添付資料１　署名したＳ／ＷとＭ／Ｍ

SCOPE OF WORK
FOR
THE STUDY
ON
THE INTRODUCTION OF RENEWABLE ENERGIES IN RURAL AREAS
IN
MYANMAR

Agreed upon between
The Ministry of Electric Power of the Union of Myanmar
and
Japan International Cooperation Agency

Yangon, September 21, 2000

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22/9/2000

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I. INTRODUCTION

In response to the request of the Government of the Union of Myanmar (hereinafter referred to as "Myanmar"), the Government of Japan decided to conduct the Study on the Introduction of Renewable Energies in Rural Areas in Myanmar (hereinafter referred to as "the Study") in accordance with the relevant laws and regulations in force in Japan.

Accordingly, the Japan International Cooperation Agency (hereinafter referred to as "JICA"), the official agency responsible for the implementation of technical cooperation programs of the Government of Japan, will undertake the Study in close cooperation with the authorities concerned in Myanmar.

The present document sets forth the scope of work with regard to the Study.

II. OBJECTIVE OF THE STUDY

The Study aims at formulating a guideline for the introduction of renewable energies in rural areas of Myanmar and preparing actual development plans for selected sites. Through the installation of pilot plant(s) in the Study, the transfer of necessary knowledge and technology to concerned personnel in Myanmar and the preparation of a manual will be implemented for efficient introduction of renewable energies in Myanmar.

III. THE STUDY AREA

In formulating the guideline for the use of renewable energies (hereinafter referred to as "the Guideline"), whole situation in the country will be taken into account. To collect detailed data necessary for the formulation of the Guideline, however, some specific areas will be selected. These areas will be decided in the course of the Study through discussions between the Myanmar counterparts and the Japanese study team dispatched for the Study (hereinafter referred to as "the Japanese study team").

IV. OUTPUT OF THE STUDY

The Study comprises two (2) components: Phase I and Phase II. However, the details of the Phase II study will be decided in light of the results of the Phase I study. The expected output of each phase is as follows:

Output of the Phase I study

1) The Guideline

The following issues will be included in the Guideline:

- Set-up of proper institutional and organizational schemes for rural electrification using renewable energies
- Necessary policies and regulations for the facilitation of rural electrification using renewable energies
- Proper financial plans for rural electrification using renewable energies. These include proper tariff structures and schemes for raising required capital
- Proper operation and maintenance schemes for power supply systems using renewable energies
- Proper mechanism for the development of human resources
- Criteria for the selection of appropriate sites to be electrified and energy resources to be used
- Criteria for prioritization of prospective electrification projects
- Technical standards for data collection, equipment and power supply systems, economic evaluation of the feasibility of projects, and environmental impact assessment
- Possibility of alternative configurations of power supply systems using renewable energies

2) Identification of prospective electrification projects using renewable energies

The prospective projects of rural electrification using renewable energies will be identified mainly based on existing data and information. The identified projects will be prioritized in accordance with the Guideline.

3) Formulation of development plans for prioritized projects

Development plans will be formulated for a couple of the highly valued projects, identified through the above-mentioned process. These plans will cover the conceptual design of the power supply system, time schedule of the project, cost estimation, proper operation and maintenance scheme.

Output of the Phase II study

4) Technology transfer and preparation of a manual for the introduction of renewable energies through (a) pilot project(s)

Based on the results of the Phase I study, (a) single or multiple pilot project(s) will be conducted with the purposes of actual technology transfer and preparation of a manual for the introduction of renewable energies. This manual will cover necessary issues in each development process such as project planning, design, operation and maintenance, monitoring, and technical and economic evaluation.

V. SCOPE OF THE STUDY

Phase I Study–Preparation of the Guideline and Development Plans

1) Collection and Analysis of Background Data and Information

The following data and information will be collected and analyzed. A socio-economic survey will be also implemented to collect necessary data on general situations in rural areas.

- Situations of existing relevant projects in Myanmar
- Current status of rural electrification including institutional issues such as relevant policy, plans, laws and regulations
- Relevant organizations and their roles, activities, and awareness of rural electrification
- Existing topographical maps, hydro-meteorological data, materials indicating the location of existing power stations, and existing grids, and information on power plants under construction and operation
- Socio-economic and energy situation in rural areas (socio-economic survey)
- Potential demand for electricity in rural areas
- Potential of the development of renewable energies in rural areas
- Availability of construction materials, machineries, and equipment in the local market

2) Preparation of the Guideline

The Guideline encompassing the above-mentioned issues will be prepared.

3) Identification of Prospective Electrification Projects Using Renewable

Energies

- Identification of potential projects sites in light of existing data and information
- Implementation of field surveys in some highly rated places sampled among the identified project sites
- Prioritizing the prospective projects sites in light of the data collected through the field surveys and the criteria defined in the Guideline

4) Formulation of Development Plans

(1) Preparatory Survey

- Selection of target sites in accordance with the priority of the prospective projects
- Execution of field surveys aimed at collecting data on detailed site conditions such as topological and hydrological conditions, and analyzing the collected hydro-met data and relevant development plans
- Execution of field surveys for the target sites to be electrified. Some of the necessary data are the number and distribution of consumers, potential demand, and socio-economic conditions

(2) Project Planning

- Development of the plan for power supply and demand
- Evaluation of the potential of development. This includes examinations of the optimal size of development, economic viability, and expected effects and side effects
- Examination of the engineering design with rough specifications for power supply systems, basic drawings and cost estimation
- Preparation of the implementation schedule for development

(3) Operation and Maintenance Plan (O/M Plan)

O/M plans will be developed.

(4) Accounting System

An appropriate accounting system will be developed. The work will include the methodology of tariff collection and management of accounting.

(5) Economic and Financial Analysis

Economic and financial analysis for the formulated development plans will be carried out.

5) Comprehensive Workshop for Phase I

A comprehensive dissemination workshop shall be carried out to disseminate the entire output of the Phase I study. The expected participants will be concerned officials and personnel of national and local government, international organizations and Japanese organizations.

Phase II Study– Implementation of Pilot Project(s) and Preparation of the Manual

1) Implementation of (a) Pilot Project(s)

Stage 1: Selection of Target Site(s)

The target site(s) for the pilot project(s) will be selected among those for which the development plans are formulated in the Phase I study.

Stage 2: Detailed Design and Installation

(1) Detailed Design

Detailed design work will be carried out. Utilization of local materials and equipment shall be considered as much as possible. The specifications of the system(s) will be prepared.

(2) Procurement and Installation of Materials for the Plant(s)

Necessary materials will be procured and installed.

(3) Supervision of the Construction Work

The concerned personnel of Myanmar and the Japanese study team shall jointly supervise the construction work performed by (a) contractor(s) in a cooperative manner.

Stage 3: Operation & Maintenance, Monitoring and Evaluation of Pilot plant(s)

(1) Operation & Maintenance (O/M)

Based on the O/M plan prepared in the development plans, the organization in charge of O/M will be established in the target site(s), and O/M work and tariff collection will commence.

(2) Monitoring

Monitoring of the pilot plant(s) shall be continued after the commissioning of operation. The concerned personnel of Myanmar and the Japanese study team will implement the monitoring work in a cooperative manner.

(3) Evaluation

The viability of the pilot plant shall be evaluated based on the results of the above-mentioned monitoring.

2) Completion of the Manual and the Guideline

The manual shall be drafted in each stages and phases of the Study. These draft manuals will be compiled and completed. At this point, the Guideline will be revised to reflect the whole outcomes from above.

3) Comprehensive Workshop for the Study

To disseminate the whole outcomes of the Study, a comprehensive workshop shall be carried out. The expected participants will be concerned officials and personnel of national and local government, international organizations and Japanese organizations.

VI. WORK SCHEDULE

The Study will be carried out in accordance with the tentative work schedule shown in the appendix I.

VII. REPORTS

JICA shall prepare and submit the following reports in English to the Government of Myanmar:

- Inception report: Ten (10) copies in English
- Progress report 1: Ten (10) copies in English
- Interim report: Ten (10) copies in English
- Progress report 2: Ten (10) copies in English
- Draft final report: Twenty (20) copies in English (main reports and summaries)

Tentative time schedule for submission of these reports is shown in the attached Appendix I.

The Ministry of Electric Power (hereinafter referred to as "MOEP") shall provide its comments on the draft final report within one (1) month after the submission of the report.

- Presentation

The presentation of the draft final report shall be made to MOEP.

- Final report: Twenty (20) copies in English (main reports and summaries)

JICA will submit these reports within six (6) weeks after receiving the comments of the Government of Myanmar on the draft final report.

During the field survey in Myanmar, monthly meetings will be held, and monthly reports will be prepared for submission at these meetings.

VIII. DIVISION OF TECHNICAL UNDERTAKING

The division of technical undertakings by MOEP and JICA of the Phase I study is detailed in the appendix II.

IX. UNDERTAKING OF THE GOVERNMENT OF MYANMAR

To facilitate the smooth conduct of the Study, the Government of Myanmar shall take necessary measures:

(1) to secure the safety of the Japanese study team,

(2) to permit the members of the Japanese study team to enter, leave and sojourn in Myanmar for the duration of their assignment therein, and exempt them from foreign registration requirements and consular fees,

(3) to exempt the members of the Japanese study team from taxes, duties, fees and other charges on equipment, machinery and other materials brought into, and out of, Myanmar for the conduct of the Study,

(4) to exempt the members of the Japanese study team from income taxes and charges of any kind imposed on, or in connection with, any emoluments or allowances paid to them for their services for the implementation of the Study,

(5) to provide necessary facilities to the Japanese study team for remittance as well as utilization of the funds introduced into Myanmar from Japan in connection with the implementation of the Study,

(6) to secure permission for entry into private properties or restricted areas for the implementation of the Study,

(7) to secure permission for the Japanese study team to take all data and documents including

maps and photographs related to the Study out of Myanmar to Japan,

(8) to provide medical service as needed (expenses will be chargeable to members of the Japanese study team) and

(9) to facilitate prompt clearance through customs and inland transportation of equipment, materials and supplies required for the Study and of the personal effects of members of the Japanese study team.

The Government of Myanmar shall bear claims, if any arises, against members of the Japanese study team resulting from, occurring in the course of, or otherwise connected with, the discharge of their duties in the implementation of the Study, except when such claims arise from gross negligence or willful misconduct on the part of the members of the Japanese study team.

MOEP shall act as counterpart agency to the Japanese study team and also as coordinating body in relation with the other governmental and non-governmental organizations concerned for the smooth implementation of the Study.

MOEP shall, at its own expense, provide the Japanese study team with the following, in cooperation with other organizations concerned:

(1) available data and information related to the Study;

(2) counterpart personnel;

(3) suitable office space with necessary equipment in Yangon;

(4) identification cards;

(5) necessary vehicles with drivers, fuel and maintenance services for carrying out the field survey; and

(6) communication facilities during the execution of the Study, such as telephone, telex, transceiver, etc., if necessary.

X. UNDERTAKING OF JICA

For the implementation of the study, JICA shall take the following measures:

(1) to dispatch, at its own expense, study teams to Myanmar, and

(2) to pursue technology transfer to the Myanmar counterpart personnel in the course of the Study.

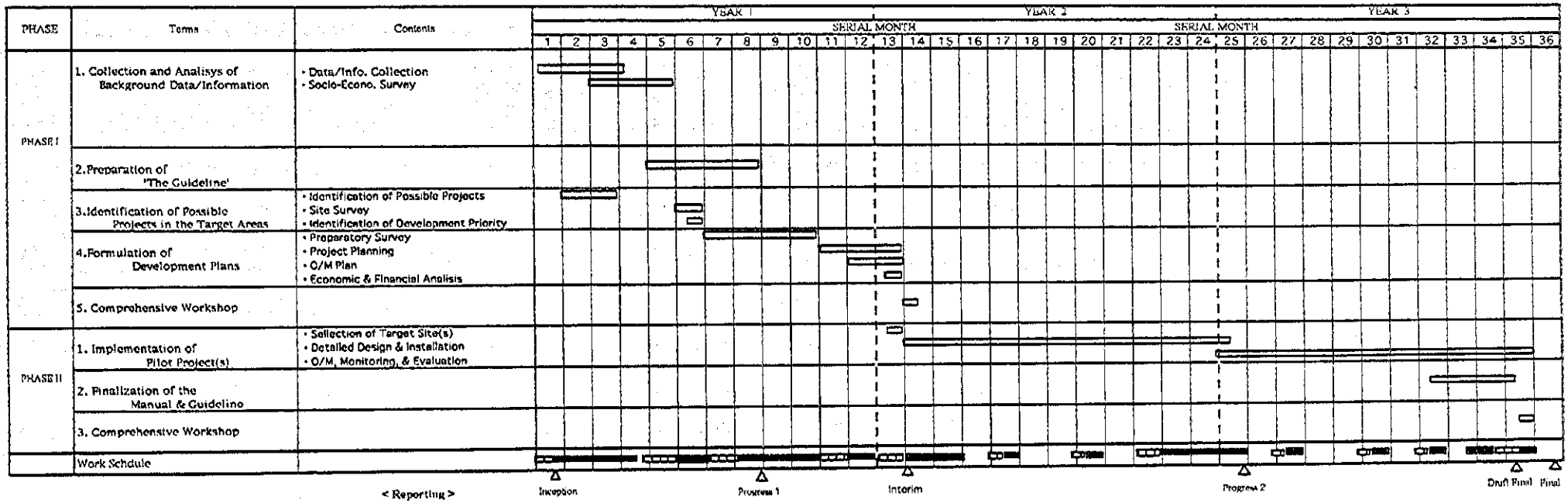
XI. OTHERS

JICA and MOEP shall consult with each other in respect of any matter that may arise from or in connection with the Study.

Appendix I

TENTATIVE SCHEDULE FOR THE STUDY

PHASE	Terms	Contents
PHASE I	1. Collection and Analisys of Background Data/Information	• Data/Info. Collection • Socio-Econo. Survey
	2. Preparation of 'The Guideline'	
	3. Identification of Possible Projects in the Target Areas	• Identification of Possible Projects • Site Survey • Identification of Development Priority
	4. Formulation of Development Plans	• Preparatory Survey • Project Planning • O/M Plan • Economic & Financial Analisis
	5. Comprehensive Workshop	
PHASE II	1. Implementation of Pilot Project(s)	• Selection of Target Site(s) • Detailed Design & Installation • O/M, Monitoring, & Evaluation
	2. Finalization of the Manual & Guideline	
	3. Comprehensive Workshop	
	Work Schedule	



:Works in Myanmar
:Works in Japan

Appendix II

Outline of Division of Technical Undertaking

	MOEP	JICA (study team)
PHASE I (Preparation of the Guideline and Development Plans)	1) Arrange the meetings with relevant authorities and organizations.	1) Collect information from relevant authorities and organizations. Discuss the progress and results of the Study with relevant authorities and organizations.
	2) Arrange the site reconnaissance in cooperation with PBANRDA.	2) Conduct site reconnaissance.
	3) Assist the collection of necessary data and information.	3) Collect and analyze relevant data and information.
	4) Examine the prepared Guideline and the development plans with concerned authorities.	4) Formulate the Guideline and the development plans in cooperation with Myanmar personnel.
	5) Arrange and Hold the comprehensive workshop.	5) Provide technical support for the implementation of the comprehensive workshop.

	MOEP	JICA (study team)
PHASE 2 (Implementation of pilot project(s) and preparation of the Manual)	1) Examine the target site(s) for the pilot project(s).	1) Evaluate the results of the Phase I study in order to select the target site(s) for the pilot project(s).
	2) Assign Myanmar personnel who will work with the Japanese study team for the detailed design, supervision and so on.	2) Carry out detailed design and supervision work in cooperation with Myanmar personnel. Transfer necessary technology and knowledge to the personnel.
	3) Arrange the site studies with local authorities and PBANRDA.	3) Carry out the site studies.
	4) Establish the O/M system and organization for O/M activities.	4) Develop O/M system and the structure of the organization in cooperation with the Myanmar personnel.
	5) Monitor and evaluate the project(s).	5) Identify criteria for monitoring and evaluation of project(s) in cooperation with the Myanmar personnel.
	6) Examine the manual and the Guideline.	6) Complete the manual and the Guideline in cooperation with the Myanmar personnel.
	7) Arrange and hold the comprehensive workshop.	7) Provide technical support for the implementation of the comprehensive workshop.

MINUTES OF MEETING
FOR
THE PREPARATORY STUDY
ON
THE INTRODUCTION OF RENEWABLE ENERGIES IN RURAL AREAS
IN
MYANMAR

Yangon, September 21, 2000

U Zaw Win
Director General,
Department of Electric Power,
Ministry of Electric Power

Yuji Otake
Leader,
Preparatory Study Team,
Japan International
Cooperation Agency

22/9/2000

U Yan Naing
Managing Director,
Myanma Electric Power
Enterprise

The Department of Electric Power, the Ministry of Electric Power (hereinafter referred to as "DEP") requested officially to implement the study on rural electrification using renewable energy in Myanmar to the Government of Japan in September 1998.

In response to the request, the preliminary study team organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA") had been dispatched to Myanmar from June 18th to July 1st, 2000.

In Yangon the preliminary study team held a series of discussions on the proposed study, which was named "the Study on the Introduction of Renewable Energies in Rural Areas in Myanmar," with DEP and Myanma Electric Power Enterprise (hereinafter referred to as "MEPE"), a state owned utility responsible for generation, transmission and distribution of electric power in Myanmar, and other relevant government departments. Through these discussions the outline of the proposed study had been clarified.

The scope of work for the actual study was drafted by JICA based on the results of the preliminary study. The preparatory study team was dispatched to Myanmar from September 14th to September 23rd to have a series of discussions on the drafted scope of work with DEP and MEPE.

Discussions were conducted in a friendly and cordial atmosphere, and both sides agreed to record the following points as summarized conclusions of the discussions:

1. Objectives of the Preparatory Study

The objectives of the preparatory study are:

(1) To collect relevant data and information; and

(2) To build up a mutual understanding regarding the contents of the scope of work for the actual study.

2. Procedure of the Implementation of the JICA Development Study

In general, the JICA Development Study is carried out through the following

three stages:

(1) Preliminary study (completed in July 2000): In this stage, the outline of the proposed study is clarified, and necessary data and information to formulate the scope of work are collected. Between JICA and the relevant organization of the recipient country (i.e., DEP), mutual understanding for the outline of the actual study is reinforced.

(2) Preparatory study: In this stage, based on the result of the preliminary study, the detailed scope of work is formulated through the discussions of the two parties. The mission of the preparatory study is sometimes called Scope of Work (S/W) mission.

(3) Actual study: In this stage, the JICA study team composed of Japanese consultants is organized and carries out the actual study in accordance with the agreed scope of work. The actual study is expected to commence in January or February 2001.

3. Responsible Agencies

DEP shall take a full responsibility for the implementation of the actual study and coordinate the related authorities and government departments such as the Ministry for Progress of Border Areas and National Races and Development Affairs (PBANRDA). MEPE shall be the actual execution body for the study.

4. Counterpart Personnel

DEP and MEPE will assign the counterpart personnel who will actually work with the members of the JICA study team in the whole course of the actual study. Through joint works in the actual study, the JICA study team will implement technical transfer to the counterpart personnel. Expertise of the counterpart personnel must correspond to that of the JICA study team members. Prior to the commencement of the actual study, the JICA will submit a member list of JICA study team to DEP; then, DEP will assign the counterpart personnel.

5. Necessary Data and Information

The preparatory study team requested DEP to ensure the availability of necessary data and information listed in the attached sheet. DEP replied that they

would be able to provide in-house data per the request of the JICA study team; however, in regard to those data only available outside MOEP/MEPE, they would do their best with the relevant authorities to collect them.

6. Pilot Project

6.1 Comments on the Pilot Project

DEP commented on the drafted pilot project scheme as follows:

(1) DEP expects a substantial size of facilities: for example, about (1) MW capacity for mini-hydropower, and about 150 kW capacity for PV and wind-power system.

(2) For PV and wind power systems DEP prefers a centralized system which can supply electricity to a village or a group of villages, rather than a stand-alone system which can supply only one building.

(3) Similarly small size micro hydro power stations such as 50kW or 100kW are not preferable because these are not cost effective in the light of current MEPE operation.

Conversely, the JICA preparatory study team explained their standpoints for the pilot project:

(1) The pilot project is one part of the actual study that is aimed at formulating appropriate schemes for rural electrification. These schemes will include not only the current form of MEPE operation but also something new forms based on collaboration between MEPE and local communities.

(2) In this context, the size of the pilot project cannot be the precondition for the project implementation but will be decided through the evaluation and discussion of the first phase study, in particular, the formulation of guideline.

6.2 Site Selection

(A) pilot project(s) will be conducted in the second phase of the actual study. The potential areas for the pilot project(s) will be nominated through the formulation of the development plan in the first phase, but the actual site(s) and type(s) of energy to be used in the pilot project(s) will be determined at the beginning of the second phase.

6.2 Installation of the Plant(s)

The whole expenses for the procurement and installation of the plant(s) will be

9.0

borne by JICA. On the other hand, DEP will support JICA's activities regarding the procurement and installation of the plant(s) in cooperation with concerned government departments.

6.3 Ownership

Facilities of the pilot project(s) must belong to JICA during the period of the actual study, but the ownership will be transferred to the Myanmar side after the completion of the pilot project.

6.4 Tariff Collection

Tariff collection will be executed in the pilot project to develop and demonstrate an appropriate financial management system.

7. Workshop

The preparatory study team explained the necessity of the implementation of workshops. The aim of the workshops is to disseminate output and lessons of the actual study to all concerned officials and personnel of national, local and international organizations. The workshops shall be held at both the ends of the first and the second phases. DEP will lead the arrangement of the workshops in cooperation with the JICA study team, while the JICA study team will provide technical and financial support to DEP and the counterpart personnel. JICA's support will also include the preparation of necessary documents for the workshops.

8. Others

8.1 Counterpart Training in Japan

DEP and MEPE requested that the counterpart personnel be trained in Japan for the purpose of effective implementation of the actual study.

8.2 Documentation of the Final Report

The final report including background data and information will be digitalized and provided to the Myanmar side. These documents must be processed and readable by personal computer (PC). The JICA study team will also provide technical transfer regarding handling of the digitalized documents and PC operation.

Attachment

Information necessary for setting up guidelines

(1) Laws and regulations

All laws, decrees, and regulations related to electric power supply, including the following.

- Laws that define the roles of the government, the Ministry of Electric Power (MOEP), the Myanmar Electric Power Enterprise (MEPE), and other energy related ministries.
- Regulations that clarify power tariff setting and collection
- Regulations that govern establishment of electric cooperatives or local entities which are engaged in power supply

(2) Financial statements of the MEPE

Data on the following items for the past five years:

- Budget allocation
- Balance sheet
- Profit and loss statement

(3) Organizational Structure of the MEPE in Rural Operation

- Management of each regional headquarters and branch office
- Role of each local office
- Composition of staff

(4) Training system of the MEPE

- Training programs

Information necessary for screening the potential sites

(1) Hydro

- Hydrological data (periodical yearly flow measurements in last several years to judge adequate flow) at the site.
- Topographic map at site with plane table in a scale of 1/50,000 or 1/25,000

(2) PV

- Monthly irradiation energy data for several years in various areas.
- Topographic map at site with plane table in a scale of 1/50,000 or 1/25,000

(3) Wind

- Periodical yearly data for wind speeds and wind directions in various areas
- Topographical maps and utilization maps with plane table in a scale of 1/50,000 or 1/25,000 for the areas where wind data are available.

(4) Biomass

- Monthly production of biomass resources by areas, and by types

7.0

添付資料２　面談議事録

面談議事録（S／W 協議に関しては M／M 要旨参照）

（1）JICA 事務所（9月15日　9時～10時10分）
面談者　青木所長、古市職員
訪問者　小林、石黒、西野入

調査団より、本事前調査の目的、対処方針及び S／W 案の内容について説明がなされた。同説明を受けて青木所長及び古市所員より以下の通りコメントがなされた。

【電力省等による本案件の捉え方】

既に手交済みの S／W 案に関して、電力省の ZAW WIN 局長に面談した結果、大きな変更は無さそうであるとのコメントを得ている。同面談は、本件に係る確認の他に、同氏が誤解している JICA の位置付けに関して正確な理解を促す事にあった。これまで日本の民間を含めた様々な機関がミャンマー国の電力セクターにアプローチしてきたが、電力省が把握していない状況で MEPE 等に接触しているケースが散見され、先方（電力省）としては JICA もそれらの活動と同じラインで作業しているとの認識にあった。今回は、あくまでも JICA は正式なルート、すなわちミャンマー国政府を窓口として協力活動を行っている旨確認し、ZAW WIN 氏の理解を得ている。現状ではミャンマー国における JICA 事務所のステイタスは大使館の協力セクションであり、JICA としての活動の捉え方が先方において曖昧に理解されている場合がある。少なくとも本邦においては、JICA が一技術協力実施機関として独立している実体は先方政府において理解されている。今後さらに JICA 案件が増える事が予想される中、ミャンマーにおける JICA のステイタスについても検討される必要があるかもしれない。

【パイロットプロジェクト】

今回の S／W 案において、パイロットプロジェクトが実施されることが記載されたことは、その必要性に鑑み、高く評価したい。同プロジェクトで持ち込まれる機材に関しては、調査用車両と同じ観点から（所有権）注意願いたいとの説明がなされた。

本件に関しては、調査団より、S／W により免税処置が担保されれば、今回 M／M において調査期間中の所有権が JICA にある事を確認することにより、問題が発生しないことを説明し、理解を得た。但し、調査用車両に関しては、車両登録、及び保有枠の制限がある中で、今後さらに検討が必要である旨付言した。

【免税処置】

機材の免税処置に関しては、大使館名で輸入されることになるが、基本的に免税対象として取り扱われることに問題は発生しないと思われる。

【調査用車両】

調査用車両に関しては、今回の電力省との協議において、仮に大使館の所有として利用した後に電力省に引き渡すとした場合、先方側に何らかの問題が発生する可能性について確認願う。仮に先方側に問題がなければ、本邦側、すなわち大使館等においてその方針で推進可能かどうか確認作業を行いたい。

【対象エネルギー】

今回の調査では、特にパイロットプロジェクトにおいては小水力と太陽光が高い可能性をもって検討・想定されているようであるが、現地の認識としてはバイオマス及び風力も可能性有りと認識しており、それらの可能性についても調査において十分検討願いたいとのコメントがなされた。特に協力重点地域のラカイン州においては風力利用がかなりの可能性をもって検討可能と理解しているところ、先方電力省における優先度が低い事は承知しているものの、農業・灌漑省等との連係を保つ事で前向きに調査対象としてゆけるものと思われる。

それに対して調査団より、あくまでも本格調査においては全てのエネルギー源（小水力、太陽光、風力、バイオマス）を同じレベルで調査・検討するものであり、ガイドラインに沿った理論的な判断に基づきパイロットプロジェクトの対象エネルギーも絞り込まれることを説明した。但し、パイロットプロジェクトにおいてはニーズとポテンシャルに加え、調査の実施し易さ、協力重点地域の考え方、BHN の方針、又は同国における将来的な全国レベルでの電源確保にも繋がる要素等も検討される必要があり、単純に技術的な判断だけでは対象エネルギーを特定しづらいことも考えうることから、必要に応じては第１フェーズと第２フェーズの移行期に当地に官団員を派遣し、フェーズ１の結果に様々な判断要素を加えた結果としてのパイロットプロジェクトの実施方針を M／M 等で確認する可能性について付言した。何れにしても、本格調査においては全てのエネルギー種が技術的、周辺環境的（事業化し易さ、データの整備状況、環境影響等）に平等に検討される旨、協調した。

（2）在ミャンマー日本国大使館（9月15日　10:30～11:30）
面談者：石崎隆　一等書記官
訪問者：小林、西野入、石黒、古市所員

調査団より本事前調査の目的及び概要に加え、S／W 案について説明がなされ、石崎書記官より以下の通り説明がなされた。

【ガイドライン】
書記官よりガイドラインの策定方針に関し確認がなされ、調査団より、同ガイドラインにおいては技術的側面以上に、組織、制度といったソフト面が重視される旨説明された。

【早期の事業化】
先方政府側も一刻も早期の事業化を希望しており、その意味で今回の開発調査においても第2フェーズの作業が前回 M／M の想定以上に早い段階から開始されるよう設定されたことは評価されるものである。

【パイロットプロジェクトの地点選定】
地点選定においては様々な側面からの検討が必要であり、特に雨期のアクセス等についても十分配慮する必要がある。特にラカイン州については雨期においてアクセスが困難となることも予想される。

【協力体制】
石崎書記官より、今回の事前調査はもちろんのこと、大使館として、今後可能な範囲で全面的に協力してゆく旨述べられた。調査団からも、機材の持ち込みをはじめとして、様々な作業における前向きな協力を依頼した。

（3）国家計画経済開発省対外経済局（9月15日　14:00～15:00）
面談者：U Soe Lin (Director General of FERD)、
訪問者：小林、石黒、マンマンタン所員

調査団より本事前調査の目的及び概要に加え、S／W 案について説明がなされ、加えてJICA による開発調査に係る一連の流れについて説明がなされた。それを受けて、局長より以下の通り述べられた。

【調査対象地域】
本格調査における調査対象地域について確認がなされた。特に Rural Areas との表現はあるが Border Areas との表記が無い事について確認された。
調査団より、ガイドラインについては全国を視野に入れて調査がなされるが、その他の調査においては、地方域、すなわち国境地域も含めて、但しヤンゴン等の都市部を除いた地域が対象となる旨説明した。但し、パイロットプロジェクトに関しては、ある特定の地点を選定して実施されるが、地点に関しては本格調査において特定される旨付言した。

【送配電】
本調査では、地域と地域を結ぶ送電線の拡張については調査がなされないのであろうか、また、なぜ地方を対象とした調査が先行されたのか、との質問に対し

て、以下のとおり調査団により回答された。

あくまでも今回の調査では、再生可能エネルギー利用による独立型電源の取扱いが調査の中心となる。将来的な送電線との関係は念頭に置くべきではあるものの、基本的にミャンマー国において再生可能エネルギーを利用した独立型電源利用の経験が少なく、十分な組織・制度も整備されていない現状に鑑み、それに対する技術移転がなされるものである。都市部においても電力供給が不十分である現状は把握しているものの、地方と都市部の格差はそれ以上に深刻な問題であり、BHN への対応必要性の観点から、日本側としては、本案件実施の必要性が承認された経緯があり、今回要請に答える形で調査開始に向けての準備がなされているものである。

【環境配慮】

本調査においては、環境的側面からのアプローチはなされるのであろうか、との問い合わせに関し、以下のとおり説明を行った。

本調査において策定されるガイドラインでは、環境的側面からの検討がなされ、結果に反映されるものである。

【ミャンマー側 Undertaking】

S／W にあるミャンマー側の Undertaking では、免税処置、安全管理等、カウンターパート機関の電力省のみでは判断できない部分がある。ついては、今回電力省に十分内容を説明頂き、電力省と関係機関との了解の基で S／W が調印されるよう配慮願う。但し、あくまでも実施機関は電力省であり、S／W への署名は電力省と電力公社で問題はない。また、安全管理に関しては、通常国内手続きに１ヶ月程かかることが予想されるため、調査スケジュールの連絡等は可能な限り事前に手配される必要がある旨付言された。

（4）Institute of Economics　(2000年9月17日　8:30~10:00)
面談者：工藤年博氏, Visiting Research Fellow
訪問者：大竹、森山、小林、西野入、石黒

調査団より本事前調査の目的及び概要に加え、本格調査の方針について説明がなされ、工藤氏より以下の通り説明がなされた。

【ミャンマーの農業部門構造】
ミャンマーの農業の特徴は、農民の三分の一から半分が農地を持たない農業労働者で占められる点にある。これは、社会主義時代（ネウィン時代）においても完全な農地改革が行われなかったことに起因する。
社会主義時代に土地は国の所有物となったが、個人の使用権が認められていた。社会主義時代に、不在地主や不耕作地主は小作農民から小作料を取ることが禁止されるようになった。その結果、それまでの小作農は自分が自由に使うことのできる土地を持つようになり、自作農化していった。この自作農は国に対する土地使用料（税金）として収穫の一部を政府に納めるようになった。
他方、農業労働者は自作農の下で働く労働者であり、土地や資産（牛、鍬、鎌など）を持たない貧しい階層である。
農業部門においても市場の機能が発達してきたことから、農民の間で所得の格差が拡大しつつある。米の生産は、かつては雨季に行われるだけであったが、現在、雨季に加え乾季にも行われるようになり、政府もそれを奨励している。ところが、乾季の生産は、灌漑のための動力、施肥などの点で投資集約的である。このため、小規模な農地しか持たない資金力に乏しい農民は、自分の土地を大規模な自作民に貸し、その下で働くようになった。その結果、自作農の間でも、貧富の差が拡大し始めた。
また、経済の拡大により米の市場取引が活発化し、需給に基づく価格決定のメカニズムが働き始めた。国内米価は輸出価格の半分ほどに抑えられていたが、市場のメカニズムが働き、米価はインフレ率を越える速度で上がり始めた。市場に収穫を流すことができる自作農の現金収入が急速に増え始めた半面、農業労働者の賃金はそれほど上がらなかった。これにより、自作農と農業労働者との収入格差がさらに拡大してきた。
ちなみに、このようなミャンマーの農業問題については、東大の高橋教授、一橋大の黒崎教授、京大の藤田教授が詳しい。

【社会調査の委託先】
本格調査において農村社会調査を現地委託するならば、農業灌漑省の傘下にあるMyanmar Academy of Agriculture, Forestry, Livestock and Fisheryが有力な候補であろう。ここはエコノミストは少ないが、能力は高い。現在、日本とミャンマー政府の間で進めている経済構造調整においても、ここに調査を委託しようとしている。
一方、Institute of EconomicsのThein Thein教授もこの分野で実績がある。ちなみに、彼は工藤氏の先生でもある。

（５）Renewable Energy Association Myanmar (REAM)（2000 年 9 月 17 日 9:30~11:00)
面談者：U Maung Maung Swe Tin (Chairman), U Hla Tun (Vice chairman), U Aung Myint (Secretary), U Zaw Moe (Joint secretary), U Aung Khin (BOD member), U Saw Hla Phyu (Board of advisory), U Min Kyaw Win (Treasurer)
訪問者：大竹、小林、西野入、マンマンタン所員

大竹団長から JICA と DEP/MEPE が検討中のミャンマーにおける再生可能エネルギー利用ガイドライン策定計画につき経緯を説明し、日本側メンバーを紹介した。REAM 側から組織と活動状況につき説明があり質疑応答がされた。

【REAM の概要】
U Maung Maung Swe Tin(Chairman)から REAM の概要が説明された。REAM はミャンマーで唯一の公認の再生可能エネルギーに関する NGO である。目的はエネルギー問題を草の根的方法で、現地産機材と人材を用いて解決する手段の普及を図ろうとするもので、集中的な大規模プロジェクトよりは、小規模でも数多く普及させることを意図している。REAM は会員のネットワークによるプロジェクトのコーディネーションを通し、会の目的を達成と会員相互の利益も図るものである。

【REAM の実績】
U Aung Mynt(Secretary)から REAM の基本方針と REAM がコーディネートしたプロジェクトの例が紹介された。
REAM の基本方針は再生可能エネルギー設備を建設した後ユーザーを教育し、次からは自分たちで実施できるようにすることである。そのため訓練コースの開設、再生可能エネルギー啓蒙のためのラヂオ放送も実施している。
REAM の会員は REAM 結成前から協力して再生可能エネルギーの実施・普及を UNDP、各国 NGO、草の根からの資金を用いて再生可能エネルギーのプロジェクトを設置し、運営の教育をしてきた。これらの実績は；

・５４０ワット PV バッテリーチャージングステーション（本年８月末完成）
マグウエイ地区１２０軒の農村に設置。８V－１０AH ミャンマ製バッテリー１２０個（単価 2,000Kyat)、蛍光灯１２０本含む。１日２４個を充電できる。資金は１５LEKH（１０LEKH＝百万 Kyat)で地元の軍高官の寄付による。PV パネルは Solarex。充電料金は無料。
この例では数名の保守専門員を任命し、住民から集めた維持費で給与を支払っている。バッテリーの充電回数、規定以上の容量のバッテリーの禁止などを 5 軒グループ単位でリーダーを決めて共同でユーザーサイドの管理をしている。

・木製水車マイクロ水力（本年 9 月完成予定）：中央ミャンマに日本の草の根無償で実施。

・河の水流を利用したバージ式５ｋW 水力発電を REAM の会員負担で試験した。

・ UNDP の依頼で１４ｋW クロスフロー水車発電機による老朽化水力発電のリハビリ FS を実施(本年３月)

・ Solar Cooker とオガクズストーブの試作。

・既設の PV 無償設備の修理・維持管理のコンサルテーション
潅漑局が UNDP から 12 年前に供与を受けた 34 箇所の PV 揚水ポンプが保守されずに放置され故障が多いので対策を依頼されているが予算が全く無いので懸案になっている。水中ポンプの空運転による故障、配線破損、制御器故障が起きている。PV パネルは問題無い。住民が揚水を余り必要ともしていないのに設置したことも保守がされていない一因になっている。

・バッテリチャージングステーション
日本の草の根無償による。中国製の安価な PV パネル 12 枚(容量不祥) 総額2.5LEKH
8V バッテリチャージ料金は1回5Kyat（ヤンゴン近郊市価は25Kyat）

・中国製15ワット風力発電機を REAM 会費負担で 1.5 年間ヤンゴン近郊で試験したが殆ど発電できず、会員の自宅に移設している最中。

・環境保全と再生可能エネルギー利用に係る啓蒙活動（セミナー実施）

・水流揚水システム試験

・大学での講議及びカリキュラム作成支援

【再生可能エネルギーの問題等】
・バイオマスは未だ実績は無い。現在普及しやすいものから実施する方針である。籾殻ガス化発電は確かに商売をしている企業があるが、タールが多すぎてプラグがすぐイグニッション不良になる。バケツ一杯のプラグを用意して運転している。バイオマスは消化ガス方式が普及しやすいと思う。

・ 2 年前南シャンで 30,000US$の予算で PV 電化の案を MEPE の要請で作ったが、住民が倉庫建設の方を望んだので中止になった。（注：国境地域少数民族開発省による順位付けによるものかと思われる）

・戸別のスタンドアロン PV はチャージングステーションより電化サイトの総額が大きくなるので今のところ推奨していない。スタンドアロン PV は安いものでも 1 軒あたり 300US$はかかる。この価格では供与にせよ自己負担にせよ高価である。

・再生可能エネルギー普及における最も重大な問題点は、実際にシステムを設置したとしても、機材のオーナーシップは政府にあるもののアフターケアーがなされず、また、住民は十分な教育がなされていない事に加え、所有権が無いために必要な保守作業を手掛けられないという悪循環な現状にある。そのため設置後にシステムが停止してしまっているケースが見られる。また、部品、機材に関する技術基準が無いために、品質に問題のある製品が市場に出てしまう。また同基準が無いために、取り扱い業者のサービスに係るモラルも低下し、適切なサービスがなされていない。

・再生可能エネルギーによる地方電化において、留意すべきことは、住民のニーズを適格に掴み実施に移す事である。村落によって意欲に大きな違いがある。住民のやる気と要望を、適切に反映したプロジェクトを実施することが重要であろう。

（6）電力省表敬（Ministry of Electric Power (MOEP)）（9月18日　9：30～10：00）
面談者：Mr. ZAW WIN (Director General, MOEP), U Aung Khaing (Director, MOEP),
訪問者：大竹、森山、小林、石黒、西野入、マンマンタン所員

大竹団長より本事前調査の目的及び概要に加え、S／W 案について説明がなされ、局長より本開発調査は、ソフト面を重視した調査であると認識している旨説明された。また、S／W の内容に関しては問題は無いと思われ、ほぼ合意できるものである旨述べられた。

（7）国境地域少数民族開発省表敬（Ministry for Progress of Border Areas and National Races and Development Affairs, Progress of Border Areas and National Races Department (PBANRD)）（ 9月19日　10:00~11:00）
面談者：Mr. Than Swe (Director General, PBANRD), Mr. Myint Swe (Deputy Director General, PBANRD), Mr. Aye Lwin (Deputy Director, International Relations Division, PBANRD）
訪問者：大竹、森山、小林、マンマンタン所員

大竹団長より本事前調査の目的及び概要に加え、S／W 案について説明がなされ、PBANRD 側と以下の通り協議がなされた。

【パイロットプロジェクトの地点選定】
先方より、パイロットプロジェクトの実施地点に関して、コーカン地区、Wa Area、Kachin State の順番で PBANRD としての優先地域が挙げられた。理由として、小水力に係るポテンシャルが高い点、及び既に JICA による支援がなされている地域であり、複合的なプロジェクトとしての成果が期待できるとのコメントがなされた。
これに関し、大竹団長より、サイトの選定はニーズ、ポテンシャル等の技術的側面に加え、治安状況等の周辺状況を含めた様々な角度からの検討が本格調査においてなされ、決定されるものである旨説明された。特に治安状況に関しては最重要事項として考慮される旨強調された。また、現在無償案件において小水力発電開発をコーカン地区において実施する計画がある旨説明し、提案された地域に関しては既に重点的な支援体制が整備されつつある旨述べられた。
PBANRD 側からは、政策的判断も十分に考慮して判断されるべきである旨述べられたうえで、国境地域においては貧困問題が顕著であり、かつ治安の問題に関しては首都部よりもむしろ安全な状況である旨説明された。何れにしても、最終的に地点が特定される前に、PBANRD にも検討の機会が与えられるような配慮が求められた。

【支援体制】
既に PBANRD は JICA と緊密な関係を構築しており、本案件に関しても全面的に支援してゆく旨述べられた。本格調査において、地方調査に係る申請が電力省を通してなされた場合にも、支援を惜しまない旨説明された。

（8）Institute of Economics　(2000年9月17日　10:00~10:30)
面談者：Pro. Myat Thein
訪問者：石黒

石黒より Myat Thein 教授に対して今回の JICA 調査の背景と目的を説明した。同時に、本格調査に際して、社会経済調査について現地委託することを想定しており、今回の事前調査でその委託先に係る情報を収集している旨の説明を行った。

一方、Myat Thein 教授からは、1967年に Australia Development Assistance Bureau から、1980年には国連食料機構（FAO: Food and Agricultural Organization）から、さらに、現在、JICA ミャンマー事務所からも調査業務を受託しており、当該分野の実績が豊富であることが説明された。

別途、Myat Thein 教授の CV 及び彼の研究室を紹介した資料を石黒宛送ることが約束された。

（9）JICA事務所（9月22日　11:30~12:30)
面談者　古市職員
訪問者　大竹、小林、石黒、西野入、（小塚職員（インドシナ課））

調査団より、署名された S／W および M／M の内容に関して説明がなされ、以下の協議がなされた。

【大竹団長からの追加説明】

・本案件に期待されるアウトプットは、パイロットプロジェクトとして実施・検証されるべき事業のあり方に加え、将来的に無償に結びつく可能性のあるプロジェクトを提示することにある。いずれにしても、重要な事は、地方電化事業における運営体制のあり方にかかる提言が具体的になされることであり、これまで通り MEPE が主体的に運営する場合、MEPE が地域住民と協調して事業を展開する場合、及びむしろ住民サイドが主体となる場合などが考えられ、それぞれ適応されるべき条件を明確にする必要がある。パイロットプロジェクトでは、特に住民が何らかの形で関わる運営体制が検証される可能性が高いと考えている。パイロットプロジェクトに関しては予算的な制約も当然念頭に置かれるべきであり、ミャンマー国側の要望にあった、大規模な集中型太陽光システム等は、経費も高く、そのものの経済性にも問題があるため、本格調査でパイロットプロジェクトとして取り上げるのは難しい可能性が高い。

・パイロットプロジェクトにおいては、現地調達を前提として実施するものであり、現地事務所及び大使館にはあらためて協力を依頼する形になるが、過度の負担が現地サイドにかからないよう本邦側（本格調査団を含めて）で十分に準備・調整するつもりである。

・調査用車両に関しては、先方からも明確な方針の提示がなく、今後も検討が必要とは思料するものの、まずは現地での車両借り上げをもって調査を実施する方針で考えたい。仮に、特に第2フェーズ（パイロットプロジェクト）において必要性が増した段階で、購入について考えることとしたい。

【森山団員からの追加説明】

先方関係機関、特にカウンターパートの本案件に向かう姿勢に、若干主体性が欠けている印象を受けている。しかし、パイロットプロジェクトの方法論において双方の狙いが焦点を同じくしつつあり、方向性は見えたとの印象である。

【石黒団員、西野入団員からの追加説明】
・本案件ではハード的な側面よりも、むしろ運営、体制等のソフト面における検討が重要であり、本格調査団においてもその重要性が認知される必要があろう。

・関連機材の現地調達・設置は可能であると考えるが、現地の実状等を本格調査団が十分に把握し、それに沿って調査を実施する必要があろう。

【古市所員】
・今回の先方との協議の経緯を聞くところ、依然 JICA 側と先方カウンターパートとの意識にずれがあると思われる。事務所としても全面的に支援してゆくつもりであるが、調査実施の土台作りがさらに必要と思われる。

・機材の現地調達に関しては、12 年ぶりの開発調査ということもあり、事務所としても手続きに手間取る可能性もあるため、本部との連絡をより密にして作業を進めてゆきたい。

・バイオマスの取り扱いについては、電力省の考え方もあるとは思うが、若干議論が不足している感がある。同技術に関しては、技術的な検証はほぼ終わっており、今後運営体制にかかる検討が必要な段階に入っている現状からも、本案件で取り扱うことが可能なアイテムであると認識している。ぜひ本格調査においては、その可能性を十分議論していただきたい。必要に応じては、農業・灌漑省との連携も模索する必要があろう。

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21. 現地NGO資料　小水力FS例
22. 現地NGO資料　REAM紹介資料

添付資料４　MEPE による関連業者情報

Questionnaire

1. Information of M.E.P.E s experiences on qualified local contractors (1/ 2)

Item	Information on Contractor . 1	Information on Contractor . 2	Information on Contractor . 3
Design (Civil and architecture)	Contractors name: Lawpita Production & Construction Co., Ltd. Address:197/199 Lower Kyeemyindine Road,Ahlone,Yangon. Telephone No. 221358, 220925 Fax No.: Typical price	Contractors name:NEPS.National Engineering and Planning Services Co., Ltd. Address: N0.880,Yadana Road,Thingankyun Township,Yangon Telephone No. 705197 Fax No.: Typical price	Contractors name: WREUT. Water Resources Exploration & Utilization Team Address: 899,Aung Saydi Kyaung Lane,7th Ward,10th Mile,Sawbwagyigon, Insein,Yangon. Telephone No. 666113 Fax No.: Typical price
Construction (Civil and architecture)	Contractors name: Lawpita Production & Construction Co., Ltd. Address:197/199 Lower Kyeemyindine Road,Ahlone,Yangon. Telephone No.221358,220925 Fax No.: Typical price	Contractors name: WREUT. Water Resources Exploration & Utilization Team Address: 899,Aung Saydi Kyaung Lane,7th Ward,10th Mile,Sawbwagyigon, Insein,Yangon. Telephone No. 666113 Fax No.: Typical price	Contractors name:NEPS.National Engineering and Planning Services Co., Ltd. Address: N0.880,Yadana Road,Thingankyun Township,Yangon Telephone No. 705197 Fax No.: Typical price
Materials (Civil and architecture)	Contractors name: Lawpita Production & Construction Co., Ltd. Address:197/199 Lower Kyeemyindine Road,Ahlone,Yangon. Telephone No.221358,220925 Fax No.: Typical price	Contractors name: WREUT. Water Resources Exploration & Utilization Team Address: 899,Aung Saydi Kyaung Lane,7th Ward,10th Mile,Sawbwagyigon, Insein,Yangon. Telephone No. 666113 Fax No.: Typical price	
Intake gate	Contractors name: Triangle Link Engineering Co., Ltd. Address:No.61,First floor,Mingalar street,Sanchaung,Yangon Telephone No .510594 Fax No.: Typical price	Contractors name:ASSCO Ashei Swanah Company Limited Address:Hlaing Thayar Industrial Zone(1), Plot No.(7), Hlaing Thayar Township,Yangon. Telephone No. 682208, 682209 Fax No:680633 Typical price	
Penstock	Contractors name: Lawpita Production & Construction Co., Ltd. Address:197/199 Lower Kyeemyindine Road,Ahlone,Yangon. Telephone No.221358,220925 Fax No.: Typical price	Contractors name: Triangle Links Engineering Co.,Ltd. Address: No.61, First floor, Mingalar street, Sanchaung Township, Yangon. Telephone No. 510594 Fax No.: Typical price	Contractors name:ASSCO Ashei Swanah Company Limited Address:Hlaing Thayar Industrial Zone(1), Plot No.(7), Hlaing Thayar Township,Yangon. Telephone No. 682208, 682209 Fax No:680633 Typical price

添付資料５　MEPE 提示の開発ポテンシャル地点例

2. List of the top several small micro-hydro sites with MW class and 100 KW class each, which MEPE wants to implement and are already prepared with adequate data necessary to start basic design within three months.

		MW class			100 KW		
Location	Name	Mong Hkak	Gan Gaw	Mawkmai	Mong Hpayak	Mong Pyin	Man Ton
	State	Easten shan State	Magwe Division	Southen Shan State	Easten Shan State	Easten Shan State	Northen Shan State
	Site	8 miles, South West of Mong Hkak	6 miles, North West of Gan Gaw	3.4 miles North of Mawkmai	5 miles South East of Mong Hpayak	2 miles South of Mong Pyin	1/2 mile South East of Man Ton
River		Nam Hkak Chaung	Zahaw Chaung	Nam Ywon Chaung	Nam Hkam Chaung	Nam Uon Chaung	Nam Kone Chaung
Discharge	cum/sec	0.34 May 1996	3.5 (15/5/96)	0.42 Dry Season	0.36 May 2000	1.4 Dry Season	1.84 Dry Season
Head	in	225 Meter(Net Head)	14 Meter	75 Meter	42.6 Meter	13.7 Meter	30.48 Meter
Type	r-o-r/dam	r - o - r	Dam Type	r - o - r	r - o - r	r - o - r	r - o - r
Capacity	KW	1200 KW	1200 KW	1200 KW	150 KW	100 KW	400 KW

添付資料6　A Study of Measured Wind Speed in Myanmar

GOVERNMENT OF THE UNION OF MYANMAR
Ministry of Transport
Department of Meteorology and Hydrology
Kaba-Aye, Yangon.

A Study of Measured Wind Speed in Myanmar

U Htay Aung
Director General

Yangon.

A study of measured wind speed in Myanmar

U Htay Aung

Abstract

An attempt is made in this paper to give a general idea of the distribution of surface wind speed by using the data from more than 30 meteorological stations with at least 15 years record. A study of maximum wind speed is then made with both measured data from 4 Dine's Anemograph stations and estimated wind speed from Rakhine Coast. It is hoped that the results from this paper will be useful for detailed study of potential use of wind as an alternative energy source.

1. Introduction

The author analyzed the monthly wind speed was obtained in the year 1984. However, it was felt that a more thorough study should be made before making any conclusions. Therefore a study of strong winds at Mingladon and Chanmyathazi Airports were made and papers were presented at the Research paper reading session of Meteorological and Hydrological Research Division during the years 1986 and 1988 respectively.

With more knowledge about the variation of wind at different stations, an attempt is made in this paper to give a general idea of the distribution of surface wind speed in Myanmar.

2. Data

A list of stations with latitude, longitude, height of anemometer (in feet) and the elevation with available mean wind speed data is shown in table 1.

For studying the maximum wind speed, all available Dine's anemographs from Hmawbi and Meiktila weather Forecasting Offices were used.

3. Distribution of surface wind speed

The monthly mean wind speed of 34 stations as listed in table 1 is shown in table 2. From table 2, the station were divided into 6 categories. They are as follows :-

CATEGORY 1 : Wind speed all months less than 3 m.p.h.
CATEGORY 2 : Wind speed 9 to 11 months less than 3 m.p.h.
CATEGORY 3 : Wind speed 6 to 8 months less than 3 m.p.h.
CATEGORY 4 : Wind speed 7 to 9 months more than 3 m.p.h.
CATEGORY 5 : Wind speed 10 to 11 months more than 3 m.p.h.
CATEGORY 6 : Wind speed all months more than 3 m.p.h.

The category obtained for each station is shown in table 1. A diagram was then drawn with categories 1 and 2

Table 2. Mean monthly wind speed.

	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	MEAN
Myitkyina	1.94	2.56	3.17	3.53	2.76	2.19	2.55	2.20	1.95	1.79	1.98	1.98	2.34
Bhamo	1.56	2.02	2.59	3.31	2.77	1.94	1.54	1.49	1.73	1.67	1.69	1.61	1.99
Lashio	1.96	2.72	3.25	3.45	3.33	3.65	3.58	2.82	2.26	1.84	1.51	1.56	2.66
Taunggyi	2.49	2.77	3.07	3.58	3.88	4.28	3.87	3.47	3.29	2.83	2.91	2.68	3.26
Kengtung	1.75	1.55	1.79	1.89	1.74	1.21	1.13	0.89	0.71	0.51	0.48	0.60	1.19
Falam	3.05	3.69	4.47	4.47	4.42	3.54	3.23	3.34	3.09	2.59	2.29	2.49	3.39
Homalin	1.14	1.33	1.49	1.66	1.52	1.36	1.39	1.30	1.04	1.36	1.00	0.99	1.22
Katha	0.85	1.00	1.33	1.55	1.39	1.75	1.57	1.26	0.93	0.77	0.77	0.77	1.16
Mawlaik	0.85	0.90	1.19	1.74	1.66	1.28	1.08	0.97	0.85	0.77	0.74	0.74	1.06
Kalemyo	0.93	1.19	1.56	1.70	1.76	1.76	1.32	1.17	1.16	0.98	1.05	0.77	1.28
Shwebo	2.95	3.39	3.56	4.60	5.98	7.62	7.97	6.26	4.23	3.25	3.27	3.22	4.69
Monywa	1.70	1.59	2.18	2.03	2.47	3.25	3.33	2.63	1.65	1.46	1.54	1.33	2.10
Mandalay	2.07	2.76	3.85	4.22	4.78	6.22	6.52	5.12	3.73	2.73	2.25	1.90	3.85
Meiktila	1.46	1.79	2.60	3.85	5.50	7.39	5.92	5.50	3.06	1.65	1.47	1.41	3.47
Yamethin	3.27	4.08	5.38	7.92	8.93	10.66	10.31	9.65	6.42	4.00	3.29	3.34	6.43
Nyaung-Oo	2.62	3.15	4.74	6.15	8.28	11.31	9.64	9.40	5.46	3.59	3.04	2.66	5.84
Pyinmana	2.11	2.30	2.80	3.49	3.69	3.99	3.68	3.06	1.94	1.43	1.84	2.10	2.70
Minbu	2.45	2.51	2.68	3.43	3.40	4.15	4.17	3.64	2.89	2.13	2.69	3.13	3.11
Gangaw	0.94	1.25	1.64	2.28	2.31	1.94	1.63	1.59	1.34	1.30	1.22	1.04	1.54
Sittwe	4.38	5.48	5.92	5.93	6.32	7.55	7.50	6.41	5.53	4.62	3.97	3.86	5.04
Sandoway	1.62	2.07	2.45	3.03	3.08	2.74	2.89	2.60	2.04	2.19	2.12	1.68	2.38
Prome	2.43	2.53	2.91	3.70	3.89	3.13	3.07	2.72	2.28	2.05	2.80	3.12	2.89
Toungoo	1.68	1.76	2.60	4.12	4.06	4.31	4.11	3.48	2.24	1.64	1.35	2.18	2.79
Hmawbi	2.39	3.04	3.73	4.86	4.57	4.34	4.96	4.02	2.75	2.78	2.39	2.39	3.13
Mingaladon	4.23	6.05	5.26	7.34	6.70	6.23	6.92	6.36	5.22	4.20	4.37	5.06	5.66
Kaba-Aye	2.63	3.21	3.70	4.28	3.81	3.35	3.70	3.46	2.73	2.64	2.62	2.89	3.25
Pathein	2.51	2.99	3.76	3.44	3.35	2.92	2.34	2.26	1.93	2.01	2.38	2.36	2.69
Hpa-an	2.46	2.59	3.56	4.05	3.94	4.28	3.98	3.38	3.27	2.67	2.17	2.46	3.23
Thaton	1.40	1.43	1.30	1.39	1.25	1.34	1.32	1.09	1.32	1.36	1.31	1.77	1.07
Mawlamyaing	3.53	3.81	4.15	4.57	4.46	4.70	4.72	4.35	3.76	3.26	4.35	4.23	4.16
Tavoy	2.25	2.18	2.38	2.21	2.58	2.51	2.35	2.58	2.00	1.90	2.35	2.81	2.34
Mergui	4.18	3.76	4.08	4.01	3.26	2.77	2.64	2.65	2.79	2.67	2.56	3.82	3.07
Kawthaung	3.90	3.45	3.28	3.05	3.13	3.68	3.38	3.42	2.67	1.99	3.15	4.16	3.27
*Loikaw	1.83	1.19	1.98	2.21	2.41	2.63	2.32	2.16	1.97	1.58	1.50	1.40	1.93

* data not reliable

combined, categories 3 and 4 combined and categories 5 and 6 combined. The diagram obtained is shown in Fig. 1.

From figure 1, we can see that the general distribution of monthly mean wind speed may be divided into three areas. They are :-

(a) Areas with least mean wind speed. These include:- Upper Sagaing Division, Kayah, Eastern Shan and Kachin States.
(b) Areas with highest mean wind speed. These include:- Northen Rakhine State, Lower Sagaing, Mandalay, Yangon, South Tanintharyi and Northern Mon States.
(c) Areas with overrange mean wind speed. These include:- Southern Rakhine, Karen, Chin and Western Shan States, Ayeyarwady, Bago, Magway, Southern Mon and Northern Tanintharyi Division.'

4. From table 2, we may say that :-

(a) There are only few areas with annual mean wind speed more than 4 m.p.h. These places are :- Yamethin and Nyaungoo districts of Coastal area.
(b) In central Myanmar, May to September are the months with highest monthly mean wind. The coastal areas of Rakhine, Deltaic and Mon experienced maximum mean wind speed during the months February to September. The monthly mean wind speed is highest during the months of March to May in the Chin State. In the Kachin States the highest monthly mean wind speed occurred during the summer months March and April. In the Shan State, the highest monthly mean wind speed occurred during the months March to August. In the Taninthayi Division, highest monthly mean wind speed occurred during the winter and summer months of December to April.

5. Maximum wind speed

There are all together 4 stations equipped with Dine's Anemometer in Myanmar. They are Mingaladon (Yangon), Chanmyathazi (Mandalay), Hmawbi and Meiktila Airports. A study of strong winds at Yangon and Chanmyathazi Airports were made by the author during the years 1984 to 1988. Therefore only the monthly maximum wind speed of Hmawbi and Meiktila will be presented in this paper. The monthly maximum wind speed in miles per hour together with direction and date of occurrence is shown in tables 3 and 4 for Hmawbi and Meiktila respectively.

for comparison purposes the monthly maximum wind speed together with the record period for all 4 stations is shown in table 5.

From table 5, the wind speed at all four stations recorded maximum winds during the pre-monsoon and post-monsoon months of April, May and October.

The estimated maximum wind speed of the most noteworthy storms during the period 1964 to 1988 at Rakhine Coast is shown in table 6. We may 130 mph and at Southern Rakhine Coast is 110 mph.

6. Meteorological situations

Areas of highest mean wind speed are those places that experienced the effect of monsoon in one way or another and areas that experienced sea breeze. In Central Myanmar areas, the highest monthly mean wind speed during the months May to September is probably due to channeling effect of the monsoon wind by the West and Central Yomas and the Shan Yomas.

In the coastal areas, the coupling of the monsoon wind the sea breeze during the afternoon and evening results in the strong wind speed in the monsoon season. The maximum wind speed in Rakhine State is associated with the passage of Severe Cyclonic Storms during the months of May and October.

7. Conclusion

In general, the wind speed is not very much during a normal weather situation over all areas of Myanmar. However there are certain places where the synoptic wind has a potential to use as an alternative energy source. Such places depends on the factors such as locality, terrain, Climate and diurnal variation.

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Table 1. Station with available monthly wind speed

STATE/DIV. Station	Latitude °N	Longitude °E	Height of anemometer (feet)	Elevation (feet)	Category	Record Period
KACHIN						
Myitkyina	25°22'	97°24'	33	481.7	2	1966-1980
Bhamo	24°16'	97°12'	33	370	2	-"-
SHAN						
Lashio	22°56'	97°45'	33	2454	3	1965-1980
Taunggyi	20°47'	97°03'	6	4712	4	-"-
Kengtung	21°18'	99°37'	33	2714	1	1967-1980
CHIN						
Falam	24°55'	94°55'	33	430	1	1968-1980
SAGAING						
Homalin	24°55'	94°55'		430	1	1968-1980
Katha	24°10'	96°20'	33	313	1	1965-1980
Mawlaik	23°38'	94°25'	14.6	380	1	1968-1980
Kalemyo	23°01'	94°04'	10	45	1	1967-1980
Shwebo	22°35'	95°43'	33	353	5	1968-1980
Monywa	22°06'	97°08'	12	267	2	1966-1980
MANDALAY						
Mandalay	21°59'	96°06'	33	249	4	1968-1980
Meiktila	20°53'	95°53'	10	706	3	1965-1980
Yamethin	29°25'	96°09'	33	652	6	1968-1980
Nyaung-Oo	21°12'	94°54'		195	5	1968-1980
Pyinmana	19°43'	96°13'	33	336	3	1968-1977
MAGWAY						
Minbu	20°10'	94°53'	11	166	3	1967-1977
Gangaw	22°10'	94°08'	9.5	701	1	1968-1977
RAKHINE						
Sittwe	20°08'	92°53'	12	43	6	1965-1980
Sandoway	18°28'	94°21'	6	36	2	1965-1980
BAGO						
Prome	16°48'	95°13'	33	102	3	1964-1977
Toungoo	18°55'	96°28'	10	165	3	1964-1980
YANGON						
Hmawbi	17°06'	96°04'	8	88	4	1964-1977
Mingaladon	16°54'	96°11'	8	92	6	1964-1980
Kaba-Aye	16°52'	96°11'	36	61.25	4	1968-1980

Table 1. (Contd.)

STATE/DIV. Station	Latitude °N	Longitude °E	Height of anemometer (feet)	Elevation (feet)	Category	Record Period
AYEYARWADY						
Pathein	16°46'	96°46'	31	33	2	1964-1980
KAYAH						
Loikaw	19°41'	97°13'	15	2938	1	1968-1977
KAREN						
Hpa-an	16°55'	97°40'	34.8	34.5	4	1964-1972 1976-1979
MON						
Thaton	16°55'	97°22'	12	28	1	1968-1977
Mawlamyine	16°30'	97°37'	33	82.3	6	1964-1980
TANINTHARYI						
Dawei	14°06'	98°13'	25	82	1	1965-1980
Mergui	12°26'	98°36'	40	66	3	1964-1980
Kawthong	09°59'	98°35'	6	153	3	1964-1980

Table 3. Maximum wind (M.P.H) AT HMAWBI MET. OFFICE

	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
1959	SW 24 23rd.	SW 24 26th.	SW 23 4th.	W 30 18th.	S 41 30th.	S 39 10th.	SW 48 10th.	SW 50 3rd.	SW 34 6th.	W 25 10th.	W 20 1st.	NW 20 12th.
1960	SW 30 26th.	E 26 5th.	SW 24 6th.	NE 49 30th.	S 42 27th.	SW 44 30th.	SW 40 25th.	W 45 13th.	E 30 22nd.	E 32 2nd.	NE 19 27th.	SW 21 1st.
1961	E 26 16th.	S 54 4th.	SW 26 18th.	NW 36 18th.	SW 40 27th.	NW 44 20th.	SW 39 6th.	W 42 3rd.	W 42 2nd.	S 33 30th.	S 30 13th.	E 21 8th.
1962	SW 26 16th.	W 28 9th.	S 26 7th.	S 42 22nd.	W 38 24th.	SW 43 15th.	SW 41 23rd.	W 38 12th.	W 34 18th.	S 34 30th.	SE 21 30th.	E 22 22nd.
1963	SE 22 15th.	S 53 26th.	SW 22 7th.	NW 32 16th.	S 38 27th.	NW 48 11th.	SW 44 4th.	SW 42 19th.	W 38 12th.	W 29 26th.	S 18 14th.	SW 22 6th.
1964	W 19 13th.	W 21 16th.	NW 26 5th.	NW 35 26th.	SW 48 8th.	S 46 29th.	W 29 31st.	W 50 20th.	W 33 5th.	S 36 6th.	E 24 19th.	NW 25 25th.
1965	E 28 15th.	N 36 2nd.	SE 35 17th.	S 31 21st.	S 43 31st.	W 45 24th.	SW 38 26th.	NW 52 26th.	SW 31 24th.	NE 38 14th.	NW 19 7th.	NIL
1966	NW 22 16th.	NW 28 19th.	S 28 29th.	SW 30 2nd.	N 59 11th.	W 44 27th.	SW 43 23rd.	SW 38 4th.	SW 39 17th.	SW 40 1st.	E 27 18th.	S 23 1st.
1967	SE 21 2nd.	S 29 4th.	SW 32 23rd.	*	E 65 17th.	SW 38 5th.	SW 41 27th.	S 44 31st.	W 40 13th.	S 36 23rd.	E 26 1st.	SE 23 13th.
1968	NW 26 11th.	S 28 19th.	W 32 28th.	N 50 20th.	W 47 10th.	SW 41 12th.	W 37 10th.	W 44 9th.	W 35 30th.	NW 24 2nd.	NE 32 19th.	N 18 10th.
1970	W 20 26th.	SW 30 1st.	S 30 22nd.	S 30 15th.	NW 40 27th.	SE 36 7th.	S 33 1st.	SW 27 27th.	W 22 13th.	E 50 26th.	S 38 8th.	NE 24 1st.
1971	SW 27 28th.	SW 29 20th.	SW 35 25th.	SW 31 26th.	N 41 17th.	SW 51 6th.	SW 37 19th.					

* data missing

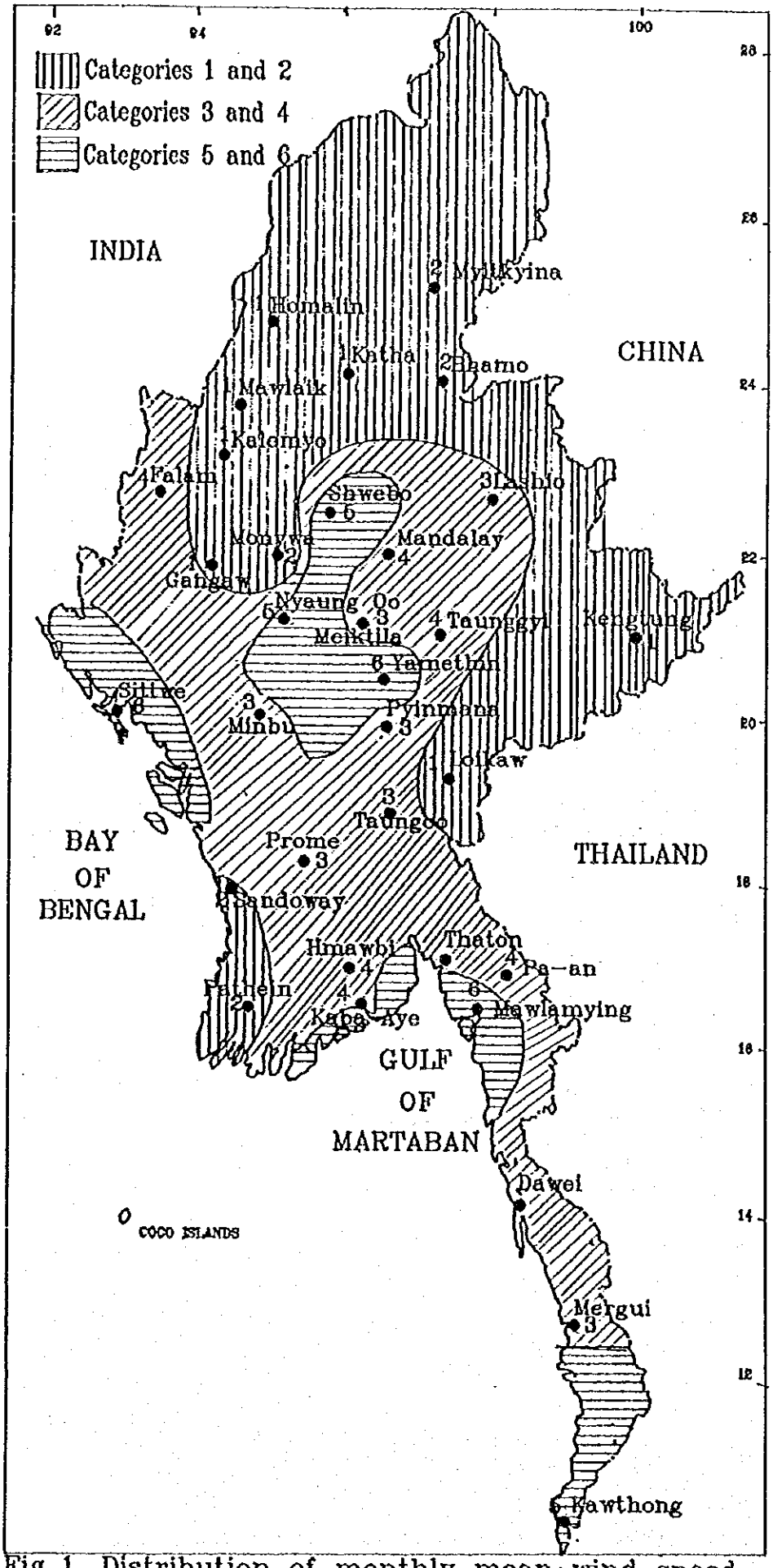


Fig 1. Distribution of monthly mean wind speed.

Table 4. Maximum wind speed at Meiktila Met. Office.

	JAN.	FEB.	MAR.	APR.	MAY.	JUN.	JUL.	AUG.	SEP.	OCT.	NOV.	DEC.
64		S 25 24th.	SW 28 12th.	N 45 12th.	SW 41 6th.	SW 38 17th.	SW 30 1st.	S 37 22nd.	S 29 20th.	S 26 5th.	SW 23 20th.	N 22 10th.
65	**	**	**	**	S 48 31st.	S 41 28th.	S 33 9th.	S 38 2nd.	S 27 4th.	S 34 8th.	SE 24 1st.	S 29 15th.
66	N 26 4th.	N 22 19th.	N 32 14th.	S 46 18th.	NE 81 4th.	N 42 8th.	S 35 25th.	S 33 6th.	E 31 28th.	S 45 1st.	N 22 17th.	N 36 2nd.
67	S 25 31st.	SW 33 23rd.	N 32 20th.	SW 36 19th.	? 62 18th.	NE 46 5th.	S 31 2nd.	S 32 22nd.	S 29 2nd.	S 48 23rd.	S 27 17th.	? 24 15th.
68	N 32 11th.	S 26 16th.	W 38 27th.	S 40 23rd.	N 48 14th.	SW 38 18th.	S 36 10th.	SW 25 11th.	SE 27 29th.	NE 27 8th.	N 20 24th.	* 69th.
69	SW 23 10th.	SW 24 23rd.	NW 46 20th.	N 35 25th.	S 33 11th.	S 36 20th.	SW 32 28th.	SW 28 7th.	SW 35 30th.	N 22 24th.	SW 19 13th.	? 19 20th.
70	? 25 21st.	? 21 22nd.	SW 36 31st.	? 41 24th.	SW 37 4th.	W 39 3rd.	S 36 20th.	W 25 30th.	? 28 11th.	 25 12th.	S 27 13th.	N 15 6th.
71	S 21 29th.	? 20 9th.	N 33 18th.	? 58 5th.	? 40 21st.	? 31 10th.	? 28 9th.	? 28 8th.	? 40 19th.	? 33 22nd.	? 37 6th.	? 20 3rd.

* Instrument out of order
? Wind direction out of order
** data missing

Table 5. Monthly maximum wind speed in miles per hour and direction

Station record period	JAN	FEB	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC	Highest Max:
Yangon 1954-1984	37 SE	30 SSE	45 ENE	70 SE	65 W	52 SW	48 SW	67 W	50 ESE	66 E	37 E	38	70
Chanmyathazi 1962-1980	32 SE	36 NW	50 N	63 NW	68 N	51 N	48 S	44 E	49 E	44 SE	40 SE	28 S	68
Hmawbi 1959-1971	30 SW	54 S	35 SE	50 N	65 E	51 SW	48 SW	52 NW	42 W	50 E	38 S	24 NE	65
Meiktila 1964-1971	32 N	33 SW	46 NW	58 ?	81 NE	46 NE	36 S	38 S	40 ?	48 S	37 ?	36 N	81

Table 6. Estimated maximum wind speed at Rakhine Coast due to the passage of Cyclonic Storms (1964 - 1968)

Sr. No.	Landfall place of Cyclonic Storms	Estimated maximum wind (m.p.h.)	date
1.	between Sittwe and Kyaukpyu	80	18-5-67
2.	near north of Sittwe	80	23-10-67
3.	Sittwe	130	10-5-68
4.	south Rakhine coast (Gwa)	100	7-5-75
5.	near Sandoway	80	2-5-76
6.	between Sittwe and Kyaukpyu	100	17-5-78
7.	near Gwa	110	4-5-82

添付資料７　水力プロジェクトリスト（既設、建設中、計画）

The following are some of the hydro power projects which were completed within the last (10) years.

Sr. no	Project	Division / State	Installed Capacity (MW)
1	Sedawgyi	Mandalay Division	25.000
2	Zawgyi (1)	Shan State	18.000
3	Mogok	Mandalay Division	4.000
4	Kattalu (Kyunsu)	Tanintharyi Division	0.150
5	Hopin galainggyaung	Kachin State	1.260
6	Kunhing	Shan State	0.150
7	Namlat (Kyaington)	Shan State	0.480
8	Chinshwehaw	Shan State	0.100
9	Selu	Shan State	0.024
10	Maing Lar	Shan State	0.060
11	Matupi (Namlaung)	Chin State	0.200
12	Malikyun (Palaw)	Tanintharyi Division	0.192
13	Baluchaung No.1	Kayah State	28.000
14	Ching Krang Hka	Kachin State	2.520
15	Laiva	Chin State	0.600
16	Nammyao (Lashio)	Shan State	4.000
17	Namwop (Kyaington)	Shan State	3.000
18	Chinshwehaw (Extension)	Shan State	0.200
19	Kunlong (Hopan)	Shan State	0.500
20	Zi Chaung (Kalemyo)	Sagaing Division	1.260
21	Namkhamhka (Mogaung)	Kachin State	5.000
22	Nam saung ngaung (Kyaukme)	Shan State	4.000
23	Lahe	Sagaing Division	0.050
24	Tui Swang (Tonzang)	Chin State	0.200
25	Che Chaung (Mindat)	Chin State	0.200
26	Zawgyi Dam Power Station	Shan State	12.000
27	Zaungtu	Bago Division	20.000
		Total	131.146

The following are some of the major hydroelectric power projects which are under construction.

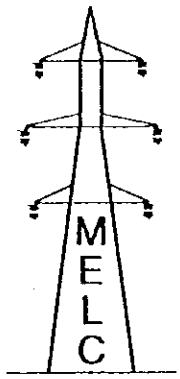
Sr. No	Name of Project	Location	Capacity MW	Annual Energy GWh	Remarks
1	Paunglaung Dam-L=940m H=130m V=11.6x10^{6}m^3	Mandalay Division	280 (70MWx4)	910	Diversion Tunnels by Kajima and NEWJEC. Project implementation signed with YMEC on 6 Oct. 1998 and 11 Nov 1998.
2	Mone Dam-L=4320' H=200'	Magwe Division	75 (25MWx3)	330	Under construction. Contract signed with CITIC on 20th Nov. 1998.
3	Thapanzeik Dam-L=22587' H=108'	Sagaing Division	30 (10MWx3)	117	Under construction. Contract signed with CITIC on 20th Nov. 1998.
4	Yeywa Dam-L= 610 m H= 120 m	Mandalay Division	700 (175MWx4)	3315	Under construction.

The following are some of the major hydroelectric power projects to be implemented in the near future.

Sr. No	Name of Project	Location	Capacity MW	Annual Energy GWh	Remarks
1	Bilin	Mon State	280 (70MWx 4)	756	A preliminary report has been completed by Nippon Koei.
2	Kun	Bago Division	84 (28MWx 3)	350	Field investigation works for feasibility study completed with China National Agricultural Machinery Export & Import Corporation (CNAMC). Project Report is delayed, to be submitted.
3	Baluchaung 3	Kayah State	48	327	Feasibility study completed by NEWJEC.
4	Pyu	Bago Division	65	260	Preliminary study by UNDP.
5	Thaukyegat	Kayin State	150	780	Pre-design report had been completed by ECI. Preliminary study to be conducted by TEPSCO.
6	Bawgata	Kayin State	160	500	Preliminary study
7	Nam Kok	Shan State	100 to 150	284	Feasibility study with Marubeni, MDX., Italian Thai developers mainly for export to Thailand. Pending
8	Hutgyi	Shan State	400	2000	Feasibility study proposed by Marubeni / NEWJEC led consortium (export to Thailand)
9	Tanintharyi	Tanintharyi Division	600	3476	Preliminary study by Nippon Koei. (export to Thailand).
10	Tasang	Shan State	3600	23000	At present lahmehyer International is finalising pre-feasibility survey as consultant to GMS Power Public Co., Ltd the developer.
11	Shweli	Northern Shan State	200 to 300	1600	Reconnaissance survey completed. Very attractive project for rapid implementation, BOT arrangement possible. Under discussion with YMEC.
12	Tamanthi	Sagaing Division	1200	5256	Prefeasibility. Interests from Indian Government side.

添付資料 8　Myanma Electric Light Co-Operative Society Ltd.
関連資料

Myanma Electric Light Co - Operative Society Limited



Bye Law

(20) December, 1994

MYANMA ELECTRIC LIGHT CO-OPERATIVE SOCIETY LIMITED

BYE-LAW OF THE SOCIETY

Part I

Name, Registration, Location, Boundary and Objective of the Society

Name and Registration of Society

1. (a) This society shall be named Myanma Electric Light Co-operative Society Limited.

(b) This society is registered under Co-operative Society Law of the Union of Myanmar.

(c) The registration number of the society is Da-830-AHTA/ Yangon.

Location of the Society

2. The location of the society is at No. 197/199, Lower Kemmendine Road, Ahlone Township, Yangon.

Objective of the Society

3. The objective of the society is as follows:-

(a) To participate as a component in building and restucturing of the country;

(b) To assist in a way in expeditions and smooth implementation of electrical works being carried out extensively in the country;

(c) To carry out electrical works permitted by the State, separately by itself where it can, and in co-operation with economic organizations in the country and abroad, if necessary;

(d) To participate in electrical works inside and outside the country by means of the resources of members of the society;

(e) To contribute as much as it can towards welfare of personnel in service with the Myanma Electric Power Enterprise;

(f) To enable members of the society to enjoy benefits commensurate with the value of their services and their shares in the society.

PART 2

Eligibility and application for membership

Eligibility for membership

4. A person who possesses the following qualifications is eligible for membership in the society:

(a) A citizen of the Union of Myanmar;

(b) A person retired from service or still in service with the Myanma Electric Power Enterprise;

(c) An outsider scrutinised and found to be capable of bringing long-term benefit to the society as approved by the Board of Directors;

(d) A person who has subscribed fully the value of the share determined in the given period of time;

(e) A person not of an unsound mind.

Application for Menbership

5. (a) A person wishing to become a menber may apply for membership in prescribed form.

(b) Acceptance or rejection of applications for membership may be decided by the Board of Directors.

PART 3

Finances of the Society

6. (a) The valve of a share is K 100000 (Kyats One Lakh).

(b) A member may participate with one share in the Least up to the number of share determined from time to time by the Board of Directors.

(c) A menber must fully subscribe the value of his or her shares within a given period of the from the date of formation of the society.

(d) Operation will begin with 700 shares, meaning an investment of K 70000000 (Kyats Seventy Million).

(e) Persons eligible for menbership may pool to make a share, elect a member from among themselves and participate in the society.

(f) Increasing or reducing shares may be done with submiss on to the Board of Directors one month before the annual general meeting.

Capital of the Society

7. The capital of the society is as follows :-

(a) Paid - up shares
(b) Accumulated funds

(c) Lawful receipts, loans and advances

(d) Local and foreign grants

(e) Other lawful receipts

(f) Investments

Loans

8. For finances necessary for operations of the society, the Board of Directors may take out loans from members, non-members and banks by means of security papers, indemnity bonds or collateral.

Monetary Security

9. For monetary security, a monetary security project shall be formulated with reference to those of co-operative societies; it shall be approved by the meeting of the Board of Directors, submitted at the nearest annual general meeting and confirmed. All monetary matters shall be conducted in accord with the project.

Part 4

Nomination of successor and right of transfer of shares

10. A member shall submit the nomination of successor for transfer of his or her shares and benefits accruing therefrom.

Right of transfer of shares

11. (a) A member has the right to transfer his or her shares to another member of one who has gained permission for membership of the society.

(b) A member has the right to possess shares transferred by another member in addition to his or her own shares.

(c) Transfer of shares between the transferrer and the transferee is valid upon acceptance of the Board of Directors.

PART 5

Right and duties of members

12. (a) Every member has the right to enjoy benefits as decided by the general meeting.

(b) The liability of each member is limited only to the extent of the value of the share subscribed.

(c) Each member has the right of one vote at general meetings, irrespective of the number of shares.

(d) Each member has the right to enjoy proportionate dividend on the money he or she has paid for his or her shares, and proportionate rebate on the value of transaction between him or her and the society.

(e) In the event of liquidation of the society and there are claims to be met, the liability of a member is limited only to the extent of the shares subscribed.

(f) For a member who has withdrawn from the society, and in the event of liquidation within two years from the date of their withdrawal, and if the society is unable to meet claims with finances in hand, liability of that member is limited only to the extent of shares he or she has withdrawn.

(g) A member has right to subscribe more shares or withdraw some of the shares only with the permission of the Board of Directors.

PART 6

Cessation of membership, resignation, management of shares thereof

Cessation of membership

13. Membership in the society ceases in the event of the following:

(a) Being permitted by the Board of Directors to resign from the society;

(b) Death

(c) Being of unsound mind

(d) Being corrupt in personal morals to the extent of harming the work of the members and the society

(e) Committing speech or behaviour detrimental to the society

(f) Being dismissed by resolution of the general meeting

(g) Being dismissed by the Government

(h) Permanently becoming a member of a religious order

(i) Being convicted by a court for an offence under the Co-operative Society Law or a serious criminal offence.

Resignation

14. (a) A member has the right to resign with intimation in writing, a month in advance, to the Board of Directors.

(b) A member is deemed as having resigned from the society on completion if his or her transfer of shares or withdrawals.

Management of shares of members upon cessation of membership

15. (a) Upon cessation of membership, what is due to the society shall be deducted from his or her share, dividend, rebate etc and the remainder shall be handed to the transferee or authorised representative.

(b) On receipt of intimation with sufficient evidence of the death of a member, shares and all that is payable to his or her shall be handed to the transferee or authorised representative.

PART 7

16. The society has the right to undertake one, some or all of the following operations, businesses and services, inside and outside the country :-

(a) To participate in conducting preliminary feasiblity studies and surveys, preparing reports, producing and computing project designs, implementing projects and in other civil works in hydro-electric works;

(b) To participate in producing mechanical and electrical designs and installing and testing electro-mechanical equipment in large industrial and business structures, housing, office, school and hospital building etc.

(c) To participate in conducting field surveys, producing and computing designs, installing and testing 400-volt lines to 33 KV overhead power lines, underground power lines and building power sub-stations in departmental or private commercial works and in townships and villages;

(d) To co-operative with organizations inside and outside the country in conducting field surveys, producing designs, building and testing for installation of 66 KV power lines, higher power lines and sub-stations;

(e) To participate in installing electrical and mechanical works where skilled and masterful in building power stations;

(f) To participate in providing technical consultancy services, construction, extension, repairs, renovation and test-operation for departmental and private concerns in the above-mentioned works;

(g) To participate in services of transporting construction materials to the required distinations;

(h) To participate in hiring or buying all kinds of mechanical and electrical equipment and testing instruments from sources inside or outside the country, storing, exchanging them and selling them directly or on commission basis if it is deemed profitable to the society;

(i) To produce all kinds of electro-mechanical goods, mainly using materials in the country, and sell them inside and outside the country, if it is favoured by the conditions and it is deemed profitable to the society;

(j) To participate in all related matters that can be taken as contributory to all or one of the above-mentioned objectives, if deemed beneficial to the society;

(k) To lease at suitable rates and purchase buildings, land, other immovable property, movable property and motor-vehicles necessary for future development, and erect buildings, depending on finances of the society;

(l) To build the staff strength for services inside and outside the country by employing retired personnel or former personnel of Myanma Electric Power Enterprise, or if necessary departmentally permitted personnel from among those still in service with the Myanma Electric Power Enterprise, at suitable rates of remuneration, and if furthermore necessary, securing the services of departmental or External experts at suitable rates of remuneration;

(m) To undertake joint venture with private partnership companies, departmental and economic organizations inside and outside the country if deemed profitable to the society;

(n) To establish suitable branch offices and stations at suitable time and suitable places inside and outside the country for smooth performance of the works of the society;

(o) To participate in pursuing technical co-operation, providing training, supplying manpower, finding employment and carrying out all kinds of electric power agency services in connection with State or private electric power works inside and outside the country;

(p) To put in banks as investment at suitable rates the funds not immediately needed by the society;

(q) To secure loans at suitable interest rates if funds are needed for the society;

(r) To scrutinise profitability of each venture periodically and scrutinise the economic and financial position of the entire society at least once every six months, so as to ensure that the society is a long-standing stable and strong business organization.

PART 8

Meeting

17. (a) Annual general meetings

Annual general meeting shall be held within three months after the end of each financial year.

(b) Special general meetings

(i) A general meeting convened as demanded by not less then one third of the members

(ii) A general meeting convened by the Board of Directors as an important matter arises

(iii) A general meeting convened by directive of the Government

Invitation to general meetings

18. (a) Invitation to an annual (or) a special general meeting shall be sent at least 15 days ahead to every member. It shall include matters to be discussed, reports, regulations, amendments (if any) and proposed resolutions.

(b) Resolutions to be sumbitted at the annual general meeting are to be sent in ten days ahead of the meeting.

(c) Regarding matters on the agenda of the general meeting, amendments and separate proposals are to be sent in to the secretary seven days ahead before the commencement of the meeting. Copies are to be made of the amendments and proposals and circulated among members attending the meeting.

Quorum for general meetings

19. (a) A general meeting shall be valid only with the attendance of more than half the number of members.

(b) There shall be right of decision by majority vote as a way in any matter.

(c) In the event quorum is not fulfilled in an hour after the stipulated time of commencement of the meeting, a meeting held on demand by members shall be cancelled outright by the chairman. A meeting held for other reasons shall be postponed and reconvened within a period not less than seven days and not more than 14 days afterwards.

Powers and functions of general meetings

20. The general meeting shall undertake the following, in addition to other matters :-

(a) Electing as members of the Board of Directors only those who are qualified in accord with rules of the society, from amongst members attending the meeting;

(b) Discussing and deciding charges if any against the Board of Directors;

(c) Discussing and approving the annual statement of accounts and the auditor's main report;

(d) Discussing and approving the report of the Board of Directors;

(e) Deciding and approving the apportionment of dividends out of the year's net profits;

(f) Amending, suspending or abrogating the bye-law of the society;

(g) Discussing, deciding and approving write-offs for various reasons;

(h) Approving the staff setup of the society;

(i) Approving the acquiring and disposal of capital goods necessary for the society;

(j) Discussing and deciding the members' appeals against cessation of membership by the Board of Directors;

(k) Discussing, approving and laying down the finance and future programme of the society;

(l) Deciding disputes and appeals.

Voting

21. (a) A member has the right to only one vote irrespective of the number of shares. There is the right of vote by proxy.

(b) There shall be open or secret voting at general meetings. Election of persons shall be done by secret vote.

(c) A tie in vote count shall be broken by vote of the chairman of the meeting.

PART 9

Board of Directors election, formation, termination and replacement

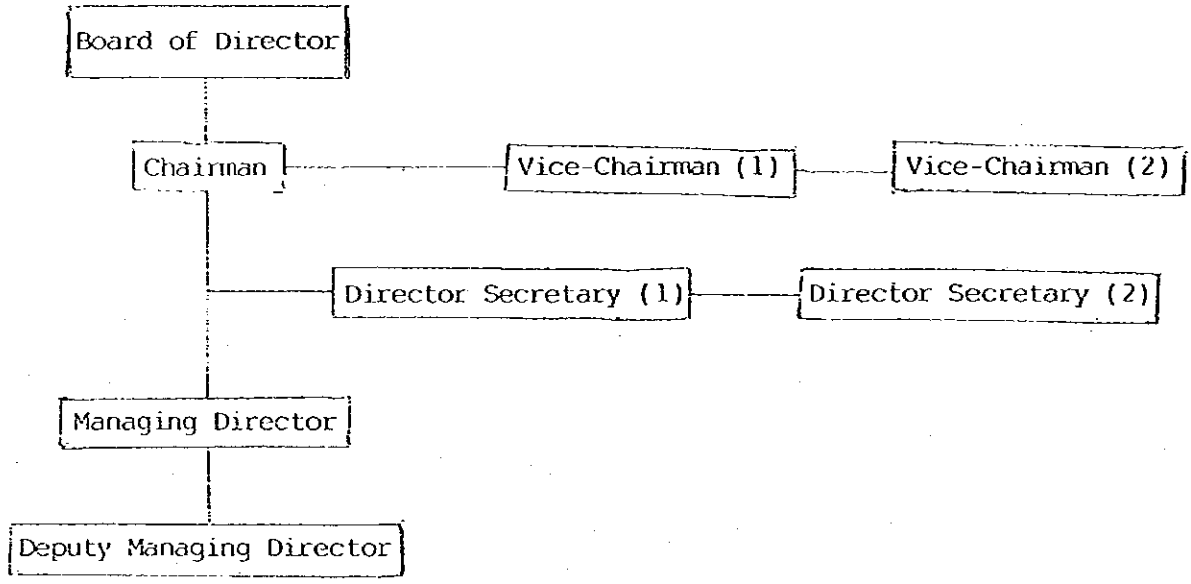
Election of members of the Board of Directors and Auditors

22. Eleven members of the Board of Directors and two Member Auditors shall be elected from amongst members attending the meeting.

Formation of the Board of Directors

23. Members of the Board of Directors shall select from among themselves and form the Board of Directors as follows :-

(a)	Chairman	-	one
(b)	Vice-Chairman (1)	-	one
(c)	Vice-Chairman (2)	-	one
(d)	Managing Director	-	one
(e)	Deputy Managing Director	-	one
(f)	Director Secretary (1)	-	one
(g)	Director Secretary (2)	-	one
(h)	Board members	-	four
	Total	-	Eleven persons



Tenure of the Board of Directors and Auditors

24. The tenure of the Board of Directors and Member Auditors shall be two years.

Cessation of Membership of the Board of Directors and Auditorship

25. A member of the Board of Directors or an Auditor ceases to be one, in the event of the following :-

(a) Resignation
(b) Termination or dismissal
(c) Dismissal by a general meeting

Replacement to fill vacancies of membership of Board of Directors and Auditorship

26. (a) In the event of vacancy of membership on the Board of Directors or Auditorship, a general meeting may be convened, and a replacement effected by majority vote.

(b) In the event it is impossible for various reasons to convene a general meeting, the Board of Directors may temporarily fill the vacancies with suitable ones from amongst members.

(c) When the general meeting can be convened, suitable persons shall be chosen and appointed as replacements in the temporarily filled vacancies.

PART 10

Duties and rights of the Board of Directors

27. Duties and rights of the Board of Directors are as follows:-

(a) The meeting of the Board of Directors shall be held at least once a month.

(b) The meeting is valid upon the attendance of six members of the Board.

(c) Accepting or rejecting new membership applications;

(d) Earing and settling disputes between members and representatives onmatters of benefits in accord with existing laws;

(e) Drawing up and laying down staff service regulations, seeking the approval of the general meeting, appointing and dismissing staff, meeting out suitable penalty, suspending from service, determining their salaries, duties, surety in terms of money or assets etc.

(f) Taking action in connection with charges other than those on the Board of Directors;

(g) Examining the monthly statement of accounts along with the auditor's report;

(h) Compiling the annual report and statement of accounts;

(i) Undertaking administrative affairs other than matters only the general meetings have the right to handle;

(j) Formulating the society's working regulations, submitting them to be laid down by the general meeting;

(k) Making replacements in vacancies on the Board of Directors and making temporary replacements in place of board members who are absent without leave at meetings;

(l) Authorising the chairman or the secretary to act to behalf of the society in cases;

(m) Procuring furniture and other necessities for the society;

(n) Authorising payments for staff salaries, contributions, bonuses, gratuities, provident fund, donations and other expenses, advertising expenses, stationery expenses, printing expenses, legal and other necessary entertainment expense for the betterment of the society;

(o) Prescribing and paying staff travelling and meal expenses in keeping with previaling commodity prices for staff of the society;

(p) Apportioning part of profits to all staff who carry out works successfully, on the basis of each undertaking or on the basis of all works taken as a whole, with aims at achieving further progress in the works;

(q) Prescribing in accord with the budget expenditures necessary for carrying on with the works, and carrying on within stipulated rights on each of the projects;

(r) In all matters undertaken, the Board of Directors shall be responsible to the general meeting;

(s) Prescribing limits of financial rights of the chairman, the managing director and each director secretary in accepting payments, making payments and getting loans in conducting the works, and approving them monthly;

(t) Entering into contracts on behalf of the society as necessary in pursuance of the objectives of the society.

28. The duties of the chairman, vice-chairman (1), vice-chairman (2), managing director, deputy managing director, director secretary (1) and director secretary (2) are as follows:-

(a) Duties of the chairman

(i) The chairman is selected and appointed by the Board of Directors from amongst members of the Board and shall act as chairman at every Board of Director and general meeting. In his absence, the vice-chairman, the managing director (or) a board member shall act as chairman.

(ii) The chirman, at his own will or at the behest of not less than three board members, may direct the director secretrary to call a special meeting of the Board of Directors.

(iii) The chairman shall conduct all matters that need to be undertaken for the society, in accord with the policy decided by the Board of Directors.

(iv) The chairman shall oversee and administer conduct of the staff of the society to ensure discipline.

(v) The chairman shall have right to grant leave of absence to the staff of the society in accord with existing regulations. He shall administer as necessary in connection with matters to be undertaken by the staff on leave, if necessary in consulation with the Board of Directors.

(a-1) Duties of the vice-chairman (1)

(i) Duties of the vice-chairman (1) shall be as assigned by the chairman.

(a-2) Duties of the vice-chairman (2)

(i) Duties of the vice-chairman (2) shall be as assigned by the chairman and the vice-chairman (1)

(b) Duties of the managing director

(i) The managing director is also the treasurer of the society and shall examine receipts and expenditures of the society.

(ii) He shall ensure safekeeping of the books and accounts of the society and administer monthly accounts.

(iii) He shall prepare monthly statements of accounts and submit them to the meeting of the Board of Directors.

(iv) He shall carry out specific tasks assigned by the chairman separetely or if necessary in co-ordination with the director secretary.

(v) He shall supervise the staff of the society and the office work of the society.

(vi) He shall so function as to ensure there is no breach of diseipline by the staff of the society and to ensure good co-operation between members and the Board of Directors through proper lines of communications.

(b-1) Duties of the deputy managing director

(i) Duties of the deputy managing director shall be as assigned by the chairman and the managing director.

(c) Duties of the director secretary (1)

(i) The director secretary (1) shall arrange meetings of Board of Directors, carry out tasks specifically assigned by the chairman and the Board of Directors, and assist in the work of the managing director.

(ii) He shall exercise supervision to ensure there are no breaches of the bye-law of the society.

(iii) He shall keep accurate records of meetings.

(c-1) Duties of the director secretary (2)

(i) The duties of the director secretary (2) shall be as assigned by the chairman and the director secretary (1).

Duties of the Member Auditor

29. The member auditor shall audit monthly accounts of the society and report to the Board of Directors.

Management of personnel affairs

30. The board of Directors shall carry out the following in connection with service personnel affairs in accord with the staff setup laid down by the general meeting;-

(a) Selecting, appointing and fixing salaries of personnel as necessary in accord with the staff setup;

(b) Assigning duties and prescribing work regulations for the staff;

(c) Taking action, meting out punishment, promoting, demoting, granting rights to staff and submitting it for approval to the nearest general meeting;

(d) Other members of th4e Board of Directors are to assist in accord with the policy of the society in administrative matters and shall not participate in direct administration of staff members.

PART 11

MISCELLANEOUS

Members' right of inspection

31. Any member wishing to inspect papers, records and accounts of the society shall have right to do so, after intimation in writing to the chairman at least seven days ahead.

Auditing of accounts

32. Auditing of accounts of the society shall be done as prescribed in the existing law.

Apportioning of profits

33. In apportioning of net profits of the society, the Board of Directors shall proceed in accord with the decision of the general meeting. The decision of the general meeting shall be final.

Liquidation

34. In the event of liquidation of the society, it shall be carried out in accord with the provisions of the Co-operative Society Law.