

D-G01 : 33kV Cable Route Map From Lungga P/S to Honiara East S/S



D-G02 : 33kV Cable Route Map From Honiara P/S to White River S/S

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NEW RANADI SUBSTATION LOCATION MAP

D-G10 ラナディ変電所:配置図 LAYOUT OF RANADI S/S









SWITCHGEAR STATION LOCATION PLAN

D-G13 ホニアラ発電所: 33kV 開閉設備 配置図 HONIARA POWER STATION LAY OUT PLAN OF 33kV SWGR

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D-G20 ホニアラ発電所:開閉設備改修系統図 HONIARA POWER STATION IMPROVEMENT PLAN OF 33kV SYSTEM



D-02 全体単線結線図:ホニアラ発電所およびホワイトリバー変電所 KEY SINGLE LINE DIAGRAM HONIARA P/S AND WHITE RIVER S/S



D-03 全体単線結線図:ラナディおよびホニアライースト変電所 KEY SINGLE LINE DIAGRAM RANADI AND HONIARA EAST S/S

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2.2.4 Implementation Plan

2.2.4.1 Implementation Policy

The Project will be implemented within the framework of the grant aid system of the Government of Japan. Accordingly, the Project will only be implemented after its approval by the Government of Japan and the formal Exchange of Notes between the Government of Japan and the Government of the Solomon Islands. The basic issues and special points for consideration for the implementation of the Project are described below.

(1) Project Implementing Body

The organization responsible for the implementation of the Project on the side of the Solomon Islands is the Department of Mining and Energy (DME) which operates and controls public works, mainly power generation as well as supply and mining. Following the completion of the installation work of the new generating unit under the Project, the SIEA will be responsible for the operation and maintenance of the said unit. Consequently, in order to ensure the smooth implementation of the Project, the DME and SIEA should maintain close contact and consult with the Japanese Consultant and Contractor, both of which will be selected by the Government of the Solomon Islands in accordance with Japan's grant aid system. For this purpose, the DME and SIEA should select a person to be responsible for the implementation of the Project. The selected person will be required to explain the contents of the Project to the staff members of the Lungga Power Station and citizens of Honiara where the planned new generating unit will be installed with a view to obtaining their cooperation for the implementation of the Project.

(2) Consultant

In order to procure and install the necessary equipment for the Project, the Japanese Consultant will conclude a consultancy agreement with the Government of the Solomon Islands and will conduct the detailed design and supervision of the site work for the Project. The Consultant will also prepare the tender documents and will execute the prequalification and tender on behalf of the project implementing body.

(3) Contractor

The Contractor, which will be a Japanese corporation selected by the Government of the Solomon Islands through open tender in accordance with Japan's grant aid system, will conduct the procurement and installation of the equipment procured under the Project. As it is deemed necessary for the Contractor to provide after-care in terms of the supply of spare parts and the

repair of equipment breakdowns in regard to the new equipment, the Contractor must pay proper attention to continual liaison with the SIEA.

(4) Necessity to Dispatch Japanese Engineers

As the planned work under the Project is the installation of a new generating unit inside an existing power station which is in operation, it will be necessary to coordinate the new structures with the existing foundations and building, etc. in addition to the establishment of a reliable link and coordination with the existing control and other systems. The construction work of the new substations and laying work of the transmission cables will take place in relatively dense residential areas or along a busy national road. These work conditions and requirements make the dispatch of a site manager from Japan essential to provide consistent management and guidance on schedule control, quality control and work safety.

In regard to the foundation work, the local shortage of skilled workers (technicians) with adequate technical expertise regarding large-scale power generation work makes it essential for the Contractor to dispatch Japanese engineers for both quality and schedule control. Moreover, the installation of the planned generating unit and transforming equipment will demand wide-ranging knowledge and expertise regarding the functions and configuration of such equipment, making the dispatch of experts by the equipment manufacturers necessary to supervise the installation work as well as test operation and adjustment.

2.2.4.2 Implementation Conditions

- (1) Construction Industry in Solomon Islands
 - 1) Use of Local Construction Companies and Dispatch of Supervisory Engineers

There is only one general construction company in Honiara and the recruitment of engineers and workers from Fiji and other places is necessary when a major construction project is planned. Accordingly, the technical level of local construction companies is not particularly high and these companies will primarily be used for the supply of labour.

The planned generating unit installation work and the transmission and distribution system construction work under the Project is complex work involving civil engineering, building, mechanical and electrical work. Accordingly, the dispatch of Japanese engineers and technicians to supervise the local contractor(s) in regard to the preparation of the construction plan, schedule control, quality control, test operation and adjustment will be essential.

2) Procurement of Construction Machinery

Construction machinery cannot be procured in Honiara, making the procurement of a hydraulic low bed trailer for the inland transportation of the engine (weighing approximately 60 tons) from Australia or another third country necessary.

(2) Important Points for Work Plan

1) Installation of New Generating Unit

Although it will be necessary to unload the new DEG and other equipment at Port Honiara, there is no suitable facility to land the new engine (weighing approximately 60 tons) at this port as mentioned earlier (2.2.1.6-(1)). Accordingly, it will be necessary to use a cargo vessel or barge equipped with a large crane for the unloading of heavy equipment.

The lack of a large mobile crane in the Solomon Islands means that the work plan should involve the use of a hydraulic jack and rollers for the installation of the new generating unit on its foundations. Proper safety measures and equipment protection measures should also be introduced during the installation work as the new generating unit will be installed next to the operating No.9 unit.

The approach road to the Lungga Power Station is asphalt paved but is damaged in parts. The Solomon Islands side must repair or reinforce the existing road prior to the commencement of the construction work under the Project to avoid any delay of the work to be conducted by the Japanese side.

The 11 kV and 33 kV switchgears will be installed in line with the existing similar switchgears to connect their main bus lines to the existing bus lines. All safety aspects, including secure interlocking, etc., must be thoroughly verified. As the suspension of power supply to the existing bus lines will be required for this connection work and testing purposes, the SIEA must be properly consulted with regarding the preparation of an appropriate work schedule.

2) Installation of Transmission and Distribution Equipment

In view of the proximity of the proposed substation construction sites to residential areas, proper attention should be paid to ensuring the safety of residents during the construction period. As the temporary yards to store equipment and materials under the Project are the installation sites of the equipment, the Japanese side will erect a gate and perimeter fencing to prevent accidents involving local residents as part of the temporary work.

There is a possibility that unexploded shells and remains from the Second World War are buried along the planned transmission routes, making it essential to conduct the excavation work with the strictest care. The search for unexploded shells will be undertaken by the Solomon Islands side and should be conducted prior to the commencement of the work to be undertaken by the Japanese side. If a burial site is identified, the Solomon Islands side must safely remove any dangerous items.

2.2.4.3 Scope of Work

The scope of work to be undertaken by the Government of the Solomon Islands and the Government of Japan is shown in Table 2-2-15.

The spare parts and maintenance tools, etc. for the generating unit, the procurement of which is planned under the Project, will be stored at the existing equipment and materials stock yard at the Lungga Power Station. Meanwhile, the spare parts and maintenance tools, etc. for the substations will be stored at the warehouse of the SIEA Headquarters.

Work Item	Japan	Solomon Islands	Remarks
1. Common Items			
(1) Provision of work site and free lease to the contractor		To carry out	Including office, stock yard
(2) Extension of water supply, electricity	On the	Up to the	The Japanese side will pay
supply and telephone services to the	construction site	boundary of the	any charges incurred during
site		construction site	the work period
(3) Levelling of construction site		To carry out	
(4) Construction of access foad (5) Obtainment of building permits		To carry out	
(5) Obtaining permits		10 carry out	
2. Extension of Lungga Power Station			
2.1 Generation Unit Installation Work			
(1) DEG (4.2 MW x 1)	To procure and		
	install		
(2) Mechanical and electrical equipment $f_{\rm err}(1)$			Including a station
$\frac{10r(1)}{(2)}$	"		transformer
(4) Fuel oil tank	"		
(5) Station cabling and earthing system	"		
(6) Spare parts and inspection/	To procure	To store	
maintenance tools related to the	Ĩ		
Project			
(7) OJT	To carry out	To attend	
(8) Fuel oil and lubricating oil for testing	To procure		For non-load operation only
of the generating facilities	T		
(9) Compressed air; water and power	1 o procure		
testing of the generating facilities			

Table 2-2-15Scope of Work

Work Item	Japan	Solomon Islands	Remarks
(10) Interruption of the service for connecting work with existing electrical equipment		To carry out	Including explanation to local residents
(11) Arrangement of the load for testing2.2 Civil Engineering and Building Work		To carry out	
 Removal or relocation of the existing structures 		To carry out	Foundations for No.10 unit, fencing for fuel tank and 11 kV distribution line. etc.
(2) Extension of the power house and switchgear house buildings	To carry out		
(3) Foundations for the fuel tank	To carry out		
3. Improvement of Honiara Transmission and Distribution System			
3.1 Substation Construction Work (Honiara East, Ranadi and White River Substations)			
 Rehabilitation of the existing 33 kV underground cable 		To carry out	
(2) 11 kV and 33 kV outdoor type switchgears (for substations)	To procure and install		
(3) 33 kV indoor type switchgear (for Lungga P/S)	"		
(4) 33/11 kV step-down transformers(5) Station transformers			
(6) Low voltage panels	"		
(7) Station cabling and earthing systems			
(8) Outdoor security lighting systems(9) 33 kV cables for system connection	"	Final connecting work with	
(10) Cables, arresters and circuit breakers	To procure	transmission line	
for connection with the 11 kV system (11) Low voltage system connection cables		To install	
(12)OJT	To carry out	To procure and install	
(13) Resetting of the existing protection relays		To attend To carry out	
(14) Interruption to service for connecting work with existing electrical equipment		To carry out	Including explanation to local residents
(15) Load for testing		_	
3.2 Honiara Switching Facility Construction Work		To secure	
(1) 33 kV outdoor type switchgear	To procure and install		
(2) Station cabling and earthing systems(3) 33 kV cable for system connection	"		
		Final connecting	
		work with existing	
		transmission line	
(4) OJT	To carry out		

Work	Item	Japan	Solomon Islands	Remarks
(5) Interruption to set	rvice for connecting			Including explanation to
work with the exi	sting electrical		To attend	local residents
equipment			To carry out	
(6) Load for testing				
3.3 Civil Engineerin	g/Building Work at			
Substations and	Switching Facilities		To secure	
(1) Removal or reloc	ation of existing			11 kV distribution cable and
structures	1 .		T (trees, etc.
(2) Removal of burle (2) E = 1 $\pm i$	d items	T (To carry out	Including unexploded shells
(3) Foundations for t	ransforming	To carry out	To communit	
(4) Equipment			To carry out	
(4) Fencing work (5) Substation building	ng (only at White			
(3) Substation building River S/S)	ng (only at white			
34 Laving Work of	33 kV			
Underground Ti	ransmission Cable			
(1) Removal or reloc	ation of existing			11 kV distribution cable and
structures	ation of enibring			trees etc
(2) Removal of burie	d items		To carry out	Including unexploded shells
(3) Laving of 33 kV	underground cables	To procure and		
		install	To carry out	
(4) Traffic control du	ring the work and		5	
explanation to loc	cal residents			
3.5 Maintenance To	ols		To carry out	
(1) Spare parts and		To procure	-	
inspection/mainte	enance tools related to			
the Project			To store	
(2) Maintenance vehi	icle related to the	To procure		
Project				
			To store	

2.2.4.4 Consultant Supervision

The Consultant will organize the project team in accordance with Japan's grant aid system and the concept and principles of the basic design in order to smoothly proceed with the implementation of the Project. The Consultant will also appoint at least one full-time on-site engineer during the construction work period to supervise the schedule control, quality control and safety control and will dispatch other expert engineers in accordance with the progress of the installation, test running and adjustment and delivery testing, etc. to supervise the work conducted by the Contractor. Furthermore, the Consultant will arrange for Japanese experts to attend the inspection of equipment manufactured in Japan or a third country at the manufacturing and pre-delivery stages to prevent any equipment problems after delivery to the Solomon Islands.

(1) Supervision Principles

The Consultant will supervise the work progress to ensure punctual completion within the planned period and will supervise and guide the Contractor in order to achieve the work quality indicated in

the contract without any problems at the site. The main points to be noted for the supervisory work are described below.

1) Schedule Control

The Consultant will make weekly and monthly comparisons between the actual work progress and the work schedule submitted by the Contractor at the time of signing the contract in terms of the following items. If the Consultant foresees any delay of the work, he will issue a warning to the Contractor, requesting that the latter submit a remedial plan in view of the completion of the work within the planned work period.

- ① Quantity of work completed
- 2 Quantity of equipment and materials delivered
- ③ Work efficiency and actual number of engineers, technicians and workers

2) Quality Control

The Consultant will supervise the Contractor in regard to the following so as to adhere to the quality of the facilities and equipment indicated in the contract documents (technical specifications and detailed design drawings, etc.) If the Consultant believes that the quality does not meet the requirements, he will demand that the Contractor correct, change or modify the situation.

- ① Checking of shop drawings and specifications for equipment
- ^② Checking of factory inspection results for equipment or attendance at shop inspection
- ③ Checking of installation manuals, site operation, inspection and test manuals and work drawings for equipment
- Supervision of site installation of equipment and attendance at test running, adjustment and inspection
- S Checking of building work drawings
- © Comparison between building work drawings and completed work

3) Safety Control

The Consultant will discuss and cooperate with the representative of the Contractor with a view to supervising the on-site construction and installation work to prevent any accidents to workers with due attention paid to the following on-site safety control principles.

- ① Establishment of safety control rules and selection of a person responsible for work safety
- ② Prevention of accidents to workers by means of periodical inspection of the construction machinery
- ③ Introduction of travelling routes for work vehicles and construction machinery, etc. and thorough enforcement of slow driving on site
- ④ Enforcement of welfare measures and days-off for workers
- (2) Project Implementation Regime

The project implementation regime, i.e. relationship between the parties involved in the implementation of the Project, including the work supervision stage, is shown in Fig. 2-2-1.



*Note: The consultancy agreement and construction contract must be verified by the Government of Japan.

Fig. 2-2-1 Project Implementation Regime

(3) Work Supervisors

The Contractor will employ a local construction company as a subcontractor to conduct the construction and installation work in accordance with the construction contract. It will be necessary for the Contractor to dispatch engineers with experience of similar work abroad to the Solomon Islands to supervise the subcontractor with a view to ensuring the strict enforcement of the schedule

control, quality control and safety control by the subcontractor. Given the size and contents of the Project, the Contractor's appointment of at least the following full-time on-site engineer is preferable.

- Site Manager (1): general management of on-site work and responsible for OJT

2.2.4.5 Quality Control Plan

The Consultant will supervise the Contractor to ensure that the latter adheres to the quality of the facilities and equipment indicated in the documents included in the consultancy agreement (technical specifications and detailed design drawings, etc.) If the Consultant believes that the quality does not meet the requirement, he will demand that the Contractor correct, change or modify the situation.

- ① Checking of shop drawings and specifications for the equipment
- ^② Witnessing of the shop inspection of equipment or checking of the shop inspection reports
- ③ Checking of the packaging, transportation and temporary on-site storage methods
- ④ Checking of the work drawings and installation manuals for the equipment
- S Checking of the test operation, adjustment and inspection manuals for the equipment at the manufacturing plants and on site
- © Supervision of the site installation work of the equipment and witnessing of the test running, adjustment and inspection
- ⑦ Comparison between the building work drawings and completed work
- Checking of the completion drawings

2.2.4.6 Procurement Plan

The generating unit and transmission/distribution equipment to be installed under the Project are not manufactured in the Solomon Islands and are difficult to procure locally. The availability of equipment and materials in the local market is explained below.

Some materials, including the cables in use, are manufactured in Indonesia and other ASEAN countries and their use does not present any special problem. As such civil engineering and building materials as cement and reinforcing bars are imported from Australia and New Zealand, etc., they are available locally.

(1) Generating Unit

① European Products

There are several manufacturers in Europe which manufacture generating units which meet the specifications adopted for the Project. In fact, the existing generating units of the Lungga Power Station were made in the UK and Finland. However, Europe is geographically quite distant from the Solomon Islands and the past delivery performance of European manufacturers in regard to spare parts and expendables for the existing generating units suggests that an emergency need for such items may not be quickly met. Moreover, the poor after-service is illustrated by the facts that the completion documents have not yet been submitted and that operation and maintenance manuals are unavailable, causing difficulties for the SIEA in terms of operation and maintenance.

② Australian and New Zealand Products

There is no manufacturer of a large DEG in these countries. Even though there are local sales agents of the existing DEGs, after-service is provided by the original manufacturers in the UK and Finland. As the response to an emergency is rather slow, the after-service is inadequate to say the least.

③ US Products

There is a tendency among US generating equipment manufacturers not to manufacture the medium-speed diesel engine generators (continuous rating of 750 rpm or less) which are required for the Project. Instead, they mainly manufacture high-speed (1,000 - 1,500 rpm) generators with a short time operation for emergency purposes. Even if a US manufacturer agrees to manufacture the DEG required for the Project, the fact that its spare parts and expendables would not be on the normal production line will mean a long delivery period for such spare parts and expendables after the commissioning of the new DEG and also high prices. As a result, the operation of the new DEG is likely to be hampered.

④ Japanese Products

The No.9 generating unit (4.2 MW x 1) provided under the previous grant aid project has been operating as a key generating unit serving Honiara since its commissioning in September, 1999, contributing to the city's emergency power supply. However, because of the chronic shortage of the city's power supply capacity, this No.9 unit has been in continuous use without any suspension of its use for periodic maintenance. Even under such circumstances, the No.9 unit has continued to perform its function. The overhaul conducted in November, 2002 found hardly any problems despite its long continuous operation, confirming its high level of reliability. In view of the proven quality and durability of the No.9 unit, the high level of

after-service provided and the familiarity of engineers with the operation and maintenance techniques required for a generating unit manufactured in Japan, the SIEA is strongly hoping for the procurement of the new generating unit under the Project from Japan. Given the situation described so far, the new generating unit to be procured under the Project will be manufactured in Japan.

(2) Transmission and Distribution Equipment

① 11 kV and 33 kV Indoor Type Switchgears for Lungga Power Station

The bus layout, equipment specifications and operating method, etc. of the 11 kV and 33 kV indoor type switchgears to be installed at the Lungga Power Station under the Project should be similar to those of the existing switchgears because of their installation in line with the existing switchgears (manufactured in Australia) and because of the need to ensure their proper operation and maintenance. For this reason, Australia and New Zealand will be included in the possible supply sources.

② Outdoor Type Switchgears

The new substations to improve the transmission and distribution system will be constructed at important load centres in Honiara. Outdoor type switchgears will be installed as, in principle, they do not require a building to house them, keeping the construction/installation period short. As these types of switchgears are not often manufactured in a third country, Japanese products will be procured in view of the reliable after-service.

③ Transformers

While the Lungga Power Station has 33/11 kV step-down transformers made in Europe, it is pointed out that these transformers experience problems, including oil leakage, and that their after-service system is inadequate. In contrast, the Japanese transformers installed under the previous grant aid project have maintained steady operation without any breakdowns and the SIEA is hoping for the procurement of Japanese transformers, which are key equipment under the Project, because of their high performance level and ease of maintenance. Accordingly, Japanese transformers will be procured to ensure proper operation and maintenance.

Based on the above considerations, the prospective supply sources for the equipment to be procured for the Project are shown in Table 2-2-16.

	S	upply Sourc	e
Equipment/Materials	Solomon Islands	Japan	Third Country
(Oils)			
① Fuel oil and cooling water	0		
	0		
(Construction Materials)	-		
① Sand and gravel	0		
© Cement	0		
(a) Steel			
© Structural Steel	Õ		
© Building service equipment, finishing materials and fencing materials	Õ		
(Construction Machinery/Transport Vehicle)			
© Construction machinery	0		
^② Low bed trailer (for transportation of the engine)		\bigcirc	0
(Extension of Lungga Power Station)			
① DEG		0	
[©] Auxiliary equipment for the above (fuel oil supply equipment, cooling		0	
water equipment, compressed air equipment and fuel oil unloading			
pump, etc.		\cap	
 Pring inacchais and accessories for the above Pring inacchais and accessories for the generating unit (high voltage nanel station) 		\circ	\bigcirc
transformer and low voltage control panel, etc.)		0	
© 11 kV indoor type switchgear			0
			(see Note)
© Cabling materials (11 kV cables, low voltage cables, conduits and		0	0
accessories, etc.)			
© Fuel oil tank			0
		0	
(Improvement of Honiara Transmission and Distribution System) \oplus 22 kV and 11 kV autoer two switches are		\bigcirc	
\bigcirc 55 kV and 11 kV outdoor type switchgears			
③ 33/11 kV step-down transformers		Õ	
Cabling materials (33 kV cables and accessories, etc.)		Õ	0
© Cabling materials (11 kV cables, low voltage cables, conduits and		0	0
accessories, etc.)		-	
© Spare parts and maintenance tools for the transmission and distribution		0	
lines			

Table 2-2-16	Supply Sources of Equipment and Materia	ıls
	NUMBER NOUTOOD OF LOUIDMONT OND MOTORIC	N I G
	NUMBER AND AND A STREET AND A STREET	415
	· · · · · · · · · · · · · · · · · · ·	

Note: Third countries are DAC countries and ASEAN countries. The third countries for the 11 kV and 33 kV indoor type switchgears for the extension of the Lungga Power Station are DAC countries.

2.2.4.7 Implementation Schedule

Following approval of the implementation of the Project by the Government of Japan, the E/N will be signed by the two governments to commence the actual implementation process of the Project in accordance with Japan's grant aid scheme. The Project will largely be implemented in three stages, i.e. ① detailed design and preparation of the tender documents, ② tender and signing of the construction agreement and ③ procurement and installation of the equipment. Fig. 2-2-2 shows the project implementation schedule.



(Phase 1 Work: Extension of Lungga Power Station)

(Phase 2 Work: Improvement of Honiara Transmission and Distribution System)

Month	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
led gn		Field Sur	vey)													
etai Jesi				(Work i	n Japan)											
D I				(1	Field Ver	ification)							(Total:	3.5 mont	hs)	
tion			(P	reparatio	n of Sho	p Drawir	igs and C	btaining	of Neces	sary App	oroval)		(Total:	16.0 mor	ths)	
italla t									(N	lanufactu	ire)					
nd Ins pmen										(Tr	ansportat	ion)				
nt ai Equi									(Civil	Enginee	ring)					
eme of l																
ocur													(Testing	and Adjı	istment)	
Pr																

Fig. 2-2-2 Project Implementation Schedule

2.3 Obligations of Recipient Country

The Government of the Solomon Islands has the obligation to provide or conduct the following in connection with the implementation of the Project

Common Items

- (1) To provide data and information required for the Project
- (2) To ensure the speedy, unloading, customs clearance and tax exemption of the goods required for the Project at the port of disembarkation in the Solomon Islands
- (3) To accord the equipment, etc. required for the Project and Japanese nationals dispatched to the Solomon Islands in connection with the Project exemption from all domestic taxes and such facilities as may be necessary for their entry into the Solomon Islands and stay therein to conduct their assignments
- (4) To procure the equipment and materials required for the implementation of the Project but not covered by the Japanese grant aid and to exempt the Japanese companies and Japanese nationals from the enterprise tax and any other business-related tax
- (5) To bear the commission of a Japanese foreign exchange bank for banking services based on the banking arrangements
- (6) To bear all expenses other than those covered by the Japanese grant aid which are necessary for the implementation of the Project
- (7) To appoint counterpart engineers and technicians for the transfer of operation and maintenance techniques related to the equipment to be procured and installed under the Project, to verify the work completion and to witness the quality inspection of the equipment and materials
- (8) To properly operate and maintain the equipment procured and installed with Japanese grant aid
- (9) The contents of the environmental management plan (EMP) will be observed. The main issues are listed below.
 - ① Assignment of full-time environmental controllers
 - ② Periodic measuring of air pollution, noise and vibration (at least twice a year)
 - ③ Preparation of operation and safety control standards for the generating and distribution facilities

Extension of Lungga Power Station

(10) To remove the foundations for the existing No.10 generating unit at the Lungga Power Station prior to the commencement of the construction work by the Japanese side

- (11) To improve the existing approach road to the Lungga Power Station prior to the commencement of the construction work by the Japanese side
- (12) To level the ground at the new fuel oil tank site and to relocate the existing fence and 11 kV distribution line
- (13) To provide free of charge temporary sites for the work office and stock yard, etc.
- (14) To provide sites for surplus soil, drain and waste oil during the work period
- (15) To ensure that power to the existing facilities is cut when the work to connect the new equipment provided under the Project to the existing switchgears, transformer and fuel oil pipeline, etc. is conducted
- (16) To arrange the necessary load at the time of the load test to be conducted during the work period

Improvement of Honiara Transmission and Distribution System

- (17) To clear and level the substation construction sites, to construct an approach road at each system and to remove or relocate the existing structures
- (18) To provide free of charge temporary sites for the work office and stock yard, etc.
- (19) To remove or relocate any existing buried items (including unexploded shells, if any)
- (20) To connect the 11 kV distribution equipment provided by the Japanese side to the existing 11 kV distribution line
- (21) To renew and readjust the existing protection relay system
- (22) To arrange the necessary load at the time of the load test to be conducted during the work period

2.4 Operation and Maintenance Plan

2.4.1 Basic Principles

The most important equipment to be provided under the Project from the maintenance point of view is the generating unit. The proper operation and maintenance of this unit and the upkeep of its operating environment are essential to ensure a stable power supply in response to daily demand fluctuations. In order to maintain the proper performance and functions of the planned generating unit to ensure a stable power supply, the implementation of appropriate preventive maintenance designed to improve the reliability, safety and efficiency of the generating unit is desirable. Fig. 2-4-1 shows the basic concept of such maintenance.



Fig. 2-4-1 Basic Concept of Generating Unit Maintenance

Bearing the above three principles of maintenance in mind, it will be necessary for the SIEA to use the O & M techniques and skills transferred through the OJT conducted by specialist engineers dispatched by the Japanese Contractor during the work period and the O&M manuals supplied by the Japanese side.

2.4.2 Operating Plan for New Generating Unit

The planned new generating unit will provide the base load for Honiara which is the political and economic centre of the Solomon Islands and the adoption of the following operating conditions is deemed appropriate.

- Annual utilization factor : approximately 50%
- Annual operating hours : approximately 8,000 hours

Table 2-4-1 shows the periodical inspection items required for the proper operation of the new generating unit while Fig. 2-4-2 shows the annual operation programme for the same unit for the first year based on the operating conditions mentioned above, taking the regular inspection items into consideration. It is expected that the operation of the new generating unit will be suspended for 32 days a year as shown in Fig. 2-4-2 for maintenance. Either the No.9 unit or the No.10 unit at the Lungga Power Station should be used as the alternative power source during this period to compensate for the loss of power supply by the new generating unit.



Note: Based on an annual operating rate of 90%.

Fig. 2-4-2 Annual Operation Programme for New Generating Unit

2.4.3 Periodical Inspection Items

(1) Generating Unit

The standard periodical inspection items of the planned generating unit are shown in Table 2-4-1. The SIEA will be required to prepare an operation and maintenance plan for the planned generating unit in accordance with this table and the O&M manuals to be submitted by the unit manufacturer with a view to establishing the unit's operation programme in line with the actual power demand.

Item	Type of Inspection	Main Inspection Item/Work
Diesel	Daily Inspection	- Checking of fuel oil level of fuel oil tank and lubricating oil level of sump
Engine		tank
-		- Checking of jacket cooling water level
		- Checking of starting-up air receiver pressure
		- Visual check of appearance
	1,000 Hours	- Checking of proper tightening of nuts and bolts
	Inspection	- Cleaning of fuel and lubricating oil filters
	2,500/3,000	- Checking of proper working of and oil leakage from intake and exhaust
	Hours Inspection	valves, starting valve, fuel valve, fuel pump, piston and liner, etc.
		- Analysis of lubricating oil quality of sump tank
	7,500/8,000	- Checking of proper working of and oil leakage from piston and cylinder liner
	Hours Inspection	and replacement of gasket
	-	- Replacement of piston ring, oil scraper ring and O-ring
		- Overhauling of cylinder head and replacement of gasket and O-ring
		- Inspection of intake and exhaust valves and replacement of exhaust valve
		O-ring
		- Inspection of fuel injection valve and replacement of nozzle
		- Inspection of crank pin bearings and replacement if necessary
		- Overhauling and inspection of turbo charger and replacement of bearings, etc.
		- Analysis of lubricating oil of sump tank and change of oil if necessary
	16,000 Hours	- All items under "7,500/8,000 Hours Inspection"
	Inspection	- Inspection of main bearings and replacement if necessary
	1	- Inspection of exhaust valves and replacement if necessary
		- Overhauling and inspection of lubricating oil pump attached to engine and
		replacement if necessary
Generator	Daily Inspection	- Visual inspection of all sections and checking of abnormal sound and
		temperature
	Monthly	- Checking of abnormal vibration
	Inspection	- Checking of lubricating oil flow and oil leakage from bearings
	-	- Necessary cleaning of components
	Annual	- Measurement of insulation resistance and inspection of lead wires and
	Inspection	terminals
	1	- Visual inspection of accessories, including space heater
		- Visual inspection of bearings and cleaning if necessary

The following number of days will be required to complete the standard inspections listed in the table.

- 2,500/3,000 hours inspection : 7 - 8 days/inspection

- 7,500/8,000 hours inspection : 15 - 18 days/inspection

- 16,000 hours inspection : 20 - 25 days/inspection

(2) Transmission and Distribution System

① Periodical Inspection of Transmission/Distribution/Transforming Equipment

Table 2-4-2 shows the standard periodical inspection items for the transmission/ distribution/ transforming equipment to be procured and installed under the Project. As shown in this table, the inspection of such equipment can be divided into the three categories described below.

- a) Patrol inspection: daily inspection of abnormal heat and abnormal sound, etc. from the equipment using the five human senses
- b) Ordinary inspection: inspection of the proper tightening of bolts, etc., surface staining of insulating materials and charged parts which cannot be properly inspected by the routine patrol inspection
- c) Close inspection: inspection of the functions of the interlocking mechanism, etc. and maintenance of the accuracy of instruments

In general, ordinary inspection is conducted every one or two years while close inspection is conducted approximately every four years. The replacement of fuses, instruments and relays, etc. which are liable to performance deterioration, insulation performance deterioration, abrasion of the contact points and changes of the characteristics if so required is desirable at the time of ordinary inspection and close inspection based on confirmation of the characteristics and frequency of use of these parts.

Inspection Item	Inspection Contents (Method)	Patrol Inspection	Ordinary Inspection	Close Inspection
	State of indication of on-off indicators/indicating lamps	0	0	
	Abnormal noise and/or smell	0	0	
A	Thermal discolouration of terminals	0	0	
Appearance of	Cracking or damage to bushing; state of dirt	0	0	
Equipment	Rust on installation case and frame, etc.	0	0	
	Abnormal temperature (use of a thermometer)	0	0	
	State of fastening at bushing end (mechanical	\bigcirc	\bigcirc	
	check)			
	State of indication of each instrument	0	0	0
	Indication on each counter		0	0
	Condensation and/or rust on operating box and		\bigcirc	\bigcirc
	boards; state of dirt		<u> </u>	\bigcirc
	State of oiling and cleaning		0	0
Operating	State of fastening at cable ends	0	0	0
System and	State of on-off indication		0	0
Control Panel	Air or oil leakage		0	0
Control 1 unor	Pressure (air and other) before and after operation		0	0
	Operation of performance meters		0	0
	Rust, deformation and damage of springs (repair)	0	0	0
	Abnormality of pins at tightened sections		0	0
	Inspection of auxiliary switches and relays (repair)		0	0
	Inspection of DC control power source	0		
	Measuring of insulation resistance		0	0
Measuring/	Measuring of contact resistance			0
Testing	Check of heat disconnection		0	0
	Testing of functioning of relay		0	\bigcirc

Table 2-4-2Standard Periodical Inspection Items for Transmission/Distribution/
Transforming Equipment

⁽²⁾ Periodical Inspection of Transmission/Distribution Lines

The most important aspect of the maintenance of the transmission/distribution lines from the viewpoint of customer service is to discovery any failure, damage or breakage of a line through routine patrol inspection and to immediately conduct repair work. The main inspection items for this routine patrol are listed below.

- (a) Contact between distribution equipment and trees, etc.
- (b) State of fencing and locks
- (c) State of circuit breaker panel and switchgear panel

2.4.4 Fuel Oil Procurement Plan

The estimated annual fuel (diesel oil) consumption volume to run the generating unit to be procured and installed under the Project is approximately 4,500 kilolitres based on an assumed utilization factor of 50%. At present, the SIEA purchases fuel oil for the Lungga Power Station from a private oil company in the Solomon Islands. The SIEA will be required to prepare and implement a practical fuel oil procurement plan to ensure the steady operation of the said generating unit as in the case of the existing generating units.

2.4.5 Spare Parts Procurement Plan

The spare parts for the generating unit are classified as standard spare parts which require replacement after a certain length of operation and spare parts reserved for emergency replacement at the time of an accident, etc. The Government of the Solomon Islands is required to procure an appropriate quantity of spare parts for the periodical inspection cycle.

The procurement of the spare parts required for 16,000 hours, i.e. two (2) years of operation to complete the periodical inspection cycle, is planned under the Project and the main items determined from the periodical inspection schedule are listed in Table 2-4-3. Accordingly, the Government of the Solomon Islands is required to set aside the necessary funds to procure the standard spare parts (approximately 3% of the cost of the generating unit and transmission/distribution/transforming equipment) and emergency spare parts by the end of the second year of the commissioning of the new generating unit.

Table 2-4-3 Spare Parts and Maintenance Tools to be Procured Under the Project

No.	Item	Quantity	Remarks
1.	Mechanical Spare Parts		
(1)	Expendables		
1)	Cylinder Cover		
	① Packing and O-Ring, etc.	six sets/cylinder	
	② Gasket Packing	"	
	③ Packing (Air Feed Pipe)	"	
2)	Intake Valve		
	① Funnel Cap	one set/cylinder	
	⁽²⁾ Valve Spindle		
•	③ O-Ring	six sets/cylinder	
3)	Exhaust Valve	1 5 4 4 11 1	
	U Valve Spindle	1.5 sets/cylinder	
	© Sleeve		
	(a) O Bing	air acts/aulindar	
	(4) O-King (5) Funnal Can	six sets/cylinder	
4)	Eval Injustion Value	one serveynnder	
4)	\square Nozzle Chin	siv sets/culinder	
	$\bigcirc \Omega_{\mathbf{R}}$	51A 5015/091111001	
5)	Piston		
5)	① Piston Ring	two set/cylinder	
	2 Oil Ring	"	
	③ Piston Pin Bearing	one set/cvlinder	
	④Piston Head Tightening Bolt	"	
	© O-Ring	two sets/cylinder	
6)	Connecting Rod		
	① Crank Pin Bearing	two sets/cylinder	
	© Tightening Rod	one set/cylinder	
7)	Main Bearing		
	1) Main Bearing	two sets/cylinder	
	@ Thrust Bearing	two sets	
8)	Fuel Injection Pump	· · · · 1° 1	
	Plunger Sleeve Deflector	two sets/cylinder	
	© Deflector	six sets/cylinder	
0)	Starting Value Packing	civ sets/outinder	
10)	Cylinder Safety Valve Packing	two sets/cylinder	
11)	Indicator Valve (Complete)	one set/cylinder	
12)	Exhaust Extension Pine	one set/cylinder	
13)	Fuel Injection Pine	0.5 sets/cylinder	
14)	Turbo Charger	o.o octo, cymiddi	
1.)	① Gasket Kit	two sets	
	[©] Bearing	"	
	③ Thrust Bearing	"	
15)	Air Cooler Packing	two sets	
16)	Auxiliary Equipment		
	① Spare Parts for Auxiliary Pumps	200%	
	② Filter Mesh and Gasket for Fuel Oil System	"	
	③ Filter Mesh and Gasket for Lubricating Oil System	"	
	Packings for Cooler	"	
	(5) Gasket Kit for Lubricating Oil Purifier	two sets	
	⁽⁶⁾ Air Intake Filter Element (for Engine Air Intake	tor one replacement	
	and Blower)	2000/	
	Resin)	200%	

I-1 Spare Parts for Generating Unit

No.	Item	Quantity	Remarks
(2)	Emergency Spare Parts		
1)	Cylinder Cover (Complete, including Valves)	one set	
2)	Air Feed Valve (Complete)	two sets	
3)	Exhaust Valve (Complete)	one set	
4)	Fuel Injection Valve (Complete)	0.5 sets/cylinder	
5)	Piston (Complete)	one set	
6)	Cylinder Liner	one set	
7)	Fuel Injection Pump		
	① Delivery Valve (Complete)	one set/cylinder	
	② Fuel Injection Pump (Complete)	four sets	
8)	Starting Valve (Complete)	two sets	
9)	Cylinder Safety Valve (Complete)	two sets	
10)	Governor Actuator	one set	
11)	Spare Parts for Instruments		
	① Pressure Switch	one of each kind	
	^② Temperature Switch	"	
	③ Pressure Gauge	"	
	④ Temperature Gauge	"	
2.	Electrical Spare Parts		
(1)	Consumable Spare Parts		
1)	Fuses elements for Control Device	200% of each type	
2)	Fuses for High Voltage Equipment	"	
3)	Lamps or bulbs for indication	"	
4)	Fluorescent Lamps for panels with grow lamp	"	
(2)	Emergency Spare Parts		
1)	Printed Circuit Board for AVR	one set	
2)	Complete set of 11 kV Circuit Breaker	"	
3)	Closing and Trip Coils for the Above	"	
4)	Auxiliary Relays	one of each kind	
5)	Timers	"	
6)	MCCBs	"	
7)	Earth Leakage Breakers	"	
8)	Electromagnetic Contactor	"	
9)	Fuses for Voltage Transformers	"	
10)	Fuses for High Voltage Equipment	"	

No.	Item	Quantity	Remarks
1.	Expendables		Common for all S/Ss and Switching Facilities
	 Fuses Elements for Control circuit High Voltage Power fuse Lamps or bulbs for indicator Fluorescent Lamp for panel Halogen Lamps for Outdoor Lighting 	200% of each kind "" ""	
2.	(6) Silica Gel (2 kg) Emergency Spare Parts	100%/transformer	Common for all S/Ss and Switching Facilities
	 Auxiliary Relays Timers MCCBs Electromagnetic Contactor Fuses for voltage Transformers Fuses for High Voltage Equipment Line Switch (11 kV, 630A) Lightning Arrester (11 kV, 10 kA) 11 kV termination kit Ballast for Outdoor Lighting Cut-Out Switch with fuse 	one of each kind " " " " one set " three sets "	For 3 phase application

I.2 Spare Parts for Transmission/Distribution/Transforming Equipment

II-1 Maintenance Tools for Generating Unit

No.	Item	Quantity	Remarks
1	Diesel Engine		
	(1) Special tools for maintenance (for Mechanics)	one set	
	(2) Valve and seat Grinder (Portable type)	"	
	(3) Assembling tool kit for intake and exhaust valves		
	(4) Remover for cylinder liner	"	
	(5) 2 tons Chain Block	"	
	(6) 500 kg Chain Block	"	
	(7) 1.5 ton Hand Pallet	"	
	(8) Wire Rope	"	
	(9) Water analyzer (Portable type)	"	
	(10) Lube oil analyzer kit	"	
	(11)Head type of year pad	1	
2	Generator and Electrical Equipment		
	(1) Circuit Tester (Analogue Meter)	2	
	(2) Maintenance Tool Set (for Electricians)	two sets	
	(3) Insulation Resistance Tester (500 V, 1,000 M Ω)	1	
	(4) Insulation Resistance Tester (2,500 V, 100 G Ω)	1	
	(5) Noise Meter	1	
	(6) Phase Meter	2	
	(7) Digital Multi-Meter	2	
	(8) AC Clamp Meter	2	

No.	Item	Quantity	Remarks
1	Testing Apparatus		
	(1) Circuit Tester (Analogue Meter)	2	
	(2) Simplified Single Phase Relay Tester	1	
	(3) Insulation Resistance Tester (500 V, 1,000 M Ω)	1	
	(4) Insulation Resistance Tester (2,500 V, 100 G Ω)	1	
	(5) Insulation Resistance Tester $(0 - 100\Omega, 0 - 30 \text{ V})$	1	
	(6) Phase Meter	2	
	(7) Voltage Detector (for Low Voltage)	1	
	(8) Voltage Detector (for 11 kV)	1	
	(9) Digital Multi-Meter	2	
	(10) AC Clamp Meter	2	
	(11) Cable Fault Point Detector	1	
	(12) Vacuum Checker	1	
2	Tools		
	(1) Maintenance Tool Set (for Mechanics)	two sets	
	(2) Earthing Cable (for 3 phase application)	one set	
	(3) Cable Drum Jack (5 tons)	1	
	(4) Terminal Compression tool with Dice	1	
	(5) Terminal tools	1	
	(6) Wire stripper	1	
	(7) Cable Cutter	1	

II-2 Maintenance Tools (for Transmission/Distribution Equipment

III. Maintenance Vehicle

No.	Item	Quantity	Remarks
1	Truck with Bucket (for Maintenance of Transmission Lines)	1	4 tons; boom length of 12 m

2.4.6 Electricity Tariff Plan

The electricity tariff of the SIEA consists of a fixed charge and a fuel cost adjustment surcharge which is based on the price of fuel oil. This fuel cost adjustment system has been in place since 1991. Under this system, the difference between the standard fuel oil price (SB\$ 0.55/litre) and the actual fuel cost is reflected on the electricity charge every three months. If the fuel cost is higher than the standard price, one-third of the increased expenditure is added to the electricity charge while two-thirds is borne by the SIEA.

However, the financial structure of the SIEA requires further improvement and the fixed charge was increased by 20% in 2001 with government approval. Table 2-4-4 shows the historical changes of the electricity tariff adopted by the SIEA.

The actual average fuel price from January to September, 2004 is SB\$ 2.736 /litre which is approximately five times higher than the standard price (SB\$ 0.55/litre). As shown in Table 2-4-4, a fuel

cost adjustment surcharge of SB\$ 0.84/kWh has been added to the fixed electricity charge since January, 2002 and this surcharge is a heavy burden for customers.

The fact that two-thirds of the increased portion of the fuel cost is borne by the SIEA means a significant impact of a rising fuel price on the worsened profitability of the SIEA's operation.

One of the menus included in the Financial Improvement Programme of the SIEA which is assisted by the World Bank is "calculation of the electricity charge for sound financial management". There is a possibility that the electricity charge will be revised in FY 2005 following the recommendation of the World Bank.

Category		Up to December, 2000	Jan. to Dec., 2001	Jan., 2002 onwards
Desidential	Fixed Charge	0.4646	0.4646	0.5575
Residential	Automatic Fuel Price Adjustment	0.16	0.33	0.84
Industrial/	Fixed Charge	0.6875	0.6875	0.8220
Commercial	Automatic Fuel Price Adjustment	0.16	0.33	0.84
High Voltage	Fixed Charge	0.6180	0.6015	0.7250
Bulk Supply	Automatic Fuel Price Adjustment	0.16	0.33	0.84

Table 2-4-4 Historical Changes of Electricity Tariff of SIEA

(Unit: SB\$/kWh)

Source : SIEA

Note : SB\$1 = \$14.75 (as of August, 2004)

2.4.7 Operating Plan

In the period after the end of the ethnic conflict, a maximum power demand of 9.9 MW was recorded on 29th November, 2004 for the HPN. The operating status of each generating unit at the Lungga Power Station on this day is shown in Fig. 2-4-3, indicating the use of the No.9 unit for the base load, the use of the No.6 and No.8 units for the middle load and the use of the No.5 unit for the peak load.



Fig. 2-4-3 Operating Status of Generating Units at Lungga Power Station (29th November, 2004)

By the target year (2011) of the Project, the No.5 Unit at the Lungga Power Station will have been withdrawn because of ageing and the operable generating units will be the No.6, No.8, No.9, No.10 and No.11 units at the Lungga Power Station and the No.2 and No.3 units at the Honiara Power Station, totalling seven generating units.

Table 2-4-5 shows the optimal operating mode for each generating unit in the target year based on the operation status of each of the existing generating units described above. The estimated maximum power demand in 2011 is 13.0 MW and there will be a reserve supply capacity of 4.8 MW (17.8 MW – 13.0 MW = 4.8 MW). The base load in 2011 is estimated to be approximately 6.5 MW and the generator outputs required for different operating modes will be available.

Fig. 2-4-4 shows the operating modes of the generating units in the HPN when the operation of one generator (assuming the No.10 unit at the Lungga Power Station) is suspended for periodical inspection. As this figure shows, the introduction of the No.11 unit under the Project will ensure that the supply capacity at the time of the periodical inspection of one generator exceeds the estimated maximum demand of 13.0 MW in the target year (total current output of 17.8 MW – maximum demand of 13.0 MW in the target year (total current output of 17.8 MW – maximum demand of 13.0 MW in the target year (total current output of 3.7 MW = 1.1 MW), providing the minimum required reserve capacity for emergency supply. When the No.11 unit, the output of which is the largest among all of the generating units, is suspended, there is still a reserve capacity of 0.8 MW for emergency supply (17.8 MW – 13.0 MW – 40 MW = 0.8 MW).

In contrast, if the No.11 unit is not installed, there will be a supply shortage of 2.9 MW when one generating unit undergoes periodical inspection (total current output of 13.8 MW – maximum demand of 13.0 MW – output of generating unit under inspection of 3.7 MW = -2.9 MW) as shown in Fig. 2-4-5, making the suspension of power supply on a rota basis necessary. This situation verifies the necessity of the Project and the relevant of the planned scale of output.

Operating Mode	Operating Hours	Assumed Current Output of Generating Unit		Total Current
		Lungga P/S	Honiara P/S	Output
Base Load	0:00 – 24:00 (24 hours)	L9: 3.6 MW (installed under the previous project) L10: 3.7 MW L11: 4.0 MW (present project)	-	11.3 MW
Middle Load	08:00 – 22:00 (14 hours)	L8: 3.5 MW	-	3.5 MW
Peak Load	08:00 – 17:00 (9 hours)	L6: 1.9 MW	H2: 0.55 MW H3: 0.55 MW	3.0 MW
Total		16.7 MW	1.1 MW	17.8 MW

Table 2-4-5Operating Mode of Each Generating Unit in 2011





(Reserve capacity for emergency supply secured: assuming the suspension of operation of the Lungga No.10 unit for periodical inspection)


Fig. 2-4-5 Operating Mode of Generating Units (2011 Without the Planned No.11 Unit) (Assuming the suspension of operation of the Lungga No.10 Unit for periodical inspection)

2.5 Estimated Project Cost

2.5.1 Estimated Project Cost

This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant. In the case of the Project's implementation under Japan's grant aid scheme, the total project cost is estimated to be approximately ¥1,476 million (Japanese side 1,471 million, Solomon Islands side 4.5 million). The breakdown of the cost based on the division of work between the Japanese and Solomon Islands sides is outlined here based on the estimation conditions listed in (3) below. However, it should be noted that this estimated project cost does not limit the amount of E/N in case it is formally exchanged between both Governments.

	Estimated Cost (¥ million)					
	Cost Itom			Upgrading of	Honiara	Sub-total
	Cost item	Lungga	Power	Transmission	and	
		Station		Distribution Sy	stem	
Facility	Extension of power house and switchgear		82			87
	house		62	-		62
Equipment	Diesel Engine Generator (4.2MW,1set)					
	Auxiliary Equipment (Fuel oil, Lubricating					
	oil, Air intake and Exhaust, Cooling water,		563	_		563
	and Compressed air system)		505			505
	High voltage (11kV) and station electrical					
	facilities					
	Construction of 33kV substations (3 sites)					
	Installation of 33kV underground cable	-			703	703
	Upgrading of 33kV switching facilities					
Detailed Design and Work Supervision			67		56	123
Total			712		759	1,471

(1) Japanese Portion ¥1,471 million

(2)	Solomon Islands Portion	SB\$ 300,000 (approx. ¥4.5 million)
	The main cost items for the Solo	mon Islands side are listed below.

	① Removal of the foundation Lungga Power Station	ons for the No.10 unit at the	: SB\$ 40,000 (approx. ¥0.6 million)
	② Improvement of the exist Lungga Power Station	ing approach road to the	: SB\$ 120,000 (approx. ¥1.8 million)
	③ Levelling of the fuel tank existing fence and 11 kV	site and relocation of the distribution line	: SB\$ 40,000 (approx. ¥0.6 million)
	④ Levelling/construction of removal/relocation of the substation sites	f an approach road and existing structures at the	: SB\$ 100,000 (approx. ¥1.5 million)
(3)	Estimation Conditions		
	^① Date of Estimation	: October, 2004	
	^② Foreign Exchange Rate	 : SB\$ 1 = ¥14.77 (TTS aver : US\$ 1 = ¥110.90 (as above) : A\$1 = ¥80.16 (as above) 	rage from April to September, 2004) e)
	③ Work Period	: Two phases (① extension improvement of the Honia see the implementation sc procurement and other per	n of the Lungga Power Station and ② ara transmission and distribution system; hedule for the detailed design, equipment riods)

OthersThe Project will be implemented in accordance with the Guidelines for Japan's Grant Aid Cooperation

2.5.2 Operation and Maintenance Cost

The average electricity charge set by the SIEA for the budget for 2004 is SB\$ 1.09 (approx. \pm 16)/kWh and Table 2-4-6 shows the estimated income and expenditure for the planned generating unit based on this electricity charge. As the table shows, when the annual utilization factor of the generating unit to be installed under the Project is assumed to be 50% (8,000 hours of operation a year), the resulting balance between the income and expenditure is quite favourable. However, if the utilization factor drops to 41% or below, operation will produce a deficit, making the self-financing operation of the generating unit

difficult to sustain. Accordingly, the SIEA must conduct proper maintenance to maintain a suitable utilization factor of the generating unit to avoid a financial loss.

Moreover, the SIEA must save the depreciation cost shown in Table 2-4-6 with a view to using the funds to replace the generating unit installed under the Project when it reaches its expected life.

Itom			Unit		Annua	l Utilization factor	· (%)	
Item			Unit	40	41	42	50	60
I. Income								
1. Generating Capacity	(1)		kW	4,200	4,200	4,200	4,200	4,200
2. Annual Operating Hours	(2)		hr	3,504	3,592	3,679	4,380	5,256
3. Electric Energy Generated	(3)		kWh	14,716,800	15,084,720	15,452,640	18,396,000	22,075,200
4. Station Consumption	(4)	(3) x 0.03	kWh	441,504	452,542	463,579	551,880	662,256
5. Transmission/Distribution Loss	(5)	(3) x 0.06	kWh	883,008	905,083	927,158	1,103,760	1,324,512
6. Electric Energy Sold	(6)	(3) - (4) - (5)	kWh	13,392,288	13,727,095	14,061,902	16,740,360	20,088,432
7. Average Unit Sales Price	(7)		SB\$/kWh	1.09	1.09	1.09	1.09	1.09
Total Income	(8)		SB\$	14,597,594	14,962,534	15,327,474	18,246,992	21,896,391
II. Expenditure								
1. Fuel	(9)	(3) x (c) x (e)	SB\$	9,703,905	9,946,502	10,189,100	12,129,881	14,555,857
2. Lubricating Oil	(10)	(3) x (d) x (e)	SB\$	315,081	322,958	330,835	393,851	472,621
3. Personnel	(11)	(f)	SB\$	8,900	8,900	8,900	8,900	8,900
4. Maintenance	(12)	(g)	SB\$	1,025,085	1,025,085	1,025,085	1,025,085	1,025,085
5. Head Office Management	(13)	(8) x (h)	SB\$	1,605,735	1,645,879	1,686,022	2,007,169	2,408,603
6. Depreciation	(14)	(i)	SB\$	2,050,169	2,050,169	2,050,169	2,050,169	2,050,169
Total Expenditure	(15)		SB\$	14,708,875	14,999,493	15,290,111	17,615,055	20,521,236
			SB\$	-111,281	-36,959	37,362	631,937	1,375,155
III. Operating Balance		(8) - (15)	Converted	1 641 307	545 150	551.007	0 321 072	20 283 542
			to yen	-1,041,397	-343,130	331,097	9,321,072	20,265,342

 Table 2-4-6
 Estimated Income and Expenditure for Planned Generating Unit

Preconditions

(a) The average unit sales price of SB\$ 1.09/kWh which is budgeted for 2004 by the SIEA is adopted as the unit sales price.

(b) The station loss (3%) and transmission loss (6%) are assumed figures.

- (c) The fuel cost is estimated to be SB\$ 2.736/litre.
- (d) The lubricating oil cost is estimated to be SB\$ 13.381/litre.
- (e) The consumption volumes of fuel oil and lubricating oil are estimated as follows: Fuel oil: 0.241 litres/kWh Lubricating oil: 0.0016 litres/kWh
- (f) The personnel cost is calculated based on an annual wage of SB\$ 1,780/person for five staff members.
- (g) The maintenance cost covers the cost of regularly replaced spare parts, etc. and is estimated to be 3% of the original equipment cost.
- (h) The management cost (head office cost) is estimated to be 11% of the power sales income.
- (i) The depreciation cost is calculated based on the straight line method using the main cost of the generating unit in question with an expected life of 15 years and a residual value after 15 years of 0%.
- (j) The foreign exchange rate used is SB\$ $1 = \pm 14.75$ (as of August, 2004)

2.6 Other Relevant Issues

Other relevant issues which are likely to influence the implementation of the requested Japanese assistance are discussed below. Under the previous project, the Government of Japan procured and installed the No.9 generating unit (4.2 MW x 1) at the Lungga Power Station. In view of the operation and maintenance situation of this No.9 unit since its installation, the following lessons have been learned for the present Project. Meanwhile, the Solomon Islands side should introduce appropriate measures to address the issues raised here.

Planning Aspect

① Securing of reserve generating capacity

Review of the plan to expand the generating facilities based on the demand forecast from time to time is essential so that the necessary reserve generating capacity, i.e. generating capacity capable of providing a stable power supply even if the operation of the generating unit with the largest capacity is suspended) can be secured to allow the periodic suspension of the generating units for maintenance purposes.

② Environmental and social considerations

The generating facility extension plan will be formulated to ensure the strict observance of the environmental standards and regulations regarding air quality, water quality, noise and vibration.

Operating Aspect

① Constant availability of spare parts

Emergency spare parts must be constantly available to minimise the stoppage time for the repair of a generating unit or any other equipment which has failed.

② Management of unit generating cost

The unit generating cost must be properly managed by enforcing the thorough control of (i) the fuel oil and lubricating oil consumption volumes and (ii) the operation of the power source for auxiliary equipment, etc. and also by centrally controlling the relevant data.

③ Environmental management

The environment must be properly managed in accordance with the Environmental Management Plan (EMP) and the contents of this plan should be reviewed from time to time to ensure their relevance through self-reliant environmental management efforts.

④ Maintenance techniques

The water softener and other auxiliary equipment must be properly managed and the necessary skills to analyse the recorded data must be improved to establish a preventive maintenance regime.

CHAPTER 3

PROJECT EVALUATION AND RECOMMENDATIONS

CHAPTER 3 PROJECT EVALUATION AND RECOMMENDATIONS

3.1 Project Effects

The implementation of the Project is expected to have the following effects.

(1) Direct Effects

Current Situation and Problems	Improvement Measures Under the Project	Effects and Degree of Improvement Under the Project
1. Because of the insufficient reserve supply capacity in Honiara, power supply is not reliable; for example, shutdown of a generating unit due to failure or inspection immediately results in power supply shortage which cannot cope with demand increase and additional power system failure.	Installation of a new diesel generating unit (4.2 MW) at the Lungga Power Station of the Honiara Power Network	With the implementation of the Project, the available generating capacity in the target year (2011) will exceed the peak demand by 4.8 MW. This will enable to secure an emergency reserve supply capacity of 0.8MW even if the largest generating unit is stopped due to failure or inspection and power supply will become reliable.
2. In Honiara, planned load shedding is implemented due to insufficient power supply capacity whenever a generating unit is stopped for periodical maintenance.	As above	With the implementation of the Project, sufficient reserve supply capacity is secured and planned load shedding which is accompanied with any periodical maintenance of a generating unit will be avoided.
3. In Honiara, power failure due to the ageing and/or insufficient capacity of the transmission and distribution system occurs two to four times a month.	Construction of three 33 kV substations and one 33 kV switching facility at the load centres of the HPN and extension of the 33 kV underground transmission lines	Elimination of the insufficient capacity of the step-down transformers and transmission lines will prevent power failure caused by an insufficient equipment capacity.
 4. The insufficient capacity of the transmission and distribution system in Honiara causes voltage drop of as much as - 20% and this low quality of the supplied electricity has adverse impacts on the functioning of electrical appliances. 	As above	The availability of 33 kV high voltage transmission to load centres will alleviate the voltage drop, reducing the voltage drop to less than -10%.
5. A fused circuit breaker is the only protective equipment for the transforming facilities at the Honiara Power Station. As these facilities cannot be quickly cut off from the system, power failure on the system may severely damage these transforming facilities.	Installation of a 33 kV switchgear equipped with a function to protect the transforming facilities at the Honiara Power Station	At the time of power failure, the transforming facilities will be quickly cut off from the system, preventing severe damage to these facilities.

(2) Indirect Effects

Current Situation and Problems	Improvement Measures Under the Project	Effects and Degree of Improvement Under the Project
1. Unstable power supply in Honiara hinders the economic activity in the city from recovery.	 (1) Installation of a new diesel generating unit (4.2 MW) at the Lungga Power Station in the HPN (2) Construction of three 33/11 kV substations and one 33 kV switching facility for the HPN 	Stable power supply and improved power quality in Honiara will vitalize the economic activity in Honiara.
2. Unstable power supply in Honiara hinders stable operation of public/welfare facilities in the city.	As above	Stable power supply and improved power quality in Honiara will enable the stable operation of public/welfare facilities such as the government offices, schools, hospitals, etc.

3.2 Recommendations

The Solomon Islands should meet the following necessities to ensure the emergence and continuation of the positive effects of the Project.

- (1) With the implementation of the Project, the reserve capacity for emergency power supply will be secured up to 2011. However, it will be necessary to develop power sources without fail to meet the demand from 2012 onwards so that there is always a sufficient reserve capacity to allow the stoppage of a generating unit for periodic maintenance.
- (2) The SIEA should improve its financial management to ensure the transparency of its business operation.
- (3) The necessary budget for the proper maintenance of the generating, transmission and distribution facilities and for the procurement of spare parts should be secured and emergency spare parts should always be held in stock to minimise the duration of any stoppage of the equipment for repair should equipment failure occur.
- (4) In addition to appropriate control of the unit generation cost through the proper management of operation, taking the fuel consumption volume and usage of the power source for auxiliary equipment, etc. into consideration, the depreciation cost of the fixed assets for power generation, transmission and distribution, including the equipment provided under the Project, should be properly accounted and the amount should be saved in the form of a reserve fund for future investment in new equipment.

- (5) An appropriate operating plan for the existing as well as new generating units at the Lungga Power Station should be prepared so that the utilization factor of the new unit provided under the Project is at least around 42% or higher.
- (6) The achievements of the OJT and counterpart training under the Project should be spread to all operation and maintenance staff and efforts should be made to improve the operation and maintenance skills of the staff to establish a preventive maintenance regime.
- (7) The contents of the IEIA and environmental management plan should be strictly followed so that the environmental impacts of the implementation of the Project do not exceed the estimated impacts of the IEIA.
- (8) It is necessary to implement Honiara Repairs and Maintenance Programme which is assisted by other donor without delay in order to make the outcome of the Project more efficient.

APPENDICES

1. MEMBER LIST OF THE STUDY TEAM

Member List of the Study Team

1. Basic Design Study

Name	Work Assignment	Position
Mr. Yuki Aratsu	Leader	Team Director, Traffic Infrastructure Team, Project management Group II, Grant Aid Management Department, JICA
Mr. Masatsugu Komiya	Chief Consultant/Operation and maintenance Planner/ Environmental and Social Consideration Analyst	Yachiyo Engineering Co., Ltd.
Mr. Hirohito Seto	Deputy Chief Consultant/ Distribution Equipment Planner	Yachiyo Engineering Co., Ltd.
Mr. Kyoji Fujii	Generating Equipment Planner	Yachiyo Engineering Co., Ltd.
Mr. Hisayuki Yamamoto	Generating Facility Planner	Yachiyo Engineering Co., Ltd.
Mr. Toru Fujii	Procurement Planner/ Cost Estimator	Yachiyo Engineering Co., Ltd.

2. Explanation of the Draft Basic Design Study Report

Name	Work Assignment	Position
Mr. Yoshimoto Koyanagi	Deputy Leader	Traffic Infrastructure Team, Project management Group II, Grant Aid Management Department, JICA
Mr. Masatsugu Komiya	Chief Consultant/Operation and maintenance Planner/ Environmental and Social Consideration Analyst	Yachiyo Engineering Co., Ltd.
Mr. Hirohito Seto	Deputy Chief Consultant/ Distribution Equipment Planner	Yachiyo Engineering Co., Ltd.
Mr. Kyoji Fujii	Generating Equipment Planner	Yachiyo Engineering Co., Ltd.

2. SURVEY SCHEDULE

Survey Schedule

1. Basic Design Study

NL	D		Official Member	Consultant Members	<u>Stars</u> 1
INO.	Da	ıy	Mr. Aratsu	Mr. Komiya, Mr. Seto, Mr. Fujii, Mr. Yamamoto, Mr. Fujii	Stay at
1	13Sep.	Mon.		*Trip[Narita: NRT(21:35)→JL761→]	Air
2	14Sep.	Tue.		*Trip[→(07:15)Brisbane: BNE(11:00)→IE701→(15:00) Honiara (HIR)] -Courtesy Call to JICA	Honiara
3	15Sep.	Wed.		 -Greeting to EOJ -Discussion with Solomon Islands Electricity Authority (SIEA) -Confirmation of the Field Survey Schedule and explanation of IC/R and questionnaire - Survey of Lungga and Honiara Power Station (P/S) -Greeting to Ministry of Mines and Energy (MME) 	Honiara
4	16Sep.	Thu.		-Discussion on Questionnaire with SIEA -Discussion with Department of Forests, Environment and Conservation (DFEC)	Honiara
5	17Sep.	Fri.		-Discussion on Questionnaire with SIEA -Hearing to AUSAID, WB, EU, ADB and Mobil	Honiara
6	18Sep.	Sat.		-Survey of existing Lungga and Honiara Power Stations -Survey of Honiara port	Honiara
7	9Sep.	Sun.		-Detailed survey of existing 33 kV Transmission Lines	Honiara
8	20Sep.	Mon.	*Trip[Tokyo(21:35) \rightarrow JL761]	-Discussion on Questionnaire with SIEA -Discussion with Ministry of Development and Planning (MDP)	Official: On flight Consultant: Honiara
9	21Sep.	Tue.	*Trip[→(07:15) BNE (11:00)→IE701→ HIR(15:00)]	-Discussion on Questionnaire with SIEA -Data collection from parties concerned	Honiara
10	22Sep.	Wed.	-Courtesy Call to JICA and EOJ -Courtesy Call and Discussion with Department of Mines and Energy (DME) and SIEA		
11	23Sep.	Thu.	-Site survey: Lungga and Ho -Discussion on M/D with SI	niara P/S and new 33kV Substation areas EA	Honiara
12	24Sep.	Fri.	-Discussion on M/D with SII	EA	Honiara
13	25Sep.	Sat.	-Market Survey and Internal	Meeting	Honiara
14	26Sep.	Sun.	-Market Survey and Data and	alysis	Honiara
15	27Sep.	Mon.	-Signing on M/D		Honiara
16	28Sep.	Tue.	-Report to JICA and EOJ *Trip[HIR(16:00)→IE700 →BNE(18:00)]	-Survey and confirmation of remaining data & information with SIEA	Official: On flight Consultant: Honiara
17	29Sep.	Wed.	*Trip[BNE(08:55)→ JL762 →NRT(16:45)]	-Survey and confirmation of remaining data & information with SIEA	Honiara
18	30Sep.	Thu.		-Data collection from parties concerned	Honiara
19	10ct.	Fri.		-Explanation and Discussion of F/R -Survey and confirmation of remaining data with SIEA	Honiara
20	2Oct.	Sat.		-Market survey and data sorting	Honiara
21	3Oct.	Sun.		-Data Sorting and Internal Meeting	Honiara
22	4Oct.	Mon.		-Data collection from parties concerned	Honiara
23	5Oct.	Tue.		-Discussion on F/R with SIEA.	Honiara
24	6Oct.	Wed.		-Signing on F/R	Honiara
25	7Oct.	Thu.		-Courtesy Call to DME and SIEA -Report to JICA and EOJ	Honiara
26	80ct.	Fri.		*Trip[Honiara(18:00)→IE702→BNE(20:00)]	Brisbane
27	90ct.	Sat.		*Trip[BNE(08:55)→JL762→NRT(16:45)]	Tokyo

Na	Dar		Official Member	Consultant Members	Story of
INO.	Da	Mr. Koyanagi		Mr. Komiya, Mr. Seto, Mr. Fujii	Stay at
1	6 Jan.	Thu.		*Trip[Narita: NRT(21:35)→JL761→]	Air
2	7 Jan.	Fri.		*Trip[→(07:15)Brisbane, BNE(23:00)→IE701→]	Air
3	8 Jan.	Sat.		*Trip[→(03:00) Honiara (HIR)]	Haniana
				-Internal Meeting	Honiara
4	9 Jan.	Sun.		-Site Survey (Lunnga and Honiara P/S, new Substation sites	Honiara
				and new Transmission Lines Route)	Homara
5	10 Jan.	Mon.	*Trip[Tokyo(21:35) \rightarrow	-Courtesy Call to EOJ	0.07 i i
			JL761]	-Courtesy Call to JICA	Official:
				-Courtesy Call to DME and SIEA	Consultant [.]
				-Explanation and Discussion on the Draft Basic Design	Honiara
				Report (SIEA)	
6	11 Jan.	Tue.	*Trip[→(07:15) BNE	-Explanation and Discussion on the Technical	
			$(11:00) \rightarrow IE701 \rightarrow$	Specifications of the Equipment and Materials (SIEA)	Honiara
			HIR(15:00)]	-Explanation and Discussion on the Draft Basic Design	Tiomara
				Report (SIEA)	
7	12 Jan.	Wed.	-Site Survey (Lunnga and Ho	oniara P/S and new Substation sites)	Honioro
			-Explanation and Discussion	and on the M/D	Homara
8	13 Jan.	Thu.	-Signing on M/D		Honioro
			-Site Survey (new Transmiss	ion Lines Route)	пошага
9	14 Jan.	Fri.	-Report to JICA and EOJ		
			*Trip[HIR(16:35)→IE702	-Explanation of Grant Aid Scheme and confirmation of	Official:
			\rightarrow BNE(18:35)]	remaining data & information with SIEA	Brisbane
					Consultant:
10	15 Jan	Sat	$*Trin[BNE(00.30) \rightarrow$	*Trip[Honjarg(18.20) \rightarrow IE702 \rightarrow BNE(20.20)]	пошага
10	1 <i>3</i> Jail.	Sat.	II 762 \rightarrow NRT(17.20)]	$= \operatorname{III}_{\operatorname{Div}} \operatorname{III}_{\operatorname{Div}} \operatorname{III}_{\operatorname{Div}} \operatorname{Div}_{\operatorname{Div}} \operatorname{Div}_{$	Brisbane
11	16 Ian	Sun	$\frac{11}{102}$ $\frac{11}{11}$	*Trip[BNF(09·30)→II 762→NRT(17·20)]	Tokyo

2. Explanation of the Draft Basic Design Study Report

Remarks:

JICA: Japan International Cooperation Agency

DME: Department of Mines & Energy

SIEA: Solomon Islands Electricity Authority

NRT: Narita International Airport

BNE: Brisbane

M/D: Minutes of Discussions

3. LIST OF PARTIES CONCERNED IN THE RECIPIENT COUNTRY

List of Parties Concerned in the Recipient Country

Department of Mines and Energy (DME)

Mr. Stephen Paeni	Minister
Mr. Donn Tolia	Permanent Secretary
Mr. Steve Likaveke	Acting Permanent Secretary
Mr. John Korinihona	Director of Energy
Mr. Alison Keikera Papabatu	Seismology Observer
The Ministry of Finance, Econor	nic Reform and Planning
Mr. Nick Gagahe	Government Statistician
Department of National Reform	and Planning
Mr. Reuben Touutoru	Chief Planning Officer, Director Macroeconomic Reform
Mr. Moses Tepai	Chief Planning Officer, Director Macroeconomic Reform
Mr. Kazumi Ogawa	Aid Advisor
Department of Forestry, Environ	nment and Conservation
Mr. Moses Biliki	Director of Environment and Conservation
The Ministry of Infrastructure I	Development
Mr. Osborn Vangana	Director, Urban Work Services
Solomon Islands Electricity Aut	hority (SIEA)
Mr. Danny Bula	Chairman, Board of Director
Mr. Tony Makabo	Deputy Chairman, Board of Director
Mr. Michael Nation	General Manager
Mr. Andrew Daka	Deputy General Manager
Mr. Patrick Taloboe	Manager Generation
Mr. Rex Inomae	Manager Financial
Mr. Martin Sam	Manager Distribution
Mr. Dreadnaught Namohunu	Distribution Engineer
Mr. Dudley Posala	Generation Engineer
Mr. Mahli Sanau	Data Acquisition Officer (GIS/RS)
Mr. Vincent Fiuta	Electrical Services Engineer (Retired)
Mr. Alaric P. Rore	Civil Service Engineer (Retired)
Solomon Islands Ports Authority	<i>v</i>
Mr. Bill Barile	Director of Engineering
Marine Infrastructure Project	
Mr. David Torrance	Project Manager
Embassy of Japan in Solomon Is	lands (EOJ)
Mr. Katsuhiko Kubo	Charge d' Affaires a.i.
Mr. Hiroaki Fujiwara	First Secretary
Mr. Isamu Nakamura	Second Secretary and Vice Council
Ms. Atsuko Orimoto	Research/ Advisor
Japan International Cooperation	n Agency (JICA)
Mr. Hiromi Fujita	Resident Representative
Ms. Yoko Asano	Project Formulation Advisor
Mr. Yoshinobu Takishita	Coordinator of Japan Overseas Cooperation Volunteers (JOCV)

4. MINUTES OF DISCUSSIONS

Minutes of Discussions on the Basic Design Study on the Project for Improvement of Honiara Power Supply in Solomon Islands

In response to the request from the Government of Solomon Islands (hereinafter referred to as "Solomon Islands"), the Government of Japan decided to conduct a Basic Design Study on the Project for Improvement of Honiara Power Supply (hereinafter referred to as "the Project") and entrusted the study to the Japan International Cooperation Agency (hereinafter referred to as "JICA").

JICA sent to Solomon Islands the Basic Design Study Team (hereinafter referred to as "the Team"), headed by Mr. Yuki Aratsu, Team Director, Traffic Infrastructure Team, Project Management Group II, the Grant Aid Management Department, JICA, and is scheduled to stay in the country from September 14 to October 8, 2004.

The Team held discussions with the concerned officials of the Government of Solomon Islands. In the course of the discussions, both sides have confirmed the main items described in the attached sheets. The Team will proceed to further works and prepare the Basic Design Study Report. -

Honiara, September 27, 2004

Mr. Yuki Aratsu Leader Basic Design Study Team Japan International Cooperation Agency

Mr. Donn/H. Tolia Permanent Secretary Department of Mines and Energy Ministry of Natural Resources Solomon Islands

Mr. Tony Makabo Deputy Chairman of Board Solomon Islands Electricity Authority

ATTACHMENT

1. Objective of the Project

The objective of the Project is to supply reliable electricity services in Honiara area by the installation of a new diesel engine generator at Lungga Power Station, and upgrading of transmission and distribution systems.

2. Project Site

The Project site is Honiara distribution network and Lungga Power Station in Honiara area, shown in Annex-1.

3. Responsible and Implementing Organizations

- (1) The responsible organization is the Department of Mines and Energy, the Ministry of Natural Resources (hereinafter referred to as "DME").
- (2) The implementing agency is Solomon Islands Electricity Authority (hereinafter referred to as "SIEA").

The organization charts of the above two organizations are shown in Annex-2.

4. Items Requested by the Government of Solomon Islands

After discussions with the Team, the items described in Annex-3 are finally requested by the Solomon Islands side. JICA will assess the appropriateness of the request and will recommend to the Government of Japan for approval.

5. Japan's Grant Aid Scheme

- (1) The Solomon Islands side understands the Japan's Grant Aid scheme and the necessary measures to be taken by the Government of Solomon Islands explained by the Team as described in Annex-4.
- (2) The Solomon Islands side promised to take necessary measures, as described in Annex-5, for smooth implementation of the Project as a condition for the Japan's Grant Aid to be implemented.

6. Schedule of the study

- (1) The consultants will proceed to further studies in Solomon Islands until October 8, 2004.
- (2) JICA will prepare a draft report in English and dispatch a mission to Solomon Islands in order to explain its contents in January 2005.
- (3) When the contents of the report are accepted in principle by the Government of Solomon Islands, JICA will complete the final report and send it to the Government of Solomon Islands by April 2005.

7. Other Relevant Issues

- (1) The Solomon Islands side shall submit answers to the Questionnaire, which the Team handed to the Solomon Islands side, by the end of September 2004.
 - (2) The Solomon Islands side shall provide necessary number(s) of counterpart personnel to the Team during the period of their studies in Solomon Islands.
 - (3) The Solomon Islands side shall obtain full approval for the Initial Environment Impact Assessment (IEIA) on the Project from the Environment and Conservation Division, Department of Forests, Environment and Conservation, by the end of September 2004, based on the revised calculation for ground surface concentration of NO₂ and the Environmental Management Plan (EMP) which were prepared by SIEA.
 - (4) The Solomon Islands side shall allocate necessary budget for undertakings to be done on a timely manner, which are shown in Annex-5.
 - (5) The Solomon Islands side shall obtain a permission to use the land in the existing fence of the Lungga Power Station from the land owner by the end of December 2004.
 - (6) The Solomon Islands side shall remove the existing foundation for No.10 diesel engine generator unit which is located outside of the power house at Lungga Power Station before the construction works of the new power generation facilities will be commenced.
 - (7) The Solomon Islands side shall relocate the existing facilities such as fence, 11kV distribution line, etc., and clear the land for a new diesel oil storage tank at the Lungga Power Station, before the commencement of construction works.
 - (8) The Solomon Islands side shall obtain a permission to use the land for new White River substation from the authorities concerned by the end of December 2004.
 - (9) The Solomon Islands side shall remove the existing facilities and any other obstructions in the substation sites and clear the land, before the commencement of the work.
 - (10) The Solomon Islands side shall procure the necessary equipment and materials for 11kV distribution network and conduct their installation work, for the Project.
- (11) The Solomon Islands side shall repair the damaged 33kV underground cables in Honiara, before the commencement of construction work.
- (12) The Solomon Islands side shall use/maintain effectively and properly facilities and equipment constructed/installed by the Project.
- (13) The Team explained that Japanese side has a keen interest in transparency and sound finance of SIEA. Solomon Islands side replied that the World Bank will assist the financial management of SIEA for its purpose.

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ANNEX-1: 33kV HONIARA POWER NETWORK (MAP OF THE PROJECT SITE)

Ministry of Natural Resources Department of Mines and Energy (DME) Organization Chart





Organization Chart of Solomon Islands Electricity Authority (SIEA)

Annex2-2

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Annex-3 Items requested by the Government of Solomon Islands (GSI)

The following equipment and facilities are confirmed as the final requests item from GSI.

Component-A: "Supply and installation of a new generating facility in Lungga Power Station"

(1) A diesel engine generator unit with auxiliary facilities (4,200 kW)

(2) A fuel storage tank (300m³) with a fuel unloading station

(3) Extension of powerhouse and switchgear buildings with foundations

(4) Maintenance tools and spare parts

Component-B: "Upgrading of transmission and distribution system in Honiara area with supply and installation of associated equipment"

(1) New 33 kV Ranadi Substation

Consisting of: a) 33 kV and 11kV outdoor type switchgears, and Low Voltage outdoor type panels

b) 3.5 MVA, 33/11 kV step-down transformers (2 sets)

c) 300 kVA, 11 kV/415-240 V station transformer (1 set)

- d) Other related facilities and foundations for above equipment
- (2) Extension of 33 kV transmission line from Lungga Power Station to new 33kV Henderson Substation
 1) 33kV underground cables (Approximately 4.2km)

2) Lungga Power Station

Consisting of: a) 33 kV indoor type switchgears

3) New 33kV Henderson Substation

Consisting of: a) 33kV and 11kV outdoor type switchgears, and Low Voltage outdoor type panels

b) 3.5 MVA, 33/11 kV step-down transformer (1 set)

c) 300 kVA, 11 kV/415-240 V station transformer (1 set)

d) Other related facilities and foundations for above equipment

Note: The Solomon Islands side explained that the substation "Tenaru" mentioned in the request letter shall be called as "33kV Henderson substation" because of its location.

(3) Upgrade of 33 kV System at Honiara Power Station

Consisting of: a) 33 kV outdoor type switchgears

b) Other related facilities and foundations for above equipment

(4) Extension of 33 kV transmission line from Honiara Power Station to new 33kV White River Substation

1) 33kV underground cables (Approximately 4.2km)

2) New 33kV White River Substation

Consisting of: a) 33 kV and 11kV outdoor type switchgears, and Low Voltage outdoor type panels

b) 3.5 MVA, 33/11 kV step-down transformer (1 set)

c) 300 kVA, 11 kV/415-240 V station transformer (1 set)

d) Other related facilities and foundations for above equipment

(5) Maintenance tools and equipment

1) Maintenance vehicle with basket crane

2) Maintenance tools and spare parts for transmission and distribution system

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Annex-4

JAPAN'S GRANT AID

The Grant Aid Scheme 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. The Grant Aid is not supplied through the donation of materials as such.

1. Grant Aid Procedures

Japan's Grant Aid Scheme is executed through the following procedures.

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

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 Scheme, 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 (E/N) 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 (hereafter referred to as "the Study") conducted by JICA on a requested project (hereafter referred to as "the Project") is to provide a basic document necessary for the appraisal of the Project by the Government of Japan. The contents of the Study are as follows:

- Confirmation of the background, objectives, and benefits of the Project and also institutional capacity of agencies concerned of the recipient country necessary for the Project's implementation.

- Evaluation of the appropriateness of the Project to be implemented under the Grant Aid Scheme y

from a technical, social and economic point of view.

- Confirmation of items agreed on by both parties concerning the basic concept of the Project.

- Preparation of a basic design of the Project.

- 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 the 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 consulting firm(s). JICA selects (a) firm(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 consultant 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) 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.

(2) "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 national disaster, 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.

(3) 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, constructing 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.)

(4) 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.

(5) 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:

a) To secure land necessary for the sites of the Project and to clear, level and reclaim the land prior to commencement of the construction,

b) To provide facilities for the distribution of electricity, water supply and drainage and other incidental facilities in and around the sites,

c) To secure buildings prior to the procurement in case the installation of the equipment,

d) To ensure all the expenses and prompt excursion for unloading, customs clearance at the port of disembarkation and internal transportation of the products purchased under the Grant Aid,

e) 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,

f) 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.

(6) "Proper Use"

The recipient country is required to maintain and use the facilities constructed and the 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.

(7) "Re-export"

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

(8) Banking Arrangements (B/A)

a) 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.

b) The payments will be made when payment requests are presented by the Bank to the Government of Japan under an Authorization to Pay (A/P) issued by the Government of the recipient country or its designated authority.

(9) Authorization to Pay (A/P)

The Government of the recipient country should bear an advising commission of an Authorization to Pay and payment commissions to the Bank.

Annex-5

Maior U	ndertakings	to	be tal	ken by	Each	Government
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Items	To be covered by Grant Aid	To be covered by Recipient Side
Fo secure land		•
To clear, level and reclaim the site when needed		•
To construct gates and fences in and around the site		•
To construct the parking lot	•	
To construct temporary roads		
) Within the site	•	
) Outside the site		•
To construct the buildings	•	
o provide facilities for the distribution of electricity, water supply, drainage and		
ther incidental facilities		
) Electricity		
a The distributing line to the site		•
b The drop wiring and internal wiring within the site	•	
c. The main circuit breaker and transformer	•	
) Water Sunnly		
a The city water distribution main to the site		•
a. The only water distribution main to the one of elevated tenks)		
b. The supply system within the site (receiving and elevated tanks)		
) Drainage		
a. The city drainage main (for storm, sewer and others to the site) to the site		•
b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site	•	-
) Gas Supply		
a. The city gas main to the site		•
b. The gas supply system within the site	•	
) Telephone System		•
a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		•
h The MDF and the extension after the frame/nanel	•	
b. The WIDT and the extension after the name pare		
Concerel furniture		•
a. General furniture		
b. Project equipment		
σ bear the following commissions to the sapance bank for banking services ased upon the B/Δ		
Advising commission of A/P		•
) Revent commission		•
a ensure unloading and customs clearance at port of disembarkation in recipient		
o onsulo unloading and ouslosis oromanoo at port of abomountation in recipions		
) Marine (Air) transportation of the products from Japan to the recipient country		
) Tax exemption and custom clearance of the products at the port of		•
disembarkation		
) Internal transportation from the port of disembarkation to the project site	•	
o accord Japanese nationals whose service may be required in connection with		•
as supply of the products and the services under the verified contact, such		
acilities as may be necessary for their entry into the recipient country and stay		
nerein for the performance of their work.		
o exempt Japanese nationals from customs duties, internal taxes and other fiscal		•
evies which may be imposed in the recipient country with respect to the supply		
f the products and services under the verified contracts		
o maintain and use properly and effectively the facilities constructed and quipment provided under the Grant Aid		•
o bear all the expenses, other than those to be borne by the Grant Aid, necessary		•
or construction of the facilities as well as for the transportation and installation		
f the equipment	l	
anking Arrangement, A/P: Authorization to pay, N/A: Not Applicable)		
		I'M tol
· A-15		
	Items b secure land c clear, level and reclaim the site when needed c construct gates and fences in and around the site c construct temporary roads) Within the site c construct the parking lot c construct the parking lot c construct the site c construct the site c construct the site c construct the site c construct the distribution of electricity, water supply, drainage and ther incidental facilities) Distributing line to the site c. The main circuit breaker and transformer) Water Supply a. The distribution main to the site b. The city water distribution main to the site b. The city water distribution main to the site b. The city water distribution main to the site b. The city water distribution main to the site b. The supply system within the site (receiving and elevated tanks)) Drainage a. The city drainage main (for storm, sewer and others to the site) to the site b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site b. The drainage system (for toilet sewer, ordinary waste, storm drainage and others) within the site b. The drainage system within the site b. The drainage system in the site b. The drainage system and the site b. The drainage system in the site b. The drainage system in the site b. The drainage system and the site (receiving and elevated tanks) cleas Supply b. The MDP and the extension after the frame/panel b. Troject equipment a. General furniture b. Troject equipment b. Troject equipment c. Gravention of the products from Japan to the recipient country b. Project equipment c. Gravention from the port of disembarkation to the project site co accord Japaneses nationals whose services made the verified contact, such acilities a	Items Items 0 escure land

Minutes of Discussions on the Project for Improvement of Honiara Power Supply in Solomon Islands (Explanation on the Draft Report)

In September 2004, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Basic Design Study Team on the Project for Improvement of Honiara Power Supply (hereinafter referred to as "the Project") to Solomon Islands, and through discussions, field survey and technical examination of the results in Japan, JICA prepared a draft report of the study.

In order to explain and to consult with the concerned officials of the Government of Solomon Islands on the contents of the draft report, JICA sent to Solomon Islands the Basic Design Explanation Team (hereinafter referred to as "the Team"), which is managed by Mr. Kyojin Mima, Group Director, Project Management Group II, Grant Aid Management Department, JICA, and headed by Mr. Yoshimoto Koyanagi, from January 8 to 15, 2005.

As a result of discussions, both sides confirmed the main items described in the attached sheets.

Honiara, January 13, 2005

桂泉 柳

Yoshimoto Koyanagi Basic Design Study Team Japan International Cooperation Agency

Donn Tolia¹ Permanent Secretary Department of Mines and Energy Ministry of Natural Resources Solomon Islands

Hon. Danny Bula Chairman of Board Solomon Islands Electricity Authority

ATTACHMENT

1. Contents of the Draft Report

The Solomon Islands side agreed and accepted in principle the contents of the Draft Report explained by the Team.

2. Japan's Grant Aid Scheme

The Solomon Islands side reconfirmed the Japan's Grant Aid scheme and the necessary measures to be taken by the Government of Solomon Islands explained by the Team as described in Annex-4 and Annex-5 of the Minutes of Discussions (M/D) signed by both sides on September 27, 2004.

3. Schedule of the Study

JICA will complete the Final Report in accordance with the confirmed items and send it to the Solomon Islands side by April 2005.

4. Other Relevant Issues

(1) The Solomon Islands side agreed to change the name of "Henderson Substation" to "Honiara East Substation".

(2) The Solomon Islands side shall provide temporary sites for the work office and stock yard.

(3) The Solomon Islands side shall arrange the necessary load at the time of the load test to be conducted during the work period.

(4) The Solomon Islands side shall remove the existing foundation for the No.10 generating unit at the Lungga Power Station prior to the commencement of the construction work by the Japanese side.

(5) The Solomon Islands side shall improve the existing approach road to the Lungga Power Station prior to the commencement of the work by the Japanese side.

(6) The Solomon Islands side shall provide dumping sites near the Project sites for surplus soil, drain and waste oil during the work period.

(7) The Solomon Islands side shall ensure the stoppage of power supply when the work to connect the new equipment to the existing switchgears, transformers and fuel oil pipeline, etc. is conducted.

(8) The Solomon Islands side shall clear and level the substation construction sites, and remove or relocate the existing structures.

(9) The Solomon Islands side shall investigate the unexploded objects on the 33kV cable line construction route, and remove them if necessary.

(10) The Solomon Islands side shall re-adjust the existing protection relay system at each substation site.

(11) The Solomon Islands side requested the Team to carry out the counterpart training in Japan on the operation and maintenance of the new generating power plant, and transmission and distribution system as a technical cooperation by JICA, and the Solomon Islands side understood the another official request will be needed to submit from the Solomon Islands side to the Japanese side.



5. POWER BALANCE IN HONIARA POWER NETWORK

8	Rated			Reco	rded			Forecast												IL BR. KW
Descriptions	Output	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2015	Remarks
																				AALR (%)
1. PEAK DEMAND	(Total)	10,550	10,330	9,200	8,500	9,280	9,900	10,300	10,700	11,100	11,500	12,000	12,500	13,000	13,500	14,000	14,600	15,200	15,800	4.0
2. POWER SUPPLY CONDITION	28,600	17,200	17,200	17,200	17,200	21,500	23,800	21,000	19,500	22,000	22,000	20,500	20,500	20,500	18,800	18,800	18,800	17,100	19,600	
(Total rated output)																				
2. I Honiara Power Station (Total)	7,100																			
*1 No.1 (1997)	1,700	1,000	1,000	1,100	1,100	1,000		700	700	(retire)										Peak
*1 No.2 (1997)	1,700	1,100	1,100	1,100	800	800		700	700	6.50	650	600	600	550	(retire)					Pcak
*1 No.3 (1997)	1,700	1,000	1,000	1,100	1,100	1,000		700	700	650	650	600	600	550	550	500	500	(retire)		Peak
*2 No.5 (1985)	1,000	500	500	500	500	500	(retire)									1. 2022	1975	100000		10.000
*2 No.6 (1985)	1,000	500	500	,500	500	500	(retire)				514 Y 10 K		100000000							
(Total Available Capacity)		4,100	4,100	4,300	4,000	3,800		2,100	2,100	1,300	1,300	1,200	1,200	1,100	550	500	500		•	
2.2 Langga Power Station (Total)	21,500													1.11						
	0.000	0.000	12222	1.222.02	0.000	1000		57-565	10000000											18.73
No. 4 (1971)	1,500	900	900	900	1,000	900	•	\$00	(retire)											Peak
No. 5 (1971)	1,500	900	900	1,000	800	900	900	800	800	700	700	(retire)		1.1.1						Peak
•3 No. 6 (1998)	2,900	2,700	2,700	2,300	2,200	2,300	2,200	2,200	2,100	2,100	2,000	2,000	1,900	1,900	1,800	1,500	1,700	1,700	1,600	Middle
*2 No. 7 (1987)	2,800		•				(retire)													
No. 8 (1993)	4,300					4,000	3,800	3,800	3,700	3,700	3,600	3,600	3,500	3,500	3,400	3,400	3,300	3,300	3,200	Middle
(Previous Assistance) No. 9 (1999)	4,200	4,200	4,200	4,100	4,000	4,000	3,900	3,900	3,800	3,800	3,700	3,700	3,600	3,500	3,500	3,400	3,400	3,300	3,300	Base
⁻⁴ No. 10 (2005)	4,300	_	•		•	•	•	4,000	4,000	3,900	3,900	3,800	3,800	3,700	3,700	3,600	3,600	3,500	3,500	Base
(This Project) No. 11 ()										4,200	4,100	4,100	4,000	4,000	3,900	3,900	3,800	3,800	3,700	Base
(Tetal Available Canacity)		8 700	\$ 700	8 100	8 000	17.100	10 500	16 668	14.400	15.400	15 000	17.760	16 800	16.700	16 100	16.100	15 504	15 (00)	17 344	
2.3 AVAILABLE CAPACITY (A C)		17 800	17 800	17.688	17.668	15 900	10 500	17.688	16 680	19 700	19 366	18,400	15,000	17.655	16.858	16.600	16 168	15,009	15,300	
J. POWER BALANCE (23-1)		2 250	2.470	3,400	3 260	6.620	900	7.360	5 800	\$ 600	7 800	6 400	5 500	4 800	11.00	2600	1,260	15,809	15,500	
4. A C OF THE LARGEST UNIT		4,300	4 300	4 100	4 000	4 000	1900	4 000	4 000	4 300	4 100	4 100	4000	4 000	3,900	1900	1800	1 500	1 200	
5. STABLE CAPACITY (23-4)		8.600	8,600	8.500	8.000	11,900	6,900	13.600	12,500	15 500	15,200	14 300	14,000	13,800	12.950	12,200	12 500	11 500	11.600	
6. URGENT RESERVE CAPACITY	(51)	-1,950	-1,730	-700	-800	2.628	-3,000	13,300	1,890	4,400	3,700	2.360	1.500	500	-550	-1,300	-2,100	-3,400	-4.200	
7. A C OF THE SECOND LARGEST U	UNIT	2,700	2,700	2,300	2,200	4,000	3,800	3,900	3,800	3,900	1,900	3,800	3,800	3,700	3,700	1,600	3,600	1.500	1.500	
8. FIRM CAPACITY (6-7.)		-4,650	-4,430	-3,000	-3,000	-1,380	-6,800	-600	-2,000	500	-200	-1,500	-2,300	-2,900	-4,250	-4,900	-5,700	-6,900	.7,700	

Power Balance in Honiara Power Network

Remarks 1) +1: Generator of these three units are now under repair and will be operated in 2005.

2) +2: These three units had been retired by September 2004.

3) +3: Manufacturing year of engine is 1987.

4) +4: This unit shall be installed within 2004 and put into operation on 2005.

4) Above output means available output at the end of each year,

5) AAIR: Average of the Annual Increasing Rate.

17

Target year for Transmission facility

Target year for

Power Station

and the latence

6. RE-CALCULATION OF NO_X CONCENTRATION ON THE GROUND SURFACE

SOLOMON ISLANDS ELECTRICITY AUTHORITY

MENDANA AVENUE HONIARA

Piease quote our letter reference on all correspondence, which should be addressed to General Manager.

PO BOX 6, HONIARA, SOLOMON ISLANDS Telephone: (677) 21 711 Facsimile: (677) 21 467 E-mail: mike@siea.com.sb Your Ref: Our Ref:

15 September 2004

Permanent Secretary Ministry of Forestry, Environment & Conservation PO Box G24 HONIARA

Attention: Mr Moses Biliki – Director of Environment & Conservation

Dear Sir,

RE: HONIARA POWER GENERATION PROJECT - PHASE II

We refer to our letter of 10 August 2004, regarding further information on the likely NO_2 , SO_2 and CO_2 emissions associated with the above project.

Since my earlier letter, Japanese consulting engineers from Yachiyo Engineering Co. Limited have compiled the attached report which is based on actual mode of diesel generation operation and not the unrealistic scenario where every machine at Lungga power station is in operation 24-hour per day, 7-days a week.

Base on these findings, the maximum value of ground surface NO_2 concentration calculated, that of 0.056201 ppm, is within acceptable standards set under Japanese Air Quality Standard nominally 0.04-0.06 ppm.

The results of this new report removes the necessity of having to heighten the generator exhaust stacks as originally thought necessary.

In respect to the Environmental Management Plan; this report is now nearing completion and will be forwarded presently.

Yours faithfully, SOLOMON ISLANDS ELECTRICITY AUTHORITY

MICHAEL NATION General Manager


Daily Load Curve of Honiara Power System (Year 2016, Estimation)



Daily Operation Mode of Each Generating Unit

Unit	Output	Operating Capacity(MW)			Dail	y Operat	ing Hours	Coefficient ^{*1} used for	
No.	(MW)	Off-peak	Peak	Middle	Off-peak	Peak	Middle	Total	NOx & SOx Calculation
L6	1.9	0	1.9	1.9	0	9	5	14	14h/24h=0.583
L8	3.3	0	3.3	0	0	9	0	9	9h/24h=0.375
L.9	3.3	0	3.3	3.3	0	9	5	14	14h/24h=0.583
L10	3.6	3.6	3.6	3.6	10	9	5	24	24h/24h=1
L11	3.9	3.9	3.9	3.9	10	9	5	24	24h/24h=1
Total_(W)	7.5	16.0	12.7					
Deman	d (MW)	7.3	15.2	11.3					

[Remarks] *1: These coefficients are used to calculate ground surface concentration of NOx and SOx which actual operation mode of each generating unit is taken into consideration.

	C(x) _{24h} (ppm)								
x (m)	L5	L6	L8	L9	L10	L11	Total		
100	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000	0.000000		
200	0.000000	0.000938	0.000009	0.000004	0.000025	0.000004	0.000979		
300	0.000000	0.006243	0.000650	0.000498	0.001732	0.000663	0.009786		
400	0.000000	0.010403	0.002662	0.002631	0.007100	0.003950	0.026745		
500	0.000000	0.011736	0.004685	0.005249	0.012494	0.008358	0.042521		
600	0.000000	0.011503	0.005922	0.007128	0.015791	0.011739	0.052083		
700	0.000000	0.010654	0.006436	0.008104	0.017162	0.013633	0.055990		
800	0.000000	0.009640	0.006485	0.008418	0.017294	0.014364	0.056201		
900	0.000000	0.008648	0.006278	0.008326	0.016741	0.014352	0.054345		
1,000	0.000000	0.007745	0.005946	0.008012	0.015856	0.013913	0.051471		
1,100	0.000000	0.006947	0.005565	0.007589	0.014841	0.013253	0.048195		
1,200	0.000000	0.006252	0.005177	0.007125	0.013805	0.012498	0.044857		
1,300	0.000000	0.005648	0.004802	0.006658	0.012804	0.011720	0.041633		
1,400	0.000000	0.005125	0.004450	0.006208	0.011867	0.010958	0.038607		
1,500	0.000000	0.004669	0.004126	0.005784	0.011002	0.010233	0.035813		
1,600	0.000000	0.004271	0.003829	0.005390	0.010212	0.009555	0.033258		
1,700	0.000000	0.003922	0.003560	0.005028	0.009493	0.008928	0.030931		
1,800	0.000000	0.003615	0.003315	0.004697	0.008841	0.008351	0.028818		
1,900	0.000000	0.003343	0.003094	0.004394	0.008249	0.007821	0.026901		
2,000	0.000000	0.003102	0.002892	0.004117	0.007713	0.007336	0.025160		
3,000	0.000000	0.001679	0.001633	0.002352	0.004355	0.004214	0.014234		
4,000	0.000000	0.001071	0.001058	0.001531	0.002821	0.002748	0.009229		
5,000	0.000000	0.000752	0.000748	0.001085	0.001996	0.001951	0.006532		
6,000	0.000000	0.000562	0.000562	0.000816	0.001498	0.001467	0.004904		
7,000	0.000000	0.000439	0.000440	0.000639	0.001173	0.001150	0.003841		
8,000	0.000000	0.000354	0.000356	0.000517	0.000948	0.000930	0.003104		
9,000	0.000000	0.000293	0.000294	0.000428	0.000785	0.000771	0.002571		
10,000	0.000000	0.000247	0.000249	0.000362	0.000663	0.000651	0.002171		

Ground surface concentration of NO₂ (24hours mean value) (Actual operation mode of each generator is taken into consideration)

x (m): Distance from the pullution source

C(x)_{24h} (ppm): Gounrd surface concentration of NO₂ (24 hours mean value)

L5~L11: Identification number of generating units in Lungga power station Ambient Air Quality Standard of Japan: 0.04-0.06ppm or less (NO₂)

																				(Unit: kW)
Descriptions	Rated Output	Recorded 1999	Recorded 2000	Recorded 2001	Recorded 2002	Recorded 2003	Forecast 2004	Forecast 2005	Forecast 2006	Forecast 2007	Forecast 2008	Forecast 2009	Forecast 2010	Forecast 2011	Forecast 2012	Forecast 2013	Forecast 2014	Ferecast 2015	Forecast 2016	Remarks
1. PEAK DEMAND		10,550	10,300	9,200	8,800	9,090	9,500	9,900	10,300	10,700	11,100	11,500	12,000	12,500	13,000	13,500	14,000	14,600	15,200	AALR (5) 40
2. POWER SUPPLY CONDITION (Total rated output)	27,700	27,700	27,700	27,700	, 27,700	27,700	27,700	20,600	24,800	22,400	22,400	21,000	21,000	19,600	19,600	19,600	19,600	19,600	19,600	
2. I Honiara Power Station (Total)	(6,000)																			0
*1 Na.1 (1997) *1 Na.2 (1997) *1 Na.3 (1997) *2 Na.5 (1985) *2 Na.5 (1985)	1,400 1,400 1,400 900 900	1,000 1,100 1,000 500 500	1,000 1,100 1,000 500 500	1,100 1,100 1,100 500 500	1,100 800 1,100 500	1,000 800 1,000 500 500	:	(retire) 1,000 1,000 (retire) 500	1.000 1.000 \$00	900 900	900 900	800 (retire)	800	(retire)						Not reliable Not reliable
(Total Available Capacity)		4,100	4,100	4,300	4,000	3,800		2,500	2,500	1,800	1,500	800	800							
2.2 Lungga Power Station (Total)	(21,700)													-	-		-	-		
*3 No. 4 (1971) *3 No. 5 (1971) No. 6 (1998) *4 No. 7 (1987) *5 No. 8 (1993)	1,500 1,500 3,000 2,800 4,500	900 900 2,700	900 900 2,700 -	900 1,000 2,300	1,000 800 2,200	900 900 2,300 - 4,000	1,000 2,300	(retire) 500 2,100 (retire) 3,900	900 2.000 3.900	(retire) 2.000 3.800	1,900	1,900	1,800	2,100	2,100	2.000	2.000	1,500	1,900	Middle
(Phase-I) No. 9 (1999)	4,200	4,200	4,200	4,100	4,000	4,000	4,000	3,900	3,900	3,800	3,800	3,700	3,700	3,600	3,600	3,500	3,500	3,400	3,300	Base
*6 No. 10 (2005)	4,200			•	•	•		4,100	4,100	4,000	4,000	3,900	3,900	3,800	3,800	3,700	3,700	3,600	3,600	Base
(This Project) No. 11 ()	4,200								4,200	4,200	4,200	4,100	4,100	4,100	4,000	4,000	4,000	3,900	3,900	Base
(Total Available Capacity)		\$,700	\$,700	\$,300	8,000	12,100	7,300	14,900	19,000	17,800	17,700	17,300	17,200	17,200	17,100	16,700	16,700	16,200	16,000	
23 AVAILABLE CAPACITY (A.C)	12,800	12,800	12,600	12,000	15,900	7,300	17,400	21,500	19,600	19,500	18,100	18,000	17,200	17,100	16,700	16,700	16,200	16,000	
A FOWER BALANCE (23 - 1)		2,250	2,500	3,400	3,200	6,810	(2,200)	7,500	11,200	8,900	8,400	6,600	6,000	4,700	4,100	3,200	2,700	1,600	800	
S STABLE CAPACITY (23.4)		8,600	8,600	8,500	8,000	11 900	1,000	4,100	4,300	4,300	4,300	4,100	4,100	4,100	4,000	4,000	4,000	3.900	1,900	
6. POWER BALANCE STARLED	5.13	-1,950	-1,700	.700	-800	2.810	-6.200	3,400	7.000	4 700	4 200	2 500	1,900	600	10,100	-14,000	12,700	-2 300	-1.100	
7. A C OF THE SECOND LARGEST	UNIT	2,700	2,700	2 300	2 200	4,000	1,900	1,900	4,100	4,000	4,000	1,900	1,500	1.800	1 800	1 200	1 200	1.600	1600	
8. FIRM CAPACITY (67.)		-4,650	-4,400	-3,000	-3,000	-1,190	-10,100	-500	2,900	700	200	-1,400	-2,000	-3,200	-3,700	-4.500	-5.000	-5.900	-6.700	

Power Balance of Honiara Power System (as of June 2004)

Remarks 1) +1: One of these three DEG sets is currently in service.

2) +2: These two units are now under rehabilitation work_

3) +3: No.4 or 5 DEG of Lungga P/S shall be retired at 2007 because of low thermal efficiency, plenty of lube oil consumption and difficulty of the procurement of spare parts.

1

4) +4: This DEG unit had been retired beginning of 2004.

5) +5: This unit was returned to service in Oct, 2002. However this machine is yet to prove its reliability.

6) •6: This unit will be in service during 2005.

7) Above output means available output at the end of each year.

8) AAIR: Average of the Annual Increasing Rate used for demand forecast.

7. APPROVAL LETTER FOR IEIA FROM THE DEPARTMENT OF FORESTS, ENVIRONMENT AND CONSERVATION

SOLOMON ISLANDS GOVERNMENT	Dept. of Forests, Environment and Conservation P. O. Box G24 Honiara Solomon Islands Telephone: (677) 24325
Mr. Mike Nation	Fax: (677) 28735
SIEA P.O.Box 6	Our Ref: Env/4/1
Honiara	Date: 29/09/04

Dear Mr. Nation,

Re: Approval by the Environment and Conservation Division of DFEC of Honlara Power Generation Project – Phase Two

Following your letters of response (see letters of 10th August 2004, 15th September 2004 and 21st September 2004) to our decision as conveyed to you on 30th June 2004 on the above subject, the Environment and Conservation Division of DFEC has reviewed its earlier decision and has made a new decision as follows.

Decision

This decision is made in accordance with the powers vested in the Director of Environment and Conservation as stipulated in Part II of the Environment Act 1998.

"The Director of Environment and Conservation of the Environment and Conservation Division (ECD) of DFEC has reviewed the IEIA submitted by SIEA through the Department of Mines and Energy on the Honiara Power Generation Project – Phase Two, together with the information and with clarifications provided by SIEA as contained in the letters dated 10th August 2004, 15th September 2004 and 21st September 2004, and has given full consent for the development to proceed. SIEA is again advised that it has been granted exemption from doing any further Environment Impact Assessment prior to the commencement of the project. The ECD will await the completion of a detailed environmental management plan as earlier requested and as assured by SIEA."

Sincerely,

Moses Biliki

Environment and Conservation Division Department of Forests, Environment and Conservation

Cc: Permanent Secretary/DME Cc: Director/Energy Division

8. ENVIRONMENTAL MANAGEMENT PLAN

SOLOMON ISLANDS ELECTRICITY AUTHORITY



Please quote our letter reference on all correspondence, which should be addressed to General Manager. PO BOX 6, HONIARA, SOLOMON ISLANDS Telephone: (677) 21 711 Facsimile: (677) 21 467 E-mail: mike@sica.com.sb Your Ref: Our Ref:

21 September 2004

Permanent Secretary Ministry of Forestry, Environment & Conservation PO Box G24 HONIARA

Attention: Mr Moses Biliki – Director of Environment & Conservation

Dear Sir,

RE: HONIARA POWER GENERATION PROJECT - PHASE II

Further to our recent letter of the 15 September 2004, we have pleasure in enclosing the relevant section of the Environmental Management Plan, namely Section v. 'Management of All Types of Wastes and Emissions'.

In respect to Sections i. to iv. relating to general background to SIEA; the Authority is currently preparing a booklet containing information and statistics covering the SIEA organization, generation, transmission and distribution, electricity sales, management, staffing and future planning. This booklet should be available before the end of this year at which time, a copy will be forwarded to your office.

With the Japanese consultants responsible for this project currently in Honiara we would respectively request your Department's written approval of the Environmental Impact Assessment study as it stands to date, in order that this very important project for ensuring reliable electricity supplies to Honiara can pass from the planning to the implementation stage in the fastest possible time.

Yours faithfully, SOLOMON ISLANDS ELECTRICITY AUTHORITY

MICHAEL NATION General Manager

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THE PROJECT

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FOR

HONIARA POWER GENERATION DEVELOPMENT

(PHASE-2)

Environmental Management Plan (EMP)

September 2004

MINISTRY OF MINES AND ENERGY

SOLOMON ISLANDS ELECTRICITY AUTHORITY

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Attachment-1 Annual Report of SIEA Attachment-2 Monthly Report of SIEA

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Environmental Management Plan (EMP)

- i. General Description of the Authority and its functions/services See attachment-1, Annual Report of SIEA.
- ii. Description of its Power Systems and Related Facilities See attachment-1, Annual Report of SIEA.
- iii. Management of Power Stations and Substations See attachment-2, Monthly Report of SIEA.
- iv. Management of Transmission Lines and Related Systems See attachment-2, Monthly Report of SIEA.

v. Management of All Types of Wastes and Emission

The purpose of the Environment Management Plan (EMP) is to:

• Provide an overall guideline.

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- Control significant environmental impacts.
- Ensure that control measures are incorporated in the constructional and operational frameworks.

The following EMP in a tabular format had been developed to cover the most significant issues anticipated as main concerns to the environment. It includes the followings:

- Emissions to Air
- Noise
- Waste Management

Issue:	Objective:	Management Strategy		Responsible
				body
Emissions to	To minímize	•	Have the latest design Diesel	STEA and
Air	emissions of air		Engine Generator which	Contractor
	poliutant such as NOx		consumes less fuel oil.	
	and SOx.	•	Suitable and appropriate air	
			pollution mitigation	

			equipment shall be employed to minimize emissions to the air, if necessary.	
		•	The Diesel Engine Generator shall be designed so as to reduce the emissions of NOx and SOx.	
		•	Exhaust gas stack shall be high enough so that ground surface concentration of NOx and SOx are kept lower than	
		•	the environmental standards. Sulfur content of the fuel shall be kept not higher than 0.17%	_
		•	as specified in IEIA report. The Diesel Engine Generator shall be well maintained so as to keep the operational	. –
			performance guaranteed by the manufacturer.	
Noise	To reduce noise level from the generator and auxiliary equipment during the construction period.	•	The Diesel Engine Generator shall be installed inside a building. Application of silencers to the Diesel Engine Generator. Noise insulation shall be included in the design features of the powerhouse extension. Staffs should be instructed to keep outside doors closed at all times. Generating equipment of low-noise type shall be selected. Noise level at the property line	SIEA and Contractor
			of Lungga power station shall	

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			be monitored periodically (at least once a year).	
Waste Management	To avoid and minimize waste impact.	•	Waste oil generated from the Lungga power station shall be combusted by the existing incinerator	SIEA and Contractor
		•	Existing waste water treatment system shall be utilized to minimize contamination in the waste water.	
		•	Old equipment and materials removed under the Project shall be properly treated.	
		•	Enough and safe land shall be secured to store the removed equipment and materials, if necessary.	-

vi. Safety Procedures Relating to its Systems

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Issue:	Objective:	Management Strategy	Responsible body
Fire	Avoid fire hazard at all times.	 Fire extinguisher shall be provided in all rooms. Development of a fire management plan. Regular training of staffs/workers on fire management. Designating the area as a non-smoking area. Non-smoking stickers to be displayed everywhere on walls. Proper fencing of the area. 	SIEA and Contractor
Injury	Avoid injury of	Regular training of	SIEA and

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workers during construction and	•	staffs/workers on safety Ensure usage of safety goods	Contractor
operation			

vii. Monitoring Regimes Relating to the Implementation of the EMP

Issue:	Objective:	Management Strategy	Responsible
			body
Monitoring Regime	To continue environmental monitoring and compliance activity	 SIEA shall establish an environmental section within SIEA's organization and assign staffs who will supervise environmental compliance, 	SIEA

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