

Republic of Malawi

Ministry of Natural Resources, Energy and Environment

Department of Energy (DOE)

**The Malawi
Rural Electrification Promotion Project**

Project Completion Report

December 2009

Japan International Cooperation Agency (JICA)

**Chubu Electric Power Co., Inc.
KRI International Corp.**

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1. Introduction

1-1. Background of the Project

The Government of Malawi (GoM) is promoting rural electrification (RE) as a means of local economic stimulation for poverty reduction. At present, less than 1 percent of the households are electrified in rural areas, where about 80 percent of the population lives. In 1980, the government launched the Malawi Rural Electrification Programme (MAREP) and the Electricity Supply Corporation of Malawi (ESCOM; formerly "the Electricity Supply Commission of Malawi") was placed in charge of the MAREP. Along with subsequent reform of the power sector, the MAREP was transferred to the GoM in 1995. The government, which had had no practical experience of RE projects, supervised the work through the Department of Energy (DOE) under the former Ministry of Natural Resources and Environmental Affairs (the current Ministry of Natural Resources, Energy and Environment).

In response to the request from the GoM, the Government of Japan (GoJ) provided assistance for the MAREP through a variety of activities, including the long-term experts to act as RE advisors, debt relief grant aid to MAREP Phase 4, the formulation of an RE master plan (development study), installation of photovoltaic (PV) systems at rural clinics with financing from the Grassroots Grant Aid, dispatch of senior overseas volunteers as an instructor in operation and maintenance (O&M) of PV systems, and training programs in Japan and a third country. These activities of technical assistance (TA) induced a steady improvement in DOE capacity for RE-related planning and implementation. On the other hand, DOE had not experienced the whole sequence of work beginning with detailed design (D/D), continuing with supervision of construction works, and culminating in hand-over inspection.

In preparation for the peak to come in the MAREP Phase 5 implementation, there was a rising need for a strengthening of the DOE capacity in areas such as management of the RE Fund that was newly instituted in accordance with the RE Act and technical supervision for PV systems as well as supervision of the grid extension works. It is against this background, the GoM requested the GoJ the Technical Cooperation Project (hereinafter referred to as "the Project") aiming at development of human resources and improvement of implementation structure at the DOE, particularly its RE Division (RED). In response to the request, the Japan International Cooperation Agency (JICA) made preliminary studies in June 2004 and June 2006, and the Record of Discussions (R/D) was signed in October 2006.

Based on the R/D, the Project entitled "Malawi Rural Electrification Promotion Project (MAREPP) was commenced in December 2006 with a period of three years. From January 2009, The Project Manager/ Organizational Management/ Distribution Planning, Deputy Project Manager/ Rural Electrification Advisor/ PV Technology, Distribution Technology Advisor, Financial Management Advisor and Micro-hydropower Advisor were dispatched to DOE.

The Project Design Matrix (PDM) of the Project which stipulates the Project objectives/target and relevant activities was signed on 17th December 2006 between the Ministry of Energy and Mines (current Ministry of Natural Resources, Energy and Environment) and JICA. Attachment 1 shows the PDM. The Terminal Evaluation Study Team was dispatched from JICA Headquarters in July 2009 and it was

confirmed that the Project would be finished in November 2009 (after three years) as scheduled because the Project had been implemented smoothly with expected outputs.

1-2 Objective of the Project

Project objective: Building of capacity for implementation of RE projects mainly at the RE Division (RED) of the DOE, and improvement of MAREP planning and execution

1-3 Project purpose

Project purpose: Capacity for planning and implementing MAREP is enhanced and improved

1-4 Overall goal

Overall goal: Electrification rate of households is increased by extending distribution lines and disseminating Photovoltaic (PV) system

1-5 Outputs and major indicators

Outputs of the Project:

- 1) Technical capacity for planning and implementing MAREP is enhanced and improved
- 2) Capacity of contract management for planning and implementing MAREP is improved through Phase 5
- 3) Technical capacity of inspectors and trainers for PV systems is improved
- 4) Capacity of new financial management for RE Fund is developed and enhanced
- 5) Capacity of administration and management in RED is enhanced and improved

Major indicators of the Project :

- 1) Records of proper implementation of feasibility studies (FS), outsourcing of detailed design (D/D), and supervision of construction work
- 2) Record of proper execution based on specification sheets and contracts
- 3) Number of inspectors and trainers who have been trained in PV systems
- 4) Preparation and operation of the account management system
- 5) Preparation and operation of the activity management system

2. Situation of the Counterpart (C/P) Organization

As of January 2007 when the Project practically started, the counterpart organization (Rural Electrification Division (RED), DOE) consisted of one MAREP Manager (Chief Energy Officer), 4 engineers (2 of them were seconded from ESCOM) and 2 economists; in total 7 members. Thereinafter Mr. Sambani, an economist, was transferred to the Ministry of Education and the number of RED staff became 6. Dr. Kafumba, the former Director of Energy Affairs (DEA), resigned DOE and became the Chief Executive Officer (CEO) of the Malawi Energy Regulatory Authority (MERA)¹

¹ Dr. Kafumba had worked as DEA for approximately 10 years and was the key person to the formulation of energy policy,

and, as a result, the position of DEA had been vacant for almost a year. Later, Mr. Nyirongo, the former Chief Energy Officer (MAREP Manager) was promoted to the DEA position in June.

The position of the Accountant Officer had been vacant for a long time and this was one of the biggest staffing issues at DOE. Finally Mr. Songa was transferred from the Ministry of Home Affairs in August 2007. However, he moved to the Ministry of Foreign Affairs because of his promotion to the Principal Accountant (at that moment, there was no equivalent position at DOE).

The new institutional framework which was submitted more than one year ago has been approved. Basic structure is the same as before, however, each post will be upgraded. This movement may give good motivation to the officers who have been in the same positions. Each Division Manager will be promoted to the Deputy Director and other officers' oppositions will also be promoted by one rank. However, this framework has not yet been put in place as of October 2009. Attachment 2 shows the organizational chart of DOE as of October 2009.

3. Situation of Malawi Rural Electrification Programme (MAREP)

3-1 Situation of regulations and institutional and organizational issues related to RE

(1) Malawi Energy Regulatory Authority (MERA)

The energy and electricity related acts which were approved by the Parliament in 2004 came into force in 2007 and the Malawi Energy Regulatory Authority (MERA) was inaugurated in January 2008. One (sole) regulator was established from two previous regulators of the Petroleum Control Commission (PCC) and the National Electricity Council (NECO). Various activities have started since Dr. Kafumba's appointment to the CEO in July 2008.

(2) Rural Electrification Fund (REF)

The financial resource for RE was sourced from the Energy Fund collected from the levy on the petroleum sales² before. The fund was transformed into the Rural Electrification Fund (REF), which has been expanded to the levies from 4.5% of all the energy sales such as electricity and petroleum sales after the enforcement of the RE Act. The levies collection started in the end of 2008. However, the collection from electricity sales has not yet started as of October 2009 because it is scheduled to start together with the approval of new electricity tariff (raised tariff).

(3) Rural Electrification Management Committee (REMAC)

The Rural Electrification Management Committee (REMAC) which was established based on the RE Act, approves the MAREP work plan, budget and accounts mainly from REF. The Committee meeting had been held as the Interim REMAC up to the enforcement of the RE Act. The first REMAC meeting was held on 12th September 2008 and the Phase 6 sites were approved.

laws, institutions and organizations in Malawi. He was also the key person to the assistance from Japan which started in 1999 in the field of RE. He worked very hard for the implementation of regulations and regulatory issues even after he was assigned to MERA. Unfortunately he passed away in August 2009. His absence would be a big loss for the energy sector in Malawi.

² 0.5 Malawi Kwacha (MWK) per litre for petrol and 0.4 MWK per litre for diesel.

3-2 Situation of MAREP Phases (grid extension)

The Project has been implemented during the period from the final stage of MAREP Phase 4 construction works through Phase 5 construction works to the tender/bidding of MAREP Phase 6 materials procurement. DOE has experienced a series of grid extension works from the survey and procurement to supervision.

(1) MAREP Phase 4

MAREP Phase 4, whose construction works started in May 2002 and scheduled to be completed in 2 years, eventually completed in May 2007 (for 5 years) with 3years' delay. It is because the number of the target Trading Centres (TCs) increased from 40 to 58, small TCs on the way to the target TCs were electrified without concrete agreement between DOE and ESCOM (as contractor), and financial resources were not prepared beforehand to meet the increased construction works.

The Phase 4 was the first full-scale RE activities for DOE. DOE, as a result, has learned the necessity of pre-survey, clarification of the clear demarcation between the employer (DOE) and contractor (ESCOM) and the necessity of appropriate budgeting through the experience of Phase 4.

(2) MAREP Phase 5

MAREP Phase 5 was implemented as the first Phase after the formulation of RE Master Plan (M/P). Originally the number of TCs was 54 (2TCs from each District) and feasibility study (F/S) was conducted from 2003 to 2004. However, the number became half of the original plan, 27, due to the delay of Phase 4 and lack of financial resources. Japanese Counter Value Fund was utilized to purchase the equipment and funds were also sourced by the GoM.

Detailed design (D/D) was carried out in January 2007 (when the Project started). The construction works started in November 2007 with one-year construction period after the procurement of equipment. The contractor was also ESCOM (same as Phase 4). All construction works were completed as scheduled (by October 2008) except for 2 TCs whose extension length of 33kV lines were approximately 100km. The electrification of these 2 sites took up to March 2009. There was a remarkable improvement seen (compared to Phase 4) as witnessed by the following facts:

- ✓ Pre-investigation such as the F/S and D/D was conducted in proper manner;
- ✓ Bill of quantity (BOQ) and construction costs were estimated properly, and
- ✓ Relationship between the Employer (DOE) and Contractor (ESCOM) was clearly defined.

(3) MAREP Phase 6

27 Phase 6 TCs were selected from original list of Phase 5 sites which were already surveyed through F/S in 2004. In addition, 27 TCs were picked from the M/P list and in total 54 TCs were approved as Phase 6 Sites in the first REMAC meeting held on 12th September 2008. Thereafter, Basic design (B/D)³ and D/D were conducted and tender/bidding of material procurement were

³ In the M/P Study, the role of F/S was to evaluate economic viability of the candidate TCs. However, the fact is that all TCs are not feasible, and that is why DOE is implementing MAREP. Therefore, it was agreed that F/S is not necessary and RED conducts B/D instead of F/S.

completed. The Suppliers were being selected as of October 2009. The Counter Value Fund was not applied because of sufficient financial resources expected from the REF whose levy collection has already started.

4. Inputs from both Countries

Japanese Experts (Advisors), the office and measurement equipment (distribution, PV and micro hydro and power measurement) and the local activity costs were provided by Japanese side. An office at DOE, desks and chairs, a cabinet and bookshelf for the Japanese Experts were provided by Malawi side.

5. Record of dispatched Japanese Experts

The table below shows the names and period of dispatch of the Japanese experts.

Name	Title	Period of work in Malawi
Yasuhiro KAWAKAMI	Project Manager (PM)/ Organizational Management/ Distribution Planning	10 th - 28 th Jan. 2007 (7 th - 30 th Jan.)
		13 th May - 5 th Jun. 2007 (12 th May - 7 th Jun.)
		*1 st - 21 st Nov. 2007 (31 st Oct. - 23 rd Nov.)
		13 th May - 3 rd Jun. 2008 (12 th May - 4 th Jun.)
		27 th Oct. - 18 th Nov. 2008 (26 th Oct. - 20 th Nov.)
		25 th Jun. - 12 th Jul. 2009 (24 th Jun. - 14 th Jul.)
		20 th Oct - 6 th Nov. 2009 (19 th Oct. - 8 th Nov.)
Akio SHIORA	Deputy PM/ RE Advisor/ PV Technology	10 th Jan. 27 th Fe. 2007 (7 th Jan. - 1 st Mar.)
		24 th Apr. - 29 th Jul. 2007 (23 rd Apr. - 31 st Jul.)
		2 nd Oct. 2007 - 15 th Feb. 2008 (1 st Oct. - 17 th Feb.)
		13 th May - 24 th Jul. 2008 (12 th May - 26 th Jul.)
		21 st Oct. 2008 - 27 th Feb. 2009 (20 th Oct. - 1 st Mar.)
		2 ^{dn} Jun. - 28 th Jul. 2009 (1 st Jun. - 30 th Jul.)
		30 th Aug. - 3 rd Nov. 2009 (29 th Aug. - 5 th Nov.)
Tomohide KATO	Distribution Technology	11 th - 31 st Jan. 2008 (10 th Jan. - 2 nd Feb.)
Morihiro IWATA	Distribution Technology 1	10 th - 20 th Nov. 2008 (9 th - 22 nd Nov.)
Tatsumi FUKUNAGA	Distribution Technology 2	17 th Nov. - 7 th Dec. 2008 (16 th Nov. - 9 th Dec.)
		9 th Jan. - 8 th Feb. 2009 (18 th Jan. - 10 th Feb.)
		7 th - 12 th Jun. 2009 (7 th - 14 th Jun.)
		26 th Jul. - 9 th Aug. 2009 (26 th Jul. - 12 th Aug.)
		14 th Sep. - 6 th Oct. 2009 (13 th Sep. - 8 th Oct.)
Yuki KOBAYASHI SANGALA	Financial Management	8 th - 19 th Jan. 2007
		2 nd - 20 th Jul. 2007
		16 th Oct. - 12 th Nov. 2007
		23 rd Jan. - 13 th Feb. 2008
		29 th Jun. - 12 th Jul. 2008
		1 st - 14 th Aug. 2008
		12 th - 20 th Sep. 2008
		26 th Oct. - 15 th Nov. 2008
		7 th - 24 th Dec. 2008
		15 th - 28 th Feb. 2009
7 th Jun. - 6 th Jul. 2009		
		6 th Oct. - 2 nd Nov. 2009

Name	Title	Period of work in Malawi
Toshiaki KIMURA	Micro Hydropower Technology	26 th Jun. – 19 th Jul. 2007 (25 th Jun. – 21 st Jul.)
		27 th Jun. – 24 th Jul. 2008 (25 th Jun. – 26 th Jul.)
		6 th Oct. – 2 nd Nov. 2008 (5 th Oct. – 4 th Nov.)

(Days from and to Japan inclusive)
*(Days in Zambia inclusive)

6. Results of Activities

Each activity of the Project was conducted by the assistance from the Advisors based on the agreement under the R/D and PDM signed by the GoM and JICA, with the purpose of enhancing and improving the capacity for planning and implementing MAREP through DOE. Necessary activities are specified on the PDM together with the target, purpose and indicators of the Project and the C/P s conducted their day-to-day works with the assistance from the Advisors. Attachment 3 shows the Work Schedule, which indicates each activity and conducted period (result) and Attachment 4 shows the pictures of the activities for 3 years.

The activities are classified into some groups:

- ✓ Activities on the improvement of organizational and planning issues;
- ✓ Activities on the improvement of technical skills/knowledge of grid extension through MAREP Phases (planning, survey, procurement and supervision);
- ✓ Activities on the improvement of solar photovoltaic (PV) system technologies for inspectors and trainers, and
- ✓ Activities on the improvement of the proper financial management (budgeting, accounting and asset management).

Individual activity will be described below.

6-1 Preparation of MAREP Annual Work Plan

In Malawi the financial year starts in July and ends in June. DOE as the Secretariat of the (Interim) Rural Electrification Management Committee (I) (REMAC) prepares the MAREP annual work plan including relevant activities and budgets for the Committee, which is scheduled to be held in August every year. DOE and the Advisors discussed the contents of MAREP activities and produced a schedule chart around May to June for planning, and around October to November for revision.

The discussion of the work plan was made among all the RED members with the presence of the MAREP Manager, Project Manager, R/E Advisor and Financial Management Advisor using the methodology of brainstorming⁴. Each RE activity was clarified considering its priority, starting month, duration and consistency with other activities. This activity was done with the Challenge

⁴ The brainstorming method is very useful for each and every one to realize/understand what should be done

Sheet activity which is explained later. The Counterparts (C/Ps) realized that the detailed plan can set up the detailed targets for the capacity development and the planning process became smoother.

The annual work plan formulation process became smoother because RED has established the solid work process from survey through procurement to supervision as the phase progresses the availability of financial resources became clearer than before because of the set up of RED and, most importantly, the C/Ps have acquired the planning capability through various MAREP activities.

6-2 Preparation and operation of RED's mission statement and job descriptions, and set up of evaluation system on capacity development

The work contents and roles of the C/Ps were confirmed at the beginning of the Project based on the job description and mission statement of RED. Thereafter, the Challenge Sheet system was introduced in order to evaluate the progress of the capacity development bi-annually throughout the Project.

When the Project practically started in 2007, DOE had already completed the mission statement and job descriptions for the new organizational framework which was approved in 2008. The C/Ps pursued day-to-day works based on the job descriptions. However, it was observed that some C/Ps did not clearly understand their roles and individual skills/capabilities.

This Project introduced a *challenge sheet* system to grasp and evaluate the progress of capacity development of the officers. The sheet was filled by the officers after discussion with the Manager and was reviewed and evaluated by themselves and the Manager. All RED members including the MAREP Manager and the Experts held a meeting and discussed the contents of sheet in early November 2007 as the first step. The members set up their own targets of the coming half year considering "What are major jobs?" and "What kind of knowledge/skills to be learned through those job?" The Evaluation was conducted every half year by self-evaluation and MAREP Manager's evaluation (comments). At the same time, they set up the new targets for the following half year. This evaluation was done in total 5 times up to October 2009.

As mentioned it above, the MAREP Annual Work Plan became more detailed and the knowledge/skills to be acquired became clearer. This is because of the fact that the C/Ps themselves grasped the contents of the works and began to understand the knowledge/skills to be learned to implement the works.

6-3 Operation of information sharing system

The Advisors attended some meetings within and outside from RED and made some comments and advise on the reporting methodologies and management of the meetings.

Regarding information sharing, DOE and ESCOM held the MAREP Phase 5 monthly progress meetings every month from December 2007 when the construction works started. REMAC meeting started from September 2008. However a new information shearing system should be set up because

the new organizational framework is being introduced. Three new positions for the Deputy Directors are still vacant under the new framework as of October 2009 although the DEA was appointed in June 2009.

6-4 Updating of the RE M/P database

The situation of the database developed in the RE M/P Study with basic information at un-electrified and electrified TCs was confirmed at the beginning of the Project in early 2007. Thereafter, effective operational methodologies and information analysis were considered.

The priority list of electrification was prepared by analyzing economical potential at each TC, and 2-dimensional geographical information was not considered in the M/P Study. Therefore, the database was created based on statistical information such as population, number of households, number of public facilities, number of private entities market fees, and etc. This information was used to estimate economical potential at each TC.

At the beginning of the Project, this database (ACCESS format) was stored in the old PC that lied dormant. Therefore, the database was transferred to the newly donated PCs under MAREPP. Unfortunately, the person in charge to maintain ACSESS database was transferred to another Ministry. Since ACCESS based database requires ACCESS software and people have to learn how to use ACCESS, the database was converted to EXCEL format that allows everybody to use it easily.

The statistical information in the database includes outskirts of each TC. The required data was number of households, number of public facilities and number of private entities within the radius of 500m from the centre of TC where distribution line can reach them. This led to the situation that there was no exact match between the estimated economic potential based on the database and actual economical potential of each TC.

MAREP Phase 4 that started during M/P study electrified 96 TCs (target TCs were 58 and 38 TCs were beneficiaries, which benefited along distribution lines). MAREP Phase 5 electrified 27 TCs and 8 TCs also electrified under government direct project. MAREP Phase 6 will electrify 83 TCs (target TCs are 54 and 29 TCs are beneficiaries). DOE's hard work enabled this rapid implementation of MAREP and almost all the medium sized TCs have been electrified. This means economic potential of candidate TCs for MAREP Phase 7 or later phases will become smaller and smaller. There will be not much difference among those small TCs in terms of economic potential. Therefore, the criteria of electrification priority will be focused on geographical information rather than economic potential of each TC. In addition to the distance from exiting tapping point, number of benefited TCs along distribution lines will be important to determine the priority of electrification.

Therefore, it was deemed that the role of the database created during the M/P Study ended, and DOE ceased to use the database.

6-5 Assessment of the existing accounting, budgeting and asset management procedure, and drafting and utilization of the guidelines

The Project firstly assessed the procedure for accounting, budgeting and asset management in Japanese fiscal year (JFY) 2006 and 2007, and thereafter, drafted the guidelines for those areas and started utilizing it since JFY2008. The guidelines were finalized after reflecting the lessons learned from the utilization in JFY2009.

(1) Assessment of the existing accounting, budgeting and asset management procedure

<Budgeting>

MAREP Budget is approved by the REMAC as specified in the RE Act 2004. The budget relies on the REF which consists of RE Levy, Donor Fund, and Parliamentary Appropriated Budget.

RE Levy is not a part of the parliamentary approved budget and it was the same for its predecessor, Energy Fund (Levy). The basic guideline of how to spend the revenue from the levy is to allocate 11% for the other recurrent transaction (ORT) of the Secretariat of REMAC, i.e. DOE and 89% to the construction of MAREP facility.

<Accounting>

Before the establishment of MERA, PCC collected the Energy Fund (Levy) and DOE administered the expenditure of MAREP from the fund. The accounting report of the Energy Fund had not been reported to the Parliament nor parliamentary accounting committee. However, once the fund was transformed into the REF, it is made accountable to the REMAC and is bound to be audited.

Prior to the introduction of the REF, DOE was audited in FY 2007 for FY2004-2005 for all the accounts (not only the expenditure from the Parliamentary Appropriated Budget but also the expenditure made from the Energy Fund). In September and October 2008, the Internal Auditor Team from the Ministry audited the expenditure of MAREP Phase 4 and 5 made in FY2006 and FY2007. Thus the Financial Management Advisor considered the issues raised in the audit reports into the guidelines.

Although the REF consists of various funds such as RE Levy, the Parliamentary Appropriated Budget, and Donor funds, the Accountant General confirmed that the Fund shall be accounted for based on the Public Finance Management Act 2003 and the Treasury Instructions 2004.

As of November 2007, the discussion was held with the counterparts on how the accounting regarding MAREP has been handled, after going through the accounting books and issues raised in the audit reports, which revealed the following:

- (i) Payment voucher did not follow the necessary approval process
- (ii) Link between the approved budget and expenditure for MAREP is weak
- (iii) Cash flow control was weak
- (iv) Record of revenue was not updated

<Asset>

As for MAREP Phase 1 to 3, the electrified facilities are owned by, and operated and maintained by ESCOM. From MAREP Phase 4, which was completed after the approval of the RE Act 2004, the electrified facilities are owned by DOE, and operated and maintained by the concessionaire, who should be the authorized electricity power company (in reality, ESCOM).

The GoM adopts cash accounting and single-entry bookkeeping system, thus there is no balance sheet. As long as the GoM continues to adopt this accounting system, the asset management shall not be linked to accounting (thus no depreciation). On the other hand, even the GoM adopt accrual accounting and double-entry bookkeeping system, it would remain difficult to administer asset accounting if the MAREP electrified facility construction remains being funded by the different fund sources such as levy, parliamentary appropriated budget, and donor fund and those are not integrated into one account⁵.

When all the funds are integrated into one account and double-entry bookkeeping is introduced and a balance sheet is created, the capacity of DOE should be strengthened on how to assess the construction in progress and stock of the unused materials, and depreciation. This has to be applied not only to Accounts Section but also to the Rural Electrification Division.

There has not been any asset register or books to control assets opened at DOE. Not only electrified facilities but also the office equipments and computers, including donated items which should be managed by the Store Manager have not been managed through register before.

(2) Drafting Guidelines

In July 2008, the guidelines for budgeting, accounting and asset management were drafted based on the assessment of the procedures made in JFY 2007.

It was agreed that the guidelines to cover budgeting, monthly accounting report, and asset register. The details of the accounting procedures are not covered, because basically they are covered in the Public Finance Management Act 2003 and the Treasury Instructions 2004. In addition, the department improved the accounting capacity a lot after the audit in 2007 so it was decided that there is no need to cover the accounting procedure itself in the guidelines.

(3) Utilization and Finalization of the Guidelines

After August 2008, the counterpart Mrs. Mkagula, Assistant Accountant mainly applied the Draft Guidelines to the asset value identification for opening the asset register of MAREP Phase 4 and 5.

<Utilization of the Guidelines>

Firstly the asset value identification for MAREP Phase 4 involved going back to the accounting books and files from 2002. Since the book-keeping in those days did not assume this process of

⁵ GoM is in the process of creating the public asset guidelines under the World Bank supported Financial Management, Transparency, and Accountability Project (FIMTAP), which will focus on asset disposal. On the other hand, the need for public asset management has been recognized by the Accountant General and there was movement of establishing a division for that purpose. In 2008 the department issued a memo requesting all the government departments to submit the list of office equipment, but it seems the response was not good.

value identification, in general most of the necessary information such as purpose of the expenditure and name of the construction sites travelled was not included in the books. Meanwhile all the accounts staff was replaced therefore it was not possible to rely on the memory of the staff to get this type of information. In the process it was revealed that a part of the Phase 4 was constructed using the funds which were not administered by the DOE Accounts, so the books at DOE alone could not provide the necessary information. Since ESCOM was finalizing asset register for Phase 4 electrified facilities, it was transferred to DOE to consolidate the amount of direct costs (construction and materials)⁶.

Under the Phase 4 lots of TCs were added after the commencement of construction. Among those, the expenditure for “the sites along the line (the site dropped a transformer just because they are located along the line leading to the approved TCs)” was not separated from the expenditure for the approved TCs, so its value was included in the neighboring sites. Thus the final value of Phase 4 electrified facility assets reached MK1,399,768,011.46, out of which, construction fee and materials comprise MK1,392,009,589.53, and indirect expenditure is MK7,758,421.93. The contribution from ESCOM amounted to MK548,938,139.11.

After opening the asset register for MAREP Phase 4, the work started for Phase 5, by opening the book to classify indirect costs (e.g. the costs of feasibility study, supervision and monitoring). The remaining task is to wait for the official closure of Phase 5 accounts, specify the construction fee allocation to each site with ESCOM, and allocate materials used for each site. Then the total of these three accounts (indirect costs, construction fee, and materials) will constitute Phase 5 electrified facility asset value, which shall be registered in the Asset Register.

It was planned that the Advisors to join the material audit of MAREP Phase 5. However, it did not materialize due to other priority duties such as the finalization of tender documents for MAREP Phase 6 material procurement. According to the RED, the material audit was conducted for MAREP Phase 4 after its completion. Nevertheless, there is no systematic record remaining from the exercise, and there is no trace of the audit information being shared with the Accounts Section, thus it was not possible to incorporate the results into the MAREP Phase 4 asset value identification. In the Guidelines it is recommended that the material audit shall specify the surplus materials from that phase so that its value to be removed from the total purchase amount before it is incorporated in the value of assets.

It was also advised to register the properties other than electrified facilities (eg. office equipment, furniture, and vehicle) which were purchased using REF (formerly Energy Fund), and JICA donated MAREP equipments. The Asset Register for these items was also opened.

<Finalization of the Guidelines>

After the above processes the information necessary for calculating asset value was identified, such as purpose of expenditure, phase number of MAREP, and the name of the TCs travelled. The importance of this information was shared with the counterpart and DEA (then MAREP Manager).

⁶ At first ESCOM was not aware of the Act and finalized the Asset Register of Phase 4. The Phase 4 Asset Register opened by ESCOM reflected not only the amount received from DOE and other accounts under GoM, but also the value of materials procured by DOE, and contribution from ESCOM.

Following points were included in the final Guidelines when they were finalized:

- “Request by an Officer to Leave His/Her Duty Station” was revised to include the information to specify whether the trip is for MAREP or not and visited site. It is in use since January 2009;
- Monthly Report Format was made to include the information necessary for MAREP classification, and
- Other formats were also created.

6-6 Implementation of surveys regarding power demand and connection increase, and preparation of a field manual and implementation of socio-economic surveys based on the manual

A preliminary socio-economic survey was conducted in 2007 at un-electrified TCs and power consumption was measured directory in 2009 at electrified TCs. Throughout these activities, effective power demand survey methodologies were developed and a socio-economic manual was developed.

The demarcation between ESCOM and DOE in RE is the degree of economic potential at each TC. If a TC has enough economic potential that benefits ESCOM, ESCOM is responsible to electrify the TC. Otherwise, DOE has a responsibility to electrify TCs. Therefore, the M/P Study focused on socioeconomic survey and demand estimate survey of the target TCs for MAREP. Even at the time of MAREP Phase 4, however, there were no TCs which have enough economic potential to be electrified by ESCOM, and the economic potential of TCs which were to be electrified after Phase 4 has become smaller and smaller. In addition, the main purpose of demand estimate is to determine the capacity of transformers so that accuracy is not so required⁷. In order for RED to operate with the very limited technical resources⁸, it is necessary to assess the volume of each work and remove unnecessary works. It is also necessary to utilize effective method of work to reduce the burden of RED staff. Thus the number of socioeconomic survey items was minimized, and eventually the survey itself became unnecessary due to the situation described above.

When economic potential became smaller, it is enough to survey the number of maize mills to estimate power demand instead of counting the number of public facilities, private entities and households.

Therefore, a part of socioeconomic survey was included in B/D, as mentioned later, and the rest was omitted. In addition, direct measurement of the actual load at each TC was carried out instead of interviewing individual users of electricity.

Based on the result of actual load analysis, the peak load at TC is at daytime since maize mills, heavy power users, operate during the day. On the other hand, the peak load at national level is around 8pm and there is load shedding since the capacity of power generation is less than peak load.

⁷ Estimated value can be rounded to every 50kVA since capacity of transformer is set by 50kVA.

⁸ There are only two DOE engineers and two ESCOM engineers

Therefore, it is considered that the promotion of RE does not affect the supply problem at peak load time which ESCOM is facing.

6-7 Preparation of B/D and D/D manuals and implementation of survey using the manuals

Existing methodologies of field survey were confirmed through the results of MAREP Phase 5 F/S and D/D conducted by DOE in 2004 and 2007 respectively. The Advisors assisted DOE to come up with the effective methodologies with a few staff through Phase 6 B/D and D/D conducted in 2008 - 2009. At the same time, the B/D Manual and D/D Manual were developed

In the M/P Study, F/S was required for each candidate TC to analyze economic potential. As is already described above, F/S became unnecessary work so that it was decided to carry out B/D instead of F/S. The confirmation of candidate TCs and overall budget estimate were done by B/D and detailed budget estimate and BOQs were determined by D/D.

Duration of field survey depends on travel time to candidate TCs and survey time at each TC. To minimize the duration of field survey, it was necessary to reduce survey time at TCs since travel time is not possible to be reduced. Therefore, the new method to use GPS and satellite imagery was introduced. By using this method, survey time at TCs became dramatically shorter. In Phase 6, the number of target TCs has been increased to 83 from that of 27 in Phase 5. RED with limited resources could manage to accomplish B/D and D/D in short period by using this new method.

6-8 Preparation of technical and installation standards for distribution lines

The policy of technical and installation standards was discussed in January 2008 and decided as follows:

- ✓ The item which corresponds to ESCOM's company rule should be excluded and the mandatory rules should be selected carefully.
- ✓ The item which corresponds to the specification of each distribution material should be deleted.
- ✓ The prevention of accidents and disasters, and the security and safety for the general public should especially be taken into consideration from the viewpoint of DOE, and the contents should be selected carefully.

The contents of the draft technical and installation standards for distribution lines were discussed between C/P and the Advisors, based on the results of the survey at the sites of MAREP Phase 5 from November 2008 to September 2009. Because it was confirmed that the C/P lacked the knowledge of technical and installation standards through the site survey, the Guidebook for Power Engineers which is a reference for the Standards was drafted for helping engineers' understanding. The Standards and the Guidebook were also discussed among ESCOM, DOE and the Advisors. The lack of knowledge of C/P on how to calculate the voltage drop of the distribution lines was also confirmed through the site survey, so the technical transfer was done to the C/P.

The Standards and the Guidebook were completed in October 2009, based on the results of discussion among ESCOM, DOE and the Advisors on September 2009.

6-9 Assessment of contractual documents for material procurement and construction works and implementation of appropriate contractual process

(1) Assessment of and assistance to improve the contractual documents for material procurement

RED organized two teams to conduct the D/D for MAREP Phase 5. At the stage of bill of quantities (BOQ) preparation, one problem was found since one team used over head line (OHL) program developed by ESCOM, and the other team used Excel program prepared by DOE, to calculate BOQ. There were conflicts of the BOQs calculated using two different programs. The RE Advisor assisted the evaluation of the difference of calculation results between the two programs, and found both programs had some problems to calculate the quantity of materials. There was urgent need to fix this problem. Therefore, a new excel-based program was developed urgently by the expert together with two engineers seconded from ESCOM.

When the BOQ for MAREP Phase 6 was produced, material quantity for each structure was standardized. The excel-based program was also modified to easily cope with the change.

(2) Assessment and assistance to improve the contractual documents for construction works

While the material procurement of MAREP Phase 5 was in progress, in 2008, DOE was urged to draft the contract agreement on the construction works. DOE modified the first draft prepared by the former R/E Advisor into the Government's official format and had a series of discussions with the Advisors on the contents of the draft. The Advisors pointed out that the construction schedule must be realistic in order to take into the consideration that ESCOM's (contractor's) technical capacity and availability of human and financial resources, which were very restricted. Finally DOE completed the final draft in June 2007.

The Advisors assessed the details of the final draft already sent to ESCOM and pointed out that the following points were not covered sufficiently:

- ✓ Details of monitoring and inspection of the construction works;
- ✓ Responsibility on management of the materials procured by DOE;
- ✓ Payment schedule;
- ✓ Security of the sites until hand-over to ESCOM;
- ✓ How to solve unexpected problems, and
- ✓ How to cope with the natural disaster.

The final version of MAREP Phase 5 contract agreement stipulated that the total amount of construction fee was to be paid to ESCOM at once in advance. This payment method is not the normal procedure for this kind of agreement and the JICA intermediate monitoring mission pointed

out this issue in the M/M of the JCC.

6-10 Preparation of the supervision manual on the MAREP construction works and implementation of the supervision based on the manual

Before preparing the supervision manual, the policy of the supervision manual was discussed in January 2008 and decided as follows;

- ✓ At first, DOE checks the contents of a monthly report submitted by ESCOM. If there were no problems concerning the progress, DOE shall not conduct the intermediate on-site inspection.
- ✓ When the construction was delayed and ESCOM was not liable for it, DOE shall not conduct the intermediate on-site inspection.
- ✓ When ESCOM were liable for the delay, or when a serious work accident occurred during the work, DOE shall go to the site and give an administrative guidance to ESCOM so that ESCOM can improve the situation.
- ✓ If DOE had another task near the MAREP site, DOE can go there and check the site as a sampling inspection.

The contents of the Supervision Manual were discussed among DOE and the Advisors based on the results of the survey of the MAREP Phase 5 sites and the Draft Manual was revised. The Supervision Manual was completed in October 2009, based on the results of discussion held among ESCOM, DOE and the Advisors in September 2009.

6-11 Preparation of the Hand-over Inspection Manual and implementation of the hand-over inspection based on the Manual

The contents of the hand-over inspection were discussed with reference to items inspected by ESCOM at the completion of works. The first draft of the manual was prepared in January 2009.

The methods of how to use measurement instruments which are necessary for the hand-over inspection (such as insulation resistance tester, voltage/current tester, phase indicator, voltage checker and measurement pole) and safety work's equipment (such as safety belt, grounding hooks, insulation clothes and etc.) were instructed by the Advisors. RED members were also trained on how to use the equipment/materials using a dummy distribution facility.

The hand-over manual was discussed by DOE and the Advisors based on results of the survey at the sites of MAREP Phase 5 from November 2008 to September 2009. Though the site survey, the difference of view among C/Ps with regard to the inspection criteria was confirmed. Because of this, the figures and illustrations describing "Good Case" and "Bad Case" were added to the Draft Manual for engineers to easily understand how to check the acceptable quality of distribution line facilities easily. The way of how to conduct Field Material Audit after the completion of the construction was

also added to the Hand-over Inspection Manual based on the discussion with C/P and the Advisors.

The Hand-over Inspection Manual was completed in October 2009, based on the results of discussion among ESCOM, DOE and the Advisors in September 2009.

6-12 Examination of a scheme for monitoring and assessment of PV systems, and selection of candidates for training as inspectors and trainers

The existing PV monitoring system was confirmed at the beginning of the Project (January - February 2007) and candidates for trainees of PV monitoring engineers and PV trainers.

In Malawi, there is an authentication mechanism that DOE certifies solar PV installers and DOE inspects solar PV systems installed by those certified companies. The installations of solar PV systems have been increasing recent years since solar PV systems became popular especially for public facilities such as clinics and schools. It was urgent matter therefore to enhance the technical level of PV inspectors and to increase their numbers. Thus, candidates for PV inspectors were not only limited to RED staff but also included those from other divisions. On the other hand, the training for PV inspectors were included in the training for PV trainers, because the required technical level for PV inspectors should be the same as that for PV trainers to inspect PV systems properly.

6-13 Preparation of a manual for PV system inspectors, and implementation of the inspection based on it

An inspection manual on PV system was drafted and revised through existing PV system monitoring and new installed system inspection.

The type of solar PV systems installed in Malawi was only Solar Home System (SHS) type when the Project started. Later, independent centralized PV systems were installed and grid connected PV system will be installed in the near future. Therefore, the original inspection manual for SHS has been revised to include centralized system and grid-connected system.

During the On the Job Training (OJT) for the inspection of centralized PV and wind hybrid system, many fault PV modules were found. These Indian PV modules did not comply with Malawi technical standard. Normally the inspection is supposed to be conducted after the installation of PV systems. However, it may be necessary to inspect components to check whether they comply with Malawi technical standard or not before the installation, especially in case of large systems.

On the other hand, MERA has been established in September, 2008 and certification work was handed over from DOE to MERA. Since MERA is the authentication organization, it is not a proper for MERA to carry out inspection by themselves. Therefore, MERA is considering to establish the new inspection mechanism.

6-14 Preparation of a manual for PV system trainers, and implementation of the training based on it

A training manual for PV system trainers was drafted and training for trainers was conducted in October 2007. Thereafter, a follow-up training for assistant trainers with training for installers by them was conducted. The training manual was completed through these trainings.

The solar PV training has been conducting at Test & Training Centre for Renewable Energy Technologies (TCRET), Mzuzu University. TCRET was supposed to be a training institute to disseminate the correct knowledge and skills of solar PV systems. However, their capacity to conduct proper PV training course have some problems. Some lecturers lack enough PV experience, teaching materials were not well prepared and there are no measurement instruments necessary for hands-on practice.

We, therefore, conducted trainers' training to enhance the capacity for conducting proper solar PV training course at TCRET in October 2007. Participants⁹ were from DOE, ESCOM, BARREM, MBS and Tumba College of Technology (TCT), Rwanda. After the assessment of the training, two trainers and four assistant trainers were certified from Malawian participants. The practical manual for solar PV training has been prepared and the follow-up training for three assistant trainers were held in September 2009. They also managed to conduct solar PV training course for installers properly after the follow-up training. Therefore, they were certified as trainers. Currently, there are five certified trainers and one assistant trainer. They will be able to conduct a proper solar PV training by using the training manual and teaching materials.

These certified good trainers should be utilized to establish training institute that can conduct efficient solar PV training. At the moment, training institute for solar PV is TCRET at Mzuzu University only. The location of TCRET, however, is not convenient for many installers since most of them are located in Lilongwe and Blantyre. The travel cost and allowances in addition to tuition fee are heavy burden to solar companies so that sending their technicians to attend solar PV training course is difficult especially for small companies. It is recommended to have some training institutes for solar PV in Lilongwe and/or Blantyre. This would also reduce expensive tuition fee by competing each other.

6-15 Potential survey for the candidate micro hydro sites identified in the M/P Study

Micro hydro potential surveys were conducted at the candidate sites identified in the Master Plan Study with assistance of the Micro Hydropower Advisor. 2 sites in the South and 3 sites in the North were selected among all the candidate sites apart from inaccessible ones¹⁰. The Advisor played the central role for the field survey and technical transfer in the South, and then the RED officers by themselves conducted the survey in the North

Based on the results of the potential survey, which was conducted July 2007, the Micro Hydro

⁹ TCRET was invited but did not participate.

¹⁰ For example Rwarwe, which may be one of the best sites, was excluded because it is reachable only by boats and there are no access roads.

Advisor provided technical guidance on site survey and feasibility analysis for micro hydropower in July and October 2008. After the guidance by the Advisor, DOE officers were able to understand the techniques of site survey and feasibility analysis for micro hydropower planning, and they can now plan micro hydropower projects themselves. Unfortunately, two micro hydropower sites, where feasibility studies were conducted, turned out to be not matching up to the T/C demands. Therefore, the conclusion is that grid-extension would be better than micro hydropower for these two sites.

The techniques taught and experiences gained from the field survey, however, will be useful for the general hydropower planning. The trained C/Ps are now capable of providing some advice for the projects planned by some donors and for mini & small hydropower projects in the near future, and to supervise them. After this technical guidance on micro hydropower, the C/Ps showed the strong interest in learning mini and small hydropower.

DOE themselves conducted the potential survey in October 2008 at Lichenya River site which will supply electricity to Bondo Village using learned techniques based on the request from Mulanje Renewable Energy Agency (MUREA) .

7. Other Activities

7-1 Cooperation to Japanese grant aid project

The Japanese grant aid project for IMPROVEMENT OF RURAL HEALTH CARE FACILITIES was in the D/D stage in 2007. This project constructed 14 Health Centres and provided medical equipment for 55 Health Centres. All of the targeted Health Centres were not considered to be electrified. Therefore, a tiny PV lighting system (one light) was included in the equipment for 55 Health Centres. The RE Advisor provided the list of electrified Trading Centres where target Health Centres are located.

7-2 Sharing the experience of MAREP with Zambian officers.

The Zambian officers in charge of RE were invited for a study tour from 15th to 18th (practically from 16th to 17th) of November 2007. At that time, a RE M/P Study on was in progress in Zambia. Participants were two officers from Zambian DOE and one officer from the Rural Electrification Agency (REA).

Discussion was held on 16th November at DOE's conference room. At the beginning of the session, the Project Manager presented the history of Japanese assistance. Then both Zambian and Malawian counterparts made presentations for prepared topics such as R/E master plan, legal and institutional framework, distribution technology and PV technology. Since Zambian counterparts were working-level officers, the discussion was made very actively.

Both sides confirmed that high connection fee and shortage of grid extension materials hampered the improvement of electrification rate. It was also observed that both countries have specific funds for RE, however, the details of the fund in Zambia was not yet clear, while that in Malawi is defined in

the Act.

The field trip was conducted at Dickson TC (Phase 4 site) which is located near Lilongwe on 17th November. Distribution lines there were installed in May 2007. However customers at the TC could not use electricity because power meters were not prepared by ESCOM yet. PV systems were installed at a community secondary school in the TC, but some of them were broken down. This might be due to the inappropriate installation and lack of instruction to the user.

The tour was a good experience for the C/Ps from Zambia because they learned not only good practice but also some issues occurring during the implementation of RE. For Malawian C/Ps, it was also useful because they understood the progress and issues on RE at the neighboring county and received good motivation through the advices to Zambian C/Ps as an experienced agency on RE.

7-3 Assistance to JICA missions

(1) Cooperation for JICA's baseline study on the power sector in Malawi

JICA headquarters dispatched Ms. Orui, the Special Advisor of the Economic Development Department to carry out a baseline study on the power sector in Malawi in May to June 2007. The Advisors assisted the mission's activities through coordinating meetings with DOE, ESCOM, the United Nations Development Programme (UNDP), Infrastructure Service Project (ISP) of the World Bank (WB) and so on, collecting relevant information and attending the meetings as much as possible. The DOE with advisors continued to collect additional information which was not available during her stay in Malawi as necessary.

(2) Discussion with a mission from JICA Headquarters

JICA's intermediate monitoring mission headed by Mr. Hayashi came to Malawi in November 2007, and had a series of discussions with DOE, Experts and JICA Malawi Office. They pointed out two major issues. One was the understaffing of DOE and the other was the way of administering financial resources by the DOE. Their concerns were included in the Minutes of Discussions together with the PDM.

(3) Cooperation to the Terminal Evaluation Team

The Terminal Evaluation Team for the Project was dispatched to Malawi in July 2009 and visits/interviews were made with DOE, MERA and relevant organizations and the Experts. The Advisors assisted the Team through schedule arrangement, interviews and attendance to some organizations.

8. Recommendations

8-1 DOE's new organizational framework in future

The Chief Energy Officer (MAREP Manager) was promoted to DEA in July 2009 and DOE has started new organizational framework. The new framework indicates that 3 Deputy Directors

(DDEA), 6 Assistant Directors and more than 20 officers will be assigned.

DOE is planning to implement MAREP by implementing two phases in parallel (i.e. B/D and D/D for the following phase will be carried out during the construction period of the current phase). In addition jobs for operation & maintenance (O&M) will be increased (touched upon later). DOE should secure human resources as one of the urgent issues. Especially, the Accountant (unfortunately assigned only for 10 months during the three-year Project) must be hired as soon as possible to adjust the increased jobs such as opening asset register for each phase of MAREP, budgeting, and accounts reporting.

8-2 Importance of O&M

According to RE Act, the electrification materials are owned by the GoM and its O&M will be managed by concessionaire(s) (from Phase 4). It is also stipulated in the Act that the loss after the O&M will be covered from the REF. ESCOM is currently the only concessionaire operating and maintaining the MAREP Assets. However there are no concessionaire agreement and O&M agreement signed between GoM and ESCOM. For example there is not even an agreement regarding the repair and replacement of the installed equipment under Phase 4. As of now, DOE is not ready to engage themselves in O&M arrangement yet.

O&M issues such as the repair and replacement of the equipment and compensation of the loss will emerge in the future and, therefore DOE and ESCOM should start discussion as soon as possible.

8-3 More than 10 year assistance from Japan and future assistance

Since the dispatch of the first RE Advisor in April 1999, GoJ continued assistance to Malawi on Rural Electrification through the dispatch of successors to the RE Advisor, RE M/P Study (JICA Development Study), procurement of electrification materials from Dept Relief Grant Aid for Phase 4 and Counter Value Fund for Phase 5, PV system installation using Grassroots Grant Aid, dispatch of Senior Volunteers on PV to Christian Health Association in Malawi (CHAM) and this Technical Cooperation Project (MAREPP) (See attachment 5).

During this period, DOE which is a responsible organization to implement MAREP activities, gained an abundant experience through implementing a series of grid extension works technically and organizationally from B/D to supervision for MAREP Phase 4 and 5. On the other hand, the financial resources for MAREP will be secured because of the commencement of the REF. Therefore, it can be concluded that the solid foundation has been set for GoM to implement MAREP in sustainable and self-sufficient manner.

On the other hand, the shortage of power in Malawi is very serious. GoM is trying to expand the installed capacity of Kapichira from 64MW to 128MW and also to start construction of newly planned hydropower stations in addition to the interconnection of transmission lines from Mozambique. And GoM realizes the necessity of obtaining the technical assistance from Japan for the supply side (generation). Currently, Malawi's power sector has three major players of DOE, MERA and ESCOM

as shown in the attachment 6 under the newly introduced framework. For instance, hydropower projects with less than 5MW are implemented by DOE (MAREP) and ones with more capacity will be implemented by Independent Power Producers (IPPs). It is high time to consider the future realistic power sector framework, roles of the organizations and necessary technologies to be assisted by Japan.

9. Record of the Joint Coordinating Committee (JCC) Meetings

The JCC was held in total 5 times in order to discuss the Project's plan and issues and have a consensus. The Committee consists of the Principal Secretary (PS) of the Ministry as the chairperson, DEA, MAREP Manager, MERA, ESCOM, JICA Malawi Office (and Headquarters), RED Officers and the Advisors. Attachment 7 shows the M/M of the 5 JCC meetings.

9-1 First JCC meeting (24th January 2007)

<Major discussion points>

- All the participants confirmed that the Project is for capacity development of the DOE officers (the Experts would assist the DOE's activities), and not for the implementation of electrification works and direct financial assistance.
- Necessity of increasing the staff of the DOE was re-realized by the participants. Also establishment of the REF was raised as the urgent issue. It was agreed that the progress of these issues would be reported in the 2nd JCC.
- Discussion was made to confirm relationship between the Rural Electrification Management Committee (REMAC)¹¹ and the JCC of the Project. It was confirmed that the JCC is for reporting the results of capacity development, which support the DOE's activities while the REMAC is for reporting MAREP activities, and consequently the nature of the two Committees are different.
- It was also agreed that the setup of a concrete institutional framework for solar photovoltaic (PV) system development in the DOE including capacity development of PV engineers was essential.

9-2 Second JCC meeting (12th November 2007)

<Major discussion points>

- DOE had been implementing MAREP Phase 5 smoothly from the survey, procurement to preparation of construction works based on the lessons learned from Phase 4. The Project Manager pointed out that DOE by itself had been taking appropriate steps to "Notice", "Learn" and "Practice", which were a basic process for capacity development.
- As discussed in the first JCC, RED's understaffing became one of the biggest issues in the 2nd

¹¹ REMAC was not yet established because the Rural Electrification Act had not yet put in force. At this moment, therefore, Interim REMAC (IREMAC) was acting for the DOE as the Secretariat.

JCC. DOE seemed to think that there were sufficient staff members in RED. However, JICA pointed out that DOE was still understaffed to meet the future work burdens. This issue of an appropriate allocation of staff was still under discussion among participants.

9-3 Third JCC meeting (13th November 2008)

<Major discussion points>

- The Project Manager of MAREPP pointed out that DOE had gone through the whole process of MAREP Phase 5 (from F/S to construction) based on the lessons from Phase 4 and acquired technical skills. The Project Manager also pointed out that it would be necessary for DOE to secure human resources related to rural electrification management such as asset management, budgeting and accounting including their capacity development.
- In response to the Project Manager's comment, the PS indicated that a Principal Accountant in addition to the vacant position of the Accountant would be assigned in line with the promotion of positions in the newly approved DOE organizational framework. The PS also added that this promotion of positions would directly produce a positive incentive to the DOE staff.
- It was announced by JICA that final evaluation mission of MAREPP would be dispatched by JICA Headquarters a half year before the end of the Project (practically June 2009, immediately after the Presidential election). Because of this, it was agreed that an extraordinary JCC could be held for the evaluation mission, while the 4th (regular) JCC would be held in October 2009

9-4 Fourth JCC (9th July 2009)

The fourth JCC was held in order to make some comments on the Terminal Evaluation of the Project with the presence of the Evaluation Team in addition to the regular members. The M/M together with the Joint Evaluation Report (JER) was signed between the PS as the representative of GoM and the Team Leader as the representative of JICA.

<Major discussion points>

- The Evaluation Team announced that the Project would be finished successfully in November 2009 with 3-year period as scheduled because the Project had been implemented smoothly and it could achieve the expected outputs. The Malawian side agreed with it.
- The gratitude to JICA's 10-year assistance on MAREPP was expressed from Malawi side and a request of new technical assistance to supply side (generation) was also made by Malawi side.

9-5 Fifth JCC (28th October 2009)

The fifth JCC was held on 28th October 2009 as the final JCC of the Project.

<Major discussion points>

- A presentation of the Progress of MAREP was made by DOE. Then presentations of overall progress of the Project and history of Japan's ten-year cooperation to MAREP were made by the Advisors.
- Three issues such as recruitment of new staff (especially Accountant), necessity of operation and maintenance (O&M) framework, especially Concession agreement and O&M agreement between ESCOM and GoM and set up practical rules on replacement/repair of installed equipment after Phase 4 were pointed out by the Advisors as way forward. In reply to the comments, it was indicated by Malawi side that a task force to discuss the issues would be set up among MERA, EACOM and DOE.
- Malawi side thanked for the long-term cooperation from Japan to RE in Malawi and hoped further cooperation. JICA also thanked everybody on the successfully completed Project and advised DOE that the next responsibilities are with them and that the good cooperation should continue.

10. Results of training courses in Japan

Three C/P training courses were held in Nagoya (at Chubu Electric Power Company: CEPCO), Japan during the Project period and in total 6 officers participated in the training courses. Attachment 8 shows the action plans from the participants on the C/P trainings.

10-1 First C/P training for JFY 2007

- Name and title: Mr. Gideon G. Nyirongo, Chief Energy Officer (MAREP Manager), DOE
Mr. Willy W. Silema, Principal Economist, RED, DOE
- Field: Rural Electrification
- Period: 2nd – 23rd December 2007
- Training organization : CEPCO
- Brief of the course:

In the first week, lectures of economic evaluation by Mr. Hayashi, a site visit to Kyosera's PV Centre, etc. were conducted in Tokyo. In the second week, lectures of outline of RE Plan and management procedure of grid extension, a site visit to a distribution materials factory, etc. were conducted.

One day before the end of the training, an intensive discussion on various issues such as MAREP Phase 5, overall MAREP schedule, financial management and power sector development in Malawi was held in the presence of Mr. Hayashi, Project Manager, Micro-hydro Advisor and Distribution Advisor.

10-2 Second C/P training for JFY 2008

- Name and title: Mr. Christopher Kapito, Chief Engineer from ESCOM, RED, DOE
Mr. MacDonald Nzima, Energy Officer, Technical Services, RED, DOE
- Field: Rural Electrification
- Period: 15th September – 5th October 2008
- Training organization : CEPCO
- Brief of the Course:
For the first few days, site visits and lectures of PV system design, operation and maintenance were arranged in Tokyo. For the rest of the days, lectures and site visits on grid extension such as the outline of jobs, design and operation at a customer service center, trainings for employees, factories of equipment, etc, were conducted in Nagoya at CEPCO.

At the final stage of the C/P Training course, one-day intensive discussion regarding the technical and installation standards of the distribution lines and the way forward was made with the presence of the MAREPP Project Manager, R/E Advisor and two distribution Advisors.

At almost the same time, CEPCO was operating JICA's general training course entitled "Small Hydro and Clean Energy Power Engineering Course". Mr. Lungu, Principal Energy Officer (engineer) and Mr. Kalila, engineer at Tedzani hydropower station, ESCOM participated in the course. The participants of the two courses were combined for the site visits to the PV facility and hydropower facilities for the efficient training course operation and information sharing among the participants¹².

10-3 Third C/P training for JFY 2009

- Name and title: Mr. Henry Perera, Engineer from ESCOM, RED, DOE
Ms. Temwani Winnie Kumwenda, Economist, Planning Division, Ministry of Natural Resources, Energy and Environment
- Field: Rural Electrification
- Period: 24th August – 12th September 2009
- Training organization : CEPCO
- Brief of the Course:
For the first few days, site visits and lectures of PV system design, operation and maintenance were arranged in Tokyo. For the rest of the days, lectures and site visits on grid extension such as the outline of jobs, design and operation at a customer service center, trainings for employees, factories of equipment, etc, were conducted in Nagoya at CEPCO. At the same time the C/P training on the "Power System Development Master Plan Study in Zambia" was combined for efficient training management and information sharing between the two countries.

One day before the end of the training, an intensive discussion on mainly organizational and institutional framework including regulations was held in the presence of Project Manager and Distribution Advisor.

¹² After the training course, Mr. Kalila of ESCOM was trained by the Micro-hydro Advisor as a member of the micro hydro potential survey in Malawi. He also arranged a site visit from the potential survey team at Tedzani Hydropower Station.

11. Result of the transferred equipment for the Project

Office Equipment such as personal computers and printers, electrical measurement and monitoring equipment for PV, distribution inspection equipment, micro hydro survey equipment and power measurement equipment were procured and handed over to DOE in JFY 2006, JFY2007 and JFY2008. Basically the equipments were kept in the office of the C/Ps (in the cabinets with keys) and some of them were kept in the Project office due to small space available in other offices.

11-1 Equipment procured and transferred in JFY 2006

Office equipment and electrical measurement and monitoring equipment for PV were purchased in Japan and transferred to Malawi. Arrival date was 4th January 2007 and all the equipment was checked on 17th January. Ten steel cabinets with four drawers were purchased locally (in Lilongwe) on 22nd January, and AutoCAD was procured through JICA South Africa. The rest of the items were procured in Japan.

List of equipment for JFY 2006

Office Equipment	
Desk Top Computer, Dell OptiPlex 745 Core2 Duo, 2GB RAM, 250GB HDD, Windows Xp Pro, 20inch LCD Display	4 Sets
Software(Office 2003 Standard)	2 Sets
Software(Office 2003 Professional)	2 Sets
Software(Internet Security 2007)	4 Sets
Laptop Computer, Dell Latitude D520 Core2 Duo, 2GB RAM, 120GB HDD, Windows Xp Pro (With Carry Case)	2 Sets
Software(Office 2003 Standard)	2 Sets
Software(Internet Security 2007)	2 Sets
Laser Printer, Canon LBP3300	1 Unit
Tonner(508II)	1 Pc
Transformer (AVR-1500E) 1.5kw	1 Pc
Ink Jet Printer, Canon MP600	1 Unit
Ink Cartridge (BCI9BK+BCI7e)	6 Pcs
Transformer (CT-100X) 100w	1 Pc
Ink Jet Printer, Canon IP4300	1 Unit
Ink Cartridge (BCI9BK+BCI7e)	6 Pcs
Transformer (CT-100X) 100w	1 Pc
Projector, Epson EMP-1700 With Carry Case	2 Sets
Lamp Epson ELPLP38 (170w UHE)	2 Pcs
Electrical measurement and monitoring equipment for PV	
Handy Clamp Ac/Dc Meter 3287 DCA: 0.01A, DCV: 001V	5 Set
Handy Clamp Electric Power Meter 3286 ACV:600V, ACA: 200A	1 Set
Clamp Electric Power Meter 6300 (6300-07)	1 Set

ACV:600V, ACA: 100A	
Sunlight Meter 510-01, 100,000Lx	1 Set
GPS (Garmin Etrex Legend Cx)	1 Set
Digital Camera F31fd	1 Set
Battery Charger K-KJQ90M34C With Ni-MH Rechargeable Battery (4pcs.)	2 Set
Ni-MH Rechargeable Battery (4pcs.)	2 Set
Thermometer Ir-100	1 Pcs
Data Logger 3545-20 For DC Voltage, +/- 50mv, 500mv, 5V, 50V, 1ch 32000	5 Set
Data Logger 3637-20 For AC Voltage, 600V AC, 1ch 32000	5 Set
Data Logger 3636-20 For AC Current, 50A AC, 2ch 16000/2ch	5 Set
Clamp On Sensor 9650 For 3626-20 ACA: 100A	10 Set
Communication Base 3912-20 (Data Transfer Unit)	1 Set
Ladder, Hp-38	1 Unit

11-2 Equipment procured and transferred in JFY 2007

Distribution inspection equipment and micro hydro survey equipment were purchased in Japan and transferred to Malawi. Arrival date was 29th June 2007 and all equipment was checked on 23th July.

List of equipment for JFY 2007 (1) Distribution inspection equipment

No.	Items	Specifications	Quantity
1	Measure pole	SK FS-12	1
2	Binocular	Nikon Travelite x 8 Case and strap add on	3
3	Measure wheel	TOEI EA720-F3 Case add on	3
4	Earth tester	Kyoritsu-denki-keiki 4105A Case add on	1
5	Insulating tester	Kyoritsu-denki-keiki 3021 Case add on	2
6	Digital multi meter	Sanwa-denki-keiki CD800a	1
7	Digital thermo-hygrometer	Multi-keisoku CN1114C range of thermometer : 0~50C, range of hygrometer : 25~95%RH	1
8	Clamp ammeter	HIOKI 3281 range of AC current : 30A~600A	1
9	Phase checker	HIOKI 3126-01 range of voltage : 110V~480V	1
10	Voltage checker (for LV)	OOSAKI-denki ODC-6 , 80V~7kV	1
11	Voltage checker (for MV)	OOSAKI-denki ODC-70 , 3.3kVV~77kV	1
12	GPS	Garmin eTrex Legend Cx English version 12ch, USB cable, English manual, MicroSD card 512MB, Mapsource World Map	1
13	Digital camera	Canon IXYD 900IS 6 million pixel, Memory card 1GB	1
14	Helmet	TANIZAWA 109 Electricity guard type (7kV or less)	4
15	Safety shoes	SIMON SIFD11M Electric strength 3kV/min.	4

16	Earth hook	SUNAZAK F type 6.6kV~22kV, Case add on	1
17	Working glove (for LV) 1	Electric strength 3kV/min. 600V or less, Under glove add on	4
18	Working glove (for LV) 2	Electric strength 20kV/min., 7kV or less, Under glove add on	2
19	Guard glove	wear up on the working glove (for LV)	2
20	Protective clothes	Insulation jacket, Electric strength 20kV/min. 7kV or less	2
21	Protective boots	Electric strength 20kV/min. 7kV or less	2
22	Safety belt	FUJII-denko TE-27	1
23	Ladder	Hasegawa , Folding type	1

List of equipment for JFY 2007 (2) Micro hydro survey equipment

No.	Items	Specifications	Quantity
1	Anemometer	REKNOS-keisoku LP1100-09PS range : 0~2m/s	1
2	Laser distance meter	Nikon Laser 600 Amplification x6, Range of distance: 10~500m, Precision +/- 1m, Case and strap	1

11-3 Equipment procured and transferred in JFY 2008

Power measurement equipment were purchased in Japan and transferred to Malawi. Arrival date was 6th June 2008 and all equipment was checked on 8th June.

List of equipment for JFY 2008 Power measurement equipment

No.	Items	Specifications	Quantity
1	Power Meter	Kyoritsu-denki-keiki 6300 Power meter / logger	1
2	Clamp sensor	Kyoritsu-denki-keiki 8126 Current sensor for Kyoritsu 6300, Capacity : 200A	3
3	CF Card	Buffalo RCF-X128MY CF card for Kyoritsu 6300, Capacity : 128MB	4
4	Battery Charger	Panasonic K-KJQ90M34C Battery charger for NiMH batteries	2
5	UPS	APC APC ES 500 (BE500JP) Input voltage : 90 V to 110V, Output Voltage 100V, 500VA	2
6	Step down Transformer	Roadwarrior RW-33 Input voltage : 230V, Output voltage : 100V	2
7	Document Scanner	Fujitsu ScanSnap S510 Document scanner with A3 carrier sheet	1
8	Digital camera	Panasonic Fx-35 1000 million pixel, Memory card 1GB	1

12. Local Expenses Report

Local Expenses for car rental, petrol, copy papers were prepared for the Project by JICA. The table below shows the results of local expenses.

Results of Local Expenses

(Japanese Yen)

Local Expenses	JFY2006	JFY2007	JFY2008	JFY2009	Total
Interpretation and Translation Cost	0	0	0	0	0
Repair and Maintenance Cost	0	0	0	0	0
Material/Equipment Purchase Expenses	0	0	0	0	0
Expendable Supplies	2,419	505,580	459,009	112,409	1,079,417
Travel Expenses	0	150,002	0	0	150,002
Communication Expenses	0	0	0	0	0
Printing and Binding Cost	31,510	11,475	32,968	0	75,953
Rental Cost	271,264	1,450,986	1,332,732	461,775	3,516,757
Training fee	0	0	0	225,450	225,450
Conference Cost	0	0	0	0	0
Others	0	0	0	0	0
Total	305,193	2,118,043	1,824,709	799,634	5,047,579

13. Ingenuity for implementation of the Project and lessons learnt

The main purpose of the Project is to develop the capacity of the C/P (capacity development). Important processes of capacity development are; let counterparts *notice* problems (Normally, people do not notice any problems. Even when people noticed the problem, they would ignore it.). Let counterparts *think* solutions (Normally, people wait until the solution is instructed.). During the project period, experts focused on those DOE officers who would obtain these abilities through their major jobs. The biggest “notice” for DOE was realized through the implementation of MAREP Phase 4. DOE managed to finalize the construction works although the works delayed seriously and they faced the shortage of financial resources. DOE succeeded in MAREP Phase 5 because of the lessons learnt from Phase 4. It is a good lesson for DOE to “notice”, “think” and “practice”.

As mentioned frequently, DOE is always facing the understaffing issue and, nevertheless, huge amount of (day-to-day) jobs must be carried out. Currently human resources of RED are very limited and, therefore, it was necessary to manage capacity development in the manner where the work contents were simplified and made efficient as much as possible. One example was the new technique using GPS and satellite imagery for implementing B/D. It took a lot of time and human power to conduct MAREP Phase 5 F/S using roller measure, tape measure and footsteps during the sketch in TCs. The working time at each site was reduced tremendously by utilizing this method.

The challenge sheet method which was used for measuring the level of individual capacity development was also utilized when DOE develops and revises the MAREP Annual Work Plan. At the beginning, it was observed that some C/Ps did not clearly understand his own roles and job requirements. Therefore the target of skills to be learned was also unclear. However after sometime, the MAREP Annual Work Plan became more detailed and the knowledge/skills to be acquired became clearer. This is because of the fact that the C/Ps themselves grasped the contents of the works and began to understand the knowledge/skills to be learned to implement the works. It is expected that they will continue coping with the capacity development more positively in the future.

14. Output list of the Project

(1) Reports

JFY	Name of the Report	Submitted period
2006	Activity Plan	January 2007
	Bi-annual Project Progress Report (No.1)	March 2007
2007	Bi-annual Project Progress Report (No.2)	November 2007
	Bi-annual Project Progress Report (No.3)	February 2008
2008	Bi-annual Project Progress Report (No.4)	November 2008
	Bi-annual Project Progress Report (No.5)	February 2009
2009	Project Completion Report	December 2009 (Planned)

(2) Outputs for Technical Cooperation

1. Practical Manual for Basic Design on MAREP
2. Practical Manual for Detailed Design on MAREP
3. Practical Manual for Supervision of Construction Works on MAREP
4. Practical Manual for Hand-over on MAREP
5. Technical Standards for Power Distribution Facilities
6. Practical Manual for Demand Survey (Socio-economic Survey)
7. Practical Manual for Inspection of Solar PV Systems
8. Manual for Solar PV Training
9. Guidelines for MAREP Financial Management
10. Statement of Purpose and Job Descriptions (DOE produced)

15. Attachments

1. Project Design Matrix
2. Organization Chart of DOE (As of October 2009)
3. Work Schedule
4. Pictures on relevant activities
5. Assistance from Japan to Rural Electrification in Malawi
6. Framework of the Power Sector in Malawi
7. Minutes of meetings for the Joint Coordinating Committee (JCC)
8. Action plans on the Counterpart Trainings in Japan

Attachment 1

Project Design Matrix

Project Title: Malawi Rural Electrification Promotion Project

Project Period : December 2006 to November 2009

Implementing Agencies: Rural Electrification Division, Department of Energy (RED)

Project Site: Nationwide Target Group: *Primary* Officers of RED, *Secondary* ESCOM, and relevant organization related to PV system such as MOH, TCRET, CHAM, etc.

Version 1.0, As of 12th November, 2007

Narrative Summary	Indicators / Targets	Means of Verification	Important Assumptions
<p><u>Overall Goal</u></p> <p>Electrification rate of households is increased by extending distribution lines and disseminating Photovoltaic (PV) systems.</p>	<ul style="list-style-type: none"> • Electrification rate of households is increased to the national target of 10% by the end of 2010. 	<ul style="list-style-type: none"> • Electrification statistics from ESCOM 	<ul style="list-style-type: none"> • The present government policy on rural electrification will be maintained. • ESCOM continues to extend distribution lines to individual households. • Connection fee of household and electricity tariff remain affordable. • Urban and peri-urban electrification will be implemented in parallel by ESCOM. • Household income increases and enable them to be connected. • PV systems are installed to rural households.
<p><u>Project Purpose</u></p> <p>Capacity for planning and implementing MAREP is enhanced and improved.</p>	<ul style="list-style-type: none"> • Total of 27 trading centres (T/Cs) are energized under MAREP Phase 5 as planned. 		<ul style="list-style-type: none"> • Malawi Energy Regulatory Authority (MERA) is established. • Rural Electrification Fund (REF) is collected to secure financial resources for MAREP. • DOE fills vacant posts in RED.
<p><u>Outputs</u></p> <p>1. Technical capacity for planning and implementing MAREP is enhanced and improved.</p>	<ul style="list-style-type: none"> • Counterparts (C/Ps) are able to conduct F/S, (B/D) appropriately. • C/Ps are able to conduct detailed design (D/D) appropriately. • C/Ps are able to conduct procurement and management of electrification materials. • C/Ps are able to monitor and supervise construction works. • Necessary manuals are prepared. • C/Ps understand contents of manuals well, and use them. 	<ul style="list-style-type: none"> • Result of F/S (B/D) • Result of D/D • Result of procurement and management of the materials. • Reports on monitoring and supervision of MAREP Phase 5. • Manuals 	<ul style="list-style-type: none"> • DOE fills vacant posts in RED.

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Narrative Summary	Indicators / Targets	Means of Verification	Important Assumptions
<p>Outputs (Continued)</p> <p>2. Capacity of contract management for implementing MAREP is improved.</p>	<ul style="list-style-type: none"> MAREP is implemented smoothly based on proper contractual documents. 	<ul style="list-style-type: none"> Contractual documents and completion report of MAREP Phase5. 	<ul style="list-style-type: none"> DOE fills vacant posts in RED.
<p>3. Technical capacity of inspectors and trainers for PV systems is improved.</p>	<ul style="list-style-type: none"> Number of participants trained. Number of certified inspectors and trainers. Training materials are prepared. 	<ul style="list-style-type: none"> Record of training Training Materials 	<ul style="list-style-type: none"> Accreditation of installers and inspection of PV systems will be continued by DOE/MERA.
<p>4. Capacity of new financial management for REF is developed and enhanced.</p>	<ul style="list-style-type: none"> Appropriate new financial management procedure is developed and implemented. 	<ul style="list-style-type: none"> Audited annual (financial) report Manuals 	<ul style="list-style-type: none"> DOE hires qualified accountant for REF.
<p>5. Capacity of administration and management in RED is enhanced and improved.</p>	<ul style="list-style-type: none"> Appropriate information sharing and reporting procedures are prepared. Administrative and management activities are carried out efficiently. 	<ul style="list-style-type: none"> Job description Work Evaluation 	<ul style="list-style-type: none"> DOE fills vacant posts in RED.
<p>Activities</p> <p><i>Following activities are carried out with C/Ps.</i></p> <p>1- 1. Prepare MAREP annual plan.</p> <p>1- 2. Update the database of un-electrified T/Cs prepared under the master plan study for rural electrification.</p> <p>1- 3. Conduct F/S (B/D) using the manual, and revise the manual if necessary.</p> <p>1- 4. Prepare the manual for D/D implementation.</p> <p>1- 5. Conduct D/D using the manual, and revise the manual if necessary.</p> <p>1- 6. Prepare the manual for monitoring and supervision of construction works.</p> <p>1- 7. Conduct monitoring and supervision of construction works using the manual, and revise the manual if necessary.</p> <p>1- 8. Prepare the manual for taking-over inspection.</p> <p>1- 9. Conduct taking-over process at Phase 5 sites using the manual, and revise the manual if necessary.</p> <p>1-10. Prepare technical standards for installation of distribution lines.</p> <p>1-11. Adopt this standards for contractual and supervision process, and revise the standards if necessary.</p> <p>1-12. Conduct feasibility study on micro hydropower sites identified by the M/P Study.</p> <p>1-13. Prepare the manual for social and economic surveys.</p>	<p>Inputs from Japan</p> <ul style="list-style-type: none"> Personnel (Dispatch of experts) Training of C/Ps in Malawi, Japan and/or third country Provision of Necessary Equipment Operating Expenses 	<p>Inputs from Malawi</p> <ul style="list-style-type: none"> Personnel Office Space with furniture and utility services Travel expenses for local site visits Expenses for local training 	<ul style="list-style-type: none"> DOE fills vacant posts in RED. MERA is operated properly. REF will be collected to secure financial resources for MAREP. Energy officers who gained capacity development through the Project remain in DOE. <p>Prerequisites</p> <ul style="list-style-type: none"> There is enough incentives to retain officers. Macro-economy is stable.

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Narrative Summary			
Activities <i>(Continued)</i>			
1-14. Conduct social and economic surveys including power demand estimate for Phase 6 sites using the manual, and revise the manual if necessary. 1-15. Conduct social and economic survey for monitoring the power demand and connection increases at newly electrified trading centers in order to improve the method of demand forecast.			
2-1. Review the existing contract agreements for material procurement and construction works. 2-2. Carry out contractual process for material procurement for Phase 5 and review the tender documents for procurement. 2-3. Carry out contractual process for construction works for Phase 5 sites, and revise the contract agreement if necessary.			
3-1. Identify engineers of stakeholders to be trained as inspectors and trainers for PV systems. 3-2. Formulate inspection and monitoring system. 3-3. Prepare inspection manual. 3-4. Train inspectors, carry out inspection works using the manual, and revise the manual if necessary. 3-5. Prepare training materials. 3-6. Conduct train of trainers, and revise the materials if necessary. 3-7. Conduct training by certified trainers.			
4-1. Assess the present procedure for accounting, budget and asset management. 4-2. Prepare guidelines and manuals for appropriate procedures for accounting, budget and asset management. 4-3. Carry out accounting, budget and asset management using the guidelines and manuals, and revise the guidelines and manuals if necessary.			
5-1. Confirm mission statement and job descriptions of RED, and revise them if necessary. 5-2. Prepare appropriate information sharing and reporting procedures. 5-3. Carry out the administrative and management activities using the job descriptions, information sharing and reporting system, and revise them if necessary.			

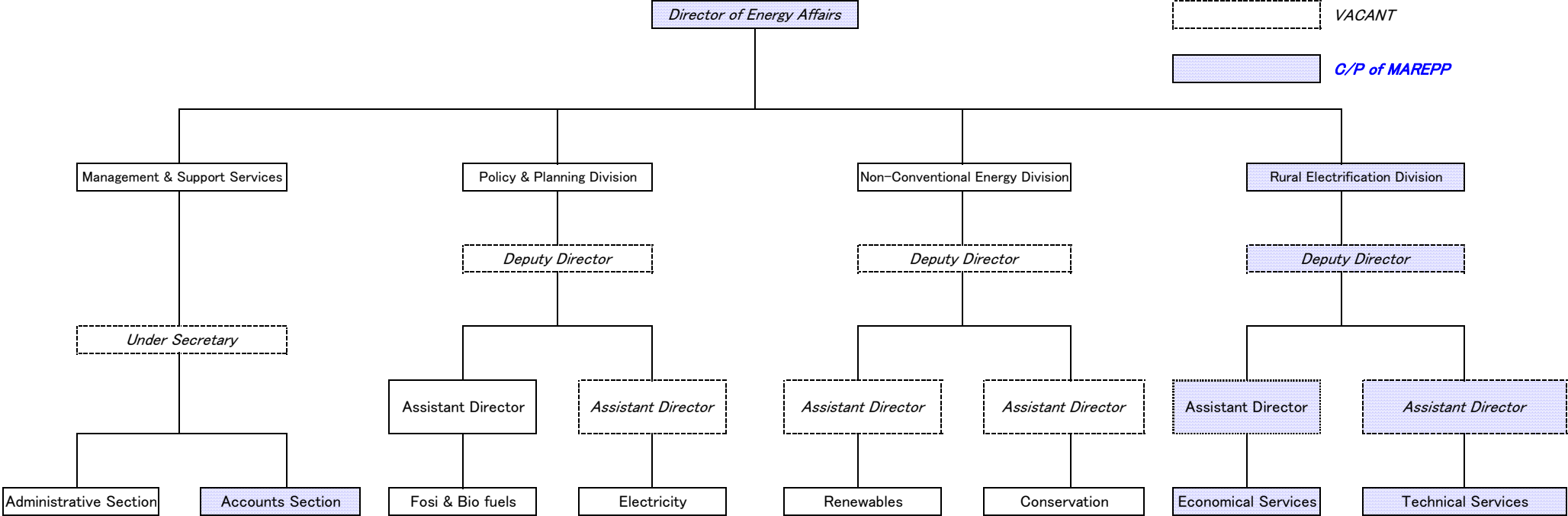
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Attachment 2

Organizational Chart of the Department of Energy Affairs (As of October 2009)



Attachment 3

MAREPP Work Schedule

JFY: Japanese Fiscal Year

Activities	JFY2006	JFY2007												JFY2008												JFY2009																										
	Calendar Year 2007												Calendar Year 2008												Calendar Year 2009																											
	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12															
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□ Work in Japan ■ Work in Malawi