整 ： 多田 和幸（平成10年度、平成12年度） 上田憲生（平成11年度）
Coordinator : Kazuyuki TADA (1998 & 2000) Norio UEDA (1999)