CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 4 PROJECT EVALUATION AND RECOMMENDATIONS

4-1 Project Effects

With the implementation of the Project, the new Hithadhoo Power Station (750 kW x three units) will be constructed to replace the ageing Gan Power Station and temporary Hithadhoo Power Station in the western part of the Seenu Atoll which is the key area for economic development in the southern Maldives. The commissioning of this new power station will assure a stable power supply upto the year 2004, the target year of the Project. In addition, the replacement of two existing power stations by a new station will enable rationalisation as well as manpower saving in relation to the management of power generation.

The 11 kV distribution network to be developed under the Project will be connected to the existing 11 kV distribution network on Hithadhoo Island which was constructed under the Phase II Project and will form part of the power grid covering the entire Project area. As a result of this development, it will be necessary to replace both the existing substation equipment, the operation of which has become hazardous due to frequent oil leakage, etc. caused by deterioration, and the ageing 3.3 kV distribution lines. In addition, centralised power supply to all five islands in the Project area will make it possible to conduct rational and efficient power supply operation.

The operation and management of the new generating and distribution facilities following the completion of the Project will be conducted by the STELCO which is the sole power service provider in the Maldives and which provides power supply for 20 Atoll Islands nationwide in addition to Male Island. Since its establishment in 1997 as a public corporation, the STELCO has been managed as a self-financing corporation and does not receive any government subsidy. Its financial health has been steadily improving due to the rationalisation of manpower, strengthening of the regional management capability in five regions and revision of the user charge. In the technical field, the staff members of the STELCO appear to have sufficient technical skills in regard to the operation and maintenance of DEG units and the 11 kV distribution network given the actual operating status of the Hulhudhoo/Meedhoo Power Station and the distribution network on Hithadhoo Island, both of which were constructed under the Phase II Project, posing no special problems for the implementation of the Project.

In regard to the operating cost of the new generating and distribution facilities to be constructed under the Project following their commissioning, it is estimated that the

operating balance will show a profit with an annual operating rate of the new DEG units of 60% or more based on the electricity charge of 2.5 Rf/kWh currently applied by the STELCO in the Project area. Consequently, the future cost of equipment renewal, i.e., depreciation cost, can be met, making proper operation of the new power station feasible.

Among the equipment to be supplied and installed under the Project, the DEG units demand the most careful attention in regard to possible impacts on the environment. However, possible adverse impacts on the environment in the surrounding area can be minimised by the implementation of measures designed to deal with noise, exhaust gas and waste oil.

The implementation of the Project will consolidate an important component of the social infrastructure on five atoll islands (Hithadhoo, Maradhoo, Maradhoo/Feydhoo, Feydhoo and Gan) in the western part of the Seenu Atoll which is a key base for economic development in the Maldives. A stable supply of electricity to these islands will facilitate improvement of the living conditions of local people (estimated benefitting population in 1998: 20,914), stabilisation of the management of public facilities and vitalisation of industrial and other economic activities. All of these positive effects will lead to rectification of the gap in the standard of living between Male Island and these atoll islands, thus easing the population concentration on Male Island which is a main target of the Fifth National Development Plan.

The above evaluation results suggest that the implementation of the Project with grant aid provided by the Government of Japan is highly suitable because of the major positive impacts of the Project on the Maldives.

Current Situation and Problems	Improvement Measures Under the Project	Project Effects and Degree of Improvement
1. The generating units of the existing Gan Power Station are nearly 40 years old. The general deterioration and lack of spare parts due to termination of their production by the manufacturer have resulted in a decline of the output by some 40%. Apart from the impossibility of conducting proper maintenance, the average fuel consumption rate of 0.339 litres/kWh indicates poor operation efficiency.	Construction of a new power station (new Hithadhoo Power Station with three 750 kW generating units) to meet the power demand upto the target year of the Project (2004).	Establishment of a stable power supply upto the year 2004 with proper maintenance of the generating units, etc. and improvement of the fuel consumption rate by approximately 30%, achieving economical operation.
2. The presence of two power stations, i.e. Gan Power Station and the temporary Hithadhoo Power Station, in the same area has necessitated the employment of many operation and maintenance staff and the separate transportation of fuel oil, resulting in inefficient operation.	As above	Replacement of the two existing power stations by a single new power station will enable the rationalisation of manpower by approximately 25% through reorganizations. The transportation of fuel oil will become more efficient because of a single destination.
3. The Government of the Maldives has found it impossible to implement the planned relocation of the generation units of the temporary Hithadhoo Power Station to non-electrified areas to promote the new electrification programme.	As above	Following commissioning of the new Hithadhoo Power Station, the generating units of the temporary power station will be relocated to the Laamu Atoll to newly electrify the area.
4. The existing 3.3 kV distribution network on Gan, Feydhoo, Maradhoo/Feydhoo, Maradhoo Island uses second-hand equipment which was used on Male Island in the 1960's. In particular, the substation suffer such frequent problems as oil leakage due to deterioration. The breakdown of the measuring instruments and protective devices makes operation less reliable and dangerous. Moreover, the distribution loss is as high as some 20%.	Procurement and supply of substation equipment required for the 11 kV distribution network to cover all islands in the Project area.	The reliability of power supply by the distribution network will be improved as a power supply system with fewer power cuts and breakdowns is established. The distribution loss will be improved to approximately one-fourth of the present level.
5. The mixed presence of 11 kV and 3.3 kV distribution networks in the Project area complicates maintenance work due to the lack of coordination between the two networks in terms of spare parts, etc.	As above	The integration of the different networks into a uniform 11 kV network will make operation and maintenance easier.

4-2 Recommendations

The suitability of the Project for grant aid provided by the Government of Japan is confirmed by its wide-ranging benefits described earlier and also be its contribution to the improvement of BHN in the Maldives. In addition, as the Maldives side has sufficient manpower and funds, no specific problems are anticipated in terms of the operation and management of the Project. Further improvement of the following points will, however, ensure the smooth and truly effective implementation of the Project.

(1) Any delay of the construction of the new distribution network using the equipment and materials to be provided under the Project will lead to failure to achieve the expected function within the Project period. It will, therefore, be necessary for the Maldivian side to organize a construction team to be responsible for the formulation of the work schedule, personnel, procurement and other relevant plans with a view to facilitating and completing the work to be conducted by the Maldivian side on time so as to complete the Project as planned.

(2) The re-use of the four generating units currently installed at the temporary Hithadhoo Power Station will be necessary as soon as the construction of the new Hithadhoo Power Station has been completed by the Japanese side to electrify other atoll islands in order to increase the number of islands receiving public power supply.

(3) While the power supply capacity upto the year 2004 will be secured with the completion of the Project, it will be necessary for the Government of the Maldives to periodically review the likelihood of a further increase of the power demand after 2004 and to formulate a plan to increase the power supply capacity accordingly. In addition, it will also be necessary for the Government of the Maldives to secure the necessary budget for the procurement of new DEG units, etc.

(4) It will be necessary for the STELCO to develop various consumers designed to encourage power consumption for day time to maintain the operating rate of the new DEG units at a high level. In addition, it should also examine ways of achieving diversification as well as flexibility of the electricity charge, including a review of the daytime and nighttime charges if necessary, to improve the load factor.

(5) The completion of the Project will mean the establishment of a power supply system for all users in the Project area. However, it will be necessary for the Government of the Maldives to introduce additional measures, including the installation of emergency power generating units, at such important public facilities as the airport, to deal with any unforeseen breakdown of the new power supply network in order to ensure the uninterrupted operation of such facilities.

APPENDICES

APPENDIX 1 STUDY TEAM MEMBERS

APPENDIX 1 STUDY TEAM MEMBERS

1. Basic Design Study

Name	Work Assignment	Current Position
Mr. Hayao Adachi	Team Leader	Development Specialist, Institute for International Cooperation, JICA
Mr. Masatsugu Komiya	Chief Consultant/ Operation and Maintenance Planner	Yachiyo Engineering Co., Ltd.
Mr. Masayuki Tamai	Power Generating Facilities Planner	Yachiyo Engineering Co., Ltd.
Mr. Yutaka Muraki	Power Distribution Facilities Planner	Yachiyo Engineering Co., Ltd.

2. Draft Report Consultations

Name	Work Assignment	Current Position
Mr. Toru Take	Team Leader	Deputy Director, First Project Management Division, Grant Aid Project Management Department, JICA
Mr. Masatsugu Komiya	Chief Consultant/ Operation and Maintenance Planner	Yachiyo Engineering Co., Ltd.

APPENDIX 2 STUDY SCHEDULE

APPENDIX 2 STUDY SCHEDULE

1. Field Survey for Basic Design Study

Day	Date	Activity		Overnight
		Government Officials	Consultants	
1	Apr. 10th (Fri.)	Travelling [Tokyo (12:00) - SQ997 - (17:55) Singapore (22:30) - SQ452 - (23:55) Male']		Male'
2	Apr. 11th (Sat.)	Team meeting		Male'
3	Apr. 12th (Sun.)	am. Courtesy visit to Department of External Resources and STELCO pm. Explanation of and discussions on Inception Report (at DER)		Male'
4	Apr. 13th (Mon.)	Submission, explanation of and discussions on Inception Report, survey contents, schedule and required facilities, etc. (at STELCO)		Male'
5	Apr. 14th (Tue.)	am. Briefing on Gan Island Development Plan by Maldives side (at Department of Planning, Human Resources and Environment) pm. Discussions on contents of Inception Report		Male'
6	Apr. 15th (Wed.)	am. Submission, explanation of and discussions on M/D (draft) pm. Travelling [Male' (13:10) - L63211 - (14:10) Gan]; attendance at 11 kV cable pressure-resistance test; survey on Gan Power Station		Gan
7	Apr. 16th (Thu.)	- Courtesy visit to STELCO Gan Office; survey on local power supply situation - Survey on substations on Feydhoo, Maradhoo/Feydhoo and Maradhoo Islands - Survey on planned new power station site - Survey on existing Hithadhoo Power Station - Survey on power station and distribution network on Hulhudhoo/Meedhoo Island constructed under Phase II Project		Gan
8	Apr. 17th (Fri.)	Survey on Hithadhoo Island (new residential areas)		Gan
9	Apr. 18th (Sat.)	am. Team meeting; sorting of gathered information pm. Travelling [Gan (14:30) - L63218 - (16:15) Male']		Male'
10	Apr. 19th (Sun.)	Discussions on and signing of M/D (Department of External Resources and STELCO)		Male'
11	Apr. 20th (Mon.)	- Travelling [Male' (07:55) - UL102 - (10:20) Colombo] - Courtesy visit and reporting to Japanese Embassy and JICA Office in Sri Lanka - Travelling [Colombo (23:55) - SQ401 - (05:50) Singapore]	am. Reconfirmation of field survey schedule; gathering of general information pm. Travelling [Male' (13:10) - L63211 - (15:00) Gan]; survey on general conditions of power generation and supply at STELCO Gan Office	Government officials: onboard airplane Consultants: Gan
12	Apr. 21st (Tue.)	Travelling [Singapore (09:50) - SQ012 - (17:35) Tokyo]	- Rough survey on power station site - Rough survey on substation sites	Gan
13	Apr. 22nd (Wed.)	——	- Rough survey on substation sites - Detailed survey on causeway	Gan
14	Apr. 23rd (Thu.)	——	Sorting of gathered information; supplementary survey	Gan
15	Apr. 24th (Fri.)	——	am. Travelling [Gan (10:30) - L63212 - (12:00) Male']	Male'
16	Apr. 25th (Sat.)	——	Preparation of field report	Male'
17	Apr. 26th (Sun.)	——	- Preparation of field report - Survey on and confirmation of superior plan(s) - Survey on aid of other donors and aid organizations - Gathering and confirmation of general information (environmental standards, design standards, climatic conditions, social environment, etc.)	Male'
18	Apr. 27th (Mon.)		Preparation of field report	Male'
19	Apr. 28th (Tue.)	——	- Explanation of and discussions on field report - Survey on and confirmation of maintenance system, work to be conducted by Maldives side, manpower requirements, necessary budget, etc. - Survey on and confirmation of electricity tariff, etc.	Male'
20	Apr. 29th (Wed.)	——	Explanation of and discussions on field report	Male'
21	Apr. 30th (Thu.)	——	As above	Male'
22	May 1st (Fri.)	——	Modification of field report	Male'
23	May 2nd (Sat.)	——	Modification of field report; sorting of gathered information; team meeting	Male'
24	May 3rd (Sun.)	——	am. Acquisition of approval of field report pm. Courtesy visit to DER and STELCO	Male'
25	May 4th (Mon.)	——	Travelling [Male' (00:55) - SQ451 - (08:40) Singapore (09:50) - SQ012 - (17:35) Tokyo]	Return to Japan

2. Draft Final Report Consultations

Day	Date	Activity	Overnight
1	July 15th (Wed.)	Travelling [Tokyo (12:00) - SQ997 - (17:55) Singapore (22:30) - SQ452 - (23:55) Male']	Male'
2	July 16th (Thu.)	Courtesy visit to the STELCO and DER and explanation of and discussions on the Draft Report Travelling [Male' (15:20) - LA3211 - (16:20) Gan]	Gan
3	July 17th (Fri.)	Project site survey	Gan
4	July 18th (Sat.)	Consultations with the STELCO Gan Office Travelling [Gan (16:45) - LA3218 - (17:45) Male'] Mr. Take (Team Leader) arrivals at Male (23:55 by SQ452)	Male'
5	July 19th (Sun.)	Survey on the existing powerhouses (Maafushi and Gradhoo)	Male'
6	July 20th (Mon.)	Discussions with the STELCO	Male'
7	July 21st (Tue.)	Discussions on the M/D (Draft) with the STELCO and DER	Male'
8	July 22nd (Wed.)	Signing of the Minutes of Discussions	Male'
9	July 23rd (Thu.)	Travelling [Male' (07:45) - EK811 - (10:05) Colombo] Reporting to the JICA Colombo Office and Embassy of Japan Travelling [Colombo (23:55) - SQ401 - Singapore]	on board aircraft
10	July 24th (Fri.)	Travelling [05:50) Singapore (09:50) - SQ012 - (17:35) Tokyo]	Return to Japan

APPENDIX 3 LIST OF PARTY CONCERNED IN THE RECIPIENT COUNTRY

APPENDIX 3 LIST OF PARTY CONCERNED IN THE RECIPIENT COUNTRY

Ministry of Foreign Affairs	
Mr. Solah Shihab	Deputy Minister
(Department of External Resources)	
Mr. Ahmed Latheef	Director of External Resources
Mr. Mohamed Ahmed Didi	Deputy Director
Ms. Aishath Azeema	Project Officer
Ms. Kahekshan Kamaludeen	Assistant Secretary
Ms. Aishath Shuwey	Assistant Undersecretary
Ministry of Finance and Treasury	
Hon. Arif Hilmy	Minister
Mr. Adam Maniku	Deputy Minister
Ministry of Planning, Human Resources and Environment	
Mr. Hamdun A. Hameed	Director General, Human Resources Development
Mr. Mohamed Hunaif	Deputy Director, Physical Planning
Mr. Ahmed Shareef Yoosuf	Program Analyst
Mr. Ibrahim Naseen	Statistical Officer
Ministry of Tourism	
Mr. Mohamed Saeed	Deputy Minister
State Electric Company Limited (STELCO)	
Mr. Abdul Shakoor	Managing Director
Mr. Mohamed Latheef	Assistant Director
Mr. Mohamed Rasheed	Director Engineer
Mr. Ahmed Nazim	Senior Engineer
Mr. Abdulla Wahhid	Senior Engineer
Mr. Zahid Jameel	Supervisor
Mr. Mohamed Hameez	Supervisor
Mr. Abdul Raheem	Supervisor
Mr. Moosa Sameer	Supervisor
Mr. Ibrahim Athif	Engine Room Section
Mr. K. Sjuathasmn	Accountant
Ms. Nazima Gaseem	Accountant

STELCO Gan Powerhouse	
Mr. Ahmed Solih Ali Didi	Manager
Mr. Mohamed Qasim	Assistant Manager
Mr. Ibrahim Shakeeb	Supervisor
Mr. Abdula Zahir	Supervisor
Mr. Moosa Marfoou	Supervisor
STELCO Hulhudhoo / Meedhoo Powerhouse	
Mr. Ahmed Solih Ali Didi	Manager
Mr. Abdulla Waseem	Supervisor
Mr. Ahmed Azoor	Supervisor
STELCO Hithadhoo Powerhouse	
Mr. Mohamed Zuhair	Manager
Mr. Ibrahim Fareed	Engineer
Eden Fashion Pte Ltd.	
Mr. Ibrahim Rasheed	Administrative Manager
Linea Clothing Pte Ltd.	
Mr. Deva Chandrarathne	Maintenance and Administration Manager
Jeweltex Pte Ltd.	
Mr. Rohantha Samarajewa	Administration Manager
Hithadhoo Regional Hospital	
Mr. Abdullah Saeed	Senior Regional Health Administrator
Southern Secondary School	
Mr.John Mathew	Principal
Mr. Mohamed Saudhy Hassan	Assistant Principal
Embassy of Japan is Sri Lanka	
Ms. Tomoko Nada	Attache
JICA Sri Lanka Office	
Mr. Yoshiaki Kano	Resident Representative
Mr. Masafumi Nagaishi	Asst. Resident Representative

APPENDIX 4 MINUTES OF DISCUSSION

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY
ON
ATOLL ISLAND ELECTRIFICATION PROJECT
(PHASE-III)
IN
THE REPUBLIC OF MALDIVES

In response to a request from the Government of the Republic of Maldives, the Government of Japan decided to conduct a basic design study on Atoll Island Electrification Project (Phase-III) (hereinafter referred to as "the Project") and entrusted the study to Japan International Cooperation Agency (JICA).

JICA has sent to Maldives a study team, which is headed by Mr. Hayao ADACHI, Development Specialist, Institute for International Cooperation, JICA, and is scheduled to stay in the country from April 10 to May 4, 1998.

The team held discussions with the officials concerned of the Government of Maldives and conducted a field survey at the study area.

In the course of the discussions and field survey, both parties have confirmed the main items described on the attached sheets. The team will proceed to further works and prepare the Basic Design Study report.

Male', April 19, 1998

Mr. Hayao ADACHI
Leader
Basic Design Study Team
JICA

Mr. Ahmed LATHEEF
Director
Department of External Resources
Ministry of Foreign Affairs
Republic of Maldives

Mr. Abdul SHAKOOR
Managing Director
State Electric Company Limited (STELCO)
Republic of Maldives

ATTACHMENT

1. Objective

The objective of the Project is to provide regular, reliable and constant supply of electricity to all households, buildings and facilities in the selected islands in Seenu Atoll.

2. Project Sites

The Project site is located at Gan, Feydhoo, Maradhoo/Feydhoo, Maradhoo and Hithadhoo Islands in Seenu Atoll as shown in Annex-I.

3. Responsible and Implementing Agencies

The Department of External Resources (DER), the Ministry of Foreign Affairs is responsible for the administration of the Project and the State Electric Company Limited (STELCO) is responsible for the implementation of the Project. The organization charts of STELCO is shown in Annex-II.

4. Items requested by the Government of Maldives

After discussion with the Basic Study Team, the following items were finally requested by the Maldivian side.

(1) Generating facilities for a new power station at Hithadhoo Island.

a) Supply and installation of three (3) sets of diesel engine generators with output capacity of approximately 750 kW each including necessary electrical equipment and mechanical auxiliaries (DEG sets).
b) Supply of spare parts for two (2) years operation and maintenance tools for DEG sets.
c) Supply and installation of workshop equipment necessary for DEG sets.
d) Provision of the Operation and maintenance manuals for DEG sets.

(2) Equipment and materials for 11kV distribution networks at Gan, Feydhoo Maradhoo/Feydhoo, Maradhoo and Hithadhoo Islands

a) Supply of 19 sets of distribution substation which consist of 11 kV switchgears, transformers (11 kV/415 V, 200 kVA each) and low voltage distribution panels.
b) Supply for 85 sets of local LV distribution board for Hithadhoo Island.

(3) Construction of a power house and equipment foundations for DEG sets and it's auxiliaries including building services, rainwater collecting and supply system, well water supply system and sewerage system within new power station premise.

However, final items to be constructed and procured under Japan's Grant Aid will be decided after further studies in Japan, taking into account of:
- existing conditions of power supply networks in the Project sites
- power demand forecast
- operation and maintenance capability of the implementing agency (STELCO)
- economic and administrative viability of the Project

5. Japan's Grant Aid System

(1) The Government of Maldives and its implementing agency have understood the system of Japan's Grant Aid explained by the Team, as described in Annex-III.

(2) The Government of Maldives and its implementing agency will take necessary measures, as described in Annex-IV, for smooth implementation of the Project, on condition that the Grant Aid Assistance by the Government of Japan is extended to the Project.

6. Schedule of the Study

(1) The consultants will proceed to further studies in Maldives until May 4, 1998.

(2) Based on the Minutes of Discussions and technical examination of the study results, JICA will prepare a draft report in English and dispatch a mission to Maldives in order to explain its contents around the beginning of July, 1998.

(3) In case that the contents of the draft report are accepted in principle by the Government of Maldives, JICA will complete the final report and send it to the Government of Maldives by the end of November, 1998.

7. Other relevant issues

(1) Maldivian side has agreed that if the requested items stipulated in Section 4 above is not covered by the Grant Aid for the Project, the following alternatives could be adopted under the Project.

a) Generating facilities for a new power station at Hitadhoo Island.
   (i) Supply and installation of two (2) sets of diesel engine generators with output capacity of approximately 1100 kW each including necessary electrical equipment and mechanical auxiliaries (DEG sets).
   (ii) Supply of spare parts for two (2) years operation and maintenance tools for DEG sets.
   (iii) Supply and installation of workshop equipment necessary for DEG sets.
   (iv) Provision of the operation and maintenance manuals for DEG sets.

b) Equipment and materials for 11kV distribution networks at Feydhoo Maradhoo/Feydhoo, Maradhoo and Hithadhoo Islands

(i) Supply for 10 sets of distribution substation which consists of 11 kV switchgears, transformers (11 kV/415 V, 200kVA each) and low voltage distribution panels.
(ii) Supply for 85 sets of local LV distribution board for Hithadhoo Island.

c) Construction of a powerhouse and equipment foundations for DEG sets and it's auxiliaries including building services, rainwater collecting and supply system, well water supply system and sewerage system within new power station premise.

(2) Both parties have agreed that the installation works of the substations and distribution lines should be implemented by Maldivian side by utilizing the equipment and materials to be provided under the Project and the existing 11kV cables which were stored in Gan Island, within a certain period to meet the requirement of the Japan's Grant Aid.

(3) Maldivian side has agreed that all necessary accessories for the existing 11kV cables such as termination kits, straight joint materials, etc. should be supplied by Maldivian side.

(4) Maldivian side has agreed to secure the land which might be necessary for the new substation facilities, before the implementation of the Project.

(5) Maldivian side has requested to the Team that the basic design for the distribution lines should be carried out in the scope of the Basic Design to be done by the Japanese side. The Team agreed to the request

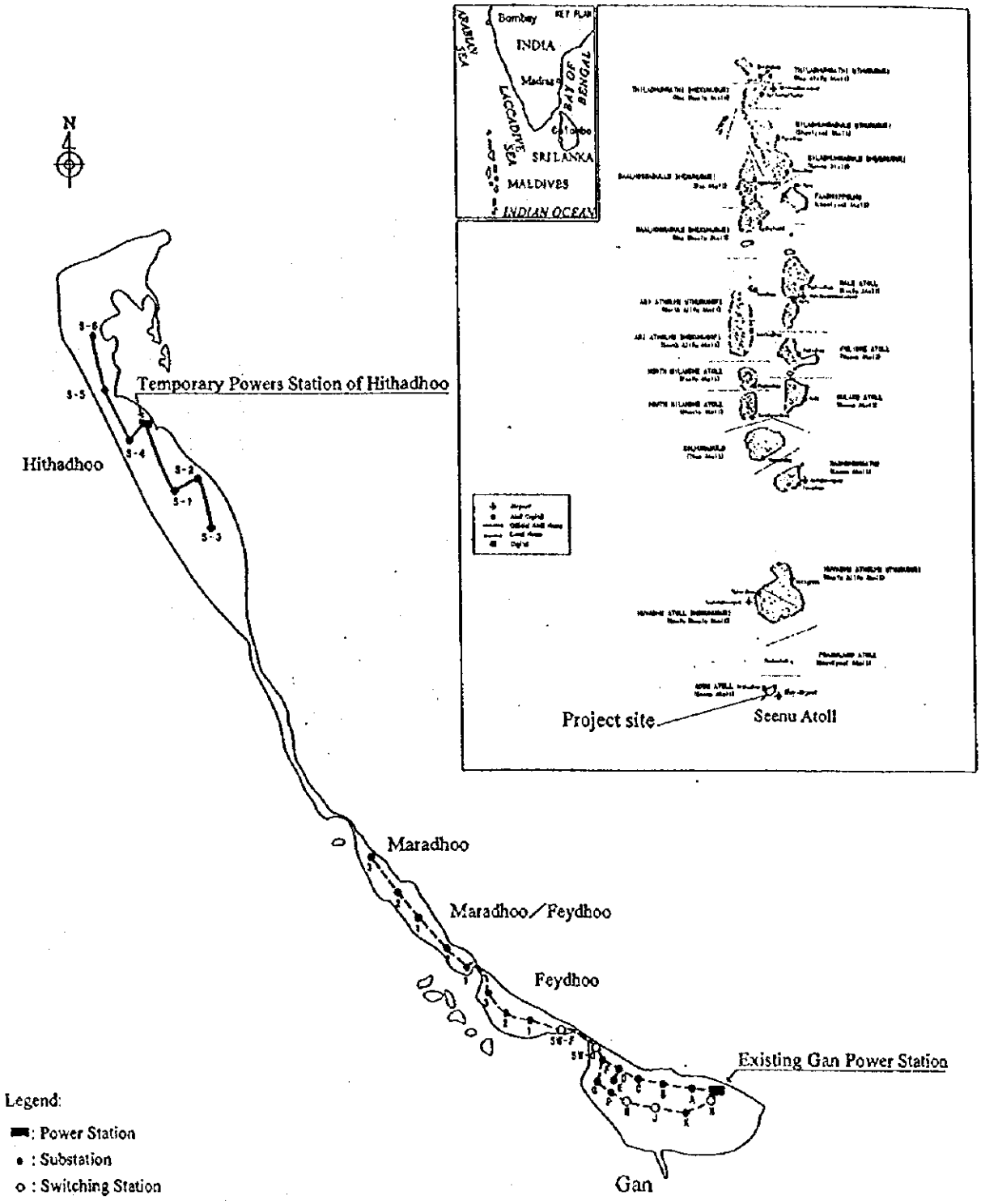
(6) The Team has recommended to the Maldivian side that, in case that the 2 sets of 1100kW DEG were adopted, the installation of an additional unit (No.3 unit) might be required in around the year 2001 from the view-point of the stable power balance of the system. Maldivian side has understood the recommendation and mentioned that the additional installation would be considered by Maldivian side.
Also Maldivian side explained that the existing 3.3kV distribution network in Gan Island of the Project site was planned to be utilized for the Project by using a step-down transformer (11/3.3kV) which should be supplied by Maldivian side.

(7) Maldivian side has explained that the existing temporary diesel generating facilities operating at Hithadhoo Island would be utilized at Laamu Atoll (Gan Island) or any other island to be identified by the Government of Maldives, by STELCO after completion of the Project.

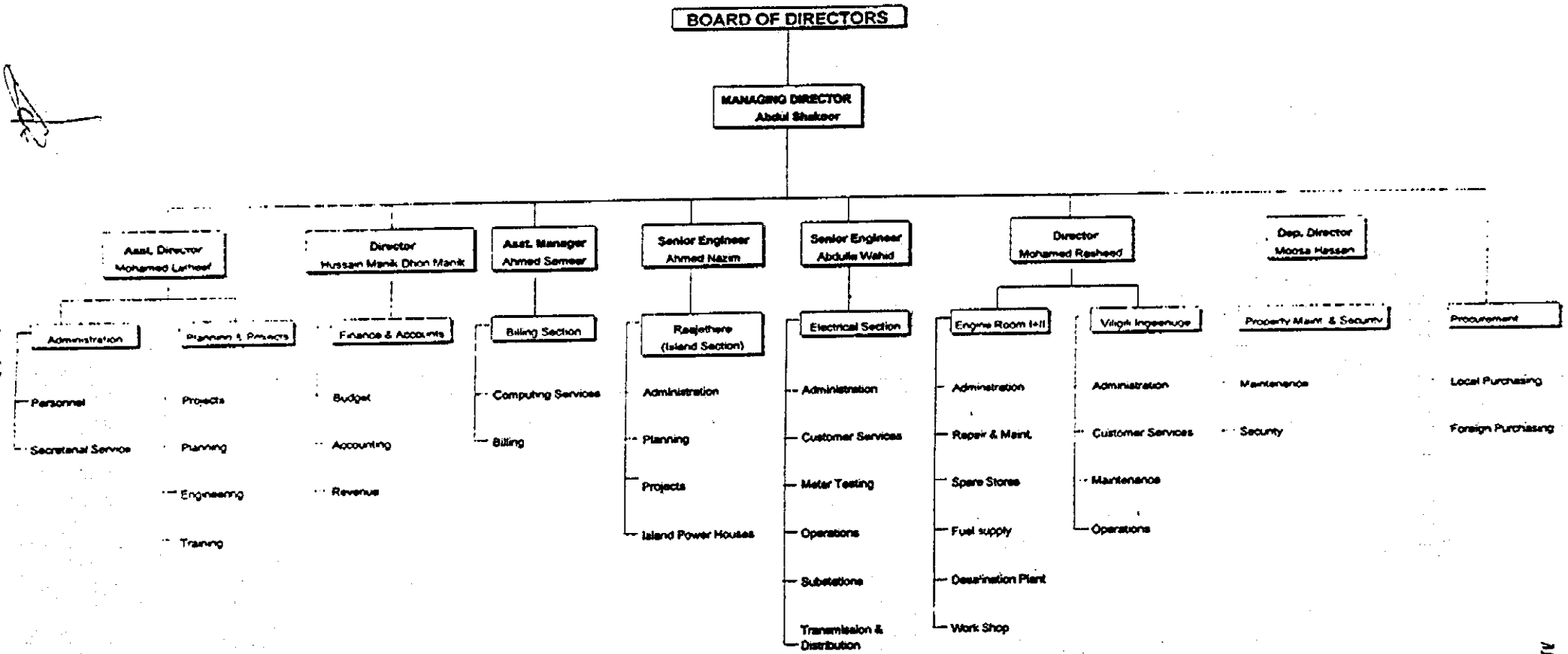
(8) Both parties have agreed that the required capacity of the new DEG sets for the Project will be evaluated based on a power demand forecast of the Project sites by envisaging the Project Target Year of around 2004.

(9) Maldivian side agreed to secure and allocate necessary budget for operation and maintenance of the new power station and distribution networks provided under the Project, in order to maintain the proper function of the new power station and distribution networks.

ANNEX-I Project Sites



STATE ELECTRIC COMPANY LIMITED
Male'



ANNEX- II The Organization chart of STELCO

A - 12

Minutes of Discussions

ANNEX-III

Japan's Grant Aid Scheme

1. Grant Aid Procedures

(1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

(2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.
Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).
Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.
Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.
Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

(1) Contents of the Study
The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

a) Confirmation of the background, objectives, and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
d) Preparation of a basic design of the Project
e) Estimation of costs of the Project

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.
The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firms(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

3. Japan's Grant Aid Scheme

(1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

(2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

(3) "The period of the Grant Aid" means the one fiscal year which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

(4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
3) To secure buildings prior to the procurement in case the installation of the equipment.
4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port

of disembarkation and internal transportation of the products purchased under the Grant Aid.

5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.

6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(8) "Re-export"

The products purchased under the Grant Aid should not be re-exported from the recipient country.

(9) Banking Arrangements (B/A)

1) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in an authorized foreign exchange bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.

2) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

MINUTES OF DISCUSSIONS

BASIC DESIGN STUDY
ON
ATOLL ISLAND ELECTRIFICTION PROJECT (PHASE III)
IN
THE REPUBLIC OF MALDIVES
(CONSULTATION ON DRAFT REPORT)

In April 1998, the Japan International Cooperation Agency (JICA) dispatched a Basic Design Study Team for Atoll Island Electrification Project (Phase III) (hereinafter referred to as "the Project") to the Republic of Maldives, and through discussions with Maldivian side, field survey, and technical examination of the results in Japan, has prepared the draft report of the Study.

In order to explain and to consult the Maldivian side on components of the draft report, JICA sent to Maldives a study team, which is headed by Mr. Toru TAKE, Deputy Director, First Project Management Division, Grant Aid Project Management Department, Japan International Cooperation Agency (JICA), and is scheduled to stay in the country from July 15 to 23, 1998.

As a result of discussions, both parties confirmed the main items described on the attached sheets.

Male', July 22, 1998

Mr. Toru TAKE
Leader
Draft Report Explanation Team
JICA

Mr. Solah SHIHAB
Deputy Minister
Ministry of Foreign Affairs
Republic of Maldives

Mr. Abdul SHAKOOR
Managing Director
State Electric Company Limited (STELCO)
Republic of Maldives

ATTACHMENT

1. Components of the Draft Report

The Government of Maldives has agreed and accepted in principle the components of the Draft Report proposed by the Team.

2. Japan's Grant Aid System

(1) The Government of Maldives has understood the system of Japan's Grant Aid explained by the Team, as described in Annex-I.

(2) The Government of Maldives will take necessary measures, as described in Annex-II, for smooth implementation of the Project, on condition that the Grant Aid assistance by the Government of Japan is extended to the Project.

3. Further Schedule

The Team will make the final report in accordance with the confirmed items, and send it to the Government of Maldives by the end of November 1998.

4. Other Relevant Issues

(1) Existing Generating Facilities
The existing diesel generating facilities (4 x 160 kW) temporally operating at Hithadhoo Island shall be utilized at Laamu Atoll (Gan Island) or any other island to be identified by the Government of the Republic of Maldives upon completion of the Project.

(2) Installation Works for Distribution Networks
Maldivian side agreed to allocate the necessary budget and to complete all the installation works for Distribution Network within a certain period to meet the requirement of the Japan's Grant Aid.

Annex-I Japan's Grant Aid Scheme

Japan's Grant Aid Scheme

1. Grant Aid Procedures

(1) Japan's Grant Aid Program is executed through the following procedures.

Application	(Request made by a recipient country)
Study	(Basic Design Study conducted by JICA)
Appraisal & Approval	(Appraisal by the Government of Japan and Approval by Cabinet)
Determination of Implementation	(The Notes exchanged between the Governments of Japan and the recipient country)

(2) Firstly, the application or request for a Grant Aid project submitted by a recipient country is examined by the Government of Japan (the Ministry of Foreign Affairs) to determine whether or not it is eligible for Grant Aid. If the request is deemed appropriate, the Government of Japan assigns JICA (Japan International Cooperation Agency) to conduct a study on the request.
Secondly, JICA conducts the study (Basic Design Study), using (a) Japanese consulting firm(s).
Thirdly, the Government of Japan appraises the project to see whether or not it is suitable for Japan's Grant Aid Program, based on the Basic Design Study report prepared by JICA, and the results are then submitted to the Cabinet for approval.
Fourthly, the project, once approved by the Cabinet, becomes official with the Exchange of Notes signed by the Governments of Japan and the recipient country.
Finally, for the implementation of the project, JICA assists the recipient country in such matters as preparing tenders, contracts and so on.

2. Basic Design Study

(1) Contents of the Study
The aim of the Basic Design Study (hereinafter referred to as "the Study"), conducted by JICA on a requested project (hereinafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Japanese Government. The contents of the Study are as follows:

a) Confirmation of the background, objectives, and benefits of the requested project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.
b) Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme from a technical, social and economic point of view.
c) Confirmation of items agreed on by both parties concerning the basic concept of the Project.
d) Preparation of a basic design of the Project
e) Estimation of costs of the Project

The contents of the original request are not necessarily approved in their initial form as the contents of the Grant Aid project. The Basic Design of the Project is confirmed considering the guidelines of Japan's Grant Aid Scheme.
The Government of Japan requests the Government of the recipient country to take whatever measures are necessary to ensure its self-reliance in the implementation of the Project. Such measures must be guaranteed even though they may fall outside of the jurisdiction of the organization in the recipient country actually implementing the Project. Therefore, the implementation of the Project is confirmed by all relevant organizations of the recipient country through the Minutes of Discussions.

(2) Selection of Consultants

For smooth implementation of the Study, JICA uses (a) registered consultant firm(s). JICA selects (a) firms(s) based on proposals submitted by interested firms. The firm(s) selected carry(ies) out a Basic Design Study and write(s) a report, based upon terms of reference set by JICA.

The consulting firm(s) used for the Study is(are) recommended by JICA to the recipient country to also work on the Project's implementation after the Exchange of Notes, in order to maintain technical consistency.

3. Japan's Grant Aid Scheme

(1) What is Grant Aid?

The Grant Aid Program provides a recipient country with non-reimbursable funds to procure the facilities, equipment and services (engineering services and transportation of the products, etc.) for economic and social development of the country under principles in accordance with the relevant laws and regulations of Japan. Grant Aid is not supplied through the donation of materials as such.

(2) Exchange of Notes (E/N)

Japan's Grant Aid is extended in accordance with the Notes exchanged by the two Governments concerned, in which the objectives of the Project, period of execution, conditions and amount of the Grant Aid, etc., are confirmed.

(3) "The period of the Grant Aid" means the one fiscal year (April to March) which the Cabinet approves the Project for. Within the fiscal year, all procedures such as exchanging of the Notes, concluding contracts with (a) consultant firm(s) and (a) contractor(s) and final payment to them must be completed.

However in case of delays in delivery, installation or construction due to unforeseen factors such as weather, the period of the Grant Aid can be further extended for a maximum of one fiscal year at most by mutual agreement between the two Governments.

(4) Under the Grant Aid, in principle, Japanese products and services including transport or those of the recipient country are to be purchased.

When the two Governments deem it necessary, the Grant Aid may be used for the purchase of the products or services of a third country.

However the prime contractors, namely, consulting, contracting and procurement firms, are limited to "Japanese nationals". (The term "Japanese nationals" means persons of Japanese nationality or Japanese corporations controlled by persons of Japanese nationality.)

(5) Necessity of "Verification"

The Government of recipient country or its designated authority will conclude contracts denominated in Japanese yen with Japanese nationals. Those contracts shall be verified by the Government of Japan. This "Verification" is deemed necessary to secure accountability to Japanese taxpayers.

(6) Undertakings required of the Government of the Recipient Country

In the implementation of the Grant Aid project, the recipient country is required to undertake such necessary measures as the following:

1) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction.
2) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites.
3) To secure buildings prior to the procurement in case the installation of the equipment.

4) To ensure all the expenses and prompt execution for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid.
5) To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which will be imposed in the recipient country with respect to the supply of the products and services under the Verified Contracts.
6) To accord Japanese nationals whose services may be required in connection with the supply of the products and services under the Verified Contracts, such facilities as may be necessary for their entry into the recipient country and stay therein for the performance of their work.

(7) "Proper Use"
The recipient country is required to maintain and use the facilities constructed and equipment purchased under the Grant Aid properly and effectively and to assign staff necessary for this operation and maintenance as well as to bear all the expenses other than those covered by the Grant Aid.

(8) "Re-export"
The products purchased under the Grant Aid should not be re-exported from the recipient country.

(9) Banking Arrangements (B/A)
1) The Government of the recipient country or its designated authority should open an account in the name of the Government of the recipient country in a bank in Japan (hereinafter referred to as "the Bank"). The Government of Japan will execute the Grant Aid by making payments in Japanese yen to cover the obligations incurred by the Government of the recipient country or its designated authority under the Verified Contracts.
2) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an authorization to pay issued by the Government of the recipient country or its designated authority.

Annex-II Necessary measures to be taken by the Government of Maldives on condition that Japan's Grant Aid is extended.

1. To provide necessary data and information for the Project.

2. To secure and provide cleared, embanked and leveled land as well as access road for the new power station, prior to the commencement of the construction for the Project.

3. To ensure speedy unloading and customs clearance of the goods for the Project at port and /or airport of disembarkation in Maldives.

4. To accord Japanese nationals whose services may be required in connection with the supply of products and services under the verified contracts such facilities as may be necessary for their entry into Maldives and stay therein for the performance of their work.

5. To meet the charges of custom duties, internal taxes and other fiscal levies which may be imposed on Japanese nationals in the Republic of Maldives with respect to the supply of the products and services under the verified contracts. And to take necessary measures for such tax exemption.

6. To bear commissions to a Japanese bank for the banking services based upon the banking arrangement.

7. To bear all the expenses other than those to be borne by the Grant Aid necessary for the execution of the Project.

8. To assign exclusive counterpart engineers and technicians to the Project in order to transfer the operation and maintenance techniques for the Project and to witness and confirm construction/installation works and qualities of equipment and materials when inspection is carried out.

9. To use and maintain properly and effectively all the facilities constructed and equipment and materials installed and purchased under the Japan's Grant Aid.

10. To construct incidental outdoor facilities, boundary fence and entrance gate at the new power station by the completion of the Project.

11. To install equipment and materials for distribution networks supplied under the Project in accordance with the design drawings prepared by the Japanese side and proper implementation schedule to meet the requirements of the Japan's Grant Aid.

12. To install 11kV cables, termination kits, cable joint materials, low voltage distribution cables, etc., necessary for completion of the power distribution networks in the Project areas.

13. To take necessary measure for the prevention of the environmental pollution such as disposal of oil sludge, etc.

14. To provide proper disposal places for excavated soil, waste water and oil discharged during the implementation period.

15. To provide temporary yard for the contractor's office, the consultant's office, equipment and materials storage yard, etc., in the new power station.

16. To provide load for test operation of the new diesel engine generator (DEG) during the implementation period.

17. To de-energizes the existing networks to enable connection with the existing 11kV distribution network and newly installed system.

18. To provide necessary fuel oil, lubrication oil and water for the initial start up and site tests for the new DEG sets.

APPENDIX 5 COST ESTIMATION BORNE BY THE RECIPIENT COUNTRY

APPENDIX 5 COST ESTIMATION BORNE BY THE RECIPIENT COUNTRY

Main items of the construction cost to be bone by the Maldivian Side are as follows:

1. Power Station Construction

1.1	Civil Works including Office, Accommodation, Workshop, etc.:		7,200,000 Rf
		(Total)	(7,200,000 Rf)

2. Distribution Network

2.1	Cable Trenching		3,200,000 Rf
2.2	11kVCables, Cable Joint Materials and Maintenance Vehicles		9,300,000 Rf
		(Total)	(12,500,000 Rf)

APPENDIX 6 POWER DEMAND FORECAST

1 Power Demand Forecast

Description			Unit	1995 actual	1996 actual	1997 actual	1998 estimated	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
A. NIGHT TIME PEAK (18:00~01:00)																			
A1. Domestic/Government use																			
A1.1 Hitadhoo Island	①		*population increasing ratio*		1.018	1.018	1.005	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013
	②	① x former year	person	11,758	11,969	12,184	12,225	12,384	12,545	12,708	12,873	13,041	13,210	13,382	13,556	13,732	13,911	14,091	14,275
	③		person/house	9.01	8.86	8.35	8.37	8.37	8.37	8.37	8.37	8.37	8.37	8.37	8.37	8.37	8.37	8.37	8.37
	④	②÷③	No. of house	1,305	1,351	1,460	1,460	1,479	1,498	1,518	1,537	1,557	1,578	1,598	1,619	1,640	1,661	1,683	1,705
	⑤		*unit demand increasing ratio*				1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013
	⑥	⑤ x former year	unit demand (kW/house)	0.24	0.29	0.27	0.27	0.27	0.28	0.28	0.28	0.29	0.29	0.30	0.30	0.30	0.31	0.31	0.32
	⑦	④ x ⑥	Total Demand (kW)	313	394	389	394	404	415	426	437	448	460	472	485	497	510	524	537
A1.2 Maradhoo Island	①		*population increasing ratio*		1.023	1.009	1.001	1.011	1.011	1.011	1.011	1.011	1.011	1.011	1.011	1.011	1.011	1.011	1.011
	②	① x former year	person	2,918	2,986	3,013	3,017	3,050	3,084	3,118	3,152	3,187	3,222	3,257	3,293	3,329	3,366	3,403	3,440
	③		person/house	7.78	7.76	7.65	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66	7.66
	④	②÷③	No. of house	375	385	394	394	398	403	407	412	416	421	425	430	435	440	444	449
	⑤		*unit demand increasing ratio*				1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013
	⑥	⑤ x former year	unit demand (kW/house)	0.21	0.21	0.20	0.21	0.21	0.21	0.21	0.22	0.22	0.22	0.23	0.23	0.23	0.23	0.24	0.24
	⑦	④ x ⑥	Total Demand (kW)	80	80	80	81	83	85	87	89	91	94	96	98	100	103	105	108
A1.3 Maradhoo/Feydhoo Island	①		*population increasing ratio*		1.022	1.018	1.002	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013
	②	① x former year	person	1,320	1,349	1,373	1,376	1,394	1,412	1,430	1,449	1,468	1,487	1,506	1,526	1,546	1,566	1,586	1,607
	③		person/house	7.17	7.18	6.57	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58	6.58
	④	②÷③	No. of house	184	188	209	209	212	214	217	220	223	226	229	232	235	238	241	244
	⑤		*unit demand increasing ratio*				1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013
	⑥	⑤ x former year	unit demand (kW/house)	0.22	0.21	0.22	0.22	0.22	0.22	0.23	0.23	0.23	0.24	0.24	0.24	0.24	0.25	0.25	0.25
	⑦	④ x ⑥	Total Demand (kW)	40	40	45	46	47	48	49	51	52	53	55	56	58	59	61	62
A1.4 Feydhoo Island	①		*population increasing ratio*		1.019	1.012	0.999	1.011	1.011	1.011	1.011	1.011	1.011	1.011	1.011	1.011	1.011	1.011	1.011
	②	① x former year	person	4,168	4,249	4,302	4,296	4,343	4,391	4,439	4,488	4,538	4,587	4,638	4,689	4,741	4,793	4,845	4,899
	③		person/house	7.69	7.59	7.47	7.46	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59	7.59
	④	②÷③	No. of house	542	560	576	576	572	579	585	592	598	605	611	618	625	632	639	646
	⑤		*unit demand increasing ratio*				1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013
	⑥	⑤ x former year	unit demand (kW/house)	0.21	0.21	0.24	0.25	0.25	0.25	0.26	0.26	0.26	0.27	0.27	0.27	0.28	0.28	0.28	0.29
	⑦	④ x ⑥	Total Demand (kW)	113	120	140	142	143	146	150	153	157	161	165	169	173	177	181	186
A1.5 Gan Island				0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
(Total of A1)		A1.1~ A1.5	(kW)	546	634	654	663	677	694	712	730	749	768	787	807	826	849	871	893
A2. Commercial/Industrial Use																			
A2.1 Existing consumers																			
A2.1.1 Gan Island	①		*unit demand increasing ratio*				1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013	1.013
	②	① x former year	Demand (kW)	343	363	415	420	426	431	437	443	448	454	460	466	472	478	485	491
(Sub-Total of A2.1)			(kW)	343	363	415	421	427	432	438	444	449	455	461	467	473	479	486	492
A2.2 Waiting consumers																			
A2.2.1 Hitadhoo Island		Telecomm. center, VOM, etc	(kW)	0	0	0	0	0	0	0	125	125	125	125	125	125	125	125	125
A2.2.2 Gan Island		Canteen for Factory	(kW)	0	0	0	0	0	0	32	32	32	32	32	32	32	32	32	32
(Sub-Total of A2.2)			(kW)	0	0	0	0	0	0	32	157	157	157	157	157	157	157	157	157
(Total of A2)		A2.1+A2.2	(kW)	343	363	415	421	427	432	470	601	606	612	618	624	630	636	643	649
A3. Peak Demand (Night Time)		A1 + A2	(kW)	889	997	1,069	1,084	1,104	1,127	1,182	1,331	1,355	1,380	1,405	1,432	1,458	1,485	1,513	1,542
B. DAY TIME PEAK (01:00~18:00)																			
B1 Average Demand for Day Time																			
B1.1 Load Factor		Ave. of day time÷Night time peak		0.42	0.44	0.43	0.45	0.46	0.46	0.47	0.47	0.48	0.49	0.49	0.50	0.51	0.51	0.52	0.53
B1.2 Domestic/Government use		B1.1 x A1		229	279	281	298	309	321	333	346	359	373	388	403	419	435	452	469
B1.3 Commercial/Industrial Use		B1.1 x A2.1		144	160	178	190	195	200	205	210	216	221	227	233	239	245	252	258
(Total of B1)		B1.2 + B1.3	(kW)	373	439	460	488	503	520	538	556	575	595	615	636	658	680	704	728
B2. Waiting consumers (Commercial/Industrial use)																			
B2.1 Hitadhoo Island		Telecomm. center, VOM, etc	(kW)	0	0	0	0	0	0	0	270	270	270	270	270	270	270	270	270
B2.2 Gan Island		Garment Factory, etc	(kW)	0	0	0	0	0	0	477	477	477	477	477	477	477	477	477	477
(Total of B2)		B2.1+B2.2	(kW)	0	0	0	0	0	0	477	747	747	747	747	747	747	747	747	747
B3. Peak Demand (Day Time)		B1 + B2	(kW)	373	439	460	488	503	520	1,015	1,303	1,322	1,342	1,362	1,383	1,405	1,427	1,451	1,475
C Total population		A1.1~ A1.5	(person)	20,164	20,553	20,872	20,914	21,171	21,432	21,695	21,962	22,233	22,506	22,783	23,063	23,347	23,635	23,926	24,220

REMARKS:
(1) *Unit demand increasing ratio per year:* 1.013 (See Note-2)

NOTES:
(1) Population increasing ratio for islands shall be an average ratio of each island population between 1995 and 1998. Refer to the STELCO Data dated April 1,1998.
(2) *Unit demand increasing ratio* shall be calculated from an average growth ratio of GDP/capita (based on Maldivian nationals) as follows: Refer to the Fifth National Development Plan.
[Average growth ratio of GDP/capita (based on Maldivian nationals) between 1986-96; 5.2%/year]÷4 = 1.013 (1.3%/year)
(3) Waiting consumers for Commercial/Industrial use will be connected with the new distribution line in 2001~2002.
(4) Population, No. of households and power demand in 1995 ~ 1998 is based on STELCO Data dated April 1 and April 13, 1998.
(5) Load Factor shall be increasing year by year with increasing ratio 1.013. (See Note 2.)
(6) Waiting Consumers for Hitadhoo shall be Telecomm. Center (50kW), Voice of Maldives (30kW), National Security Service (35kW), Public Works (25kW) and Garment Factory (120kW).: Day Total 270kW, Night Total 125kW(except Public Works & Garment Factory)
(7) Waiting Consumers for Gan shall be Jeweltex factory (120kW), Lines Clothing Factory (177kW), Eden Clothing Factory (148kW), Canteen for Factory (32kW).: Day Total 477kW, Night Total 32kW (only Canteen for Factory)

2 Power Balance (in case 750kW x 3)

Description		Unit	1996 actual	1997 actual	1998 estimated	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
1. Peak Demand																	
1.1 Night Time Peak	A3	(kW)	997	1,069	1,084	1,104	1,127	1,182	1,331	1,355	1,380	1,405	1,432	1,458	1,485	1,513	1,542
1.2 Day Time Peak	B3	(kW)	439	460	468	503	520	1,015	1,303	1,322	1,342	1,362	1,383	1,405	1,427	1,451	1,475
1.3 Highest Peak Demand	(1.1) or (1.2)	(kW)	997	1,069	1,084	1,104	1,127	1,182	1,331	1,355	1,380	1,405	1,432	1,458	1,485	1,513	1,542
2. Station Auxiliary Supply and Distribution Loss	(9% of 1.3)	(kW)	N/A	N/A	N/A	N/A	101	106	120	122	124	126	129	131	134	136	139
3. Required Generation capacity	(1+2)	(kW)	N/A	N/A	N/A	N/A	1,228	1,288	1,450	1,477	1,504	1,532	1,560	1,589	1,619	1,650	1,681
6. Power Supply Condition																	
6.1 Diesel Generating Capacity	(Installation capacity)																
No.1 DEG	750	(kW)	N/A	N/A	N/A	N/A	750	750	750	750	750	746	743	739	735	731	728
No.2 DEG	750	(kW)	N/A	N/A	N/A	N/A	750	750	750	750	750	746	743	739	735	731	728
No.3 DEG	750	(kW)	N/A	N/A	N/A	N/A	750	750	750	750	750	746	743	739	735	731	728
No.4 DEG	750	(kW)	N/A	N/A	N/A	N/A	0	0	0	0	0	750	750	750	750	750	746
6.2 Total Available Capacity		(kW)	N/A	N/A	N/A	N/A	2,250	2,250	2,250	2,250	2,250	2,989	2,978	2,966	2,955	2,944	2,930
7. Power Balance	(3. - 6.2)	(kW)	N/A	N/A	N/A	N/A	1,022	962	800	773	746	1,457	1,417	1,377	1,336	1,295	1,249
[Study for Stable Power Balance]																	
8. Maximm Unit Capacity	No.1~No.4	(kW)	N/A	N/A	N/A	N/A	750	750	750	750	750	750	750	750	750	750	746
9. Stable Capacity (6.2- 8.)	2units operation +1 unit stand-by	(kW)	N/A	N/A	N/A	N/A	1,500	1,500	1,500	1,500	1,500	2,239	2,228	2,216	2,205	2,194	2,183
10. Stable Power Balance (9.-3.)		(kW)	N/A	N/A	N/A	N/A	272	212	50	23	-4	707	667	627	586	545	503

NOTES:
(1) The planned completion year of the new power house will be 2000.
(2) No.4 DEG unit shall be installed in 2000.
(3) Power output deterioration rate (0.5%/year) shall be adopted after 5 years from the commencement of operation.