REPORT
ON
NATIONAL POWER STUDY
IN
REPUBLIC OF INDONESIA

VOLUME I
SUMMARY AND CONCLUSION

November 1969

OVERSEAS TECHNICAL COOPERATION AGENCY

GOVERNMENT OF JAPAN

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PREFACE

The Government of Japan, in response to the request of the Republic of Indonesia, decided to carry out a basic study on the Electric Power Development of Indonesia and entrusted this task to the Overseas Technical Cooperation Agency (OTCA) which is an executing agency of the Government of Japan.

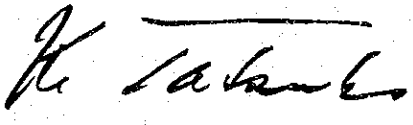
OTCA organized a study team of 15 experts headed by Mr. Juzaburo Terada, Consultant of Tokyo Electric Power Co., Inc. and dispatched it to Indonesia in December, 1968.

The study team stayed there for about seven months and successfully completed the field study including discussion with the authorities concerned and collection of data with the whole-hearted cooperation from the Government of the Republic of Indonesia, International Organizations and others.

After its return to Japan, the team made further studies on data and information and the results were hereby compiled into the present report of 3 volumes for presentation.

Finally, on behalf of OTCA, I wish to take this opportunity to express my sincere gratitude for the generous cooperation and assistance extended to the team during its stay by the Government of the Republic of Indonesia and the International Organizations concerned.

November, 1969



Keiichi Tatsuke
Director-General
Overseas Technical Cooperation Agency
Tokyo, Japan

Letter of Transmittal

November, 1969

Mr. Keiichi Tatsuke
Director General
Overseas Technical Cooperation Agency
Tokyo

Dear Mr. Tatsuke,

I have the great pleasure of submitting to you herewith this Final Report on the Study for National Power in Indonesia. The First Phase Study was made on 11 items for the rehabilitation and development of the electric power industry in Indonesia as agreed upon between the Government of the Republic of Indonesia and the Government of Japan.

The Japanese Study Team stayed in Indonesia from December 14, 1968 through July 31, 1969, and the study was implemented with positive cooperations given not only by the Counterparts comprising members of the Directorate General for Power and Electricity and PLN (National Electric Power Enterprise of Indonesia) but also by concerned persons of all the electric power organizations in Indonesia.

During its stay in Indonesia, the Study Team compiled the results of studies on all the 11 items into the Interim Reports No. 1 through No. 7, which were submitted to and approved by the Steering Committee consisting of the representatives of the Government of Indonesia, Directorate General for Power and Electricity, World Bank, Embassy of of Japan in Indonesia, the Counterparts, and the Japanese Study Team.

Upon its return to Tokyo, the Study Team prepared another Interim Report dealing with the investment plan for 1970-1971, which was presented to and approved at the meeting of the Steering Committee which was held on September 29, 1969.

This Final Report covers the contents of all the 7 Interim Reports and further incorporates the outcome of studies and reviews which were made in Japan on important matters. Please note, therefore, that the description contained in this Final Report is in the form of the Japanese Study Team directly stating to the Government of Indonesia.

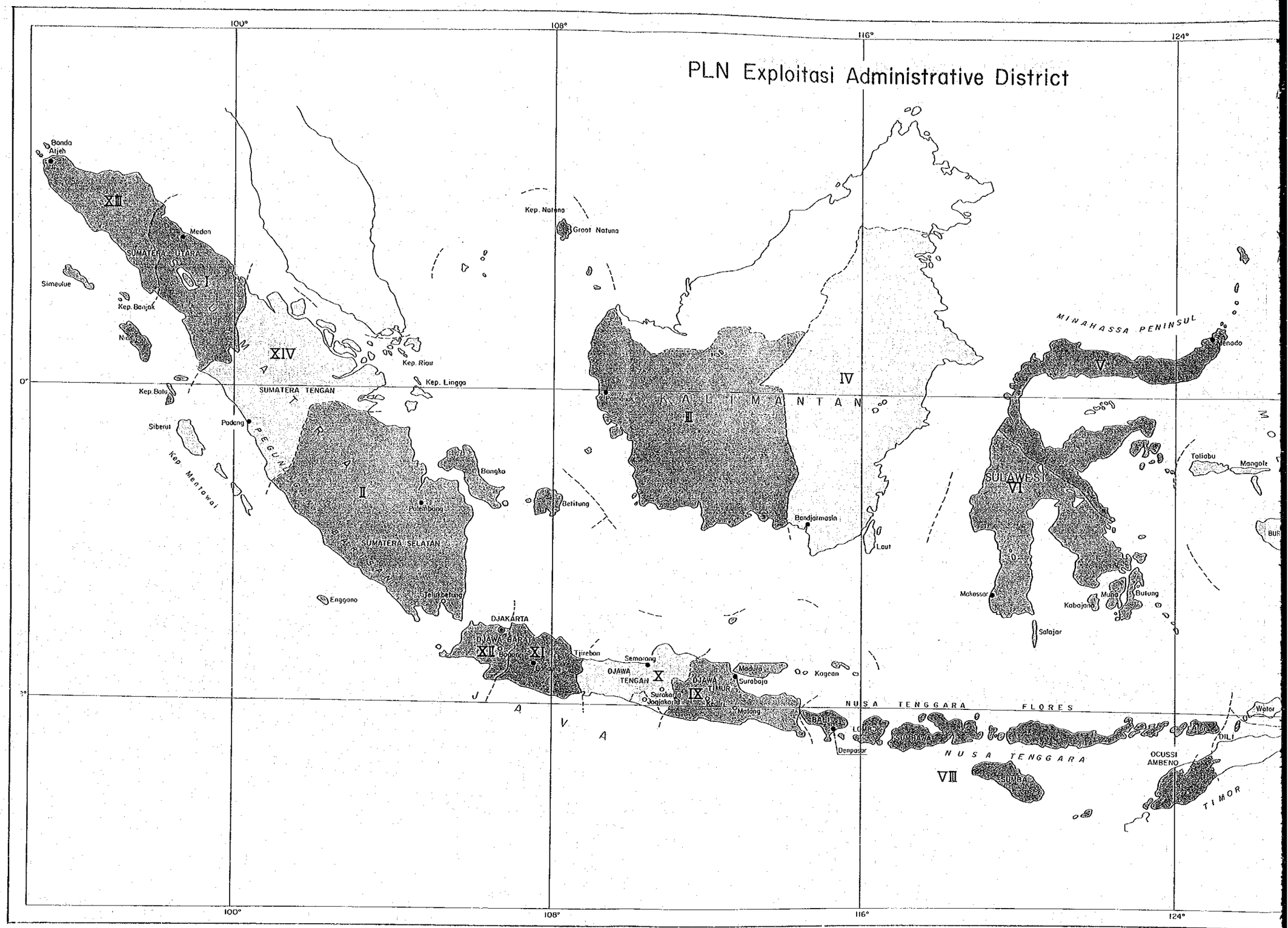
The Study Team is firmly convinced that this Final Report is adequate for the purpose of the study and is sufficiently conclusive to the development of electric power industry in Indonesia. The First Phase Study, however, is strictly a basic study for the rehabilitation and development of the electric power industry in Indonesia. It is deemed necessary, therefore, that the Government of Indonesia will, at the earliest possible date, implement the Second Phase Study, which can make use of the results of the First Phase Study, so that an early and specific rehabilitation of the electric power industry may be expected.

In submitting this Final Report, I wish to take this opportunity to express my sincere appreciation of the many assistances and great cooperations of all the persons concerned which were so generously given to the Study Team not only during its period of field studies but also throughout our subsequent preparation of this Final Report which followed upon its return to Japan.

Juzaburo Terada

Juzaburo Terada
Manager
Japanese Study Team for
National Power in Indonesia

PLN Exploitasi Administrative District



PLN Exploitasi Administrative District

Exploitasi Number	Location	Exploitasi Number	Location
I	Medan	IX	Surabaja
II	Palembang	X	Semarang
III	Pontianak	XI	Bandung
IV	Bandjalmasin	XII	Djakarta
V	Menado	XIII	Banda Atjeh
VI	Makassar	XIV	Padang
VII	Ambon	XV	Sukarnapura
VIII	Denpasar		

108° 116° 124° 132° 140°

0° 8°

Kep. Natuna
Groot Natuna
Tandjung
Pontianak
K A L I M A N T A N
IV
II
Bangka
Belitung
Bandjarmasin
Laut
MINAHASSA PENINSUL
Menado
V
Morotai
HALMAHERA
Wajoeo
Tolitoli
Mangole
Obi
Salawati
VOGELKOP
Bick
Jappen
SULAWESI
VI
Lenmafoe
VII
BURU
SERAM
Ambon
Bombarai
IRIAN BARAT
XV
Sukarnapura
D'ENTRECASTEAUX
Makassar
Kabajang
Muna
Butung
Salajar
TAJANDU
KEPULAUAN ARU
DJAKARTA
DJAWA BARAT
XII
XI
Tjirebon
Semarang
DJAWA TENGAN
X
Surakarta
Jogjakarta
IX
DJAWA TIMUR
Kediri
Malang
Madura
Surabaja
Kagean
J A V A
NUSA TENGGARA
FLORES
BALI
LOMBOK
SUMBAWA
Denpasar
Wetar
Babar
Jamdena
Frederik Hendrik
DILI
OCUSSI AMBENO
TIMOR
NUSA TENGGARA
VIII
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1. FOREWORD

1. FOREWORD

1-1 BACKGROUND OF THE FORMATION OF THE JAPANESE STUDY TEAM OF NATIONAL POWER IN INDONESIA

The Republic of Indonesia of which the existing government ruled since 1965 has established the Five Year Development Plan for the period from 1969 to 1973 in fiscal years under the guidance of IMF and with the support of the World Bank.

In order to promote the progress of the Five Year Development Plan effectively, the Government of Indonesia decided to carry out the basic study for economic development of respective industries.

The study concerning the development of the electric power industry has been decided to be separated into two phases, the first phase study and the second phase study. On June 18, 1968, the Government of Indonesia and the World Bank requested the Government of Japan to implement the first phase study. In compliance with this request, the Government of Japan decided to offer positive cooperation, and forwarded its reply to that effect on June 21, 1968. On the same day, the Government of Japan also requested the Tokyo Electric Power Co., Inc. the actual implementation of the study.

The Government of Indonesia further requested the Government of Japan to send a preliminary study team to make necessary discussions for the first phase study. In accordance with this request, the Government of Japan forthwith organized the preliminary study team comprising the following members for sending to Indonesia.

Mr. Taian Ishii
Chief of Public Utilities Research Section
Public Utilities Bureau
Ministry of International Trade & Industry

Mr. Juzaburo Terada
Consultant
The Tokyo Electric Power Co., Inc.

Mr. Saburo Nakayama
Specialist
Facilities Planning
The Tokyo Electric Power Co., Inc.

The preliminary study team agreed with the formation and the items of the first phase study by holding several meetings with the Government of Indonesia and the World Bank while it stayed in Indonesia from June 29 to August 15, 1968.

The Government of Japan entrusted the Overseas Technical Cooperation Agency (hereafter called OTCA) with the implementation of this study based upon the agreement between the Government of Japan and the Government of Indonesia. OTCA organized the team of 14 members headed by Mr. Juzaburo Terada, Consultant of the Tokyo Electric Power Co., Inc., joined by Mr. Taian Ishii, former Chief of Public Utilities Research Section of Public Utilities Bureau, Ministry of International Trade and Industry in the capacity of an advisor. OTCA sent Mr. Terada and seven members of his team as the first group to the study field on December 14, 1968. The organization of the team is as given in Section 1-5 of this report.

1-2 PURPOSES AND OBLIGATIONS OF THE STUDY TEAM

For the sound development of the electric power industry which is one of the basic industries powerfully promoting the Five Year Development Plan which aims at the economic development of Indonesia, the purposes of the study team were to point out the problems confronted by the electric power industry of Indonesia, to clarify the fundamental objectives and details of measures to be taken for the furtherance of the electric power industry, and to prepare investment plans for the electric power development for fiscal years 1969-1970 and 1970-1971.

The major obligation of the study team was to carry out necessary studies on the eleven items enumerated in Section 1-3, present the results of findings by interim reports to the Government of Indonesia through the approval by a Steering Committee consisting of the Director-General for Power and Electricity as the chairman and other members as

listed below, and prepare a complete and final report within four months after the completion of the field study.

Chairman:	Director-General for Power and Electricity
Member:	Representative of the World Bank
Member:	Representative of the Embassy of Japan
Member:	Representative of BAPPENAS
Member:	Representative of the Counterparts
Member:	Manager or Deputy Manager of the Japanese Study Team

1-3 STUDY ITEMS

a Prepare a minimum program of investments for rehabilitation and expansion of the principal power systems of Indonesia for which financing would have to be obtained in 1969 and 1970 in order to eliminate the existing power shortages and to allow for a minimum of integrated growth;

b Review the design and technical specifications of the crash-program for the rehabilitation of thermal power plants, extension of distribution network and reinforcement of transmission network in Central Java to eliminate the periodic black-outs. (Including the study for a telecommunication system for operation in Central Java);

c Review the design and technical specifications and cost estimates for the crash-program for electric power in East Java, particularly in the distribution field, in order to allow proper distribution of the additional power available from the new Tandjung Perak steam power plant at Surabaja;

d Review the design and technical specifications and cost estimates for extension of the Djakarta and West Java distribution networks in order to allow proper dist-

ribution of the additional power available from the Djatiluhur hydro-power project and the proposed extension of the Tandjung Priok steam power plant (Units 3 and 4);

e Estimate the actual cost of generation (using the cost-allocation/distribution method) of the Djatiluhur multi-purpose project (in West Java);

f Review in a preliminary way the current operating costs and revenues of P L N and recommend an interim revision of the present tariffs, with the objective of increasing revenues and of achieving a better balance between domestic and industrial tariffs;

g Review the organization of the existing Government entities (Directorate General, P L N and others) dealing with various aspects of the electric power sector, and recommend in broad outline the re-organization of these entities;

h Make recommendations for improving the organization and management of:

(a) Operation and maintenance of the plants and systems; and

(b) Execution of projects, including contracting and purchasing, supervision and all matters having connection with guarantee and acceptance-tests;

i Provide technical proposals, including the choice of fuels, to reduce the operation costs of the existing units (amongst others the three gas-turbines already commissioned, and the new ones to be projected);

j Outline in detail the approach, the phasing and staffing of the long-range study and estimate its costs.

As regards approach, this outline should describe the bases for the load and the sales forecasts, the methodology to be used for comparing different systems, the basis for cost estimates, the degree of detailed engineering to be obtained for the five-year investment program, etc.

As regards phasing, the outline should provide for the long-range study to produce

as early as possible, and long before its completion, separate feasibility studies for the most urgent new investments in sufficient detail to serve as a basis for obtaining separate financing from abroad.

Outline in detail the statistical and technical information that the existing entities in this power sector should gather in preparation for the long-range study, such as part forecasts of peak-loads and sales of the various systems, capability and production of the various plants, cost of investments, operation and maintenance, hydrological and sub-soil data on potential hydro sites and potential sources of thermal power.

1-4 PROGRESS OF STUDY

The following description relates to the progress of field study during the period of December 14, 1968, when the first group left Japan for Indonesia, through August 2nd when the last group returned to Japan, and to the activities for completion of a Complete and Final Report in Japan.

1-4-1 Field Studies in Indonesia

(1) The first group members of Mr. Terada, Manager, Mr. Futatsugi, Deputy Manager, Messrs. Takasawa, Sasaki, Ishii, Kikuchi, and Waki left Japan on December 14, 1968 and arrived in Indonesia on the same day. The counterparts to the Japanese experts were decided as early as on December 17 and they worked together with the Japanese study team. In December, main activities of the study team were discussions with the leaders of the Government of Indonesia, representatives of Directorate General for Power and Electricity, PLN (the National Enterprise of Electric Power in Indonesia), World Bank and the Embassy of Japan as well as explanations of and distribution to the counterparts about various blank data forms prepared before departure and carried from Japan, requesting them to return upon their completion. The first group members also visited Tanjong Priok Steam Power Station and Tjawan Substation.

(2) The office of the study team was opened on January 2, 1969, and substantial

study activities on items of a, b, c, and d related to the investment plan 1969-1970 of the electric power industry were commenced. During January, the first group members principally made their studies by discussions and arrangements with the staff members of the Directorate General for Power and Electricity, PLN head office, Exploitasi (the Regional head office of PLN) XII in Djakarta and Exploitasi XI in Bandung as well as by visits to the plants, substations and other facilities. On the other hand, efforts were made to collect necessary data through their counterparts. The group members, in February, made discussions and arrangements with staff members of Exploitasis No. IX in Surabaja and No. X in Semarang, visiting their facilities as well. The team began to prepare the Interim Report No. 1 – Part 1 based on the results of the above-mentioned study activities. The study team explained the Introduction and Summary of the Interim Report No. 1 to the counterparts on February 24, and submitted the complete Interim Report No. 1 – Part 1 on February 28. In the meantime, the First meeting of Steering Committee was held on January 6, and dates for submission of Interim Reports on respective study items were agreed. Mr. Terada, Manager, returned to Japan on January 17, and again left Japan for Indonesia on February 15, accompanied by Mr. Ishii, Advisor. Mr. Futatsugi, Deputy Manager, returned to Japan on January 31 because of illness, and Mr. Yui, Deputy Manager, left Japan on February 20 as his successor.

(3) At its Second meeting which was held on March 3, the Steering Committee generally approved the Interim Report No. 1 – Part 1 after discussion of its introduction and summary. After its meeting, some revisions were made in the wording of the entire Interim Report No. 1-1 as the result of discussions which were held on 4 days of March 8, 18, 20 and 21 among the representatives of the study team, counterparts and World Bank.

The study team visited Djatiluhur and Bandung areas in the period of March 26 through 28 for observations of the facilities for the Djatiluhur Project and also for discussions and observations of facilities in Exploitasi XI. Other major activities of the study team in March includes Manager Terada's return to Japan on 5th, Messrs. Umchara and Tomon, the second group members of the study team, arrived in Indonesia, and spent six days from 16th through 21st in succeeding the duties of the first group, Messrs. Takasawa, Sasaki, Yoshitake and Ishii, members of the first

group, returned to Japan on 26th, and Mr. Hata left Japan as the third group on 29th.

(4) In order to implement the studies concerning study item e, visits were made to the Djatiluhur Project twice, between April 4 through 9 and April 15 through 17, for necessary discussions, observations, data collections and data hearings, and preparation of the Interim Report No. 2 was started.

On May 5 and 6, the study team explained about the Interim Report No. 2 to the members concerned of Indonesia, completed it on 11th, and submitted it to the Government of Indonesia on 12th.

The itinerary of the study team for visiting Exploitasis during April was as follows.

April	11 through 12:	Exploitasi XII (Djakarta)
	16 through 18:	Exploitasi XI (Bandung)
	20 through 25:	Exploitasi X (Semarang)
	21 through 25:	Exploitasi IX (Surabaja)
	24:	Exploitasi XII (Djakarta)

Messrs. Kawamata and Ishii of the fourth group left Japan on April 12.

(5) Meanwhile, the report concerning the technical proposals for cost saving of existing units was prepared by the member who had returned to Japan. This report had been explained to the members concerned of Indonesia on May 5 and 7, and was submitted to the Government of Indonesia as Interim Report No. 3 on May 12, together with Interim Report No. 2. The Third meeting of the Steering Committee was held on Interim Reports Nos. 2 and 3 on May 20, which approved both.

The major itinerary in May of the study team was as follows.

May 1: Meeting held with Mr. Amir, President of PLN on main problems.

May 10: In accordance with the request by the Indonesian side, explanations on the basic philosophy and details of the investment plan for distribution system in 1969 and on the method of load estimation were made to the members concerned of PLN head office and exploitasis at PLN head office.

May 12 through 15:	Explóitasi XI (Bandung)
13 through 17:	Exploitasi II (Palembang)
16 through 17:	Exploitasi XI (Bandung)
20 through 28:	Exploitasi XIV (Padang) and Exploitasi II (Palembang)

Mr. Hata returned to Japan after completion of his field duties.

(6) Through the above study activities and field trips, the study team started the preparation of reports on items f and g specified in the Terms of Reference as Interim Reports No. 4 and No. 5. On June 16 and 19, the team made explanations to and discussed with the President of PLN, Counterparts, and other members concerned of Indonesia on these two reports. After making some revisions Interim Reports No. 4 and No. 5 were submitted to the Government of Indonesia. The Fourth meeting of the Steering Committee was held on July 3 for above two Interim Reports, which were approved by making some revisions in wording in the Interim Report No. 4 and by making partial deletions in the Interim Report No. 5.

(7) Manager Terada left Japan for Indonesia on July 1. In advance of his arrival in Indonesia, the study team had commenced activities in the beginning of June for preparation of a part of Interim Report No. 6 concerning the administration of material purchasing contracting and accounting for construction projects which relates to item h of the Terms of Reference, and Interim Report No. 7 in relation to items j and k. Both reports were completed on June 17.

The team made the supplementary study required for the completion of the

Interim Reports No. 6 and No. 7 by the following itinerary.

June 6 through 13:	PLN head office	
17 through 21:	Exploitasi X	(Semarang)
23 through 26:	Exploitasi IV	(Surabaja)

Meanwhile, the addition to the Interim Report No. 3 concerning the proposal for running cost saving of existing units (choice of fuel for a gas turbine) related to item i of the Terms of Reference had been prepared by a member of the first group in Japan and was completed on July 14 after reviewed by team members in Indonesia.

The Interim Reports Nos. 3 (addition), 6 and 7 were submitted to the Government of Indonesia after discussions on July 17. The Fifth meeting of the Steering Committee for Interim Reports Nos. 3 (addition), 6 and 7 was held on 24th, and approved the Interim Report No. 3, the Interim Report No. 6 with some revisions in wording and deletion of some descriptions, and the Interim Report No. 7 with some of its contents transferred to Appendix.

Moreover, the following items were agreed upon at the Fifth meeting of the Steering Committee.

a. The report concerning the investment plan 1970-1971 for electric power development should be submitted to the Government of Indonesia to be in time for presentation at the next meeting (the Sixth meeting) of the Steering Committee which is scheduled to be on or about September 15.

b. It is satisfactory if the remainder of item h which was not included in the interim reports will be contained in the Final Report.

In addition to the above-mentioned activities, the team has made supplementary studies for the report of investment plan for 1970-1971 and for the Final Report, and all the members of the study team returned to Japan on August 2 after completion of the field study.

1-4-2 Works in Japan

(1) On its return to Japan, the study team immediately provided an exclusive office room where it commenced the preparation of the Interim Report No. 1 – Part 2 and the Final Report.

(2) First, the Interim Report No. 1 – Part 2 was drawn up, and OTCA decided to send Messrs. Yui, Deputy Manager, Umehara and Takasawa to make explanations on this report to the Indonesian members concerned and to obtain the approval of the above report at the Sixth meeting of the Steering Committee. Mr. Yui and other two members left Japan for Indonesia on September 20, and made discussions on the Interim Report No. 1 – Part 2 with the members concerned of Indonesia on September 24 and 27.

The meeting of the Steering Committee for Interim Report No. 1 – Part 2 was held on September 29, at which the report was approved.

Mr. Yui and two other members returned to Japan on October 1 after completion of their duties.

(3) After completion of the preparation of the Interim Report No. 1-2, the study team was engaged substantially in the works for preparation of a comprehensive report which is the Final Report. Preparation of this report was completed, maintaining close contacts with Ministry of International Trade & Industry and OTCA, and this report was submitted to OTCA.

1-5 ORGANIZATION OF THE JAPANESE STUDY TEAM OF NATIONAL POWER IN INDONESIA

Manager:		
	Juzaburo Terada	Consultant The Tokyo Electric Power Company (hereafter called TEPCO), Inc.
Deputy Manager:		
	Ichiro Futatsugi	Coordinator, TEPCO

Deputy Manager: Tadashi Yui	Coordinator TEPCO
Thermal Power Expert: Katsumi Takasawa	Assistant Manager of Division Thermal Power Department TEPCO
Hydro Power Expert: Akio Hata	Assistant Manager of Division Operation and Maintenance Department TEPCO
System Planning Expert: Tsutomu Umehara	Assistant Manager of Division Investment Effectiveness Value Analysis and Program Review Department TEPCO
Transmission and Substation Expert: Kesatsugu Sasaki	Specialist (Assistant Manager of Division) Operation and Maintenance Department TEPCO
Power Distribution Expert: Kazuo Ishii	Assistant Manager of Division Power Sales Department TEPCO
Load Estimation Expert: Kazuhiko Yoshitake	Assistant Manager of Division General Planning Department TEPCO
Load Estimation Expert: Tamio Kawamata	Assistant Manager of Division General Planning Department TEPCO

Rate Making Expert:	
Kazunao Tomon	Assistant Manager of Division Power Sales Department TEPCO
Accounting Expert (I):	
Sumio Ishii	Assistant Manager of Division Accounting and Financing Department TEPCO
Accounting Expert (II):	
Kyozo Kikuchi	Senior Assistant Thermal Power Department TEPCO
Economist:	
Kunio Waki	OTCA
Advisor:	Chief of Public Utilities Research Sect.
Taian Ishii	Public Utilities Bureau Ministry of International Trade and Industry

2. SUMMARY AND CONCLUSION

2. SUMMARY AND CONCLUSION

(1) This final report is arranged by the composition of Interim Reports approved by the Steering Committee at its Second through Sixth meetings and by the supplement of necessary articles.

(2) This report consists of the Volume I Summary and Conclusion, Volume II Description, and Volume III Appendices as follows.

Volume I Summary and Conclusion

Volume II Descriptions

Section 1: Organization and Management of Electric Power Industry in Indonesia

Section 2: Plan for the Development of Electric Power Facilities

Section 3: Management of Operation, Maintenance and Execution of Project for Facilities and Systems

Section 4: Provisional Revision of the Present Tariffs

Section 5: Required Advisory services and their Expenditures for Realization of the Recommendations

Volume III Appendices

Appendix 1-1 through 1-3 are related to Section 1.

Appendix 2-1 through 2-18 are related to Section 2.

Appendix 3-1 through 3-20 are related to Section 3.

Appendix 4-1 through 4-5 are related to Section 4.

(3) The relation of the final report with the interim reports and the items in the Terms of Reference is as follows.

Contents	No. of Interim Report	Item in Terms of Reference
Volume II. Description		
1. Organization and Management of Electric Power Industry in Indonesia	No. 5	g
2. Plan for the Development of Electric Power Facilities		
2-1 Yearly Investment Plan	No. 1-1 and No. 1-2	a, b, c, d
2-2 Method and Approach for Long-term Planning	No. 7	j, k
3. Management of Operation, Maintenance and Execution of Project for Facilities and Systems		
3-1 Operation and Maintenance of Facilities and Systems	Supplement	h (a)
3-2 Cost Saving Method for Generation	No. 3 & No. 3 addition	i
3-3 Management of Execution of Project for Electric Facilities	No. 6 & Supplement	h (b)
3-4 Djatiluhur Project	No. 2	e
4. Provisional Revision of the Present Tariffs	No. 4	f
5. Required Advisory Services and Their Expenditures for Realization of the Recommendations	Supplement	j

NOTE: Supplements show the items which were excluded from Interim Reports and newly added into the final report.

The findings and recommendations of the team are given in detail in the Description, and the summary and principle of the recommendation in each section of the Description are as described below.

2-1 ORGANIZATION AND MANAGEMENT

The finding concerning item g of Terms of Reference is described in the following article.

2-1-1 Principle

(1) Indonesia consists of many islands, and each territory presents a different status in many aspects. Especially, a large difference exists in the regional economic condition, and the regional electric power enterprises will fail to maintain an independent management.

(2) The Five Year Development Plan, whose execution is the base of great development of Indonesia, is sustained largely by the development of electric power industry which is one of the basic industries. Therefore, in Indonesia the electric power industry and national policy are inseparable from each other.

(3) The electric power industry in Indonesia has many problems which need an improvement in many aspects in regard to the facilities, power supply, management, etc. Some of those problems are difficult to solve, however. Success or failure of the improvement will have great influences on the industries and economy of the nation as well as on the national life. Therefore, the support of the Government for the stable development of electric power industry is to be considered.

(4) In case of the management to meet the above-mentioned condition, the electric power enterprise should contribute to the improvement of national life and development of industries through the effective activity aiming at the self-supporting system which is the necessity for establishment of the enterprise making concordance with characteristics of a utility giving public benefit. In other words, the electric power enterprise should make it the primary concern to supply abundant and cheap electric power of good quality.

(5) The Government of Indonesia, which is intended on the national development

with the support of foreign aids, should make maximum efforts in promoting the electric power enterprise, one of foreign supported industries, to meet the expectation of supporting countries.

Accordingly, the electric power enterprise should clarify its duties, and prove that the investment is used most rationally and effectively not only to the supporting countries but also to the Indonesian people.

2-1-2 Summary of Recommendation

(1) The electric power industry should be managed by the national enterprise which assumes full responsibility. Existing PLN should be assigned to this duty.

(2) From the viewpoint of administration, the Government should supervise the management of PLN, and should also accomplish the function of supporting the development of PLN. Existing Directorate General for Power and Electricity should perform this duty.

(3) It is desirable to appoint an authoritative commission which coordinates the administrations, and also makes recommendations for major items of works of the Directorate General for Power and Electricity.

(4) The Directorate General for Power and Electricity should be reorganized into an organ having a minimum required scale to carry out the necessary administrative duties, and execute its new duties with a minimum number of qualified persons corresponding to its new organization.

(5) In case of a project for the electric power development, PLN should conduct all the process from planning to execution.

(6) The following new systems should be established within PLN head office so as to strengthen its structure.

a. Establishment of new posts for two Vice Presidents

b. The management committees of the "Committee of Directors; Committee of Facility Plan; Advisory Committee for Reward, Punishment, Proposal for Business and Technical Improvement" should be established.

c. General Planning Department which has the managing function of control between Departments, comprehensive control of the overall facilities and business, and management of budget and finance, should be established.

(7) General Planning Division should be established at each Exploitasi office according to PLN head office.

(8) PLN should make efforts to realize the following systems to improve the management of the entire PLN.

a. Reinforcement of budget control system

b. Improvement of the internal reporting system into a rational and instructive system

c. Establishment of target for control

d. Attainment of the effective management, and improvement of business management

e. Reviewal of responsibility and authority of the entire PLN organization

f. Achievement of active progress of training and education, and stabilization of personnel management

In regard to the realization of above recommendation, the electric power industry of Indonesia will be faced with many difficultics. Especially, considering the rapid development of Indonesia, the organization will greatly influence the quality of

management, and is required to be constantly reviewed with flexibility to meet changes in management condition due to the movement and progress of economy and society as well as technical innovation. The primary objective of the organization is not to establish a fixed structure only, but is to obtain the effect of management and human development.

Consequently, it is necessary to invite appropriate consultant or advisor for the Government of Indonesia in order to achieve the target step by step.

2-2 PLAN FOR DEVELOPMENT OF ELECTRIC POWER FACILITIES

This section comprises the articles of the "1969-1970 and 1970-1971 Investment Plans" concerning items a, b, c, and d in the Terms of Reference and the "Method and Approach for Long-term Planning" concerning items j and k.

The principal power systems of Indonesia is the object of item a. The scope of this section, however, is limited to Java island where the majority in the electric power systems of Indonesia is located. In regard of other islands in Indonesia, it is desirable to take the measures according to this report.

2-2-1 Investment Plan 1969-1970 and 1970-1971 for Electric Power Development in Java

(1) Fundamental approach

a. Load estimation

(a) We estimated the loads up to 1975 as a period necessary for the study of 1969-1970 and 1970-1971 Investment Plans.

(b) The calculation of load estimation is based on the factors such as load increase caused by population increase, per capita income increase, voltage improvement, increase in the rate of electrification, and increased electric power use per consumer. The average rate of load increase for five years

up to 1973 which coincide with the period of the Five Year Development Plan of Indonesia and the rate for 1974 and 1975 are calculated and broken down into the rates for respective exploitasis and into annual rates.

The following consideration is made in this case.

(i) During three or four years from 1969, because of the necessity of the concentrated efforts for the rehabilitation of existing facilities and other factors, we estimated a minimum increase of required load. Secondly, we made necessary corrections considering the prospective deficiency in power generation in some regions.

(ii) In 1974 and 1975, it is expected that the economic development of Indonesia will be more accelerated; correspondingly, the demand for electric power will be increased substantially.

(iii) The factor of load increase caused by the increased electric power use per consumer is taken into consideration for 1974 and onwards because of the increase of per capita income.

b. Investment plan for electric facilities

(a) Making a reviewal on the facilities through the power sources to power distribution, the following problems on the facilities were found.

(i) From the viewpoint of balance of demand and supply, the shortage of electric power is remarkable in some regions.

(ii) Weakness of the power systems, and inefficiency due to the unsatisfactory maintenance of facilities are observed. In particular, the weakness of power distribution is remarkable as compared with other facilities.

(b) Consequently, in order to make the annual plan for investment, it is necessary to take measures for eliminating the present problems for the time being, while mapping out measures based on the viewpoint of long run. For the time being, emphasis should be placed on the effective use of existing facilities and improvement of overaged facilities. From the view-

point of long run, the construction of the generation facilities and the strengthening of facilities considering the whole system are necessary.

The following basic consideration is made on each of facilities constituting the system.

(c) In case of the power plants, for the time being, the priority is to be given to operate existing stand-by units more efficiently and to recover the out-put of existing units in the main system. For the long run, the early commencement of the construction of power plants are required in regions which have a serious problem of the shortage of power sources.

(d) In case of the transmission and substation, for the time being, we place emphasis on the elimination of overloaded facilities, improvement of reliability by the interconnection of systems, and strengthening of communication system. For the long run, we considered the reinforcement of facilities for transmission and substation among the facilities of power generations and distribution.

(e) In case of the distribution, for the time being, we placed emphasis on the improvement of distribution facilities in major cities. For the long run, we urge positive introduction of the improvement method based on a long-term facilities plan to minimize the investment which requires a large amount, so that the systematic improvement of facilities may be achieved as soon as possible. We establish the target of service level as follows.

(i) For the major cities of Djakarta, Bandung, Semarang and Surabaja, the level of service should be substantially raised by making the range of consumers' voltage from 107 V to 127 V around 1973 and by decreasing the number of interruptions, and also by eliminating long interruptions in Djakarta.

(ii) As for the other areas than the major cities, we establish the target of service level the same as the major cities, with consideration given to their respective local conditions.

(2) Summary of recommendation

a. Load estimation

(a) Estimation of load increase by factors in Java

Factors \ Year		Five years up/to 1973	Two years for 1974 & 1975
Load Increase caused by Economic Growth	Population Increase	2.5%	2.5%
	Per Capita Income Increase	2.5%	3.0%
Load Increase caused by the Voltage Improvement		2.6%	1.5%
Load Increase caused by the Increase in the Rate of Electrification		3.0%	4.0%
Load Increase caused by the Increased Electric Power Use per Consumer		---	2.4%
Total		10.6%	13.4%

The average increase rate of five years up to 1973 is estimated by considering the power supply capabilities, the average practical load increase is estimated as 10.5 percent per annum.

(b) Estimated annual rate of load increase and maximum load (Total of Java)

Items \ Year	1968 (Actual)	1969	1970	1971	1972	1973	1974	1975	Average Annual Increase 1968-1973	Average Annual Increase 1973-1975
Rate of Load Increase	Base	8.0	8.4	10.1	10.9	15.4	13.2	13.6	10.5	13.4
Maximum Load at Generating End	235.9	254.8	276.3	304.1	337.3	389.3	440.7	500.6	--	--

b. Investment plan for electric power facilities

b-1 Power Plants

West Java

(a) By the more efficient operation of the main system and the improvement of the condition of operation and maintenance, the power supply corresponding to the increase of demand up to 1971 is ensured. Considering the above condition, the installation of new gas turbine at Djakarta which is considered to be operated in 1971 is not necessary.

(b) However, to cope with the power shortage which may happen in the beginning of 1972, the constructions for Priok Units 3 and 4, 50 MW each, should be started in 1969.

(c) The construction schedule for the development of new power sources, which are scheduled to commence operation by the end of fiscal year 1974-1975, needs the preparation in the fiscal year 1970-1971.

Central Java

(a) As a basic measure to solve the very serious shortage of power, it is urgently necessary to start, in the fiscal year 1969-1970, the construction of Semarang Steam Power Station Units 1 and 2 (30MW x 2) in order that they will be commissioned in the middle of 1972.

(b) On the other hand, various preparatory measures should be taken during the fiscal year 1970-1971 for the construction of new power plants whose operation can be started at the end of 1976.

East Java

(a) It is desirable to put Karang Kates Hydro Power Station Units 1 and

2 in operation earlier by the middle of 1972, in order to ensure the stable power supply.

(b) In case of Kalikonto System, the preparatory works should be started during the fiscal year 1970-1971 for the development of new power sources for power supply to be initiated in 1975.

b-2 Transmission lines and substations

(a) As the major construction works in 1969, the interconnection of Tuntang and Ketenger Systems, supplementary works for making double-circuit line from the existing single-circuit line of 30 KV in Central Java as well as the line between Waru and Bangil in East Java, the construction of new substations of West Substation in West Java and Djebres Substation in Central Java, and the reinforcement of communication system in Central and West Java should be carried out.

(b) In the fiscal year 1970-1971, beside the continuative works from the fiscal year 1969-1970, the strengthening of system between Bandung and Tjirebon, the interconnection of Kalikonto and Modiun systems, the construction works of the transmission lines for Karang Kates, and the construction of Antiol Substation should be carried out.

b-3 Power distribution

(a) The investment in fiscal year 1969-1970 should be held within the amount to cope with minimum required demand, with importance attached to the countermeasures for overloading and the improvement of voltage at the center of major cities, as well as to the preparatory measures for full-scale improvement in and after the fiscal year 1970-1971. For this purpose, the following items are recommended.

(i) Grasp of actual condition of the facilities

(ii) Positive use of over-head high tension lines except in the centre

of major cities, standardization of apparatus and materials, and establishment of standard voltages and a long-range plan considering the effective operation and other factors of overall facilities of transmission lines, substation and distribution.

(iii) Consolidation of man power for the designing and the construction work

(b) The real measures for reinforcement should be carried out from the fiscal year 1970-1971.

b-4 Scope of Investment for Java

Unit: Million Rp

Fiscal Year / Power Facilities	1969	1970
Power Plants	958	7,473
Transmission Lines and Substations	1,230	1,687
Distribution Facilities	2,696	5,508
Sub-Total	4,884	14,668
Diesel Units	926	228
Total	5,810	14,896

NOTE: If it is necessary to supply the power for Gresik in East Java, 50 million Rp of additional investment for distribution in fiscal year 1969-1970 will be required.

2-2-2 Method and Approach for Long-term Planning

(1) Fundamental approach

a. PLN which is responsible for the management of enterprise should be the center for the formulation of the long-term plan.

b. In case of the electric power industry of Indonesia which has the following problems, the systematization of its long-term plan should be based upon the economic elements.

(a) The harmonious development of the national economy and the electric power industry should be achieved within the framework of the Five Year Development Plan.

(b) For the strengthening of supply capabilities and the improvement of the services, the investments in facilities are apt to be very large.

(c) The financial and technical assistance from different developed nations are apt to bring about the incoordinated formation of facilities.

c. The electric power industry of Indonesia is required to consider the clear assignment of the role of individual projects, financed by foreign loans, in the whole facility plan, in order to bring about favourable conditions for obtaining loans.

(2) Summary of recommendation

a. The system and method of planning should be arranged.

(a) In order to formulate a comprehensive planning, it is necessary to establish the system for clarifying the future formation of power facilities and alternatives of the plans, and for promoting successful coordination among all sections. It is especially necessary to make a study from the economic viewpoint.

(b) Consequently, it is necessary to establish the standards, methods and so on. such as the principal steps, process of planning, methods of the load estimation, and economic calculation.

b. The following considerations are required for the establishment of the first long-term plan.

(a) Required data should be collected urgently.

(b) The schedule for making above-mentioned standards and methods is necessary.

(c) For the standardization of distribution power supply voltages for the whole country, the formation of facilities in the long-term plan should be made clear. The long-term plan should be established in conjunction therewith.

(d) It is necessary to set up a system as soon as possible in which recommendations of advisors from developed countries can be best made use of. PLN and the Directorate General for Power and Electricity should cooperate with each other to carry out the work in a most effective and efficient way.

c. The long-term plan should be reviewed at an appropriate time with account taken of the following points for improvement of the plan.

(a) Comparison between the plans and results

(b) Grasp of the tendency of total demand for electric energy in the whole country conforming to the economic development

(c) Grasp of the actual conditions of natural energy resources for their economic development

2-3 MANAGEMENT OF OPERATION, MAINTENANCE AND EXECUTION OF PROJECT FOR FACILITIES AND SYSTEMS

This section deals with the "Operation and Maintenance of Plants and Systems" relating to item h- (a) in the Terms of Reference, the "Cost Saving Method for Generation" relating to item i, the "Management of Execution of Project for Electric Facilities" relating to item h- (b), and the "Cost Allocation of Djatiluhur Project and Power Cost of the Station" relating to item e.

2-3-1 Operation and Maintenance of Facilities and Systems

(1) Fundamental approach

a. The management and operation of facilities and systems are the decisive factor in maintaining stable and economic power supply. Whether it is proper or not directly influences the balance of supply and demand, services, and economy, and is also greatly related to the investment for the facilities.

b. The primary requisites to the appropriate management are the proper operation of the facilities and the adequate maintenance that ensures it.

c. The management of facilities and systems which is of controlling importance for the electric power industry of Indonesia is noted to have the following problems.

(a) The electric power systems in Indonesia excluding those in West Java are still in the initial stage and it is hard to say that the importance of management of power system is thoroughly recognized.

(b) Even in West Java, the independence of management for an electric power enterprise is not accomplished in case of the system covered by two exploitasis.

(c) The management of the operation and maintenance of the facilities is not quite satisfactory for the appropriate operation of electric power systems.

(d) The power systems and facilities in Indonesia will be expanded rapidly in accordance with the economic development of the country. Therefore, the reinforcement in quality of the managing system is urgently called for.

d. From the viewpoint mentioned above, the electric power enterprise in Indonesia is required to have a reinforcement for the operation of power systems as well as for the operation and maintenance of facilities.

(2) Summary of recommendation

a. PLN needs to thoroughly recognize the importance, purpose and details of the management of operation of electric power systems and facilities, and should also establish a unified fundamental idea of management. Furthermore, it is important for PLN to achieve the rearrangement and consolidation of the managing system.

For this purpose, the management business should be clarified first for the head office and exploitasis, and then for the branch offices and sector offices as well.

b. The purpose of records, statistics and reports, which are the basis of the management of operation and maintenance of electric power systems and facilities, should be made clear. For attaining this purpose, the rearrangement of necessary data should be performed, the minimum data required for the head office and exploitasis should be collected, and the reporting system which ensures full use of the collected data should be established.

c. In order to achieve an effective management, the improvement of human quality should be attained. Therefore, PLN should positively advance the training and education for the leading staffs and the field technicians.

d. In the case of system operation in West Java where the system are already established, fundamental improvement measures, including those for organization, should be taken for economic system operation.

e. It is desirable to establish a clear-cut responsibility system in the management of the fuel handling for generation, thereby to clarify the scope of business, and smoothen purchasing.

f. In case of the existing power systems and facilities, the following measures should be considered to attain the effective use of facilities.

(a) Effective use of the transformers equipped with on-load voltage regulator.

(b) Effective use of existing facilities at the occurrence of system disturbance by making distinct the specified overloading rates of transformer.

(c) Effective use of existing steel transmission towers in case of changing the system voltage from existing 30 KV to 70 KV

g. In order to maintain the function of existing facilities, the following points should be considered.

(a) Repairing the oil leakage of equipment

(b) Checking and adjustment of the relays

h. Reinforcement of communication equipment, reinforcement of load dispatching panels, readjustment and maintenance of instruments at power plants, and substations, etc. which are all related to the system operation should be attained.

2-3-2 Cost Saving Method for Generation

(1) Principal notion

a. The fuel cost occupies more than 50% in proportion of the power generating cost of steam power stations. For this reason, the operation cost of steam power stations can be most effectively saved by decreasing the fuel cost.

b. In order to attain the cost saving for steam power stations, basically effective measures are to maintain the performance of equipment in high efficiency, preventing the waste of fuel and strictly observing the operation at specified values.

c. From the above-mentioned viewpoint, measures for technical improvements should be studied to bring solution to the problems which are considered to effect the thermal efficiency at existing steam power stations.

d. On the other hand, choice of fuel of a gas turbine consuming a large quantity of fuel like an ordinary steam power unit is one of the factors of importance from the viewpoint of reducing the power generation cost.

(2) Summary of recommendation

a. For the effective operation of steam power stations, efforts should be made to reduce the heat losses by conducting, at proper intervals, the calculation of heat balance from operational records and performance tests.

b. The following technical proposals are made as the cost saving method for Priok Units 1 and 2.

(a) At the present time, the two units are in service with the two high-pressure feedwater heaters separated from the main heat cycles. For this reason, the capacity reduced by 3 MW each. In order to prevent such trouble, it is preferable to install a feedwater flow regulating device at the feedwater inlet side.

(b) The present cleaning method of condenser tubes requires much labour and time, the effect of cleaning, however, has been inadequate. As the specific measures for improvement of such condition, it is important to precede the certainty of no air leakage at a condenser. The continuous cleaning device for condenser tubes with the sponge balls by which cleaning can be done at any time during the operation of turbine without the limitations of loads is effective, but its application should be preceded by checking for air leakage at the condenser.

(c) Due to the inadequacy of water treatment, actual values of dissolved oxygen contained in feedwater and condensate water were increased, and it seems hard to prevent the corrosion of equipment. In order to improve this condition, it is naturally necessary to review the existing mechanical type dissolved oxygen eliminating method, and the chemical treatment method utilizing deoxidizing chemicals should be commonly used. Because

the PH values of feedwater and condensate water are extremely low, injection of a PH controlling chemical is effective.

c. The following technical proposals are made as the cost saving method for Perak Steam Power Station.

(a) At the present time, washing of the flash evaporators is done after shutdowns of units. For making the inservice washing of the flash evaporator possible without shutting down the unit, the air leakage should be prevented by the inspection of each part of evaporators.

(b) The steam temperatures at the superheater outlet of boilers are extremely low, which is undesirable from the viewpoint of heat balance. The following are deemed as the causes of the steam temperature drop. Appropriate measures should be taken after clearing up the cause.

(i) Leakage of the spray water valve

(ii) Contaminated heat transfer surface resulting from incomplete combustion on account of inferior conditions of heavy fuel oil burner

(iii) Occurrence of carry-over resulting from inferior installation of steam separator inside the boiler drum

(c) Corrosion in the superheater tube was observed. This corrosion seems to have resulted from the inadequate preventive measures at the repeated shutdowns in every three month. We suppose that the corrosion has been caused by the indraught of air into superheater tubes, and the drain which has stayed. Since other tubes are in danger of the same corroded condition, it is desirable to take a concrete measure by consulting with the manufacturer or an appropriate consultant.

In case of the long term shutdown of the boilers, there are several measures to prevent the corrosion. For instance, preserving the entire boiler including superheater after filling up boiler with demineralized water with hydrazine and suitable chemicals is one of effective ways.

d. For the choice of fuel for a gas turbine, we have evaluated a remodelling plan for Semarang gas turbine as an example. This study has shown that the remodelling can be done most economically by the use of the IDO. For the implementation of this measure, detailed analysis of the IDO properties should be conducted, and the supplying system of IDO should be established. In addition, close cooperation with AEG, the manufacturer, is required.

2-3-3 Management of Execution of Project for Electric Power Facilities

(1) Fundamental approach

a. The project of electric power facilities is attempted to assure stable supply of electric power which is inseparable from the development of economy and society, as well as the prosperity of social welfare.

b. In order to complete the project of electric facilities, a large amount of materials, investment and labour is required. Its long construction period demands the good cooperation among relevant departments and a plan drawn up for the most economical investment. Furthermore, its implementation must be backed up by the good cooperation, effective use of funds and materials, and efficient management during the long construction period.

(2) Summary of recommendation

a. The management system for the execution of the project of electric power facilities should be established along with the rationalized management method concerning the materials, finance and accounting.

b. In order to establish the management system for the execution of the project, the following points should be taken into consideration.

(a) A general system of construction management of the overall enterprise should be established under which close cooperation can be maintained between PLN head office and exploitasis as well as between all divisions

in the head office for the efficient execution of the project.

(b) The executor of the project should keep in his mind the fact that the full responsibility for the execution lies on him, and he may obtain the help of an appropriate consultant.

(c) The responsible system for the reception and storage of the enormous amount of imported materials should be improved.

(d) The controlling system of the works of the field construction office such as the precise scheduling of construction works and others should be arranged.

(e) The quality of inspection should be improved including the establishment of inspecting system intended mainly for the acceptant performance test conducted under the guidance of the supervisory authorities and by manufacturers.

c. For the rational management of materials and accounting business, the following points should be considered for improvement.

(a) The purchasing and contracting works should be unified in one organization, as well as the technical works concerning construction and maintenance, in order to make clear the responsibility and increase the efficiency of respective works.

(b) Control of quantities, unit prices and amount of money of materials, and their values should be unified in order to make the work efficient and the control of materials intensive.

(c) Calculating method of the unit delivery price of materials should be simplified to make the work efficient.

(d) Accounting management should be unified in one organization in order to grasp the real financial condition of PLN and to control it extensively.

(e) Accounting management should be executed properly by accurate transaction of project assets account.

(f) Distinction between expenditure on capital account and revenue account

should be established clearly, in order to make financial management possible through exact capital and revenue accounting.

2-3-4 Djatiluhur Project

(1) Fundamental approach

a. Cost allocation

(a) As the method of allocation to be applied to the Djatiluhur Project, "Japanese allocation method", which is thought to be the most reasonable, is largely employed.

(b) The calculation of alternative expenditure is based on the standard annual expenditure of a steam power plant having the same value as, and serving as a practical substitute for, the electric power generation in the Djatiluhur Project.

(c) As the present electric rate is not determined based on the electric power cost, the justifiable investment is omitted.

b. Power cost

(a) According to the cost allocation made, the total construction cost for power generation is set at US $87 x 10^6.

(b) We assume the interest rate at 5 percent, the life time at 40 years and the residual value at 10%.

(2) Results of cost allocation

a. Cost allocation

(a) Adjusted construction cost

Construction cost for common facilities:

US $175.3 x 10^6

Construction cost exclusively for power generating facilities:

US $26.7 x 10^6

b. Result of cost allocation

Unit: US $ million

	Flood Control	Irri-gation	Water Supply	Power Generation	Total	Remarks
(a) Alternative Expenditure	42.3	141.4	40.1	94.4		
(b) Justifiable Investment	—	280	40.1	—		
(c) a or b, whichover is smaller	42.3	141.4	40.1	94.4		
(d) Cost for exclusive facilities	—	30	—	26.7		
(e) c - d	42.3	111.4	40.1	67.7		
(f) Separable Cost	—	85.7	11.5	58.6	155.8	
(g) Residual Benefit (e - f)	42.3	25.7	28.6	9.1	105.7	
(h) Percentage of Residual Benefit (%)	40.2	24.2	27.0	8.6	100	
(i) Allocation of the Residual Common Cost	7.8	4.7	5.3	1.7	19.5	175.3 - 155.8
(j) Share (f + i)	7.8	90.4	16.8	60.3	175.3	The construction cost of common facilities
(k) Percentage of Share (%)	4.5	51.5	9.6	34.4	100	

(3) Power cost

US ¢0.83 / KWh

2-4 PROVISIONAL REVISION OF PRESENT TARIFFS

This section is related to item f in the Terms of Reference.

2-4-1 Principal Notion

(1) The electric tariff is an important element of the management of the electric power enterprise, and greatly influences the electric power consumers and the national economy in the ultimate. The structure of electric rate should therefore be based on the following three policies.

(a) Efforts should be made for both the promotion of sound development of the electric power industry and the protection of the interest of consumers.

(b) While promoting the effective management of electric power industry, efficient allocation of resources should be made possible, thereby to contribute to the national economy.

(c) The electric rates should be reasonable and just, and equitable for every sort of demand.

(2) In order to perfectly satisfy the above-mentioned three basic policies, it would be most reasonable to determine the electric tariff on the cost basis. However, if the reviewal is made of all the aspects of Indonesia such as the national life, industrial activities and others, the electric rate based only on the cost will adversely influence the society and economy. Consequently, provisional tariffs principally based on cost but determined with thorough consideration given to the present specific conditions of Indonesia should be adopted for the time being.

(3) Taking the depreciation and interest charge in consideration to attain an effective management, the electric power enterprise should aim at achieving the self-supporting system in future.

2-4-2 Summary of Recommendation

(1) The standard electric rate should be revised to 8.82 RP/KWH on the basis of reasonable total cost.

(2) The rates by the categories of contracts should be decided by making the following rationalization, with thorough consideration of the influence to the consumers. It must be attempted to make the rates according to the respective allocated cost as much as possible.

a. From the viewpoint of the principle of cost basis, the categories by demand should be classified into residential, street lighting, commercial, and industrial uses in concordance with the using and loading conditions. Furthermore, they should be rationally sub-divided by contract in accordance with the scale of demand and rate of voltages.

b. The system of two-stage energy charge must be abolished in the future; and on the assumption that one consistent system of rates will be adopted in the future, the discrepancy between the first stage and second stage should be minimized.

c. According to the principle of cost basis, a high voltage rate should be established.

(3) The share system for construction should be revised as follows.

a. The BP-VA category is to be included in the energy rates. Considering its abolition in the future, it is revised to be Rp. 20/VA.

b. From the standpoint of the national economy, BP-VA is to be recovered through energy rate for industrial consumers.

(4) Not only the rules concerning the energy rates, but also the general rules of electric power supply, which cover all the fundamental area such as the regulations concerning the share system for construction works, should be consolidated.

(5) The power supply rules should be applied with severity and justice. Especially,

the strict enforcement of the rules is required for the collection of electricity charge.

(6) The comparison of the level of existing and revised electricity rates is as follows.

Unit: Rp/KWA

Categories		Level of Revised Rate A	Level of Existing Rate B	A/B %	Scope of Application
By Demand	By Contract				
Residential	A_1 (S_1)	5.80	2.88 (3.60)	201.4(161.1)	Fixed rate for small houses
	A_1 (R_1)	11.53	8.33	138.4	Residential houses
	A_1 (R_2)	13.23	11.59	114.1	Large houses
	Subtotal	7.73	4.78	161.8	
Street lighting	B (U_1)	7.50	2.50	300.0	Street lights
Commercial	C_1 (S_2)	7.28	3.56	204.5	Temples, Schools, etc.
	C_2 (K_1)	13.83	14.56	95.1	Shops
	C_3 (K_2)	16.52	20.14	82.0	Large shops
	C_3 (K_3)	17.62	20.00	88.1	Temporary supply
	Subtotal	11.74	11.61	101.2	
Industrial	D_1 (P) D_2 (P)	7.74	8.61	90.0	Industries
Total		8.82	7.21	122.3	

NOTE: (1) Code in parentheses in the column of contract denotes the existing contract.

(2) Figures in the parentheses in the row of Residential A_1 (S_1) *is the unit cost calculated for 400 H/month as used for the formation of existing rates, and the unit cost in revised rates is calculated for 500 H/month.*

2-5 REQUIRED ADVISORY SERVICES AND THEIR EXPENDITURES FOR REALIZATION OF THE RECOMMENDATIONS

This is related to item j in the Terms of Reference.

2-5-1 Fundamental Notions

(1) Our recommendations described in sections 1 through 5 of the Description contain the following features.

a. Our recommendations cover all the spheres of business in the electric power industry of Indonesia, and describe the diversified components involved in it.

b. Being formed on the basis of a consistent philosophy and approach, all items of our recommendations have a close relationship with each other.

c. Our recommendations provide means and measures by which to improve the quality of the electric power industry of Indonesia in a large extent.

d. Greater part of our recommendations is devoted to indicate the target and the fundamental approach of improvement of respective points.

(2) Accordingly, if the electric power industry of Indonesia is to be developed, realization of its improvement should be based on the recommendations.

However, we believe that an attempt to realize the desired improvement without any external aids will inevitably confront many difficulties and inefficiency.

(3) On the other hand, when we apply our mind to the future mission of the electric power industry of Indonesia, we feel it necessary very strongly to make our recommendations realized as early as possible.

(4) From the viewpoints mentioned above, if the electric power industry of Indonesia desires to put our recommendations into effect concretely, it would be most suitable and effective to push forward its progress with the technical assistance from developed countries whose electric power industries are on a level as high as our recommendations.

(5) In spite of that, the Government of Indonesia should never forget that the management of electric power industry must be done by itself.

2-5-2 Summary of Recommendation

(1) The electric power industry of Indonesia should obtain the technical assistance from a developed country in order to attain an early realization of our various recommendations.

(2) In obtaining the technical assistance from a developed country, the following points should be taken account of by the electric power industry of Indonesia.

a. The primary requirement is to realize our recommendations most effectively. For this purpose, an advisory team comprising experts from a developed country should be invited for the whole recommended items.

b. Preparation, final decision and execution of concrete plans based upon our recommendations should be carried out by the electric power industry of Indonesia. It is desirable to accept timely advices and guidances from the advisors to make the recommendations fruitful in respective processes of improvement.

(3) Items requiring technical assistance, and the number and period of stay of advisors shall be as follows.

a. Items

(a) Preparation of long-term management program

(b) Formation of draft for improving organization

(c) Preparation of the drafts of regulations, standards and so forth in regard to management and operation covering whole business, and their actual operation

(d) Drawing up of hydro-power research program

b. The number of advisors and period of stay

Total number of advisors	12
Period of stay	Two years

(4) Expenditures necessary to invite an advisory team is estimated at approximately U.S. $1.9 million.

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ON
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IN
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NOVEMBER 1969

OVERSEAS TECHNICAL COOPERATION AGENCY
GOVERNMENT OF JAPAN

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IN REPUBLIC OF INDONESIA

VOLUME 1 SUMMARY AND CONCLUSION