

**JAPAN INTERNATIONAL COOPERATION AGENCY(JICA)**

No. 2

**MINISTRY OF INDUSTRY, MINES AND ENERGY(MIME)  
KINGDOM OF CAMBODIA**

**THE STUDY FOR ESTABLISHMENT OF ELECTRIC  
POWER  
TECHNICAL STANDARDS AND GUIDELINES  
IN  
KINGDOM OF CAMBODIA**

**FINAL REPORT**

**SUMMARY**

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**FEBRUARY 2004**

**ELECTRIC POWER DEVELOPMENT CO., LTD.  
TOKYO-JAPAN**

**CHUBU ELECTRIC POWER CO.,INC.  
NAGOYA-JAPAN**

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**JR**

**04-044**

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## **1. OUTLINE OF THE STUDY**

### **1.1 Purpose of Study**

According to Article 5 of the Electricity Law of the Kingdom of Cambodia, the Electricity Authority of Cambodia (EAC) is to perform its work in conformity with the Electric Power Technical Standards of Cambodia, which are to be issued by the Ministry of Industry, Mines and Energy (MIME).

EAC needs such standards to be issues and published to enable EAC to fulfill the duties of Technical Standards enforcement.

On the other hand, an electric power license applicant desiring to enter the electric power business is required to submit a license application together with support materials such as internal security and safety rules and electric supply rules. But the application cannot be submitted properly since there are no application samples or technical standards available because of the current transition period.

In Cambodia, all electric power equipment has been imported. In such a situation, it is possible that the power companies would purchase and install electric power equipment of poor quality unless minimum acceptable technical standards are established. Therefore, it has been strongly requested that the Electric Power Technical Standards of Cambodia be established as soon as possible.

The purpose of this Study is to prepare the draft of the Electric Power Technical Standards of Cambodia and the Guidebook for Power Engineers, which will explain and supplement the standards necessary for the actual work, in order to transfer relevant technology to the Cambodian counterpart in the Study.

In addition, based on the information collected during the study, an analysis of the present status of the electric power sector in Cambodia and the JICA Study Team is required to identify the issues to be solved and propose proper recommendations on the issues in the study report. After this study, the JICA Study Team is also required to make suggestions concerning technical assistance for the Cambodian power sector.

### **1.2 Area of Survey**

The objective country for the study is the Kingdom of Cambodia. For reference purposes, the JICA Study Team visited Thailand, Laos and Vietnam to gather necessary information for the

establishment of the Electric Power Technical Standards of Cambodia.

### **1.3 Scope of Work**

The study was carried out based on the Scope of Work agreed to by JICA and MIME, regarding which an agreement was signed on June 24, 2002. The scope of work is as follows:

- 1) Power sector study in Cambodia, including the preparation of a survey on the electric power facilities in Cambodia and a projection of the Cambodian power sector in the future on which to base recommendations of technical assistance after issuance of the Electric Power Technical Standards
- 2) Preparation of Comments and Recommendations after issuance of the Electric Power Technical Standards by MIME.
- 3) Preparation of Electric Power Technical Standards (Draft) and Guidebook for Electrical Engineers.
- 4) Preparation of a Khmer language version of the above documents in coordination with MIME.

## **2. ACCOMPLISHMENT OF JICA STUDY TEAM**

The JICA Study Team has visited Cambodia eight times for study purposes since November 2002. The study team accomplished the following:

- 1) A survey of the power sector in Cambodia and examination of the survey results in order to find and recommend issues to be addressed.
- 2) A survey of the electric power facilities in Cambodia and preparation of a survey report in assistance with a local consultant. This survey report is the first of this kind in Cambodia, and will be used by various persons and firms with an interest in the Cambodian power sector.
- 3) Visits to the neighboring countries Thailand, Laos, and Vietnam to investigate the status of the electric power technical standards in these countries for reference in preparing the Electric Power Technical Standards of Cambodia. After collecting the

information, the JICA Study Team analyzed it and sought a strategy for preparing draft technical standards suitable for Cambodia. It then prepared the draft in a timely manner.

- 4) Preparation of a draft of the Electric Power Technical Standards of Cambodia:  
To complete the draft preparation on schedule, the JICA Study Team has paid attention to the following matters:
- a) The number of clauses should be minimal, taking into consideration the procedures for finalization prior to the issuance.
  - b) The descriptions in the clauses should be short and clear to avoid misinterpretation in execution.
  - c) To cover all cases without exception, the technical standards described in the clauses are comprehensive.
  - d) Concerning the documents in the Khmer language, MIME engineers have reviewed and confirmed the translation from English to Khmer.

On October 15 and December 3, 2003, the Electric Power Technical Standards draft was presented at a MIME conference room workshop and opinions were exchanged among the stakeholder and MIME, the EAC, and the EDC.

The draft has been studied and necessary amendments were made in reference to the discussions.

The draft has been studied and made a necessary amendment in referring to the discussions.

Based on the new draft, MIME will bring the Technical Standards to the next step of the promulgation.

- 5) Preparing the Guidebook for Power Engineers:  
The original idea was to prepare Guidelines for Electric Power Technical Standards, which would then be promulgated by MIME. However, taking the procedures and the Khmer translation into consideration, JICA and MIME agreed to prepare a "Guidebook for Power Engineers" instead of guidelines. MIME is considering issuing the Guidebook for Power Engineers as an appendix to the Electric Power Technical Standards of Cambodia. The contents of the Guidebook for Power Engineers have been expanded to include materials concerning the power sector of Cambodia (laws and regulations, organizations, power demand and supply, the

power system, power projects, procurement of machinery and materials, etc.). This is because it will be useful for concerned persons and firms, such as Cambodian power engineers, students and new applicants for electric power licenses in Cambodia, in addition to MIME, the EAC, and the EDC.

- 6) Technology transfer to counterparts in MIME, the EAC, and the EDC through the study with the JICA Study Team: have a high level of engineering ability and positions of responsibility in their respective organizations, the JICA Study Team is satisfied with their activities. In the future, the JICA Study Team is expecting its counterparts to contribute to the following activities of the study team.

### **3. CONCLUSION AND RECOMMENDATIONS**

Promulgation of the Electric Power Technical Standards of Cambodia and observance of the Technical Standards lead to improved power supply qualities (concerning voltages, frequency, outages, etc.). Therefore, it could be easy to expand the power system, receive power from the public system, supply power to the system including power purchases from neighboring countries by means of external power system interconnection, and connect the private power consumers that own generating facilities. As a result, people in Cambodia and neighboring countries could enjoy receiving electricity with stability, safety and no interruptions at a reasonable cost. It is recommended that the Ministry of Industry, Mines and Energy (MIME) take immediate steps to promulgate the Technical Standards with maximum efforts.

#### **3.1 Promulgation of the Electric Power Technical Standards**

The following are the results expected to be seen immediately after the promulgation of the Technical Standards.

##### **3.1.1 Effects Related to Operation**

- 1) Realization of an integrated power system in Cambodia  
Rated frequency and rated voltages with allowances have been designated by the Technical Standards. Therefore, the present, regionally-separated power systems could easily be interconnected in accordance with the basic power sector policy in Cambodia.



- 2) Prohibition of electrical work by unqualified persons will lead to reduced energy losses in transmission/distribution systems. The electric tariff could then be reduced since the cost of the power will be reduced.
- 3) By the common rules of electric power, anyone may easily connect power facilities to the system, and the Technical Standards will assure a continuous electricity supply. Consequently, the stability of the power supply system will be improved, and the demand increases by the new connections will improve the business.
- 4) For the above reasons, prospective customers who own private generating facilities will connect to the public power system. The growth of public power demand will be greatly increased.

### **3.1.2 Effects Related to Safety**

- 1) By complying with the Technical Standards, electrical accidents such as those caused by leakage or electric shock, fire, or damage to electric power facilities can be avoided.
- 2) After promulgation of the Technical Standards of Cambodia, products with poor quality from outside Cambodia would not be brought into the country.

### **3.1.3 Effects Related to Environmental Preservation**

- 1) A clause in the Technical Standards addresses environmental preservation, and their promulgation is expected to lead to a cleaner environment in regard to electric power facilities.

## **3.2 Implementation of the Electric Power Technical Standards**

It is not practical to apply the Technical Standards to all power facilities immediately after their promulgation. Therefore, a provisional clause (Clause 5) is included in the standards. It has been decided to allow a certain amount of time for replacement of facilities not in compliance with the Technical Standards perhaps two years for environmentally harmful facilities and facilities not causing harm could be operated as is until their time of replacement. Most existing facilities could be handled by this provisional clause. Enforcement is to be at the discretion of the EAC in accordance with the Electricity Law.

### **3.3 Promotion and Observance of the Electric Power Technical Standards**

The most important issue is to promote the Technical Standards and ensure that licensees conform to these standards. When the Electric Power Technical Standards of Cambodia are promulgated, the EAC's work will become more practical and tangible. In order for the EAC's work to be efficient, trial-and-error practice is not recommended. Instead, standardized procedures should be developed for routine work through the preparation of appropriate job manuals. The preparation of such manuals should progress as a reasonable priority in view of schedule requirements.

### **3.4 Qualified Electrical Engineers and Electricians**

Based on useful Japanese practices, the JICA Study Team has proposed employing qualified electrical engineers, along with qualified electricians, to supervise power facilities. These ideas have been accepted by MIME/EAC/EDC and put into the Technical Standards (Draft) (Clause 4: 4-3 and 4-4).

The Technical Standards (Clause 4-3) require the licensee to employ a qualified electrical engineer to supervise power facilities in accordance with the Technical Standards. However, the details and selection criteria have not yet been determined. In this connection, it is recommended that legislative procedures be studied regarding qualified electrical engineers, taking into consideration the situation in Cambodia and practical procedures.

Since the Technical Standards (Clause 4-4) require electric work to be carried out by qualified electricians, it is recommended that the details concerning qualified electricians be studied urgently, so that persons who complete a training course with a predetermined skill level can be licensed.

### **3.5 Maintenance of the Survey Report of Electric Power Supply Facilities**

The Survey Report of *Electric Power Supply Facilities in Cambodia* is a single report for compiling facility data of various kinds, and it will be used by various people. Therefore, MIME should update the report from time to time.

### **3.6 Maintenance of the Guidebook for Power Engineers**

The Guidebook for Power Engineers should be maintained by MIME in coordination with

EAC/EDC and others concerned.

The JICA Study Team's counterparts proposed that more detailed engineering sheets be added to the Guidebook, but the engineers who wish to use the more-detailed data and information must be proficient in English. Therefore, as a practical matter it would be better for them to use specialized engineering books and/or materials published in the developed countries. In this connection, there is no technical assistance for preparing a Guidebook for power engineers in Khmer.

### **3.7 Application to the Rural Electrification**

During the public consultation, there was an opinion to exempt the electric power facilities in rural areas from the Electric Power Technical Standards of Cambodia since most of these facilities do not comply with the standards. However, this could be handled by the Provisional Clause (Clause 5) of the Technical Standards. This clause can be applied to the existing power facilities regardless of whether they are located in rural areas or cities. Further details are as follows.

- 1) The Technical Standards have been prepared based on the purpose of the Electricity Law of Cambodia in reference to Article 5.  
The EAC is to ensure that licensees use the Technical Standards related to technical operation, safety and the environment. Therefore, no consideration is made of whether the license applies to a rural area or a city.
- 2) In Cambodia, the power system is to be integrated as a national grid in the future. Therefore, no distinction should be made between rural areas and cities. In view of safety and protection from possible disasters, there should be no distinction between rural areas and cities, and discrimination among people on the basis of where they live is not acceptable in view of human rights. In the points stated above, the basic concept in preparing the Technical Standards is that new facilities should comply with the standards.
- 3) For remote areas, subsidies for rural electrification are available from the government. Therefore, licensees whose businesses are not economically viable could receive a government subsidy for electrification.

### **3.8 Detailed Rules for the Electric Power Technical Standards**

A proposal was made to prepare detailed rules and regulations for the Electric Power Technical Standards. It is understood that such detailed descriptions would be necessary because the Technical Standards were general rules. However, if created under the Electric Power Technical Standards of Cambodia, such detailed rules may present people with more regulations, and more complexity, and this is unrealistic. "Simple is best" may be the best course.

Another proposal was made to create Cambodia Industry Standards (CIS) in this connection. Considering that Cambodia is not an industrial country and relies on imports for most industrial products, the Government of Cambodia would have to establish an inspection organization and inspection stations to check all imported products for compliance if such industrial standards were published. This would be very expensive for the Government and would impede the delivery of imported goods. As such a situation can be anticipated, it can be concluded that it is too early to prepare such industrial standards. As an alternative, it would be more practical and time-saving to stipulate by law that MIME would approve imported goods as acceptable in Cambodia when those goods meet the industrial standards of specified industrialized countries.

### **3.9 Technical Assistant to the Power Sector**

After the JICA Study, activity in the power sector, including that by MIME/EAC/EDC and licensees will be put on a more practical and material level by the Technical Standards even before the promulgation. This is because the fundamental contents of the Technical Standards will not be changed significantly.

It is believed that the power sector of Cambodia needs strong international technical cooperation in order for the results of the JICA Study to be maximized, since very rapid power sector development progress is expected. The reasons are as follows.

- 1) In addition to promoting the promulgation of the Technical Standards, MIME must undertake studies to enable qualified electrical engineers to supervise power facilities and qualified electricians to staff them as soon as possible.
- 2) In advance of the promulgation of the Technical Standards, the EAC, to improve its efficiency, must standardize routine work, since many unexpected tasks and jobs will disturb that work.
- 3) After promulgating the Technical Standards, the power sector of Cambodia will develop very quickly and various new issues, both engineering and legal, are expected to be faced by the EAC.

- 4) The EAC will face these engineering issues:
- a) Power system planning
  - b) Power system operation
  - c) Interconnection with Vietnam (the first 230kV system)
  - d) Power demand/supply planning for power dispatching

**Attachments:**

- 1. List of Main Personnel Contributing to the JICA Study**
- 2. Relationship of the Technical Standards and Guidebook for Power Engineers**
- 3. Contents of the Electric Power Technical Standards of Cambodia**
- 4. Flow Chart of the JICA Study**

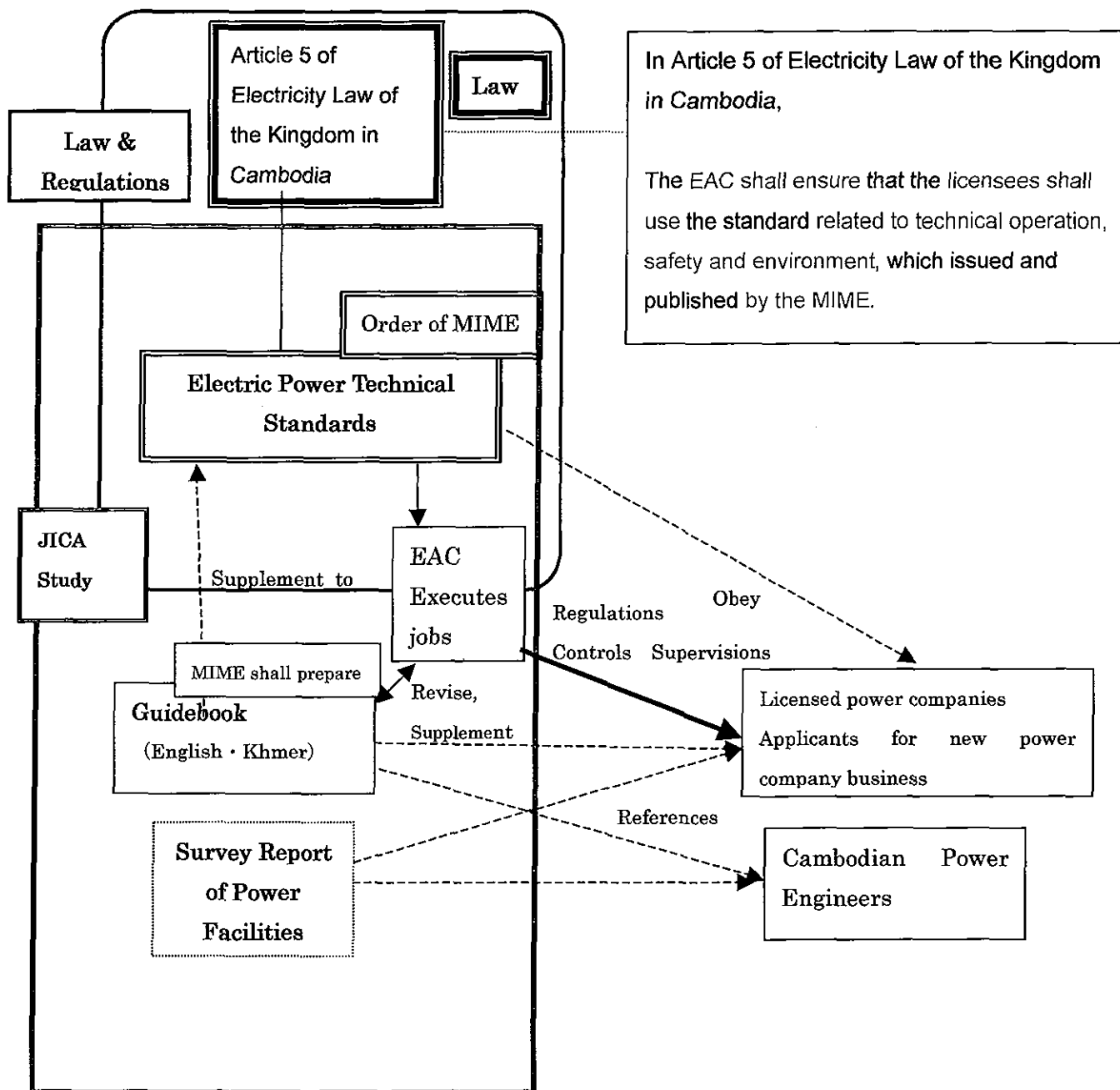
## List of Major Personnel contributed for JICA Study

MIME : H. E. Dr. Ith PRAING  
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**Relation between Technical Standards and Guidebook for power engineers**



In Article 5 of Electricity Law of the Kingdom in Cambodia,  
The EAC shall ensure that the licensees shall use the standard related to technical operation, safety and environment, which issued and published by the MIME.

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Flow-Chart of the JICA Study

