

Japan International Cooperation Agency

**Preliminary Study
for
Iraq Reconstruction Project
in
Hashemite Kingdom of Jordan**

**Final Report
March 2004**

**Pacific Consultants International
Nippon Koei Co., Ltd.**

Preface

Japanese government decided to perform the preliminary study for the Electricity, Water and Sanitation, Health, and Education and Vocational Training to formulate projects for its grant aid totaling US\$1.5 billion for Iraq reconstruction. Japan International Cooperation Agency (JICA) dispatched the JICA Study Team to Amman of Jordan from January 9 to March 19, 2004.

The Study Team compiled the results of the study for the Final Report that formulates the projects for urgent reconstruction. The study collected data and information and used interviews with the related persons of Iraq and other surrounding countries.

This Final Report should be effective for the implementation of the grant aid projects as scheduled and to further develop the relationship between Iraq and Japan.

I would like to express my gratitude to all the persons who extended to us their cooperation and support for this Study.

March 2004

Kunimitu Yoshinaga
Director
Japan International Cooperation Agency

Transmittal Letter

We, hereby, announce the finalization of the “Preliminary Study for Iraq Reconstruction Project in Hashemite Kingdom of Jordan” and we would like to submit the “Final Report”.

This study was conducted under the Agreement of Japan International Cooperation Agency and Joint Venture of Pacific Consultants International and Nihon Koei for 3 months from December 19, 2003 to March 31, 2004. This study, based in Amman Jordan, covers the existing conditions for Electricity, Water/Sanitation, Health and Education/Vocational, based on the Logistic and Procurement Conditions. The study investigated and formulated grant aid projects which are most appropriate for the reconstruction of Iraq

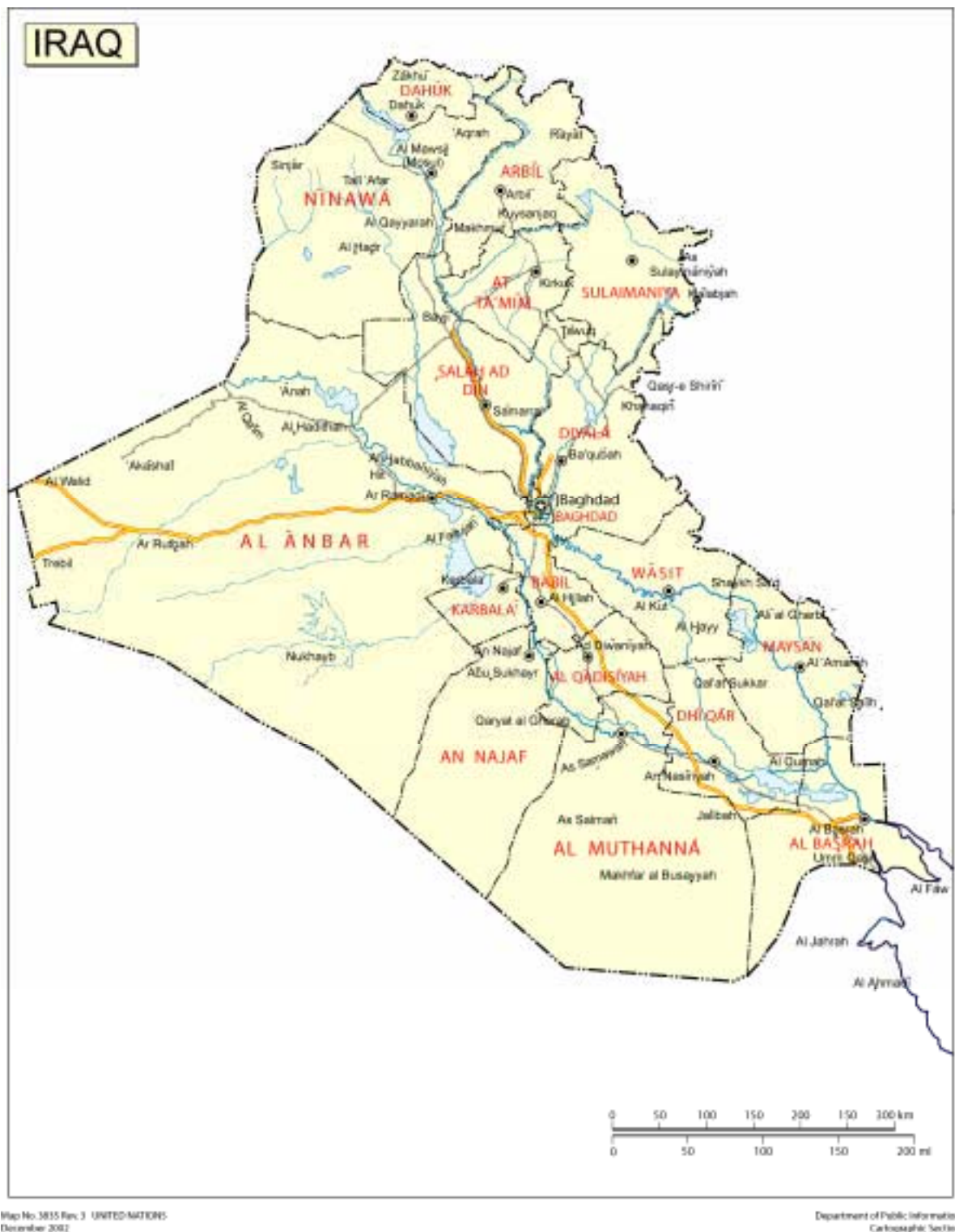
We, therefore, look forward to the practical use of the Final Report for the future development of the Iraq reconstruction.

March 2004

Team Leader

Takahide Fujihira

Representative of Joint Venture
Pacific Consultants International
Preliminary Study of Iraq Reconstruction
Project in Hashemite Kingdom of Jordan



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Abbreviations

ACD/VOCA	Agricultural Cooperative Development International/Volunteers in Overseas Cooperative Assistance, NGO in USA
BM	Baghdad Mayoralty
CPA	Coalition Provisional Authority
CSO	Central Statistical Organization
DFID	Department for International Development
DVE	Directorate of Vocational Education
D.G.	Directorate General
EC	European Commission
EMIS	Education Management Information System
EU	European Union
EVTC	Employment and Vocational Training Center
GER	Gross Enrolment Ratio
HABITAT	United Nations Human Settlements Program
IBRD	International Bank for Reconstruction and Development
IOM	International Organization for Migration
IRRF	Iraq Relief and Reconstruction Fund
KOICA	Korean International Cooperation Agency
MMPW	Ministry of Municipality and Public Works
MOHC	Ministry of Housing and Construction
MOE	Ministry of Electricity
MOED	Ministry of Education
MOHE	Ministry of Higher Education
MDG s	Millennium Development Goals
NEPCO	National Electricity Co., Ltd.
NER	Net Enrolment Ratio
NGO	Non-Governmental Organization
NRRRF	Natural Resources Risk Remediation Fund
OFF program, OFFP	Oil-for-Food Program
OHDACA	Overseas Humanitarian, Disaster and Civil Aid
OJT	On the Job Training
PDMIN	Pacific Disaster Management Information Network
RISE	Revitalising Iraqi Schools and Stabilization of Education
RO	Reverse Osmosis
RTI	Research Triangle Park, NGO in USA
THW	Technisches Hilfsberk
TVE	Technical and Vocational Education
UN	United Nations
UNJLC	United Nation Joint Logistic Center
UNDP	United Nations Development Program
UNESCO	United Nations Education, Scientific and Culture Organization
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
VT	Vocational Training
WB	World Bank
WFP	World Food Program

WHO

World Health Organization

Northern Area : In this report, “the Northern Area” covers Kurdistan region(Dohuk Governorate, Erbil Governorate, Sulaimaniya Governorate), Ninevah Governorate, Taamin Governorate, Salahuddin Governorate and etc., The international organizations such as UNICEF and UNESCO cover Kurdistan region only as the Northern area and classify Ninevah Governorate, Taamin Governorate and Salahuddin Governorate into the Central area. Therefore “the Northern Area” in the sentence referred to the report of UNICEF and UNESCO shall indicate Dohuk Governorate, Erbil Governorate and Sulaimaniya Governorates.

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1. Introduction

1. General

1.1 Outline of Study

1.1.1 Background of Study

The Japanese government expressed its aggressive support for reconstruction of Iraq since it was sure that this was the most important matter for the nation of Iraq and for the peace and stability of the Middle East and the whole world.

Participant countries held the Iraq reconstruction conference in Madrid in October 2004, and committed US\$ 3.3 billion for reconstruction programs. Prior to the conference, the Japanese government declared the amount of US\$ 150 million for the grant aid. On top of this, it added US\$ 350 million as the top figure for the yen credit; thus, the total was US\$ 500 million. Use of US\$ 150 million for the grant aid was limited to the sectors of Electricity, Water and Sanitary, Health, and Education and Vocational Training, since it was considered most important to input funds to the highest necessity and urgent projects for the Iraqi people, to improve life in Iraq.

To achieve this goal, it was necessary to study which projects would bring the highest efficiency in the reconstruction of Iraq on the basis of the limited information, since the rapid implementation of project was a most significant aim for the Iraq reconstruction program.

According to the background described above, this study was based in Amman (Jordan, the neighboring country of Iraq), and the Study Team performed collection of various data and information, analysis, and project formulation.

1.1.2 Purpose of Study

The purpose of the study was the following:

- 1) Collection and analysis of the data and information of the projects received from JICA in Japan and raised in Amman during the study, and verification of the necessity and urgency of them.
- 2) Formulation of candidate projects requiring grant aid based on examination of the technical study for the necessity and urgency of projects.
- 3) Coordination of data and information of the tendency and programs of reconstruction by the other donors like UN organizations.
- 4) Preparation of project profiles including general plan of the project, and cost estimates for project implementation for the candidate projects selected.

1.1.3 Study Area and Collection of Data and Information

The study area was the nation of Iraq, but the study was performed for the collection of data and information based in Amman of Jordan, since the JICA Study Team could not be allowed to enter to Iraq.

For the collection of data and information in Iraq, subcontract with Jordanian consultants, which have branch offices inside Iraq, was made. The branch office of the consultants did the studies and surveys and the results were given to the Study Team through the Jordanian consultants.

1.1.4 Sectors of Study

The followings were the sectors of study:

- Electricity
- Water and Sanitary
- Health

-
- Education and Vocational Training

For the above, the following areas were included:

- Logistics
- Procurement

1.1.5 Study Report

The following reports were submitted to JICA:

- 1) January 9, 2004 : List for the Candidate Projects in Japan
- 2) January 9, 2004 : Report for the Outline of Project Study in Japan
- 3) February 13, 2004 : Report for the Outline of Project Study in Amman (Flash Report)
- 4) March 26, 2004 : Final Report

1.2 Contents of Study

1.2.1 Study in Japan

It was arranged to study the items and methodology for the project list given by JICA and Ministry of Foreign Affair (MOAF). The results were submitted as the “Report for the Outline of Project Study in Japan”, which showed the numbers of projects for scope of the Study Team to be 75 out of the total 171 projects.

1.2.2 Study in Amman

Collection of data and information were made using the methods of interviews, telephone conversations, e-mail exchanges, etc. through the people of firms of proposed project(s) in Japan, related persons of Iraqi, CPA, USAID and UN organizations, etc. The persons for interview are listed by sectors in Appendix-2 of this report.

At the same time, the branch office of the Jordanian consultants which made agreement for the subcontract, collected supporting information by interview, site surveys (including the inspection and photos) according to the questionnaires and interview items given by the Study Team.

Adding to these studies, the intentions of MOFA and CPA were confirmed through the exchange of opinions in telephone conferences. Furthermore, the final intention of MOFA were confirmed for the definite project formulation at the end of February 2004.

1.3 Selection of Candidate Projects

1.3.1 Long List of Proposed Projects

The proposed grant aid projects for the Iraq reconstruction were the following:

1. Projects proposed by trading companies, makers and contractors
2. Projects proposed directly to the Study Team by trading companies, makers and contractors
3. Projects requested by the relation organization of Iraq
4. Projects suggested by international organizations

All the projects totaled 217 which were 46 projects more than the total of 171 projects of the Outline of the Study in Japan. These figures included out of scope projects. The total projects within the scope of the Study Team totaled 115: 32 for Electricity, 33 for Water and Sanitation, 18 for Health, and 32 for Education and Vocational Training. The other 102 projects included the sectors of Ocean Transport, Land Transport, Public Transport, Construction, Industry, Oil, Telecommunications, Agriculture, etc.

These projects are listed up to the “Long list for Proposed Projects” shown in Appendix-1.

1.3.2 Candidate Projects

The 102 projects out of scope were excluded from this study which focused only on Electricity, Water and Sanitation, Health and Education and Vocational Training.

The study team scrutinized 115 projects carefully based on the information collected in Jordan from various resources, taking into consideration MOFA’s guidelines of “Explanation note for the projects for Iraq reconstruction on grant aid in cooperation between Japan and Iraq”.

The fundamental procedure for selecting expected projects is outlined below, with further details described in following chapters by sector.

- ① To confirm the demands, needs and necessity of Iraqis.
- ② To confirm whether assistance to expected projects overlaps with other donor assistance programs. It is also necessary to verify the position of such projects, in the light of the relations with other related projects, and to modify the components of the projects as appropriate.
- ③ To ascertain whether local contractors in Iraq have sufficient capabilities to execute construction under the supervision of Japanese firms located outside of Iraq, since the current conditions do not allow Japanese firms to enter Iraq to supervise the construction works.
- ④ To combine proposed projects into one project, if they have similar components, taking into consideration the request from Iraqi authorities and the effectiveness of the project.
- ⑤ A proposed project is to be divided based on consideration of construction periods, volume of work, etc.
- ⑥ To forward proposed projects to the “Basic Study for Reconstruction and Rehabilitation of Infrastructure in Iraq” Study Team, also dispatched from the JICA, if the proposed projects do not fit to the categories of the grant aid and/or more time is necessary to clarify further in details, even if the proposed projects are under the categories of this project.

The projects selected by the Study Team, engaged by MOFA, are shown separately for each sector as the “Candidate Projects (Shortlist)” in the Final Report. Numbers of projects total 26 projects: namely, Electricity (8), Water and Sanitation (5), Health (8) and Education and Vocational Training (5). Only for Electricity sector, 5 projects in addition to 8 projects described in the Shortlist are recommended to be implemented by the coordination with UNDP on a multilateral basis.

In the Shortlist, the ○ mark is for high priority project judging from the “Problems for Selection of Projects” shown in the “Explanation note for the projects for Iraq reconstruction on grant aid in cooperation between Japan and Iraq”. and the ○-△ mark is for high priority by necessity and urgency but some part is still to be resolved yet.

1.3.3 Survey of Project Outline

The Outline of Project Study is prepared for 26 projects in the Candidate Projects (Shortlist). However for Electricity 5 projects for recommendation to UNDP were also included so that the total becomes 31 projects. The following is the list of areas covered in the Outline of Project Study:

- 1) Project Summary
- 2) Location Map/Detailed Location Map
- 3) Assumption of Implementation Cost

4) List of Equipment and Machineries

1.3.4 Logistic and Procurement

Investigations regarding various problems of concern for project implementation derived from political and social instability in Iraq and its surroundings after the Iraq war (in addition to the study of the necessity, urgency and technical possibility of implementation) were performed in each sector. It is true that the possibility of implementation will be impacted by selection of port, way of land transport, its route, procurement of human resources and materials in Iraq, etc. just as it will be impacted by costs.

Logistics and Procurement Conditions were surveyed from the above aspects:

(1) Logistic Conditions

For each sector, investigation was made about the sea and land transport to study delivery dates based on route, proper insurance, security for transport, costs, etc.

(2) Procurement Conditions

Most of the implementation of the project is the procurement of the equipment and machinery, and installation work in Iraq. Contractors in Iraq or the surrounding countries should perform the installation and supervision, since Japanese are not allowed to enter Iraq. The security of the site is necessary other than the ordinary conditions due to the unstable condition in Iraq. These costs must be properly estimated for the procurement for the estimation of the appropriate project costs, because this is derived from specific conditions of Iraq.

Therefore, the study included the possibility of procurement for consultants and contractors, their capability and costs. The results are reflected in the rough estimates of the project costs.

2. Electricity

2. Electricity

2.1 Outline of Electricity Sector in Iraq

2.1.1 Information Collection Activities

Study Team has collected information that is necessary to formulate projects for the electricity sector. Primary sources of data and information are the following.

(1) Information from the Ministry of Electricity of Iraq (hereinafter referred to as “MOE”)

1) Meeting with the coordination office in Amman

MOE established a coordination office in Amman in January 2004. The office intends to handle project proposals submitted by various international institutions that support Iraq reconstruction. One consultant to the Minister of MOE and two MOE staff members are stationed at the office.

Study Team has conducted interviews with MOE staff covering transmission, substation and generation engineers during the survey. The team was able to obtain the present information on conditions of power plants, transmission systems and substations in Iraq. Study Team also collected information from the questionnaires sent to Baghdad through the coordination office.

2) Meetings with MOE staffs invited to Amman

Since coordination offices of international institutions are concentrated in Amman, MOE staff have often been invited to Jordan for other reconstruction projects. Taking advantage of such visits, Study Team collected information by arranging meetings with those staff whenever needed. Meetings have been held with staff from Hartha Power Plant, the control and communication department, and power sector officials from Northern part of Iraq.

(2) Information Exchange with the UNDP Amman Office

UNDP has been involved in the electricity sector of Iraq reconstruction projects in various parts Iraq (including the three northern governorates) from the outset of the “Oil for Food Programme.” Through the local staffs stationed at project offices in Iraq, UNDP has been collecting information on power plants, transmission system and substations located throughout the country. Study Team has exchanged information with personnel at the UNDP Amman office, and has been coordinating the projects to be implemented by UNDP and those to be implemented by Japan’s grant aid.

(3) Information Exchange with the Coalition Provisional Authority (CPA)

The Coalition Provisional Authority (CPA) has planned and implemented a number of power-related projects in Iraq based on its US\$ 2,994 million budget of fiscal year 2004 for the electricity sector. Study Team has exchanged information with the CPA Baghdad and the CPA South, and has used the information to study and avoid potential overlapping between projects to be implemented by the CPA and those using the Japanese grant aid. The CPA has also supplied local information that was important in developing some of the projects.

(4) Site Investigations by Local Consultants

Study Team collected information through local consultants by questionnaires. Information contained allowed Study Team to investigate the situation of the electricity sector in Iraq, the situation of the candidate project sites, the situation of inland transportation, and so on. Based on this investigation and analysis, Study Team studied the background of the proposed projects, including the surrounding conditions, urgency, and necessity, and feasibility of those projects.

(5) Information Provided by the Firms Proposing Projects

Study Team held fact-finding sessions with Japanese firms and reviewed the contents of the proposed projects throughout the period of this study. Some of the firms had originally procured equipment for the power plants or substations in the country, and some others had performed local engineering

works. Those firms have provided Study Team with detailed and useful information for project formulation.

2.1.2 Overview of the Electricity Sector

Study Team has analyzed the current power condition in Iraq. Findings are summarized below.

(1) Needs of MOE

MOE clarified the contents of their request for Japanese assistance in the “Proposal Plan of Electricity Sector to be Financed by Japanese Grant” of December 9, 2003. A number of projects are contained in this document providing general information of MOE’s needs.

MOE mentioned that it is very important that the power supply system in Iraq be able to cover the peak power demand in the next summer. Study Team was requested by MOE to narrow down the suggested projects for the study and to formulate the top priority projects. To speed up the project formulation, Study Team has divided the narrowed projects into the first priority and the second priority as listed below.

1) First priority projects

- Power plant rehabilitation projects: Rehabilitation of Taji Gas Turbine Power Plant, Mosul Gas Turbine Power Plant, Mosul Hydro No.1 Power Plant, Al Mussaib Thermal Power Plant, and Hartha Thermal Power Plant
- Transmission lines and substation projects: Supply of mobile substations

2) Second priority projects

- New power plant construction projects: Supply of mobile power plants
- Transmission lines and substation projects: Rehabilitation of existing stationary substations
- Other projects: Rehabilitation of maintenance workshop, and other projects (including barge mounted power plants, transformer manufacturing plants, vehicle procurement, etc.)

(2) Current Conditions of Power Plants

Most of the projects requested by MOE focus on rehabilitation of the existing power plants which Japanese firms constructed in Iraq. There are six power plants that were constructed by Japanese firms in Iraq whose total output capacity is 3,219 MW. Table 2.2.1 summarizes the current status of these power plants, and Appendix-1 shows their locations.

These six power plants were constructed in 1970s and 1980s, some of which have been in operation for more than a quarter century. Lack of supply of spare parts has been a big problem for these power plants for a long time, especially after the Gulf War and subsequent imposed economic sanctions. As a consequence of lack of maintenance, all of generators cannot continuously operate at rating output. There are some generators that cannot be operated and have been disposed of already. Immediate repair and maintenance of these plants are crucial. Overhaul by procuring spare parts or replacement with units are urgently required.

Using the spare parts provided under the “Oil for Food Programme,” Iraqi engineers had tried to rehabilitate such power plants. In addition, CPA has continued its maintenance work on power plants. However, condition of the power plants has not improved much because: (a) inadequacy of the spare parts that were provided by non-original manufacturer, and (b) only various small repairing works like patch work was done on an emergency basis. It is thus recommended that these power plants, which had been originally constructed by Japanese firms, should be renovated by Japanese firms with the funds from Japan.

Table 2.1.1 Constructed Power Plants or Procured Equipment by Japanese Firms

Name of the Power Plant	Year of Commissioning	Rated Power Output	Current Condition
Al Mussaib Thermal	1987	1,200 MW (300 MW x 4 units)	- Units 1,3, and 4 : In operation with 200-230 MW each - Unit 2 : In operation with 100 MW
Hartha Thermal	1979	800 MW (200 MW x 4 units)	- Unit 1 : In operation with 180MW - Units 2 and 3 : Rehabilitation work ordered to a Russian firm under the "Oil for Food Programme", but suspended afterwards, thus merely functioning as a supply source of parts for Units No.1 and No.4 - Unit 4 : In operation with 180 MW
Taji Gas Turbine	1976 (Units Nos. 1 to 3) 1979 (Units Nos. 4 to 7)	140 MW (20 MW x 7 units)	- Units 1 and 2 : In operation with 10 MW each. Failures found in cooling systems and control systems - Unit 3 : Out of service due to damage on the rotors and failures in cooling systems and control systems. - Units 4 and 7 : Out of service due to damage on the rotors. - Unit 5 : Retired and abandoned. - Unit 6 : In operation with 10 MW.
Mosul Gas Turbine	1975	80 MW (20 MW x 4 units)	- Unit 1 : Out of service, and the existing gas turbine unit has been replaced with a secondhand unit. - Unit 2: Out of service due to excessive vibration on the speed reduction gear - Unit 3 : Existing gas turbine unit has been replaced with a secondhand unit. - Unit 4 : In operation with 10 MW
Mosul Hydro No.1	1981	750 MW (187.5 MW x 4 units)	Units 1 to 4 : Capable of operation in rating output. Various equipment including bearings, runners, and control systems, need to be overhauled.
Durbandi Khan Hydro	1987	249 MW (83 MW x 3 units)	Rehabilitation has been completed according to the information from Kurdistan engineers. But power generation is limited to only during the irrigation period due to water level of the dam.

Note: Rated power outputs of Taji Gas Turbine Power Plant and Mosul Gas Turbine Power Plant include generation by Japan-made generators, only.

Source: Study Team (based on information up to February 20, 2004)

(3) Conditions of Transmission Lines and Substations

The 400 kV transmission network, which covers the whole country, feeds the capital of Baghdad with the power generated at the hydro power plants in northern Iraq and at the thermal power plants in southern Iraq. Study Team obtained necessary data and information through the local consultant. Current condition of the transmission lines in Iraq is summarized below and in Appendix-2.

- 400 kV transmission lines and substations were destroyed during the war against Iran, and especially the damage of oil facilities and their surrounding area was extensive. Some parts of the transmission lines and substations were destroyed or stolen by the public. About 30% of the transmission system is damaged, and needs to be restored due to the collapse of transmission towers and disconnection of conductors. CPA has been playing a key role in restoring the transmission lines and substations.
- Although some parts of the 132 kV transmission system remain damaged with no restoration works in progress, the system is properly functioning compared with the 400 kV transmission system. It seems that the problem is not in transmission lines, but rather dysfunctional and aged substations caused by the lacking supply of repair parts since the Gulf War. MOE stated that at least 69 substation facilities need to be rehabilitated. According to the results of a survey by the CPA South in 2003, the number of 132 kV substations that are completely or nearly malfunctioning totals 23 (41% out of 56 substations located in the southern area of Iraq). Some

of the 132 kV substations were put into operation even though their control and protective systems are not working properly. In such case, safety (protective) measures cannot be taken at these substations in the event of faults, and this creates a serious threat. CPA has intensively been working on the rehabilitation of the 400 kV transmission lines and substations, but has not fully dealt with the 132 kV system, and little progress has been made to date.

- The distribution lines of 33 kV, 11 kV, and 400 V are barely in service and have problems of aging and high power loss. To enable power to be distributed, a power supply source needs to be provided first; therefore, rehabilitation of transmission lines and substations of higher voltages should be given high priority.

(4) Requirements for Site Construction

The requirements must be met for construction projects where the work shall be conducted without any presence of Japanese personnel at the project sites in Iraq. To fulfill this requirement, Japanese firms must first provide training to the personnel from Iraq or a third country, at the locations in Japan or nearby Iraq, and then perform construction works by remote operation from nearby countries. Therefore, selection of priority projects largely depends on whether projects can be implemented in the above way or not.

(5) Organization of MOE and Operation and Maintenance System

The counterpart agency for the electricity sector is the Ministry of Electricity (MOE) of Iraq. Organization chart of MOE is shown in the Figure 2.1.1. The Power Production division is responsible for operation and maintenance (O&M) of power plants, while the Power Transmission division is responsible for O&M works of substations. Taji Power Plant, for instance, is staffed with about 150 people, out of which 30 are engineers. The staff members have continuously managed to conduct O&M of plants by themselves since the period of “Oil for Food Programme” by utilizing spare parts taken from the same type generators for replacement. Japanese engineers, who participated in generation or substation projects in Iraq in the past, found that local staff had impressively high level of O&M capabilities. Also observed was that Iraqi staff O&M level was as high as, or possibly higher than, that of neighboring countries. Based on such information, Study Team came to a conclusion that MOE and its staff members are capable of performing basic O&M works of the power plants and substations that will be rehabilitated by Japan’s grant aid.

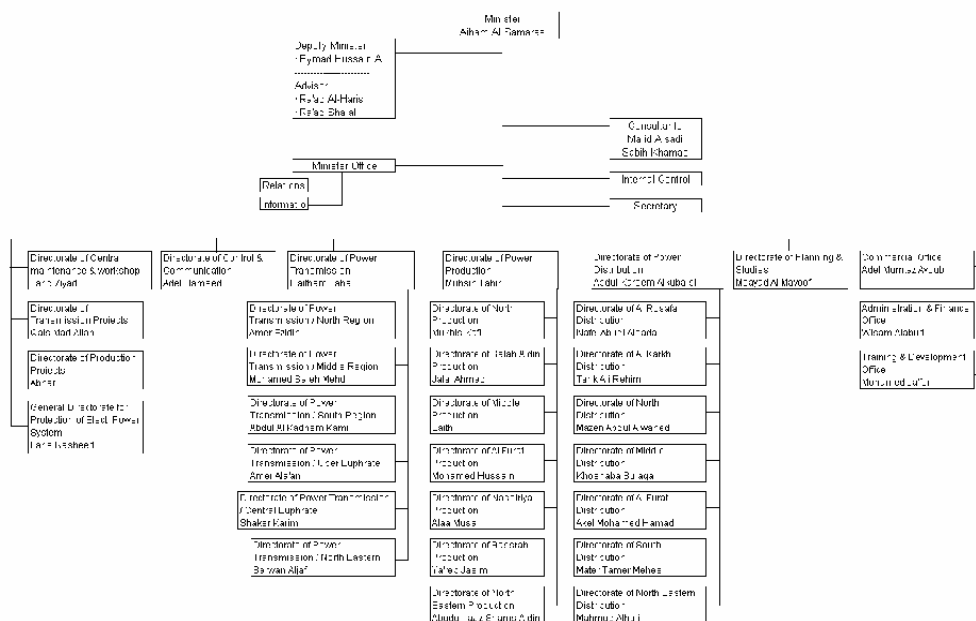


Figure 2.1.1 Organization Chart of Ministry of Electricity

(6) Needs for Training of MOE Staff

As stated above, MOE staff possess adequate O&M capability. Nevertheless, manufacturers will need to provide intensive training for local O&M staff, especially if the projects are to install new systems of control, protection. As MOE has requested, O&M training programs should be included in the assistance projects since they help improve technical capabilities of engineers and skills of new O&M staffs that had been affected by the long economic sanctions imposed in the past. Being one of the essential assistance measures, training will play a significant and important role in realizing reconstruction of Iraq and its power system.

JICA has been studying to develop training programs utilizing a training center owned by National Electricity Power Co., Ltd. (NEPCO) that is a state company responsible for power supply in Jordan. The training center can be used as a possible location for providing O&M training to MOE staff. The training center is located in the compound of the Hussein Power Plant in the city of Al-Zarqa, located about a 45 minutes drive from Amman. The training center was constructed in 1986 by Japan's grant aid. The center provides training programs for operation and maintenance of power plants, substations, transmission systems, distribution systems, control systems, etc. as well as safety measures for power facilities. The training center is furnished with a variety of indoor and outdoor training facilities and accommodations. The training center has accepted trainees from other countries before.

For this reason, the training center is considered as one of the candidate facilities for the O&M training of MOE staffs during implementing the projects. Training of MOE staffs in Japan is also being considered.

2.2 Selection of Candidate Projects

2.2.1 Review of Long List of Projects

A total of 32 projects have been proposed for the electricity sector and they are divided into four major categories as shown below. See attachment for detailed information on the long list of projects.

Table 2.2.1 Review of Long List of Projects

Category	Number of Long-Listed Projects
Category 1 Rehabilitation of existing power plants (Projects to restore original power generation capacity)	6
Category 2 Construction of new power plants (Projects to increase power generation capacity)	13
Category 3 Substations, transmission lines, and distribution lines	8
Category 4 Others (including telecommunication system)	5
Total	32 Projects

Source: Study Team

The long list of 32 projects include not only those that had been submitted to the Japanese Ministry of Foreign Affairs before the start of the Study, but also those that had been requested by Iraq or proposed by Japanese firms during the Study. Similar proposed projects are separately listed in the long-list.

Some firms have included installation works in their scope of work, while others have proposed only equipment procurement, excluding installation works.

High-quality proposals have been submitted in case of rehabilitation projects of existing power plants, since the proposing firms are well versed in local conditions and existing facilities at the project sites. On the other hand, many proposals have been submitted for projects of mobile type power plants or substations, but the majority of them were lacking in-depth investigation, thus requiring further studies.

While formulating the long list, Study Team found that it had to analyze and reconstruct the proposed projects in a way that, for example, training programs for MOE and installation firms are contained in the project scope.

2.2.2 Shortlisting of Proposed Projects

Study Team narrowed down the 32 long-listed projects into candidate (shortlisted) projects based on a variety of data and information collected. Shortlisting was conducted on the basis of the following procedures.

(1) Projects to be deleted from the short list (projects that are not shortlisted)

Projects that fall into one or more of the criteria described below were deleted from the list.

- Projects for which Japanese nationals need to enter into Iraq for detailed design or supervision of installation, even if supervisors from a third country are sent to Iraq, or even if local engineers are employed.
- Projects for which exact locations of the procured facilities cannot be identified.
- Projects that merely procure materials (specifically, the projects that can fulfill required functions by merely procuring the materials)
- Projects that do not need to be urgently executed and instead should be implemented under a development master plan through research, investigation, and analysis
- Projects that were submitted just before the Study finished, and therefore, not enough time was available for thorough investigation.

(2) Projects to be integrated with other projects

- Projects that are obviously similar to each other in nature
- Projects that are of similar nature and located in different areas, reflecting MOE needs.

2.2.3 Selection of ShortListed Projects

Study Team took the following steps and narrowed down the long list of projects into a shortlist based on the above rules.

(1) Rehabilitation of existing power plants

Long list of projects for power plant rehabilitation category are the following six projects:

- LE-1** Urgent Rehabilitation of Taji Gas Turbine Power Plant
- LE-2** Urgent Rehabilitation of Mosul Gas Turbine Power Plant
- LE-3** Urgent Rehabilitation Plan of Mosul Hydraulic Power Plant
- LE-4** Urgent Rehabilitation of No. 2 unit of Almussaib Thermal Power Plant
- LE-5** Urgent Supply of Spare Parts for Pumping System at Almussaib Thermal Power Plant
- LE-6** Urgent Supply of Spare Parts for Steam Turbine Units No.1 and No.4 at Hartha Thermal Power Plant

- Projects to be deleted for the shortlist

No power plant rehabilitation projects were deleted for the shortlist. Above mentioned six projects were originally procured and constructed by Japanese firms, who understand the local conditions fairly well. Therefore, it is expected that above projects can be successfully implemented without any presence of Japanese personnel at the site.

- Project integration with other projects

All six projects are different in nature and no project integration was necessary.

(2) Construction of new power plants

Long list of projects in this category are the following thirteen projects:

- LE-7** Urgent Installation of Barge Mounted Power Plant(s) (proposed by Firm A)
- LE-8** Urgent Installation of Barge Mounted Power Plant(s) (proposed by Firm B)
- LE-9** Urgent Supply of Container Type Mobile Power Plants
- LE-10** Urgent Supply of Mobile Generator Units
- LE-11** Urgent Supply of Mobile Gas Turbine Power Plants and Substations
- LE-12** Urgent Supply of Mobile Generator Units
- LE-13** Extension of Gas Turbine Generator Unit in Hartha Power Plant and Rehabilitation of Grid Substations
- LE-14** Construction of Diesel Engine Power Plant in North Iraq
- LE-15** Supply of Small (30-50kVA) Diesel Generators in North Iraq
- LE-16** Construction of Micro Hydro Power Plants in non-electrified villages in North Iraq
- LE-17** Construction of Erbil Gas Turbine Power Plant
- LE-18** Construction of Dohuk Gas Turbine Power Plant
- LE-19** Construction of Diesel Power Plants

- Projects to be deleted for the shortlist

Projects LE-7 and LE-8: The projects are to resolve power shortage in southern Iraq by installing barge-mounted 60 MW power plant(s) at a port in southern Iraq (Khor Al-Zubair is under consideration). This type of power plant will be assembled and tested on a barge in Japan before delivery, and then transported to Iraq as a completed power plant. Advantages of introducing a barge-mounted power plant are that local installation work is expected to be relatively simple, and that fuel used for a power plant, heavy fuel oil, is widely available in the area of project site (since diesel fuel is running short in Iraq). However, both projects were deleted from the shortlist for the following reasons:

- Presence of Japanese personnel at the site is required for completing detailed design of the projects, such as determining an appropriate barge mooring method, geotechnical study, transmission lines construction plan in detail, and so on.
- Planning of BOT project for construction of 132 kV transmission lines (60 km in total length) between Basra and Kuwaiti is in progress. It is expected that the construction will commence in June 2004 and six to seven months are required for its completion, and 200 MW will be imported. In addition, Bechtel is planning to install two of the 120 MW gas turbine units in southern Iraq. This will add the total electricity supply of 440 MW to the transmission network in southern Iraq.
- MOE has been requesting the earliest possible restoration of the nation's power system. However, at least 16 to 17 months are required to complete construction of this power plant. Study Team came to the conclusion that the projects are not effective enough in quickly resolving the power shortage in Iraq. In addition, it is not expected that electricity from the barge-mounted power plant will supply up to the peak demand of the next summer season.
- Project cost is relatively high (nearly US\$100 million for one unit) considering its power output of 60 MW. Under such circumstance, MOE has not requested this project with high priority.

Project LE-13: The project is to install a new unit of 125 MW gas turbine generator in the area of existing Hartha Power Plant located in southern Iraq. Being the original firm that had procured and installed the existing steam gas turbines, the proposing firm was versed in the detailed site conditions. The proposed project submitted by the firm was expected to be significantly effective in resolving the power issue in Iraq. However, it is difficult to execute the detailed design on the project without presence of Japanese engineers at the site. The size of the power plant (and its facilities to be restored) is too large to install the power plant; hence,

successful installation as well as assistance in operation and maintenance for the plant may not be effective or efficient without any instruction from Japanese personnel of the original manufacturer. The project is thus considered to be unrealistic to implement at this time.

Project LE-14: The project is to construct a new 29 MW diesel power plant. Construction of a diesel power plant of this size requires various technical investigations, and involves construction of a power plant building, fuel tanks, and other auxiliary equipment. It is expected that nearly 20 months will be required to complete all the works. Study Team came to the conclusion that this entire process (design, specification preparation, manufacturing, and installation) would not be completed without Japanese nationals entry into Iraq for conducting various tasks.

Project LE-15: The project is to procure many diesel engine generators (each 30-50 MVA rating). Identifying 200 locations for installation of the generators would be very difficult. Even if they could be identified, as the generators are compact in size, they might be removed after installation and be used for other purposes. Therefore, the project was unlisted.

Project LE-16: The project is to construct small hydro power plants in over 28 non-electrified areas at Kurdistan of northern Iraq. But small hydro projects should be implemented under the development plan that takes into account local water resources. In addition, what should be focused at the moment is to provide stable electricity to city areas as soon as possible, rather than to non-electrified remote areas. The projects are considered as premature and thus deleted from the shortlist.

Project LE-17 and LE-18: These two projects are to construct 50 to 100 MW gas turbine power plants in Erbil and Dohuk, capitals of Kurdistan provinces. It is considered that local construction firms or those from a third country would be able to successfully complete the tasks of installation. However, Study Team considered the following factors: (a) the project sites are located where no Japanese firms have ever implemented a construction project, (b) the works require civil works including pile driving, and (c) it might be difficult without Japanese personnel presence at the project sites to perform all engineering works by assistance of only, for instance, photos or other information provided. The projects were thus deleted from the shortlist.

Project LE-19: The project is to construct a new diesel power plant. It was deleted from the shortlist with the same reasons as described in the **Project LE-14**.

- Projects to be integrated with other projects

Project LE-9, LE-10, LE-11, and LE-12: These four projects were integrated as one mobile power plant project for further study.

(3) Substations, transmission lines, and distribution lines projects

The following 8 projects are long-listed for the substations, transmission lines, and distribution lines categories.

- LE-20 Urgent Installation of Mobile Substations in the North and Middle of Iraq
- LE-21 Urgent Installation of Mobile Substations in the South of Iraq
- LE-22 Urgent Rehabilitation of Distribution Substations in the South of Iraq
- LE-23 Urgent Rehabilitation of Distribution Substations in the North and Middle of Iraq
- LE-24 Urgent Rehabilitation Plan for Substation in Kirkuk Region
- LE-25 Urgent Rehabilitation Plan for Substations in Basrah
- LE-26 Supply of Sectional Steel Poles
- LE-27 Supply of Distribution Line Materials in North Iraq

- Projects to be deleted from the shortlist

Project LE-22 and LE-23: These projects are to construct new grid substations. In order to construct a full-fledged substation, a power network has to be thoroughly examined from a

long-term perspective, taking into account power development plans and demand forecast. However, such systematic study may take a long time to undertake, which is contrary to the fundamental concept of urgent recovery of power systems in the nation. Thus, the projects were deleted from the shortlist.

Study Team agreed with the following ideas of MOE for renovation of grid substations throughout Iraq.

- Stable electricity should be supplied promptly by installing mobile substations into existing substations damaged or substations where the transformer capacities are insufficient to meet the demand.
- Thorough investigation and rehabilitation, planning should be carried out in the subsequent years, followed by complete renovation of each of the power plants.
- Upon completion of the renovation for one substation, mobile substations should be allocated to another existing substation that requires rehabilitation, repeating the same procedures.

Project LE-26: The project proposes to procure prefabricated utility poles (panzer masts), but it is difficult to determine project locations. Since the project is merely an equipment procurement plan, it was deleted from the list.

Project LE-27: The project is to procure equipment and materials (e.g., electric wires and insulators) used for distribution lines. It is proposed that Iraqi workers implement construction works. The project was deleted from the list for the following reasons:

- Because of the nature of the project, which is to merely procure equipment
 - In order for a project to fully cover a complicated distribution network, presence of Japanese personnel is inevitable
- Projects to be integrated with other projects

Project LE-20, LE-21, LE-24 and LE-25: The above four projects were integrated into a single substation project. The project requires investigation of mobile substation types, installed capacity, and benefited areas.

(4) Other projects

From the long –list of projects that do not fall into any of the three categories above are the following five projects.

LE-28 Rehabilitation of Telecommunication System in Iraq

LE-29 Provision of Vehicles for Ministry of Electricity

LE-30 Rehabilitation of Taji Gas Turbine Maintenance Factory

LE-31 Urgent Rehabilitation Plan for Transformer Production Line of Diyala Transformer Factory

LE-32 Rehabilitation of Crude Oil Production Facilities in East Baghdad

- Projects to be deleted from the shortlist

Project LE-28: This project is to procure and install Optical Fiber Composite Overhead Ground Wire (OPGW) and microwave radio communication facilities that are utilized for MOE's Supervisory Control and Data Acquisition (SCADA) systems. Such communication infrastructures for power system are essential to operate SCADA systems. However, this type of project should be planned based on comprehensive studies from the aspect of a long-term development. In addition, determining project locations is very difficult without these surveys. Thus, the project was deleted from the shortlist.

Project LE-32: This project is to secure fuel for the Taji Power Plant and other facilities by rehabilitating the existing oil production facilities in east Baghdad and improve their oil

production. Because the project was submitted right before Study Team finished the local survey, not enough time was available for thorough investigation. Therefore, the project was deleted from the shortlist.

- Projects to be integrated with other projects

All projects mentioned above are different in nature and no project integration is necessary.

2.2.4 Evaluation of Shortlisted Projects

Table 2.2.2 shows the final shortlisted projects. All of the 13 short-listed projects, including recommendation for UNDP, are considered to play an important role for Iraq reconstruction. Study Team has divided the listed projects into two classes from the following aspects:

- Top priority projects (indicated as “○”): Projects that are expected to contribute to improvement of the nation’s electricity sector immediately upon completion of each project.
- Priority projects (indicated as “○-△”): Projects that are expected to bring ample benefit to Iraq although their impacts may not be immediate.

Japan’s grant aid for Iraq reconstruction will be implemented in the forms of either direct assistance or trust fund. Study Team presumes that some of the projects will be implemented through UNDP. Hence, Study Team has made an arrangement with UNDP and recommended that UNDP scheme be used for the following projects:

- Projects on which UNDP has conducted surveys as its own project so the institution is well versed in local conditions, and thus project management should be implemented by UNDP.
- Projects that will be divided into two projects (such as Phase 1 and Phase 2) and implemented by both direct assistance scheme and UNDP scheme so that smooth power recovery will be expected.

Study Team has surveyed and reviewed the projects and has drawn a conclusion at the present below.

Project E-1 Urgent Rehabilitation of Taji Gas Turbine Power Plant (Phase 1)

The project is proposed as one of the top priority projects, and is to be implemented using the direct assistance scheme.

Taji Gas Turbine Power Plant is located near Baghdad and was originally constructed by a Japanese firm. Rehabilitation of this power plant is listed at the top of Iraq’s priority list. The power plant contains seven Frame5-type gas turbine units (with each output capacity of 20 MW), among which four units (Units 1, 2, 3, and 5) will be replaced with new units under the project. The installed generation capacity for the four units will be 100 MW, which is expected to supply electricity to 250,000 to 300,000 people in Baghdad and its vicinity.

Under the assistance of UNDP, the original Japanese manufacturer of the existing units dispatched its Japanese engineers to the site and conducted a site survey in December 2003. Referring to the result of site survey and documents and drawings related to the time of construction, the original manufacturer has proposed a plan to rehabilitate the power plant. Study Team has determined the proposed project is reasonable and proper to implement, based on information obtained from MOE, local consultant, and so on.

It is expected that the installation works will include replacement works of gas turbine unit only so that peripheral equipment such as transformers will be able to be reused. Study Team assumes that the installation works can be executed by a company in a third country that has experience in Iraq.

Project E-2: Urgent Rehabilitation of Mosul Gas Turbine Power Plant (Phase 1)

The project is proposed as one of the top priority projects, and is to be implemented using the direct assistance scheme.

A Japanese firm constructed the Mosul Gas Turbine Power Plant in Mosul, the second largest city in Iraq. Rehabilitation of this power plant is also listed on the top of the Iraq’s priority list. The power

plant contains four Frame5-type gas turbine units, among which two units (Unit 1 and Unit 3) will be replaced with new units under the project. Replaced two units will be 50 MW in installed capacity, which is expected to supply electricity to 125,000 to 150,000 people in Mosul and the vicinity.

Just like the case for the Taji Power Plant, the Japanese original manufacturer dispatched its Japanese engineers to the site and conducted a survey in December 2003 under the assistance of UNDP. The firm has proposed a detailed plan that is based on the local survey as well as on the original design documents the firm possesses. Study Team has determined, in light of the requests from MOE and the findings of the local consultant survey team, the project is reasonable and proper to implement.

In developing the project implementation plan, the Team has considered possible site works and training.

Project E-3: Urgent Rehabilitation of Mosul Hydraulic Power Plant

The project is proposed as one of the top priority projects, and is to be implemented using the direct assistance scheme.

The project is to rehabilitate the Mosul Hydropower Plant, the largest hydro power plant in Iraq with 750 MW output capacity, which is located about 50 km northwest of Mosul city. A Japanese firm originally procured its hydroelectric generators in 1986 that are to be rehabilitated under the project. Iraqi staff have managed to keep the power plant in operation in spite of lack of supply of spare parts that had been brought on by economic sanctions after the Gulf War. The power plant requires an extensive overhaul immediately as the available spare parts are very short.

In January 2004, the Japanese original manufacturer of the existing hydraulic turbine generators conducted a site survey by delegating Iraqi engineers. Based on the survey findings, the Japanese manufacturer has made a list of equipment that needs to be replaced, and then established rehabilitation plans for the existing hydraulic turbine generators that require urgent repairs.

This project has been proposed as one of the top priority projects since this 750 MW-plant has been playing a very important role in Iraq, where current output capacity is around 4,500 MW total. In addition, this power plant is significant because it utilizes natural energy resources in Iraq. Training for MOE engineers and dispatching supervisors from a third country to the site are necessary for installation works.

Project E-4: Urgent Installation of Mobile Substations (Phase 1)

The project is proposed as one of the top priority projects, and is to be implemented using the direct assistance scheme.

There are many substations that are damaged during the war against Iraq or are deteriorated by inadequate maintenance works on the equipment due to the lack of spare parts by economic sanctions after the Gulf War. The dysfunctional substations of 132 kV, which distribute the electricity to people and industries, affect the daily life of people and the industrial activities. It is clear that there are sixty (60) 132 kV substations which are damaged and require to be repaired.

MOE has requested the Japanese Government to install 40 mobile substations at the key substations in Baghdad and other major cities. This project is to provide 27 mobile substations to improve the selected 23 substations in Baghdad and its suburbs. Mobile substations will improve the supply of transformer capacities to supply the stable power. Benefited population who will be supplied with electricity from mobile substations is expected to be totaling about 270,000 households, or 1,350,000 to 1,600,000 people.

Project E-5: Urgent Installation of Mobile Substations (Phase 2)

In consideration of increase of power demand and generation capacity, this project is to provide 13 mobile substations in addition to the 27 mobile substations, which will be provided in Phase-1.

Project E-6: Urgent Installation of Mobile Power Plant

The project is proposed as one of the top priority projects, and is to be implemented using the direct

assistance scheme. A necessary condition for implementation of the project is that adequate supply of natural gas is available at the site.

The plan is to procure and install a 40 MW trailer-mounted mobile power plant at Samawah and is expected to resolve the region's power shortage problem. The project will remedy the scheduled load shedding, and benefited population is expected to be about 200,000 to 240,000 people, or 40,000 households. City of Samawah was selected as a potential project site for the following reasons:

- 1) Among the four southern governorates, Muthanna governorate and its capital, Samawah, is experiencing the most severe power shortage, with its power outage rate of 52% (which means stable electricity is not available during 52% of the day)
- 2) Although the city has a power plant, the electricity from the power plant is supplied only to the cement plant not to residential areas. In addition, the power plant is so old and deteriorated that even the supply to the cement plant is not adequate.
- 3) CPA is planning to construct a 40 MW gas turbine power plant in Samawah, but the generation will be mainly consumed at a cement factory near the power plant. Thus, CPA has also acknowledged the necessity to establish a new power source for the area.
- 4) Information exchange with the CPA is expected to supply necessary data and information that are otherwise usually difficult to obtain but are necessary for power plant construction.

As CPA planned, the mobile power plants will be powered by gas turbine generators that are fueled by natural gas. Land space to install the power plants of both for the CPA project and this project is available nearby the Old Samawah Substation, which is considered as the predominant project site.

CPA plans to extend the existing main gas pipeline by 10 km to Samawah. It is recommended that this project be promoted in cooperation with CPA.

Project E-7: Rehabilitation of Central Workshop at Taji

The project is proposed as one of the priority projects, and is to be implemented using the direct assistance scheme.

The workshop was originally constructed by a Japanese firm and is currently staffed with 14 engineers, 23 office workers, and 81 site workers under the supervision of MOE.

The project is to rehabilitate the facilities in the existing maintenance workshop that have been damaged and deteriorated since its commissioning in 1983. High priority was not given at first to this project because it was considered that higher priorities should instead be given to rehabilitation projects of existing power plants and substations, rather than a maintenance workshop that rehabilitates those facilities. However, as many international institutions and governments including Japan have proposed a number of rehabilitation and construction projects of gas turbine power plants, it has become evident that rehabilitation of the workshop facilities that are intended to repair and maintain those gas turbine units will be required urgently.

Although it may be difficult to quantify potential benefited population, it is expected that the project will not only meet the demand as mentioned above, but also contribute to the succession and improvement of maintenance skills as well as to training of new employees at the workshop, which has been supported by technical assistance from Japanese firms, and thus this project is well worth implementing using the Japan's grant aid scheme.

A firm proposing this plan has conducted a local survey to investigate the existing workshop facilities, and amongst various equipment that needs renovation or replacement, the firm formulated a list of priority equipment to be procured. It is expected, therefore, that the project will be successfully implemented and will contribute to Iraq reconstruction.

Project E-8: Urgent Rehabilitation of Diyala Transformer Factory

The project is proposed as one of the priority projects, and is to be implemented using the direct assistance scheme.

The project is to rehabilitate the production facilities at the only transformer manufacturing plant in the Middle East, which was constructed by the Iraq Ministry of Industry and Minerals under the supervision of a Japanese firm. The plant manufactured a number of power and distribution transformers since its commissioning in 1983.

Japan's grant aid for Iraq reconstruction has focused on electricity sector's core fields such as power plants and substations to meet MOE's demands, rather than on downstream fields such as distribution facilities. As Iraqi engineers are highly skilled compared with those in other grant aid recipient countries, it may be possible to manufacture transformers for local distribution networks. However, rehabilitation of transformer manufacturing plant can improve production capacity, providing a chance for domestic procurement in the near future. Increasing demand for local employment is expected, while the project will not only enhance domestic production of power and distribution transformers but it will also allow succession of manufacturing technologies of Iraqi personnel.

The counterpart agency for the project is the Iraq Ministry of Industry and Minerals.

Project E-9: Urgent Rehabilitation of Taji Gas Turbine Power Plant (Phase 2)

The project is proposed as one of the top priority projects, and is to be implemented using the UNDP scheme.

The project aims at recovering the power plant's output up to its installed capacity by replacing, among the 7 gas turbine units originally procured by a Japanese firm, 3 gas turbine units (namely Units No. 4, 6, and 7) that are not replaced under the Phase 1. Expected recovered total output is 60 MW that will provide electricity to about 30,000 households, or 150,000 to 180,000 people.

UNDP, together with the original manufacturer, has conducted site surveys for power plant rehabilitation. It is expected that rehabilitation work of equipment is as complicated as, or possibly more complicated than the replacement work of equipment with the new one. Therefore, it is considered to be more effective if the project is executed under the supervision of UNDP, which deploys its own staff inside Iraq.

Project E-10: Urgent Rehabilitation of Mosul Gas Turbine Power Plant (Phase 2)

The project is proposed as one of the top priority projects, and is to be implemented using UNDP scheme for the same reasons as those for Project E-9.

The project aims at recovering the power plant's output up to its installed capacity by replacing, among the 4 gas turbine units originally procured by a Japanese firm, 2 gas turbine units (namely Units No. 2 and 4) that were not rehabilitated and replaced under the Phase 1 project. Expected recovered output is 40 MW total that will provide electricity to about 20,000 households, or 100,000 to 120,000 people.

Project E-11: Urgent Rehabilitation of No. 2 unit of Al Mussaib Thermal Power Plant

The project is proposed as one of the top priority projects, and is to be implemented using the UNDP scheme.

Al Mussaib Thermal Power Plant is located about 75 km south of Baghdad and a Japanese firm originally procured its boilers, plant auxiliaries, and control systems. Four units of steam turbine generators with 300 MW capacity each allow this thermal power plant to generate massive 1,200 MW in total. The project aims at recovering the plant's output by providing replacement equipment for the severely deteriorated Unit No. 2. The power plant plays a key role in electricity supply to Baghdad, and it is considered that the plant should be rehabilitated properly by the original Japanese manufacturer through the Japan's grant aid scheme. It is recommended that the project be implemented through UNDP since the institution has been conducting a survey on this project from the outset of Iraq reconstruction.

Project E-12: Urgent Supply of Spare Parts for Pumping System at Al Mussaib Thermal Power Plant

The project is proposed as one of the top priority projects, and is to be implemented using the UNDP scheme.

A Japanese firm originally manufactured the existing circulating water pumps. Prompt provision of water pump equipment can reduce the risks of power supply stoppage of the Al Mussaib Thermal Power Plant, one of the most important power plants in the nation. Study Team recommends the project be implemented simultaneously with the Project E-11 through UNDP because both are targeting the same power plant, and the E-11 project is to be implemented through UNDP as well, and also because the overall project cost has been set at relatively low JPY 300 million.

Project E-13: Hartha Thermal Power Plant - Equipment Procurement Plan for Unit 1 and Unit 4

The project is proposed as one of the top priority projects, and is to be implemented using the UNDP scheme.

A Japanese firm manufactured and installed the existing four units of 200 MW steam gas turbine generator in Hartha Power Plant. Under the Oil for Food Programme, Russian and Italian firms were contracted for rehabilitation of boilers for Units No. 2 and No. 3, but the control system which they procured were not compatible with the existing steam boiler system, leaving the power plant as still damaged until today.

UNDP has made a negotiated contract with the original manufacturer for procurement of spare parts necessary for operating Units No. 1 and No. 4 in the next three months, since such spare parts should be provided by the original manufacturer.

Continuously, the project is to procure additional spare parts for the same Units No.1 and No.4, which are not specifically listed under the UNDP's equipment procurement list but nonetheless is considered necessary to prevent possible malfunctioning of the plant in the near future. It is recommended under these circumstances that the project be implemented through UNDP.

Table 2.2.2 Shortlisted Projects

Serial No.	Sector No.	Sector	Project Name	Project Site	Executing Agency	Project Profile	Costs (100 mi. Yen)	Implementation Period	Priority
1	E-1	Electricity (Rehabi. of Generation)	Urgent Rehabilitation of Taji Gas Turbine Power Plant (Phase-1)	Taji	MOE	• Existing gas turbine generator units of No.1, No.2, No.3 and No.5 will be replaced with new units.	71.9	12 months	○
2	E-2	Electricity (Rehabi. of Generation)	Urgent Rehabilitation of Mosul Gas Turbine Power Plant (Phase-1)	Mosul	MOE	• Existing gas turbine generator units of No.1 and No.3 will be replaced with new units.	45.1	10.5 months	○
3	E-3	Electricity (Rehabi. of Generation)	Urgent Rehabilitation Plan of Mosul Hydraulic No.1 Power Plant	Mosul	MOE	• Replacement of spare parts for water turbines and generators (187.5MW x 4), such as bearings, exciters, governors, etc.	56.0	24 months	○
4	E-4	Electricity (Rehabi. of Generation)	Urgent Installation of Mobile Substations (Phase-1)	Baghdad and local cities	MOE	• Supply and Installation of 132/33kV 25MVA 16 units • Supply and Installation of 132/33kV 25MVA 11 units	78.5	9 months to 13 months	○
5	E-5	Electricity (Substation)	Urgent Installation of Mobile Substations (Phase-2)	Local Cities	MOE	• Supply and Installation of 132/33kV 25MVA 4 units • Supply and Installation of 132/33kV 25MVA 9 units	39.0	9 months to 13 months	○
6	E-6	Electricity (New Generation)	Urgent Installation of Mobile Power Plant	Samawah	MOE	• Mobile gas turbine power plants of 40 to 60 MW in total will be installed at Old Samawah Substation. (under study)	58.5	12 months	○-△
7	E-7	Electricity (Others)	Rehabilitation of Central Workshop at Taji	Taji	MOE	• Urgent Provision of machine tools for the central workshop of MOE.	12.5	12 months	○-△
8	E-8	Electricity (Others)	Urgent Rehabilitation of Diyala Transformer Factory	Diyala	Ministry of Industry and Minerals	• Rehabilitate the Power and Distribution Transformer Production Machine	10.5	8.5 months	○-△
9	E-9	Electricity (Others)	Urgent Rehabilitation of Taji Gas Turbine Power Plant (Phase-2)	Taji	MOE	• Existing gas turbine generator units of No.4, No.6 and No.7 will be rehabilitated.	24.2	21 months	○ (through UNDP)
10	E-10	Electricity (Rehabi. of Generation)	Urgent Rehabilitation of Mosul Gas Turbine Power Plant (Phase-2)	Mosul	MOE	• Existing gas turbine generator units of No.2 and No.3 will be rehabilitated.	16.1	17 months to 19 months	○ (through UNDP)
11	E-11	Electricity (Rehabi. of Generation)	Urgent Rehabilitation of No. 2 unit of Almusaiib Thermal Power Plant	Almusaiib	MOE	• Upgrade the No.2 unit output (from 100MW to 200MW) • Overhaul the boiler, plant control, auxiliary equipment and supply of the spare part	46.3	6 months	○ (through UNDP)
12	E-12	Electricity (Rehabi. of Generation)	Urgent Supply of Spare Parts for Pumping System at Almusaiib Thermal Power Plant	Almusaiib	MOE	• Provision of spare parts for pumping system for circulating water system	2.8	12 months (FOB)	○ (through UNDP)
13	E-13	Electricity (Rehabi. of Generation)	Urgent Supply of Spare Parts for Steam Turbine Units No.1 and No.4 at Haltha Thermal Power Plant	Haltha	MOE	• Provision of spare parts for No.1 and No.4 units of steam turbines	21.0	8 months (FOB)	○ (through UNDP)

2.3 Project Profile

Project Profile (Project Summary)

Sector	Electricity
Project Name	Urgent Rehabilitation of Taji Gas Turbine Power Plant (Phase 1)
Background (current state, necessity of immediate action & the needs)	Taji Gas Turbine Power Plant is located about 20km northwest of Baghdad, and consists of seven 20MW gas turbine generators supplied by a Japanese firm with a total installed capacity of 140MW. This power plant provides electricity to more than 8 million people living in Baghdad through 132kV transmission lines, making it one of the most important infrastructure facilities that support local households and public facilities such as schools, water supply facilities, hospitals and government offices. Elapse of 27 years of operation has decreased the generating capacity of the power plant. Shortage and inadequacy of equipment and spare parts have also caused shortfall of electricity supply because of the 1991 Gulf War and subsequent sanctions imposed by the United Nations. Current situation of the Taji Power Plant is as follows: • Units 1 and 2: Under operation with 10MW output, about half of its rated output, due to defects in their cooling system and control system. • Unit 3: Not in operation due to rotor damage and defects in cooling system and control system. • Units 4 and 7: Not in operation due to rotor damage. • Unit 5: Not in operation and abandoned. A used unit was installed instead. • Unit 6: Under operation with 10MW output, about half of its rated output. According to the needs assessment report by the United Nations/World Bank, Iraq's total demand for electricity in 2004 is estimated to be 6,500MW to 7,000MW, but current generating capacity remains only at 4,000MW. Instead, USAID stated that the country would need additional 6,000MW by this summer. Under these circumstances, where Baghdad's electricity shortage is especially severe, rehabilitation of the Taji Power Plant that is located in the vicinity of Baghdad is considered crucial. In order to enable quick recovery of the generation by the power plant, the proposed Plan aims at replacing the four existing gas turbine units, namely, Units 1, 2, 3, and 5, with new gas turbine generators.
Counterpart and Executing Agencies	Ministry of Electricity (MOE) of Iraq
Description of the Assistance	<u>Procurement of Equipment</u> - Four (4) gas turbine generator plants (including gas turbine units, auxiliaries, intake and exhaust systems, radiators, reduction gears, control systems, generators) <u>Equipment Installation</u> - Installation of four (4) new gas turbine generator plants - Trial operation and tests - Training of MOE operators - Removal and disassembly of the existing four power plants (the existing power plant units will not be abandoned; the main components of the units will be disassembled, cleaned up, and then stored so that reusable parts can be obtained)
Project Site	See attachment
Effectiveness/Benefit (beneficiary)	1) Benefited areas: Baghdad City and its suburban areas, and areas near the power plant 2) Benefited population: about 250,000 to 300,000 people (about 50,000 households), based on: • Capacity of power plant: 100MW (4 units * 25MW each) • Electricity consumption per household: 2kW • Number of persons in a household: 5

	- Number of households to which electricity is provided: 100,000kW / 2kW / household = 50,000 households 250,000 to 300,000 people (50,000 households * 5 to 6 persons/household)
Presumed Project Period	- Manufacturing Period (from order placing to shipping) - First two units: 2 months - Remaining two units: 4 months - Transportation: 2 months - Installation and trial operation: 4 to 5 months
Presumed Contract Manner (competitive bid, nominated contract)	Competitive bidding or nominated contract
Name of Nominated Contractor	-
Reason for Adopting Nominated Contractor	-
Expected Transit Method	Separate lading is expected. The transportation from Japan for this site is generally made via Jordan, via Kuwait, via Dubai or via Umm Qasr. To measure the transportation risk, war insurances and security force costs will be required additionally.
Necessity of the Installation of Machinery	Required
Profile of Engineer responsible for the installation (nationality & capability)	It is assumed that the installation works may be carried out by an installation firm(s) in a third country, who will employ local Iraqi workers. Some third-nation firms are well versed in gas-turbine installation and are expected to have adequate capabilities to undertake the assignment. The manufacturer(s) of the power plant is required to provide a technical training to the personnel of the installation and trial operation companies, who in turn will provide training for installation and trial operation to MOE staffs and the local technicians.
Operation and Maintenance (O&M) Structure	Taji Power Plant is currently staffed with about 30 engineers and 120 field and office workers. In spite of lacking supply of spare parts, they have managed to operate the plant for many years. This fact indicates their high operation, maintenance, and management skills, which, together with the training to be provided by the manufacture(s), will enable the personnel to adequately carry out the operation and maintenance of the new gas-turbine units of type similar to the existing units.
Necessity of O&M Training	Provided
Contents of Training	<u>Training at Workshop of the Manufacturer (location: Japan)</u> - Installation (disassembling and assembling) - Mechanical engineers: 3 persons for 2 weeks - Electrical engineers: 3 persons for 2 weeks - Maintenance - Gas Turbines: 2 persons for 3 weeks - Generators: 2 persons for 3 weeks - Control: 2 persons for 3 weeks - Power Plant Operation and Maintenance - Managers and engineers: 5 persons for 2 weeks
Other remarks regarding O&M	None
Involvement of Other Donors	Taji Power Plant Units 4, 6, and 7 are to be renovated on another project (Phase 2).
Other Considerations (environment, gender, etc)	Since the project objective is to recover the generation output of the existing power plant, environmental assessment that is normally required for power plant construction is not necessary.

Location of Project Site



Map No. 3835 Rev. 3 - UNITED NATIONS
December 2002

Department of Public Information
Cartographic Section

Rough Estimate of Project Cost

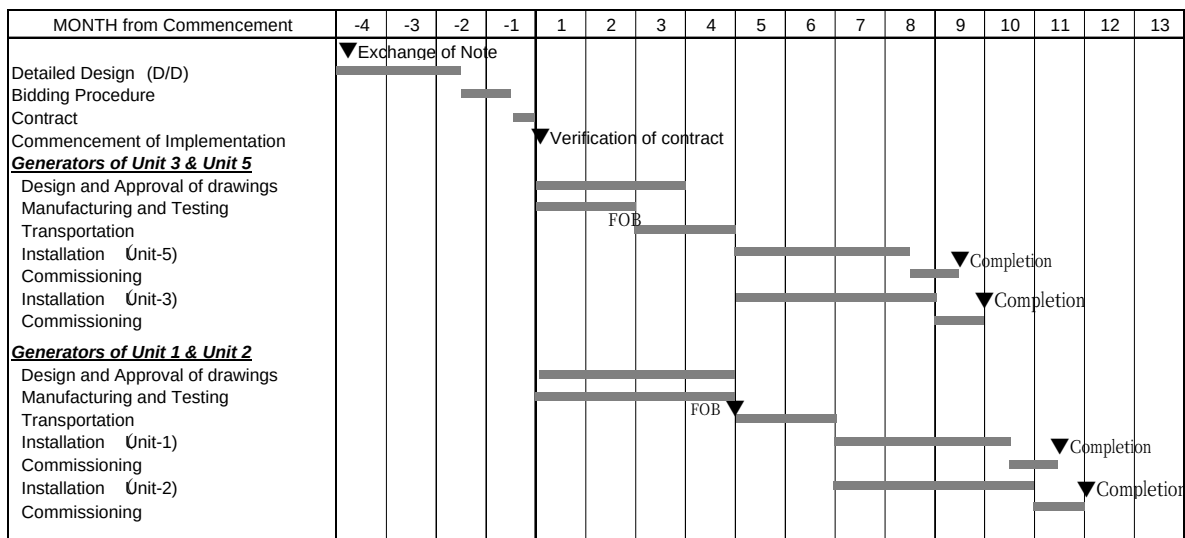
(Unit: 1,000 Yen)

Classification	Cost
Equipment Cost	6,865,535
1. Procurement cost	4,199,800
2. Transport fee	637,488
3. Installation cost	2,028,247
Design and Supervision Cost	329,200
Total of Project Cost	7,194,735

Procured Equipment

Item	Volume	Unit
1. Gas Turbine	4	sets
2. Auxiliary Equipment	4	sets
3. Air Inlet/Exhaust System	4	sets
4. Radiator Skid	4	sets
5. Reduction Gear	4	sets
6. Control Equipment	4	sets
7. Generator	4	sets
8. Others	1	lot

Project Implementation Plan



Project Profile (Project Summary)

Sector	Electricity
Project Name	Urgent Rehabilitation of Mosul Gas Turbine Power Plant (Phase 1)
Background (current state, necessity of immediate action & the needs)	Mosul Gas Turbine Power Plant is located 400km north of Baghdad, and its twelve gas turbines (20MW output each) generate 240MW. Four out of these twelve turbines were supplied by a Japanese firm. The power plant provides electricity to 1.5 million people living in Mosul City, the second largest city in Iraq and functions as one of the most important infrastructure facilities in the northern Iraq. Elapse of 28 years of operation has decreased the generating capacity of the power plant. Shortage and inadequacy of equipment and spare parts that are vital to keep the power plant in good working conditions have also caused shortfall of electricity supply after the 1991 Gulf War and subsequent sanctions imposed by the United Nations. Some repairs were made to the power plant by using low quality materials and parts, only to further damage many parts of the power plant units, resulting in serious shortage of electricity supply. Current operation conditions of the four units provided by the original manufacturer are as follows: • Unit 1: Not in operation and the unit originally provided by the original manufacturer was replaced with a used unit • Unit 2: Not in operation due to reduction gearbox vibration • Unit 3: Not in operation and the unit originally provided by the original manufacturer was replaced with a used unit • Unit 4: Under operation with 10MW output, about half of its rated output Although the Mosul area has four hydroelectric power plants that utilize abundant Tigris water, all of them are forced to operate with declining output or complete shutdown for the same reasons as for the gas turbine power plant. This has further hampered stable supply of electricity in the region. Under these circumstances, renovation of the Mosul Gas Turbine Power Plant, which seems to have required rather short construction time, has to be realized immediately. The proposed Plan aims at replacing the two existing gas turbine units, namely, Units 1 and 3, with new gas turbine units.
Counterpart and Executing Agencies	Ministry of Electricity (MOE)
Description of the Assistance	1) Procurement of Equipment Two (2) gas turbine generator units Equipment Installation 2) Installation of new power plant units, connection with the existing transmission and substations facilities • Trial operation and tests • Training of MOE operators • Removal and disassembly of the existing power plant (the existing power plant units will not be abandoned; the main components of the units will be disassembled, cleaned up, and then stored so that reusable parts can be obtained)
Project Site	See attachment
Effectiveness/Benefit (beneficiary)	1) Benefited areas: Mosul City and its suburban areas 2) Benefited population: about 125,000 to 150,000 (25,000 households), based on. • Generation output: 50MW (2 units * 25MW each) • Capacity of power plant: 50MW (2 units * 25MW each) • Electricity consumption per household: 2kW • Number of persons in a household: 5 to 6 • Number of households to which electricity is provided:

	- 50,000kW / 2kW / household = 25,000 households - 125,000 to 150,000 people (= 25,000 households * 5 to 6 persons/household)
Presumed Project Period	Manufacturing Period (from order placing to shipping) 1. Two units: 3 months 2. Transportation: 2 months 3. Installation and trial operation: 4.5 to 5 months
Presumed Contract Manner (competitive bid, nominated contract)	Competitive bidding or nominated contract
Name of Nominated Contractor	-
• Reason for Adopting Nominated Contractor	-
Expected Transit Method	Separate lading is expected. The transportation from Japan for this site is generally made via Jordan, via Kuwait, via Dubai or via Umm Qasr. To measure the transportation risk, war insurances and security force costs will be required additionally.
Necessity of the Installation of Machinery	Required
• Profile of Engineer responsible for the installation (nationality & capability)	It is assumed that the installation works may be carried out by an installation firm(s) in a third country, who will employ local Iraqi workers. Some third-nation firms are well versed in gas-turbine installation and are expected to have adequate capabilities to undertake the assignment. The manufacturer(s) of the power plant is required to provide a technical training to the personnel of the installation and trial operation companies, who in turn will provide training for installation and trial operation to MOE staffs and the local technicians.
Operation and Maintenance (O&M) Structure	The Mosul Power Plant is currently staffed with about 40 engineers and 160 field and office workers. In spite of lacking supply of spare parts, they have managed to operate the plant for many years. This fact indicates their high operation, maintenance, and management skills, which, together with the training to be provided by the manufacture(s), will enable the personnel to adequately carry out the operation and maintenance of the new gas turbine units of type similar to the existing units.
• Necessity of O&M Training	Required
• Contents of Training	1) Training at Workshop of the Manufacturer (location: Japan). - Installation - Mechanical engineers: 3 persons for 2 weeks - Electrical engineers: 2 persons for 2 weeks 2) Maintenance - Gas Turbines: 2 persons for 3 weeks - Generators: 2 persons for 3 weeks - Control: 2 persons for 3 weeks 3) Power Plant Operation and Maintenance - Managers and engineers: 5 persons for 2 weeks
• Other remarks regarding O&M	None
Involvement of Other Donors	Mosul Power Plant Units 2 and 4 will be renovated under the Phase 2 project.
Other Considerations (environment, gender, etc)	Since the project objective is to recover the generation output of the existing power plant, environmental assessment that is normally required for power plant construction is not necessary.

Location of Project Site



Map No. 3835 Rev. 3 UNITED NATIONS
December 2002

Department of Public Information
Cartographic Section

Rough Estimate of Project Cost

(Unit: 1,000 Yen)

Classification	Cost
Equipment Cost	4,215,868
1. Procurement cost	2,304,500
2. Transport fee	359,854
3. Installation cost	1,551,514
Design and Supervision Cost	295,361
Total of Project Cost	4,511,229

Procured Equipment

Item	Volume	Unit
1. Gas Turbine	2	sets
2. Auxiliary Equipment	2	sets
3. Air Inlet/Exhaust System	2	sets
4. Radiator Skid	2	sets
5. Reduction Gear	2	sets
6. Control Equipment	2	sets
7. Generator	2	sets
8. Others	1	lot

Project Implementation Schedule

MONTH from Commencement	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11
	▼Exchange of Note														
Detailed Design (D/D)															
Bidding Procedure															
Contract															
Commencement of Contract															
Manufacturing															
Transportation															
Installation (Unit-1)															
Commissioning															
Installation (Unit-3)															
Commissioning															

Project Profile (Project Summary)

Sector	Energy/Electricity
Project Name	Urgent Rehabilitation Plan of Mosul Hydraulic No.1 Power Plant
Background (current state, necessity of immediate action & the needs)	Iraq's largest group of hydro power plants, which utilize abundant water resources at the Tigris River, is located about 50km northwest of Mosul, the second largest city in the country. The group of the power plants consists of Mosul Power Plant No. 1 (total output 750MW), Mosul Power Plant No. 2 (60MW), and Mosul Hydro Power Plant No.3 (200MW). A Japanese firm originally supplied hydroelectric generators to the Mosul Power Plant No. 1, which has been in operation for 17 years since 1986. After the 1991 Gulf War and subsequent economic sanctions imposed by the United Nations, the power plant has experienced shortage and inadequacy of equipment and spare parts that are vital to keep them in good working conditions. MOE has managed to operate these hydro electric generators and produce their rated output. But the generators have the following problems to solve: • Hydro turbine runners: long-time operation has caused severe cavitation, requiring repairs to be made to the runners every year. • Penstock guide vanes: vanes for No. 3 unit are impossible to be operated open or close. • Thrust bearings: Experienced burnouts several times in the past, using up all the spare parts. Metals of the bearings for No. 3 unit are damaged, and require immediate replacement. • Misalignment of main shaft: Tilting building has caused misalignment. • Governors and pressurized oil supply systems: oil pressure pumps are damaged. • Generator stator coils: Have been in operation for about 17 years, coming closer to the life of the coils (insulation of the coils is severely degraded). • Generator exciters: Aged deterioration has caused concerns for serious decrease in reliability of field circuit breakers, discharge resistors, etc. • Drainage system: Lack of proper maintenance and aged deterioration have caused troubles to water drainage pumps. • Air compressors: Lack of proper maintenance and aged deterioration have caused malfunctions in various control valves. • Control and instrumentation equipment: Lack of proper maintenance and aged deterioration have caused frequent malfunctions. • DC power supply system: Experiencing severe capacity decrease due to aged deterioration. Urgent rehabilitation of this power plant is essential since there are concerns for a wide range of equipment in the power plant. This power plant is important for northern Iraq for the reason that it manages to supply electricity to the area by utilizing water resources rather than depending on fossil fuels that are difficult to be stably supplied.
Counterpart and Executing Agencies	Ministry of Electricity (MOE) of Iraq
Description of the Assistance	<u>Equipment procurement (see attachment)</u> - Penstock guide vanes - Thrust bearings - Renovation of governors - Renovation of exciters - Hydro turbine parts for an overhaul - Hydro generator parts for an overhaul - Renovation of auxiliary equipment <u>Equipment installation, adjustment, and commissioning</u> - Rehabilitation of four hydro plant units - Adjustment and commissioning - Training for power plant operators

Project Site	See Attachment
Effectiveness/Benefit (beneficiary)	(1) Benefited areas: Mosul City and its suburban areas (2) Benefited population: about 260,000 to 310,000 people (about 52,000 households) (Assumptions) • Estimated generating capacity (as of January 2004): 4,600GWh/year • Planned rehabilitation can prevent future operation failures, thus enabling about 20% power supply increase (920GWh/year) when compared with the current output. - Electricity consumption per household: 2kW - Number of persons in a household: 5 to 6 - Number of households to which electricity is provided: $920\text{GWh} / 8,760\text{h} / 2\text{kW/household} = 52,500 \text{ households}$ $(52,500 \text{ households} \times 5 \text{ to } 6 \text{ persons/household})$
Presumed Project Period	Total presumed project period: about 24 months after contract verification (Site works will be carried out by stages except for the summer season (June through September) when the highest electricity demand is expected. Scheduled project period for each unit is as follows. Unit 1 -Manufacturing period (from order placing to shipping): 7 months -Transportation: 2 months -Installation and trial operation: 3 months Unit 2 -Manufacturing period (from order placing to shipping): 14 months -Transportation: 2 months -Installation and trial operation: 3 months Unit 3 -Manufacturing period (from order placing to shipping): 17 months -Transportation: 2 months -Installation and trial operation: 3 months Unit 4 -Manufacturing period (from order placing to shipping): 19 months -Transportation: 2 months -Installation and trial operation: 3 months
Presumed Contract Manner (competitive bid, nominated contract)	Nominated contract
• Reason for Adopting Nominated Contractor	The Nominated Contract is for the work recognized by the consultants that would be clearly harmful for the function of existing equipment if the work would be conducted without the same contractor which has close connection for the utilities established in the past for the facility project including equipment.
Expected Transit Method	It is expected that only container transportation will be under consideration. Usually, a route selected from Jordan, Kuwait, or Dubai/Umm-Qasr port is used for transit from Japan. Addition of war agreement to an insurance and use of armed security services are recommended since transportation inside Iraq still comes with high risks
Necessity of the Installation of Machinery	Required
• Profile of Engineer responsible for the installation (nationality & capability)	It is assumed that the rehabilitation works will be contracted to a firm(s) of a third nation, who will employ local Iraqi workers. The manufacturer of the power plant is to provide technical training to the staff of the third nation to be sent to the project site.
Operation and Maintenance (O&M) Structure	The City of Mosul has hydro power plants in three different locations including the one to be rehabilitated under this plan. In spite of lack of supply of spare parts, each of these power plants has managed to operate

	the plant for many years. This fact indicates that the staffs possess high operation, maintenance, and management skills. It is considered that this rehabilitation plan will not require additional operation and maintenance skills.
Necessity of O&M Training	Required
Contents of Training	Training at Workshop of the Manufacturer (location: Japan) - Hydro turbine: 3 persons for 1.5 months - Turbine generators: 3 persons for 1.5 months - Governors: 3 persons for 1 month - Exciters: 3 persons for 1 month
Other remarks regarding O&M	None
Involvement of Other Donors	None
Other Considerations (environment, gender, etc)	Since the Project objective is to improve the output of the existing power plants, environmental assessment that is normally required for power plant construction is not necessary.

Location of Project Site



Rough Estimate of Project Cost

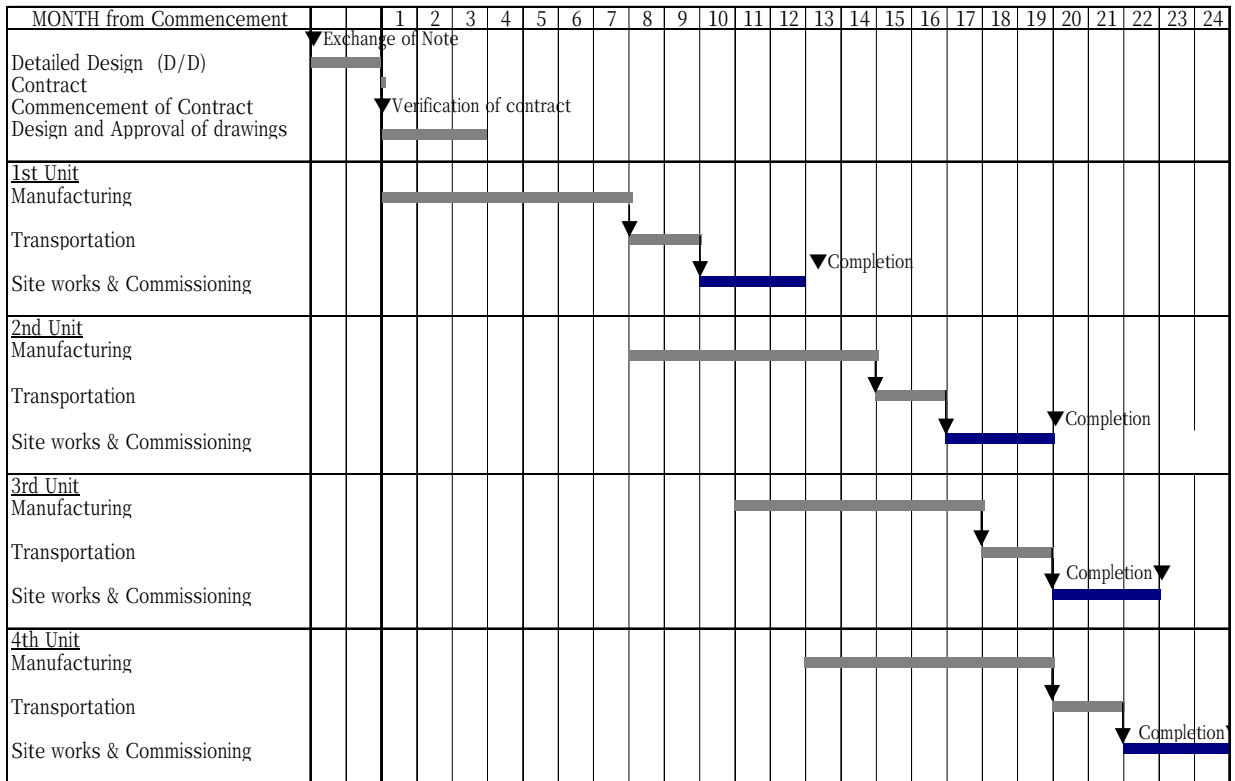
(Unit: 1,000 Yen)

Classification	Cost
Equipment Cost	5,299,674
1.Procurementt cost	2,780,425
2.Transport fee	851,194
3.Installation cost	1,668,055
Design and Supervision Cost	299,419
Total of Project Cost	5,599,093

Procured Equipment

No.	Name of Equipment	Supplied Components/ Parts	Quantity
1.	Penstock Guard Valve	Penstock Guard Valve	1 Unit
2.	Generator	Thrust Bearing	4 Units
3.	Governor	New Governor System	4 Units
4.	Excitation System	New Excitation System (excluding excitation transformer)	4 Units
5.	Turbine Overhauling (OH) Parts	Turbine OH Parts	4 Units
		Inlet valve OH Parts	4 Units
		Generator OH Parts	4 Units
		Air Compressor	4 Units
6.	Turbine Auxiliary	Draft Drainage	4 Pumps
		Pit Drainage	4 Pumps
		Water Supply Strainer	1 sets
		Pressure Oil System	4 sets
7.	Test Instrument	Testing Instruments for Field Test and Commissioning	1 set
8.	Switchyard Equipment and Materials	Repair Parts for Control System and Control Cables	1 set
9.	DC Battery	For Powerhouse and Switchyard	1 set

Project Implementation Schedule



Project Profile (Project Summary)

Sector	Electricity
Project Name	Urgent Installation of Mobile Substations (27 units, Phase 1)
Background (current state, necessity of immediate action & the needs)	The electric power network in Iraq consists of 400kV and 132kV systems. Electricity generated at hydro power plants in the north and at thermal power plants in the south is transmitted through 400kV transmission lines to the Baghdad main grid of loop type. Transmission and distribution lines have voltages of 400kV, 132kV, 33kV, or 11kV depending on the requirements. These transmissions are all essential components in supplying electricity to end-users. CPA has been actively engaged in restoration of 400kV trunk transmission lines that were bombed and destroyed by the war, some of which are still left untouched while others are undergoing restoration. The 132kV transmission facilities near the oil facilities in the northern and southern Iraq were bombed, while those facilities in other less-damaged areas remain intact in many places. The main problem these facilities are experiencing is malfunction caused by lacking supply of spare parts and of proper maintenance after the Gulf War and the following sanctions by the United Nations. The facilities barely keep their operation going with their aged and malfunctioning control and protection systems. Restoration of the 132kV substations is critical and has to be carried out immediately since an accident could happen at these facilities at any moment. Under these circumstances, the Iraq Ministry of Electricity (MOE) has requested the Japanese government as an emergency action to deploy a total of 40 mobile substations to the existing 132kV substations located in Baghdad and its suburbs, and in local districts. The Phase 1 project is to deploy 27 mobile substations in the 23 substations, and the remaining 13 will be deployed under the Phase 2. MOE is trying to secure stable electricity supply by providing mobile substations to these areas and is planning to carry out full restoration of the existing substations at the future projects.
Counterpart and Executing Agencies	Iraq Ministry of Electricity (MOE)
Description of the Assistance	Procurement of Mobile Substations As this project will cover substations in two different voltages, 33kV and 11kV, procured facilities shall have two different types. Main components are as follows: - 132/33kV, 25MVA substation facilities: 16 units - 132/11kV, 25MVA substation facilities: 11 units - Tractor heads: 6 units - Installation work for the above-mentioned facilities
Project Site	See attachment
Effectiveness/Benefit (beneficiary)	1) Benefited areas cover the following 10 Governorates among all 18 governorates in Iraq: Baghdad (Baghdad), Thi-Qar (Nassryia), Babil (Hilla), Diyala (Baquba), Anbar (Ramadi), Salah Al-Din (Tikrit), Najaf (Najaf), Qadisiya (Diwanyah), Kerbala (Kerbala) and Muthanna (Samawah). 2) Benefited population: About 1.35 million to 1.62 million (270,000 households), based on; • Capacity of power transformer: 25MVA x 0.8 x 27 = 540 MVA Supposed receiving 80% of the transformer capacity • Electricity consumption per household: 2kVA • Number of persons in a household: 5 to 6 persons • Number of households to which electricity is provided: - 540,000kVA/2kVA = 270,000 households - 1.35 million to 1.62 million people (270,000 households: 5 to 6 persons/households)

Presumed Project Period	- Manufacturing (after contract certification): about 7 to 10 months before FOB - Transportation: 2 months - Installation (per one unit): 15 days																								
Presumed Contract Manner (competitive bid, nominated contract)	Competitive bidding																								
Name of Nominated Contractor	-																								
•Reason for Adopting Nominated Contractor	-																								
Expected Transit Method	Bulk maritime transportation and inland tractor-headed transportation are under consideration. Usually, a route selected from Jordan, Kuwait, or Dubai/Umm-Qasr port is used for transit from Japan. Addition of war agreement to an insurance and use of armored securities are recommended since transportation inside Iraq still comes with high risks. As one tractor-head will be used for every 5 units of mobile substation facilities, detailed transportation plan needs to be worked out in implementing the project for efficient transportation.																								
Necessity of the Installation of Machinery	Required																								
•Profile of Engineer responsible for the installation (nationality & capability)	Some of the merits in selection of mobile substations are that their installation is easy and requires very short time. It is expected that installation will be taken over by local partners in Iraq. Manufacturer(s) of the mobile substations are expected to provide training in Japan to local Iraqi installation/ operation staffs.																								
Operation and Maintenance (O&M) Structure	The MOE has a department responsible for transmission and distribution systems. Under the department are lower branches that are responsible for districts: northern, central, and southern districts. These institutions apparently have clearly established responsibilities. In addition, they have operated and maintained nearly 100 units of mobile substations with similar type before. These suggest that the MOE has the organization of adequate capabilities to implement operation and maintenance of the substations procured by the projects.																								
•Necessity of O&M Training	Required																								
•Contents of Training	As mentioned above, it is assumed that MOE technical staffs are well versed in operation and maintenance of the existing facilities similar to those to be procured. However, it is planned that manufacturers will provide training to the staffs, in consideration of the need for ensuring successful project implementation and subsequent O&M works. Number of trainees for the training to be provided by manufacturers (Location: Japan) <table><tr><td></td><td>North</td><td>Central</td><td>South</td><td>MOE</td><td>Period</td></tr><tr><td>Operation</td><td>2</td><td>2</td><td>2</td><td>-</td><td>2 weeks</td></tr><tr><td>Maintenance</td><td>2</td><td>2</td><td>2</td><td>-</td><td>2 weeks</td></tr><tr><td>Management</td><td>-</td><td>-</td><td>-</td><td>2</td><td>2 weeks</td></tr></table>		North	Central	South	MOE	Period	Operation	2	2	2	-	2 weeks	Maintenance	2	2	2	-	2 weeks	Management	-	-	-	2	2 weeks
	North	Central	South	MOE	Period																				
Operation	2	2	2	-	2 weeks																				
Maintenance	2	2	2	-	2 weeks																				
Management	-	-	-	2	2 weeks																				
•Other remarks regarding O&M	None																								
Involvement of Other Donors	None																								
Other Considerations (environment, gender, etc)	As new substation units will be installed in the existing substations with malfunctioning units, no special considerations need to be taken.																								

Location of Project Sites



Map No. 3835 Rev. 3 UNITED NATIONS
December 2002

Department of Public Information
Cartographic Section

Location of 132kV Substations to be Equipped with Mobile Substation

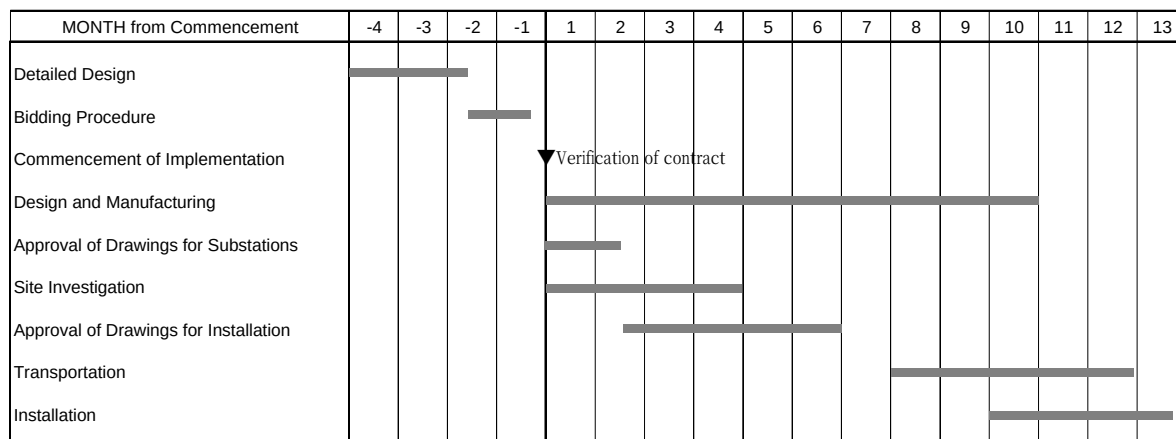
Governorate	Substation	Name of Substation or City	Voltage / Quantity	
			132KV/33KV	132KV/11KV
Salah Al-Din	①	Samara South	1	
An-bar	② / ②	Ana	1	1
Baghdad	③	Rashdiya	1	
	④ / ④	Jamilla	1	1
	⑤	Farabi	1	
	⑥ / ⑥	Iskan Al Kher	1	1
	⑦	New Baghdad	1	
	⑧	Muthana	1	
	⑨	Waziriya	1	
	⑩	Kadtmia	1	
	⑪	Al Jazair		1
	⑫	Yarmouk		1
	⑬	Jamiah		1
	⑭	Ma'ari		1
	⑮	Baghdad North		1
	⑯	Qusiba		1
Babil	⑰	Hilla	1	
Karbala	⑱	Kerbala	1	
Najaf	⑲	Najaf	1	
Qadisiya	⑳	Al Diwaniyah	1	
Thi-Qar	㉑	Old Nasiriya	1	
Muthanna	㉒ / ㉒	Old Samawah	1	1
Diala	㉓	East Baquba		1
Total	23 Locations		16 Units	11 Units

Rough Estimate of Project Cost

(Unit: 1,000 Yen)

Classification	Cost
Equipment Cost	7,457,102
1.Procurement cost 16 units for 132/33kV, 25MVA 11 units for 132/11.5kV, 25MVA	6,681,110
2.Transport fee	471,887
3.Installation cost	304,105
Design and Supervision Cost	388,899
Total of Project Cost	7,846,001

Project Implementation Schedule of Mobile Substations (27 units, Phase 1)

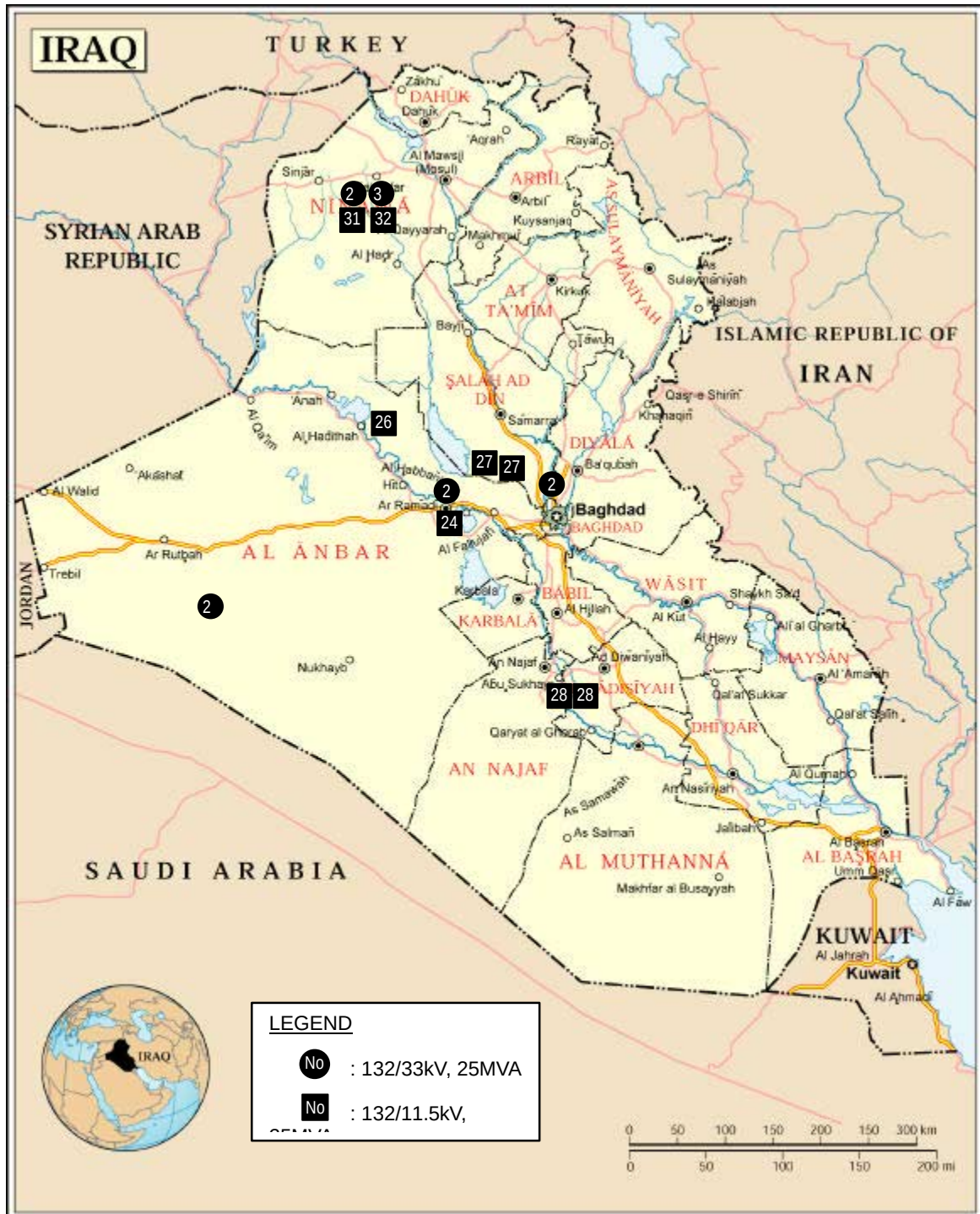


Project Profile (Project Summary)

Sector	Electricity
Project Name	Urgent Installation of Mobile Substations (13 units, Phase 2)
Background (current state, necessity of immediate action & the needs)	The electric power network in Iraq consists of 400kV and 132kV systems. Electricity generated at hydro power plants in the north and at thermal power plants in the south is transmitted through 400kV transmission lines to the Baghdad main grid of loop type. Transmission and distribution lines have voltages of 400kV, 132kV, 33kV, or 11kV depending on the requirements. These transmissions are all essential components in supplying electricity to end-users. CPA has been actively engaged in restoration of 400kV trunk transmission lines that were bombed and destroyed by the war, some of which are still left untouched while others are undergoing restoration. The 132kV transmission facilities near the oil facilities in the northern and southern Iraq were bombed, while those facilities in other less-damaged areas remain intact in many places. The main problem these facilities are experiencing is malfunction caused by lacking supply of spare parts and of proper maintenance after the Gulf War and the following sanctions by the United Nations. The facilities barely keep their operation going with their aged and malfunctioning control and protection systems. Restoration of the 132kV substations is critical and has to be carried out immediately since an accident could happen at these facilities at any moment. Under these circumstances, the Iraq Ministry of Electricity (MOE) has requested the Japanese government as an emergency action to deploy a total of 13 mobile substations to the existing 132kV substations located in Baghdad and its suburbs, and in local districts. Amongst these 40 mobile substations, 13 mobile substations that are not deployed under the Phase 1 will be procured in the 10 existing substations under this Phase 2 project. The MOE is trying to secure stable electricity supply by providing mobile substations to these areas and is planning to carry out full restoration of the existing substations at the future projects.
Counterpart and Executing Agencies	Iraq Ministry of Electricity (MOE)
Description of the Assistance	<u>Procurement of Mobile Substations</u> As this project will cover substations in two different voltages, 33kV and 11kV, procured facilities shall have two different types. Main components are as follows: - 132/33kV, 25MVA substation facilities: 5 units - 132/11kV, 25MVA substation facilities: 8 units - Tractor heads: 2 units - Installation work for the above-mentioned facilities See attachment for a detailed list of procured equipment.
Project Site	See attachment
Effectiveness/Benefit (beneficiary)	1) Benefited areas: Following 5 Governorates among all 18 governorates in Iraq: Ninevah (Mosul), Diyala (Baquba), Anbar (Ramadi), Salah Al-Din (Tikrit) and Qadisiya (Diwanyah) 2) Benefited population: About 650,000 to 780,000 (130,000 households), based on: • Capacity of power transformer: $25\text{MVA} \times 0.8 \times 13 = 260 \text{ MVA}$ (Supposed receiving 80% of the transformer capacity) • Electricity consumption per household: 2kVA • Number of persons in a household: 5 to 6 persons • Number of households to which electricity is provided: - $260,000\text{kVA}/2\text{kVA} = 130,000$ households - 650,000 to 780,000 people (130,000 households: 5 to 6 persons/household)

Presumed Project Period	-Manufacturing (after contract certification): about 7 months before FOB - Transportation: 2 months - Installation (per one unit): 15 days																								
Presumed Contract Manner (competitive bid, nominated contract)	Competitive bidding																								
Name of Nominated Contractor	-																								
•Reason for Adopting Nominated Contractor	-																								
Expected Transit Method	Bulk maritime transportation and inland tractor-headed transportation are under consideration. Usually, a route selected from Jordan, Kuwait, or Dubai/Umm-Qasr port is used for transit from Japan. Addition of war agreement to an insurance and use of armored securities are recommended since transportation inside Iraq still comes with high risks. As one tractor-head will be used for every 5 units of mobile substation facilities, detailed transportation plan needs to be worked out in implementing the project for efficient transportation.																								
Necessity of the Installation of Machinery	Required																								
•Profile of Engineer responsible for the installation (nationality & capability)	Some of the merits in selection of mobile substations are that their installation is easy and requires very short time. It is expected that installation will be taken over by local partners in Iraq. Manufacturer(s) of the mobile substations are expected to provide training in Japan to local Iraqi installation/ operation staffs.																								
Operation and Maintenance (O&M) Structure	The MOE has a department responsible for transmission and distribution systems. Under the department are lower branches that are responsible for districts: northern, central, and southern districts. These institutions apparently have clearly established responsibilities. In addition, they have operated and maintained nearly 100 units of mobile substations with similar type before. These suggest that the MOE has the organization of adequate capabilities to implement operation and maintenance of the substations procured by the projects.																								
•Necessity of O&M Training	Required																								
•Contents of Training	As mentioned above, it is assumed that MOE technical staffs are well versed in operation and maintenance of the existing facilities similar to those to be procured. However, it is planned that manufacturers will provide training to the staffs, in consideration of the need for ensuring successful project implementation and subsequent O&M works. Number of trainees for the training to be provided by manufacturers (Location: Japan) <table><tr><td></td><td>North</td><td>Central</td><td>South</td><td>MOE</td><td>Period</td></tr><tr><td>Operation</td><td>2</td><td>2</td><td>2</td><td>-</td><td>2 weeks</td></tr><tr><td>Maintenance</td><td>2</td><td>2</td><td>2</td><td>-</td><td>2 weeks</td></tr><tr><td>Management</td><td>-</td><td>-</td><td>-</td><td>2</td><td>2 weeks</td></tr></table>		North	Central	South	MOE	Period	Operation	2	2	2	-	2 weeks	Maintenance	2	2	2	-	2 weeks	Management	-	-	-	2	2 weeks
	North	Central	South	MOE	Period																				
Operation	2	2	2	-	2 weeks																				
Maintenance	2	2	2	-	2 weeks																				
Management	-	-	-	2	2 weeks																				
•Other remarks regarding O&M	None																								
Involvement of Other Donors	None																								
Other Considerations (environment, gender, etc)	As new substation units will be installed in the existing substations with malfunctioning units, no special considerations need to be taken.																								

Location of Project Sites



Map No. 3895 Rev. 3 UNITED NATIONS
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Department of Public Information
Cartographic Section

Location of 132kV Substations to be Equipped with Mobile Substation

Governorate	Substation	Name of Substation or City	Voltage / Quantity	
			132KV/33KV	132KV/11KV
Diala	23	East Baquba	1	
Anbar	24 / 24	Ramida	1	1
	25	Rutba	1	
	26	Heet		1
Salah Al-Din	27 / 27	Broad Casting at Balad		2
Qadisiya	28 / 28	Al Shamida		2
North Region	29	To be determined.	1	
	29	- ditto -	1	
	31	- ditto -		1
	32	- ditto -		1
Total	10 locations		5 Units	8 Units

Summary of Project Cost

(Unit: 1,000 Yen)

Classification	Cost
Equipment Cost	3,660,723
1. Procurement cost 4 units for 132/33kV, 25MVA 9 units for 132/11.5kV, 25MVA	3,153,010
2. Transport fee	226,423
3. Installation cost	280,290
Design and Supervision Cost	236,933
Total of Project Cost	3,897,656

Project Implementation Schedule of Mobile Substations (13 units, Phase 2)

MONTH from Commencement	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12	13
Detailed Design																	
Bidding Procedure																	
Commencement of Implementation																	
Design and Manufacturing																	
Approval of Drawings for Substations																	
Site Investigation																	
Approval of Drawings for Installation																	
Transportation																	
Installation																	

Project Profile (Project Summary)

Sector	Electricity
Project Name	Urgent Installation of Mobile Power Plant
Background (current state, necessity of immediate action & the needs)	Although the total output capacity of the six existing power plants in southern Iraq is 2,200MW, their generating output has currently dropped to 350MW to 720MW, as a consequence of the Gulf War and economic sanctions imposed by the United Nations. The power supply cannot meet even the 900MW electricity demand in the region. Four governorates in the south are still forced to conduct scheduled power outages. Based on the data on the scheduled outages conducted by the CPA South, detailed information about the governorates' outages in February 2004 can be summarized as below. Power outage rate (= length of outage hours/ 168hr; where 168hr is 24hrs * 7days) • Basrah 1.2% • Thi-Qar 48% • Missan 41% • Muthanna 52% As shown above, except for the governorate of Basrah, the region is experiencing over 40% of power outage rate. Specifically, people in Muthanna governorate are being forced to have no electricity for more than 12 hours a day. Southern Iraq is currently facing a serious electricity shortage, and the situation is even harsher in Samawah, the capital of Muthanna governorate. The city of Samawah contains one power plant that supplies electricity to a local cement plant. But the power plant is so deteriorated that it cannot even supply adequate power to the cement plant. The region needs a radical restoration of its power network to supply sufficient electricity to local residents. CPA South has set a plan to construct a power plant equipped with two 40MW gas turbines inside the Old Samawah Substation located near Samawah city. It is expected that the electricity from this new power plant will be supplied only to two cement plants nearby Samawah, not to residential areas. CPA has admitted the necessity of installing new power generation facilities that provide electricity to local people. Under these situations, MOE had requested the Japanese government to construct a large-scale fixed diesel power plant in Samawah. The project has been modified in accordance with the MOE's plan in a way that can immediately solve the electricity shortage problem in Samawah. The project will procure gas-turbine mobile power plant facilities, which can be constructed in a shorter time, under the Japan's grant aid scheme.
Counterpart and Executing Agencies	Ministry of Electricity (MOE) of Iraq
Description of the Assistance	Following equipment will be procured; - Mobile power plant facilities with 40MW or equivalent output (it is expected that 2 sets of a 20MW power generator will be mounted on several trailers) - Mobile substation facilities for grid-connection (two of 132/11kV, 25MVA substation facilities) - Construction works for the above facilities
Project Site	See attachment
Effectiveness/Benefit (beneficiary)	1) Benefited area: City of Samawah and the surrounding area 2) Benefited population: about 100,000 to 120,000 people (about 20,000 households) (Assumptions) • Capacity of power plant: 40MW (20MW * 2 gas turbine units) • Electricity consumption per household: 2kW • Number of persons in a household: 5 to 6

	- Number of households to which electricity is provided: - 4,000kW / 2kW / household = 20,000 households - 100,000 to 120,000 people (= 20,000 households * 5 to 6 persons/household)
Presumed Project Period	12 months
Presumed Contract Manner (competitive bid, nominated contract)	Competitive bidding
Expected Transit Method	Separate lading is expected. The transportation from Japan for this site is generally made via Jordan, via Kuwait, via Dubai or via Umm Qasr. To measure the transportation risk, war insurances and security force costs will be required additionally.
Necessity of the Installation of Machinery	Required
Profile of Engineer responsible for the installation (nationality & capability)	Advantages of introducing mobile power plants are that the site work is simple and construction and installation of the plant require relatively short period of time. It is assumed that the installation will be contracted to a local installation firm. And a manufacturer will provide training in Japan for the local installation staffs and operation supervisors.
Operation and Maintenance (O&M) Structure	Ministry of Electricity has the power generation division and the power transmission division. Under these divisions, regional institutions are positioned in northern, central, and southern Iraq. The organization has clearly set the responsibilities for each of these authorities, and has actually performed operation and maintenance works for similar type of mobile power plants and mobile substations. Therefore, it is considered that the organization has sufficient capability of performing operation and maintenance works for the project.
Necessity of O&M Training	Required
Contents of Training	As stated above, it is well considered that the MOE staffs are well versed in operation and maintenance works of similar equipment to be procured for the project. However, to ensure successful project implementation as well as subsequent operation and maintenance works, the manufacturer of the power plants is required to provide training in Japan.
Other remarks regarding O&M	None
Involvement of Other Donors	CPA is planning to construct a fixed power plant equipped with two 40MW gas turbine units right beside the Old Samawah Substation. CPA is also planning to extend the gas pipeline to Samawah city to secure the fuel. A mobile power plant to be constructed will utilize the same natural gas fuel as the Old Samawah Substation. As of March 16, 2004, the Team is waiting for a reply from CPA South about detailed information about the plan. Further discussions with CPA are required.
Other Considerations (environment, gender, etc)	The project is to construct a mobile power plant inside the existing substation, and may cause noise and air pollution problems after putting into operation. These potential problems will have to be addressed in due course.

Location of Project Site



Map No. 3835 Rev. 3 UNITED NATIONS
December 2002

Department of Public Information
Cartographic Section

Summary of Project Cost

(Unit: 1,000 Yen)

Classification	Cost
Equipment Cost	5,500,000
1. Procurement cost	4,800,000
2. Transport fee	140,000
3. Installation cost	560,000
Design and Supervision Cost	350,000
Total of Project Cost	5,850,000

Project Implementation Schedule

MONTH from Commencement	-4	-3	-2	-1	1	2	3	4	5	6	7	8	9	10	11	12
	▼Exchange of Note															
Detailed Design (D/D)	■															
Bidding Procedure			■													
Contract				■												
Commencement of Contract				▼Verification of contract												
Manufacturing					■	■	■	■	■	■	■	■	■			
Transportation												FOB ▼	■	■		
Installation Commissioning														■	■	