Ministry of Energy and Mines
The Repiblic of Burundi

FINAL REPORT
OF THE PREPARATORY SURVEY
ON THE PROJECT
FOR
INTRODUCTION OF CLEAN ENERGY
BY SOLAR ELECTRICITY GENERATION SYSTEM
IN
THE REPUBLIC OF BURUNDI

August 2010

JAPAN INTERNATIONAL COOPERATION AGENCY

NEWJEC Inc.
JAPAN TECHNO Co., LTD.

I D D
J R
10-077

PREFACE

Japan International Cooperation Agency (JICA) decided to conduct the preparatory survey on THE PROJECT FOR INTRODUCTION OF CLEAN ENERGY BY SOLAR ELECTRICITY GENERATION SYSTEM in Republic of Burundi

JICA sent to Burundi survey team headed by Mr. Masaru NISHIDA of NEWJEC Inc. and consist of NEWJWC Inc. and JAPAN TECHNO CO., LTD. from August 9th to 20th and from November 14th to December4th, 2009.

The team held discussions with the officials concerned of the Government of Burundi, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Burundi in order to discuss a draft outline design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

Finally, I wish to express my sincere appreciation to the officials concerned of the Government of Republic of Burundi for their close cooperation extended to the teams.

August 2010

Kazuhiro YONEDA
Director General,
Industrial Development
Japan International Cooperation Agency

SUMMARY

SUMMARY

I. Outline of the Recipient County

The Republic of Burundi is an inland country located in the central Africa, in the region called Great Lakes or the Rift Valley. It stretches over2°30' to 4°30' latitude south, and 28°50' to 30°53'30" longitude east, bordered by Rwanda to the north, Congo Democratic Republic to the west and Tanzania to the east and south across Lake Tanganyika. The territory is 2.7 thousand km^2. The country is well endowed with water resources with annual rainfall 1,500 mm, in particular the capital Bujumbura City in the region facing Lake Tanganyika with abundant water.

The climate varies across the country according to the altitude. Bujumbura has the annual average temperature of around 25 degree Celsius, with the distinct dry and wet seasons in June to September and February to May. The period between September and December is relatively rainy and that between January and February relatively dry.

Population census has not been conducted since 1990. According to the estimation by the Ministry of Development Planning and Reconstruction, the population is 7,952 thousand in 2007, growing at a little below 3% annually. Among the population, those who live in the state of Bujumbura including the capital are 525 thousand, leaving most of the population dispersed over the territory.

Prolonged turmoil since 1993 left the country as one of the poorest countries in Africa, with GDP per capita US$140 which has not yet come back to the pre-war level. The economy is dominated by agriculture and Lake Tanganyika is a great resource for traditional fisheries. The country is also endowed with minerals; reportedly rich in nickel, iron, titanium, vanadium, etc.
The government has been making efforts in economic reform. In recent years, public investment has been increasing due to the inflow of assistance resumed from abroad.

II. Background of the Project and its Outline

Burundi does not produce oil or any other energy resources for electric generation, but is rich in hydro resource. During the prolonged period of turmoil, however, many hydropower stations and transmission/distribution lines have been damaged or deteriorated. Lack of investment has had the electrification ratio of the country 2% or less, and inadequate supply capacity is apparent in urban areas. Particularly in rural areas where there is no alternative to fuel wood, deforestation has become serious problems.

The country decided to join "Cool Earth Partnership" and takes up as its policy priority reduction of GHGs emission and promotion of economic development, by the approach of adaptation and mitigation to climate change. In accordance with the initiative, Burundi Government requested to the Government of Japan for Grant Aid in June 2009.

Having received this request, JICA conducted the first phase site survey between August 26th to 20th in 2009, identified the Hospital University Center of Kamenge (CHUK) and Prince Louis Rwagasore Hospital as candidate sites, and made into an agreement with the Recipient. Based on the results of the first phase study, scale and efficiency of both site candidates have been reviewed in Japan, and CHUK was chosen as the candidate project site.

III. Outline of Study Result and the Content of the Project

Subsequently JICA sent the Study Team for the second phase site survey between November 14th and December 4th to Burundi, to investigate the Site, collect related information and have discussion with the Recipient concerning the contents of the Project.

After coming back to Japan, the Study Team examined the necessity, effectiveness and appropriateness of the Project on the basis of the result of the site survey, and prepared a Basic Design Report. With the Basic Design Report in hand, JICA's Study Team visited Burundi again between May 9th and 14th 2010, explained and discussed the report, and signed the minute of meeting with the Government of Burundi.

As a result of the study, the Project proposed is to provide CHUK with a photovoltaic system (PV system) of 260kW peak power and to supply electric power to the facility. The PV system will be interconnected with the utility grid, and suspend its operation during the blackouts. When there is a surplus power generated by the PV system the surplus is sent back to the grid. Also, training programs will be provided that cover topics like methods of operation and maintenance, and planning of solar power projects.

The Responsible Organization and the implementing agency of the Project is the Ministry of Energy and Mines.

The summary of outline design of the PV equipment is shown in the table below.

Category	Content
Site and PV Capacity	CHUK: 260kW PV power station - PV system shall be grid-interconnected, and surplus power shall be sent back to the utility grid (reverse current) - In the case of blackout, PV system shall be designed to shut down automatically.
Procurement of Generating equipments and Installation Work	260kW PV modules Ancillary equipment for PV system - Junction box - Power conditioner cubicle - Meteorological observation device - PV connection panel - Materials for wiring and earth - Electrical facility cubicle - Supporting structures for PV modules - Foundation of supporting structures for the PV system and electrical facility cubicle - Fences, gates, and gravel surfacing - Cable connection for Electrical facility cubicle/interconnection point/display equipment
Spare Parts and Tool Kits	Spare parts and tool kits for maintenances of equipment Manuals for O&M and implementation of Operation Guidance

IV. Project Implementation Cost and Period

The cost of this Project implemented under Japan's Grand Aid scheme includes no expenses on Burundi side.

The project period is planned to be five months for tendering stage, and fourteen months for the procurement of the Products and their installation.

V. Evaluation of the Project

The generating equipment procured in the Project will be, upon completion, transferred from the Ministry of Energy to CHUK, where it is managed by CHUK for its daily operation and maintenance, with supervision of the Ministry of Higher Education. The management of the equipment in the long run will also be carried out by CHUK, with technical and financial assistances and from the Ministry of Energy and REGIDESO.

At the implementation stage of the Project, a series of the training programs will be provided for operation and maintenance techniques and knowledge of solar generation and its use. The training programs is planned with intentions to make effective and sustainable the operation and maintenance organization mentioned above, and to contribute to the promotion of solar energy use in Burundi.

The direct effect of this Project will be the provision of additional power and energy in Burundi which has chronicle shortage of electricity. The energy to be produced is estimated to reach almost 60% of the annual energy consumption of CHUK. Meanwhile, the effect of reduction of CO_2 emission is, calculated on the basis of CDM method, expected to be 243 t-CO_2 per year.

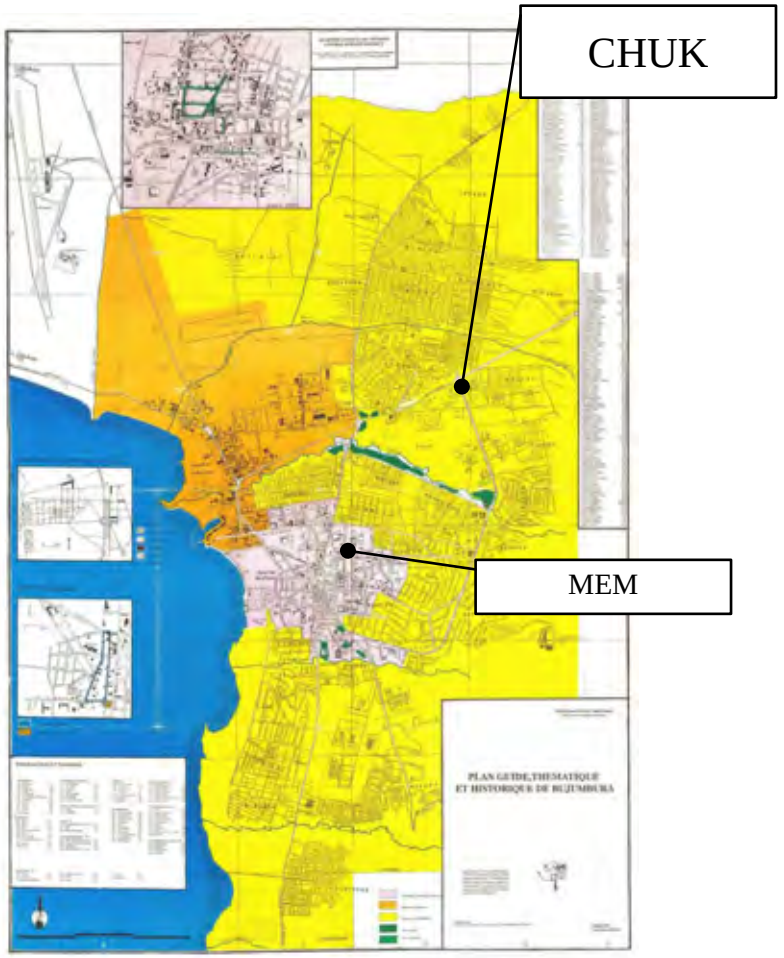
This Project will install the largest-scale solar generation system in Burundi with its population distributed over the territory and in need of solar energy in electrification of rural areas. The Project is expected to demonstrate the effectiveness of solar energy use to the wider public of the country, and will contribute to the promotion of its use in private sector.

Meanwhile, PV modules and power conditioners made by Japanese manufacturers have technical advantages over other countries in their efficiency, longevity, reliability, etc. in the market. As this Project is limiting the country of origin of this equipment to Japan, the Project will be able to offer advanced technology of Japanese products.

Adding up the discussions above, it is concluded that the Project planned herein is very effective and appropriate as a project implemented as Programme Grant Aid for Environment and Climate Change.

Table of Contents

BURUNDI



Bujumbura City

Location of Project Site

List of Figures

List of Tables

Abbreviations

AC	Alternating Current
B/A	Banking Arrangement
CT	Current Transformer
DC	Direct Current
DEG	Diesel Engine Generator
EIA	Environmental Impact Assessment
EU	European Union
E/N	Exchange of Notes
GDP	Gross Domestic Product
GNI	Gross National Income
GTZ	Deutsche Gesellschaft für Technische Zusammenarbeit
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
JCS	Japanese Electric Wire & Cable Makers' Association Standard
JEAC	Japan Electric Association Code
JEC	Japanese Electrotechnical Committee
JEM	Standards of Japan Electrical Manufacturer's Association
JICA	Japan International Cooperation Agency
JIS	Japanese Industrial Standards
MCCB	Molded Case Circuit Breaker
MEE	Ministry of Electricity and Energy
MPHP	Ministry of Public Health and Population
MPIC	Ministry of Planning and International Cooperation
MWE	Ministry of Water and Environment
O&M	Operation and Maintenance
OJT	On the Job Training
PEC	Public Electricity Corporation
PCS	Power Conditioners
PV	Photovoltaic
PVC	Polyvinyl Chloride
SI	The International System of Units
VT	Voltage Transformer
XLPE	Cross-linked Polyethylene

CHAPTER 1

BACKGROUND OF PROJECT

Chapter 1 Background of Project

1-1 Background of the Study

Burundi does not produce primary energy resources but is endowed with rich hydropower potential. However, during the prolonged period of turmoil hydropower facilities and transmission/distribution systems of power had significantly deteriorated. Investment in power sector has been absent, and electrification ratio in the country stays as low as two per cent. Even in electrified urban areas, supply capacity of electric power is insufficient. Rural areas still largely depend on firewood, which has been the cause of deforestation.

Japanese government announced its policy initiative in Davos in January 2008 to assist developing countries which intend to contribute to mitigation of climate change by means of reduction of greenhouse gas emission without compromising their economic development. The initiative is called "Cool Earth Partnership" and aims to support developing countries in their efforts to reduce energy consumption and emissions, and also to adapt to the change in climate. As one of measures, Japanese government set up "Program Grant Aid for Environment and Climate Change", a financial mechanism to support member countries which have difficulties in executing capabilities and funding.

Burundi decided to join "Cool Earth Partnership" and takes up as its policy priority reduction of GHGs emission and promotion of economic development, by the approach of adaptation and mitigation to climate change. It responded with its candidate projects to the needs surveys conducted by the Ministry of Foreign Affairs of Japan.

Solar energy is generally regarded as mitigation strategy of climate change because it does not consume fossil fuel, and especially in Burundi which is highly dependent on hydropower energy, it is also regarded as adaptation strategy for decreasing rainfall as alternative energy to complement hydropower.

Description of the request for this Grant Aid project submitted in June 2009 is as follows.

Requested amount: 549,551 thousand Yen
Description of Requested Components:

1) Solar power facility (200kW)
   PV module, power conditioner, junction box, data collection system, stand, climate observing system, display equipment, etc.
   Project site: Selected from following hospitals

1 Hôpital Prince Régent Charles (PRC Hospital)
2 Hôpital Prince Louis Rwagasore (PLR Hospital)
3 Centre Hospitalo-Universitaire de Kamenge (CHUK)

2) Soft component accompanying the above facility improvement
Workshop, training, manual, etc.

Having received the request, technical issue such as potential of installation of photovoltaic module, etc. for the above sites has been studied in the first phase site survey implemented in August 2009. Then after discussion with Burundi, two hospitals, PLR and CHUK have been selected as project site candidates, and agreed between Ministry of Energy and others in Burundi and JICA study team in August 14, 2009. After that, scale and efficiency of both site candidates have been reviewed in Japan, and CHUK has been finally determined to be the project site.

CHUK has been established as a national referral hospital in Burundi, and combined with medical educational institution closely working with University of Burundi Faculty of Medicine. Obstetrics and gynecology clinics, and pediatrics are main services, and also has the wards of internal medicine, surgery, HIV/AIDS, etc. Funding and management of the hospital has been conducted independently with assistance by the national government.

In this Grant Aid project, photovoltaic power generation systems (PV systems) will be provided as part of assistance for countermeasure of climate change in Burundi, and a part of power systems in this country will be replaced by renewable energy, in order to support for coping with both greenhouse gas emission and economic growth, by decreasing dependency rate on fossil fuel in this country and burden of electricity charge for this public facility.

1-2 Project Site and Surroundings

1-2-1 Related Infrastructure

(1) Status of Existing Electric Equipment of the Facility

The existing electricity supply of CHUK comes from the electrical room owned by REGIDESO, through a transformer (20kV/380V, 400kVA) therein, to the low voltage panel inside the other electrical room of the main building of the hospital. There is an emergency diesel generator in the latter electrical room which has been obsolete and replaced by a new 450kVA unit placed in a separate housing. This new generator is designed to detect blackout of the utility grid, and start and stop automatically. Power cables in the hospital are all buried underground, but their locations are recorded on the drawings and in some places shown with

markers on the ground.

Important functions of the hospital, such as operation theaters, intensive care units, recovery rooms, etc., are all concentrated in the main building and so is important medical equipment. Two outpatient clinics are located near the entrances of the hospital, separated from the main building, furnished with simple equipment such as examination lamps.

In 2008, electricity consumption of the hospital was 583,720kWh.

Layout of the buildings of the hospital is shown in the figure below.

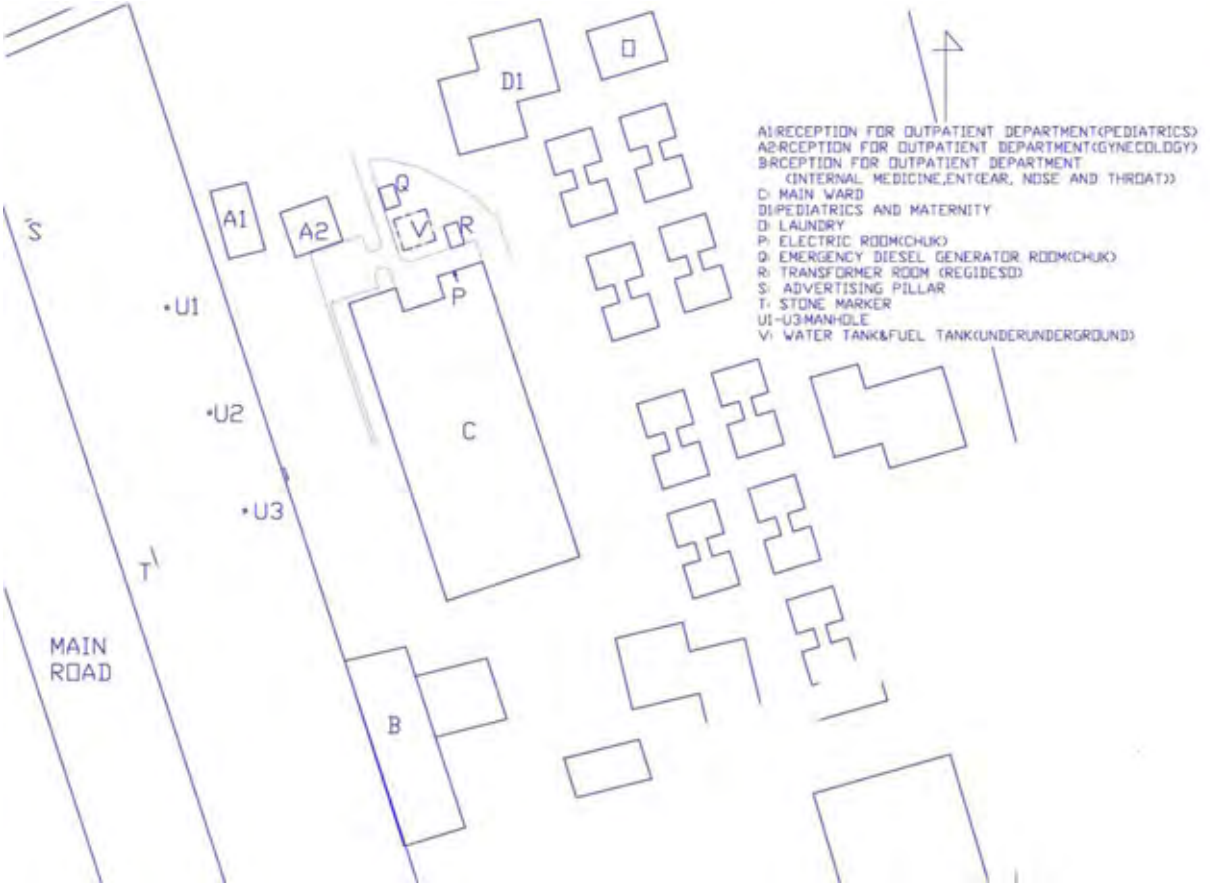


Figure 1-2-1-1 Layout of Buildings in CHUK

(2) Status of Electricity Supply in the Region

There is a shortage of electricity supply in Burundi. Most of the power comes from small scale hydro plants, where lack of investment for many years has led to the output of these plants derated. A diesel generator installed in Bujumbura is seldom used for the fuel procurement problems. Import of power from Ruzizi hydro plant of SINELAC, a co-invested company with the governments of Rwanda and Democratic Republic of Congo, has been

increased to the level of above 40% of annual electricity consumption in 2004. Meanwhile, transmission system has been deteriorated and the loss is as high as 20%. These factors amount to frequent occurrence of blackout in the country. Particularly in dry years the shortage of power supply becomes acute as the system depends mostly on hydropower.

Under these power supply conditions, the PV system is expected to function as a supplementary power supply particularly in dry season or dry years when the output of hydro plants is decreased.

1-2-2 Natural Condition

(1) Location and Topography of the Site

Bujumbura City where the Project Site (CHUK) is located is the capital of Burundi, at the flat land on the northern coast of Lake Tanganyika, surrounded by the range of 2,500m class mountains. CHUK is approximately 7km away from the Bujumbura International Airport, on a plot of land approximately 400m by 300m in size, mildly sloping toward the Lake. The premise of CHUK is surrounded by the fence and gates, while the PV installation area is outside the fence directly facing one of the main roads of the capital.

(2) Meteorological Conditions

1) Temperature

As Bujumbura is at altitude of around 800m near the equator, variation of temperature due to the seasons is small; average monthly maximum temperature is 30.2 degree Celsius, and minimum 19.2 degree. Monthly maximum temperature is shown in Table 1-2-2-1 and minimum in Table 1-2-2-2.

Table 1-2-2-1 Monthly Maximum Temperature (Bujumbura 1998 – 2008)

	1	2	3	4	5	6	7	8	9	10	11	12
1998	29.8	30.3	30.3	30.4	30.4	30.0	29.4	30.2	31.1	30.6	29.9	29.7
1999	29.8	31.5	29.4	29.3	30.3	30.1	29.4	29.1	29.9	30.3	28.8	29.2
2000	30.0	29.9	29.0	30.0	30.1	29.6	29.6	30.2	31.9	30.6	28.9	29.4
2001	28.2	28.8	29.3	30.1	29.9	29.1	29.1	29.8	30.6	29.9	28.1	29.9
2002	28.7	30.4	29.8	29.4	30.2	30.2	30.4	30.3	31.1	31.5	29.3	29.9
2003				30.7	31.0	30.7	30.0	31.1	30.8	31.4	30.2	30.1
2004	30.7	30.2	30.8	29.5	30.8	30.3	30.2	31.0	31.4	31.3	30.2	29.7
2005	29.5	31.7	31.0	31.7	30.1	30.1	30.2	31.2	32.1	31.4	30.6	30.8
2006	30.1	30.6	30.7	30.0	30.3	30.4	30.0	30.8	31.3	32.9	28.5	28.8
2007	30.2	30.8	31.2	30.9	31.1	30.0	29.6	30.4	31.7	30.8	29.1	29.6
2008	30.0	29.5	29.4	30.0	31.1	29.6	29.4	30.7	32.0	30.1	30.2	30.7

Unit : Celsius

Table 1-2-2-2 Monthly Minimum Temperature (Bujumbura 1998 – 2008)

	1	2	3	4	5	6	7	8	9	10	11	12
1998	20.6	20.7	20.6	21.0	20.5	17.9	18.0	18.3	19.2	19.4	19.8	19.2
1999	19.4	19.6	19.5	19.3	19.0	17.7	17.1	19.1	19.4	18.7	19.1	19.2
2000	19.0	18.7	18.9	19.4	18.3	16.9	17.1	18.5	19.7	20.0	19.5	20.1
2001	19.8	19.5	19.5	19.9	19.8	18.0	17.5	17.3	18.9	19.8	18.9	19.8
2002	20.2	20.3	19.9		19.6	17.9	17.5	18.2	18.9	20.3	19.8	19.8
2003	19.6	19.8	19.6	20.2	20.5	18.2	16.7	17.3	19.3	19.9	19.4	19.2
2004	19.6	19.4	19.9	19.6	19.0	16.6	15.7	17.7	18.6	19.3	18.9	19.6
2005	19.5	20.4	20.1	20.2	19.6	18.3	16.8	18.3	19.6	20.2	19.9	19.7
2006	19.5	20.5	19.8	19.9	19.9	17.8	17.5	17.8	18.9	20.6	20.0	20.3
2007	20.5	20.2	19.6	20.3	20.2	19.0	18.4	17.8	19.5	19.7	19.7	19.8
2008	19.8	19.9	19.6	20.0	19.6	18.3	17.7	18.7	19.0	19.7	20.0	20.3

Unit : Celsius

2) Humidity

Bujumbura has a relatively humid climate with the annual average relative humidity 71.7%, minimum average monthly humidity 55% observed in August, and maximum average monthly humidity 82% in April.

3) Rainfall

Although Bujumbura barely has a rainfall in dry season of June to August, it does have rain in other seasons; there is the monthly record of 315mm observed in December 2004, and daily rainfall record of 76mm in February 2008. The annual rainfall is 800mm. Monthly record of rainfall is shown in Table 1-2-2-3.

Table 1-2-2-3 Monthly Rainfall (Bujumbura 1998 – 2008)

	1	2	3	4	5	6	7	8	9	10	11	12
1998	105.7	116.9	219.8	73.7	92.8	19.9	3.8	2.0	21.6	13.1	33.4	53.4
1999	71.7	13.9	147.2	92.5	14.7	0.3	0.0	28.0	60.6	48.2	128.3	159.6
2000	103.1	37.0	149.4	42.1	0.0	0.0	0.0	0.0	2.5	40.2	203.8	150.7
2001	113.1	77.2	99.9	97.9	9.3	49.8	7.6	0.0	62.3	67.6	91.4	88.0
2002	135.4	121.6	124.4	79.5	34.0	0.0	0.0	0.0	5.6	74.9	57.1	134.2
2003	46.5	60.9	100.8	68.1	25.0	0.5	0.5	2.5	54.6	148.9	68.0	
2004	104.2	19.9	162.8	93.7	0.7	0.0	4.8	10.1	196.9	134.4	193.1	315.1
2005	195.2	61.0	145.9	70.2	130.6	1.1	0.0	4.8	4.2	32.9	116.1	55.0
2006	87.0	121.0	123.7	111.2	88.9	2.5	0.9	38.1	32.3	63.0	157.1	215.0
2007	142.8	81.7	86.5	149.9	22.2	10.7	52.3	6.9	29.9	112.8	63.4	81.4
2008	99.1	166.7	71.4	69.2	23.2	89.2	15.1	3.6	31.9	69.7	65.1	37.0

Unit: mm

4) Wind Speed and Direction

Although there are a few records of wind over 50m/s in the past, wind in Bujumbura is relatively mild with annual average 4.2m/s. REGIDESO has a design wind speed for its facilities, 40m/s.

5) Earthquake

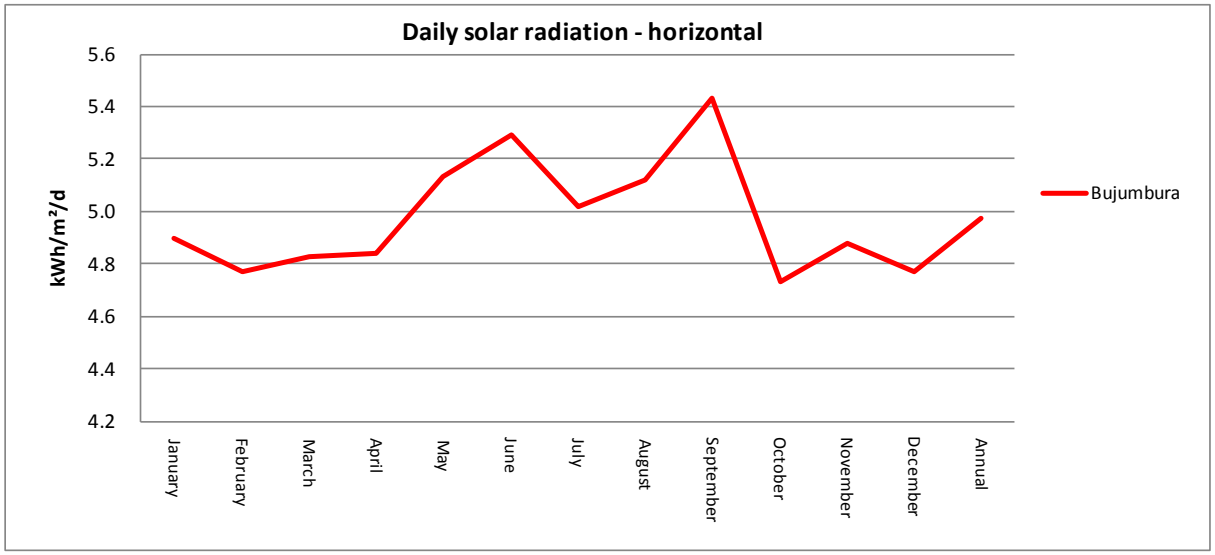
The Study Team interviewed at IGEBU, Institut Géographique du BURUNDI, and received that there has been no earthquake ever experienced in Bujumbura that was strong enough to be considered in the structural design.

6) Salinity

Burundi is an inland country and there is no countermeasure against salinity necessary.

7) Irradiation

Bujumbura enjoys relatively stable irradiation all through the year. Monthly average irradiation on horizontal plane is 5.29kWh/m^2/day in June, and 4.73 kWh/m^2/day in October, and the annual average 4.98 kWh/m^2/day. Figure 1-2-2-1shows annual variation of average monthly irradiation on horizontal plane.



Source: RETScreen

Figure 1-2-2-1 Average Monthly Irradiation on Horizontal Plane in Bujumbura

1-2-3 Environmental and Social Considerations

The solar power generation system is understood to be a typical clean energy system due to its characteristics such as no emission of noise, vibration, exhaust and waste fluid in its power

generating process. Therefore, the system can be considered to have no adverse impacts from environmental and social aspects.

As described in Chapter 2, the power supply system planned by the project is designed to supply power by Grid-interconnection. The use of batteries as supplement power during periods of insufficient insolation is not planned due to adverse impacts on the environment caused by lead contained in batteries when they are disposed.

During the construction period, several adverse impacts caused by work can be expected. The emission of noise, vibration and exhaust by vehicles and machineries for construction and the risk of accidents caused by the activities of those vehicles and machineries also need to be assumed during the construction period. The volume and hazard of waste emitted by the construction will not be significant but inappropriate management of waste can have risk of negative environmental and social impacts.

The CHUK Hospital, the project site is a large general hospital located in the city of Bujumbura with its premises isolated by a fence and containing several wards. The proposed site for installation of the solar power system is located in a vacant lot west of the main building in front of a national road. Since the site is located near the main building, potential adverse impacts during the construction may need consideration. Also, since the hospital accommodates many inpatients and their families, and many outpatients visit the hospital as well, the risk of accidents caused by construction vehicles and unauthorized entry to the hazardous sites require consideration. In addition, hindrance to surrounding traffic during the peak period for delivery of equipment, material and machinery can be assumed.

In order to mitigate the above mentioned adverse impacts during the construction period, appropriate mitigation measures which needs to be planned and implemented by the prospective contractor is required. Informing the work schedule and time table to the hospital staff, patients and neighbors in order for them to understand clearly the work procedures is also important to avoid the adverse impacts. As more concrete measures for security, the installation of temporary fencing to guard the site and arrangements for security guards will be required by the contractor. Fencing around the system is planned to prevent electrical shock due to entry of unauthorized person even after completion of the work.

The screening procedure was carried out during the field survey to confirm the categorization of the project which was set as “C” according to JICA’s guidelines for environmental and social considerations (2004) at the beginning of the study. The following table shows the results of the screening. The items are listed in accordance with the scope of objects in JICA’s guidelines.

Table 1-2-3-1 Screening for Environmental and Social Considerations

Item	Influence caused by the Project	Adaptation measure
Air pollution	None	
Water pollution	None	
Soil pollution	Medical waste dumped into the ground behind of the hospital might be dug up during excavation works.	To confirm that the Project area is located away from waste dump site.
Waste	Some waste will be generated during the construction period though there will be no waste after completion.	Necessary arrangements and supervision during the construction period should be provided.
Noise and Vibration	Noise and vibration will be generated during the construction period.	Necessary arrangements and supervision during the construction period should be provided.
Ground subsidence	None	
Offensive odors	None	
Geographical features	None	
Bottom sediment	None	
Biota and ecosystem	None	
Water usage	None	
Accidents	Risk of traffic accidents and electric shock during the construction period.	Necessary arrangements and supervision during the construction period should be provided.
Global warming	To contribute for mitigation	
Involuntary resettlement	None	
Local economy such as employment and livelihood etc.	None	
Land use and utilization of local resources	None, land for the Project is entirely owned by the hospital	
Social institutions such as social infrastructure and local decision-making institutions	None	
Existing social infrastructure and services	None	
The poor, indigenous of ethnic people	None	
Misdistribution of benefits and damages	None	
Local conflict of interests	None	
Gender	None	
Children's rights	Visitors include a lot of children, who might be potential victims of the aforementioned accidents. during the construction period.	Necessary arrangements for care of them and supervision during the construction period should be provided.
Cultural heritage	None	
Infectious diseases such as HIV/AIDS	None	

As shown in the above table, the impacts from the project will occur mostly during the construction period. Therefore, it is considered that long-term serious impacts, if any, can be

avoided or mitigated through the execution of appropriate measures at the beginning stage of the project implementation. Based on the above procedure, the project was confirmed to be categorized as "C" again at the stage of field survey.

The General Directorate of Environment and Forestry (GDEF), the Ministry of Water and Environment is in charge of supervision of the environmental Impact Assessment (EIA) in Burundi, complying with relevant provisions of the Environment law (2000). In accordance with the law, any project which might have adverse impact on the environment must be assessed by the EIA procedure. During the meetings with GDEF, the team explained about the outline of the Project and GDEF suggested to the team the negative impacts likely to be caused by the project would be quite limited and that the EIA procedure might not be required for the implementation of the project due to the following reasons:

- The photovoltaic solar power system planned by the project is regarded as a clean energy.
- Size of the project will be considered as a small scale.
- Site of the project will be located in the land owned by the beneficiary.

The team then resumed the consultation with GDEF by explaining the results of the screening which indicated that the project would not be required to undergo the process of EIA in accordance with JICA's guideline for environmental and social considerations. The above was confirmed between GDEF and the team.

1-3 Global Issues

Global warming caused by greenhouse gas (GHG) emission including carbon dioxide is considered to be the main factor of the climate change, regarded as the global issue today. In particular, since the formation of United Nations Framework Convention on Climate Change, it is unanimously agreed that the reduction of CO_2 emission would be unattainable without a contribution from developing countries, as well as developed countries.

Solar generation is very effective in the reduction of CO_2 emission and the cost of energy production is not affected by fuel. Therefore, solar generation offers additional energy source and the reduction of CO_2 emission at a stable cost, and enables developing countries especially to contribute in the global community and to obtain energy for domestic development, at the same time.

This Project has been initiated by the participation of Burundi to Cool Earth Partnership. It is expected that the Project contribute to both the development of Burundi and alleviation of climate change as the global issue.

CHAPTER 2

CONTENTS OF THE PROJECT

Chapter 2 Contents of the Project

2-1 Basic Concept of the Project

Ministry for Land Management, Tourism and Environment in July 2006 formulated a policy document in cooperation with UNDP, "National Adaptation Plan of Action (NAPA)", and set out a promotion of renewable energy along with developments of small-scale hydropower and energy saving. In particular, solar power is given a place which supplements rainfall-susceptible small-scale hydropower while the difficulties in securing fund for the investment have been the impediment of its promotion.

This Project is to provide Centre Hospitalo-Universitaire de Kamenge (CHUK) in Bujumbura, Burundi with a photovoltaic system (PV system) of 260kW peak power and to supply electric power to the facility. The PV system works with the power from the utility grid (grid interconnection), and in the case of blackout of grid power the system shuts down automatically. When there is a surplus energy generated, it is sent back to the utility power network as a reverse flow[1].

This Project is conducted under the scheme the Programme Grant Aid for Environment and Climate Change and the tendering for the contract for the procurement of equipments and construction shall be held for Japanese companies. Among the various products to be procured for the Project, PV modules and power conditioners shall be limited to Japanese products. Site works including civil engineering works for foundations, installation of PV modules and electric works, shall be undertaken and managed by the Japanese contractor in cooperation with private companies in the recipient country.

2-2 Outline Design of the Japanese Assistance

2-2-1 Design Policy

2-2-1-1 Design of the System

This Project is to procure and install a PV system (260kW) with grid interconnection to CHUK in Bujumbura City.

CHUK was established in 1984 by the country, and is providing medical/sanitary services and functions of medical education, basic and practical researches in cooperation with Burundi

[1] An electric current that flows toward the outside power network from the facility where a power generator is installed.

University. As the hospital is being managed and financed autonomously, the provision of power generated by the PV system will contribute positively to the management of the hospital as well as to the general power system of the area as an additional generation capacity with renewable energy source.

The capacity of the PV system shall be determined taking into account the current electric power consumption and availability of PV module installation area. The provision of the system shall be confirmed to be free from any interference with other aid agency's activities and the installation area selected properly in view of the future land use of, and with approval from, the facility.

As Regié de Production et de Distribution d'Eau et d'Electricité (REGIDESO) agrees to reverse power flow (meaning sending power generated by PV system upstream to the utility grid) of the PV system, the system is designed to produce power to be supplied to and consumed in the facility, and to send surplus power to the utility grid when the power production exceeds the consumption in the facility.

The PV system shall be designed to shut down automatically when there is blackout of utility grid power, and when the grid power has recovered, restart supplying the electric power, manually/automatically after having confirmed some predetermined conditions being met.

2-2-1-2 Local Conditions affecting the Works

(1) Natural Conditions

1) Temperature and Humidity

Bujumbura is located at the altitude of 800m by Lake Tanganyika, with annual rainfall of 800mm. The dry season is in June to August. Annual variation of temperature is relatively small, with the highest at 30 ℃ and lowest at 19 ℃ (according to the observation for 1998-2008).

As the power conditioners procured in the Project will be housed inside Electric Facility Cubicle with air conditioning, no other measures for the atmospheric conditions are necessary.

The design temperature inside the Electric Facility Cubicle is set at 27.5 ℃, for there are many semi-conductors used in power conditioners. Air conditioners shall be supplied with power from the low voltage switchboard. To avoid the condensation due to the difference of temperature, a space heater shall be furnished.

The equipment for exterior use should be designed for the ambient temperature of 40 ℃.

2) Lightning Strikes

Observation and records concerning lightning strikes had been sought by the Team, but found unavailable.

The countermeasures shall be that against inductive lightning, as the PV arrays are to be lying around two meter high at most, lower than surrounding buildings, and the Site is located within the development of the city, which implies low possibility of direct lightning strikes. Countermeasures for inductive lightning will consist of installation of arresters to junction boxes and power conditioners.

(2) Construction Market

In Burundi, works commissioned by public sectors are implemented according to the rules set by the presidential office. All the local contractors are eligible to engage in a government project and their technical qualifications are assessed tender by tender. There are no local contractors that have experiences in a similar project to this Project as this Project is the first-ever large-scale solar project in the country.

Construction equipment owned by local contractors is in general old and not in good condition. Their numbers of operational units are also limited. Those equipment as bulldozers, backhoes and dump trucks, mobile cranes and lorries with hoist that are necessary in the implementation of this Project are amply available from local contractors. Although these local contractors have sufficient capacity to carry out civil works, steel works and plant works in small scale, their ability to handle large scale works like this Project is still unseen. In the planning of the Project construction management should be given attentions for the above reasons.

Since the PV installation area is outside the Hospital fences facing a main street, it is important to take a measure to keep general public from getting into the construction site. Also electrical works in the hospital requires temporary shutdown of power in the hospital during the switching of power sources. The procedure of such works and their scheduling should be consulted and coordinated in detail with the Hospital prior to the commencement of the works.

2-2-1-3 Application of Local Resource

(1) Utilization of Local Companies

It is assumed the Works at the Site will be managed by a Japanese company as a prime contractor who supervises the individual works sub-contracted and carried out by local companies. Local companies also are assumed to carry out, providing equipment and manpower, installation of electric equipment. The Works at the Site include; civil works (earth

works, concrete foundation works), steel works (fabrication of support structures for PV modules), equipment installation works (PV modules, electric boards and container cubicle), and electric works (laying cables). Japanese engineer(s) or engineer(s) of other nationalities will have to be sent to the Site for quality control, schedule control, safety control, assembling supervision, testing and adjustment of equipment.

(2) Utilization of Local Materials and Equipments

Most of construction materials such as aggregates, cement and reinforcement bars are available in the country. However, electric equipments and materials including PV modules, power conditioners, and cables are not available and they will be difficult to find in local markets.

Rental large crane is available in the country and will be used to install the power conditioner cubicle transported from Japan. Local transporter's vehicle can carry 40 foot container by inland transportation.

2-2-1-4 Capability of Operation and Maintenance

Operation and routine maintenances of the PV system after the commissioning will be done by CHUK under the supervision of MEM. As the facility owns and has been maintaining power receiving and distributing equipments over a long time to use, the facility is deemed to have reasonable capacity to maintain electric equipment in general. However, the status of existing equipment in the facility indicates inadequate practice and lack of knowledge about maintenances with preventive measures including routine inspections. Therefore, this Project should stipulate that the contractor provide guidance for O&M and manuals. Further, the Consultant will be providing training programs in two separate periods; one during the commissioning of the PV system, and the other a few months after the commissioning. In addition, to realize effective and efficient operation and maintenance, a suitable management organization for operations and maintenance should be proposed in the Project.

Some parts in the PV system will need replacement in the long term and this may cost a significant amount. Such expenses may not be possible for the Facility (CHUK) to bear alone within one-fiscal year budget. Therefore, this Project will provide spare parts and maintenance tools to be needed for certain period. It is also important that the executing agency (MEM) is aware of this and is prepared to make financial arrangement with the Facility (see section 3-5 for details). As the financial benefit of reduction of power purchase due to power generation is expected to be larger than the said expenses, it is also possible to raise a fund from part of such benefit for future maintenance expenses.

2-2-1-5 Schedule of Procurement and Installation

As this Project is conducted in the scheme of the Programme Grant Aid for Environment and Climate Change, it must be conducted in as efficient manner as possible. To complete the Works and produce expected results by the specified time, the Works should be scheduled considering the sequence of inputs from both Japan and the recipient sides, and also, route, method of transportation, time for various official procedures necessary.

2-2-2 Basic Plan (Construction Plan/Equipment Plan)

2-2-2-1 Design Condition

To design the capacity and specification of the PV system, various conditions described above are considered and consequently, the design conditions shall be set as shown below.

(1) Natural and Local Conditions

1 Outdoor air temperature	40 degrees Celsius (Maximum)
2 Electric room's temperature	27.5 degrees Celsius
3 Design relative humidity	Maximum 95%
4 Design wind velocity	40.0m/s
5 Mean rainfall	annual 821mm, monthly315mm (10 years)
6 Seismic force	not to be considered
7 Elevation of the Site	about 800m
8 Allowable Load bearing capacity of the ground	50 kN/m^2 [2]
9 Salt damage	not to be considered

(2) Applicable Standard

1 Japanese Industrial Standards (JIS)	: Industrial product
2 Japanese Electrotechnical Committee (JEC)	: Electric product
3 Standards of Japan Electrical Manufacturer's Association (JEM)	: Electric product
4 Japanese Electric Wire & Cable Makers' Association Standard (JCS)	: Cables
5 International Electrotechnical Commission (IEC)	: Electric product
6 International Organization for Standardization (ISO)	: Electric product
7 Technical Standard for Electrical Facilities	: Electric product

(3) System of Unit

As a general rule, The International System of Units (SI) shall be used

[2] Assumed by the Team on the basis of observation at the Site with reference to "Guideline of Design of Foundations for Small Buildings(Architectural Institute of Japan)"

(4) Electric Mode

1	Nominal voltage (Low voltage)	380V (on-load)
2	Wiring system	3 phases-4 wires (connection point of existing equipments)
3	Frequency	50Hz
4	Earthing method	Direct grounding

2-2-2-2 Layout Plan of the PV System

The PV system procured by this Project is constructed on CHUK's premises. Thus, the layout plan of the PV system shall be considered with not only convenience of operations and maintenances but also with following conditions.

- A layout to make the maximum use of solar power in limited space
- Efficiency and convenience of construction works
- Future land use of the Facility

2-2-2-3 Summary of Outline Design

Considering the design policy, basic standard and layout plan described above, the summary of outline design in this Project is as shown Table 2-2-2-1

Table 2-2-2-1 Summary of Outline Design

Category	Content
Site and PV Capacity	CHUK: 260kW PV equipment - PV system shall be grid-interconnected, and surplus power shall be sent back to the utility grid (reverse current) - In the case of blackout, PV system shall be designed to shut down automatically.
Procurement of Generating equipments and Installation Work	260kW PV modules Ancillary equipment for PV system - Junction box - Power conditioner cubicle - Meteorological observation device - PV connection panel - Materials for wiring and earth - Electrical facility cubicle - Supporting structures for PV modules - Foundation of supporting structures for the PV system and electrical facility cubicle - Fences, gates, and gravel surfacing - Cable connection for Electrical facility cubicle/interconnection point/display equipment
Spare Parts and Tool Kits	Spare parts and tool kits for maintenances of equipment Manuals for O&M and implementation of Operation Guidance

2-2-2-4 Outline of Equipment Plan

Elements of the PV system which will be installed at CHUK are described below. Outline specification of the each equipment is shown in Table 2-2-2-5 and Table 2-2-2-6.

(1) Outline

1) Type of PV System

Type of the PV system is of grid interconnected without storage battery. Storage battery is not included as it would require large replacement cost and the disposition of used batteries may become environmentally hazardous.

2) Operation during the Power Failure

The PV system shall be shut down automatically when there is blackout of utility grid power. When the utility grid power has been recovered, the PV system shall be manually and/or automatically restarted to supply the electric power after having confirmed some predetermined conditions being met.

(2) Contents of Outline Design

1) Verification of Design Capacity or PV System

The PV system will be connected to the utility grid at the low voltage side of the existing transformer. A PV Connection Panel will be furnished by the Project at the existing diesel generator room.

The capacity of transformer at the interconnection point is 400kVA. Therefore, it is possible to have the full output of the PV system in reverse flow. An example of daily load curve of the facility is shown in the figure below.

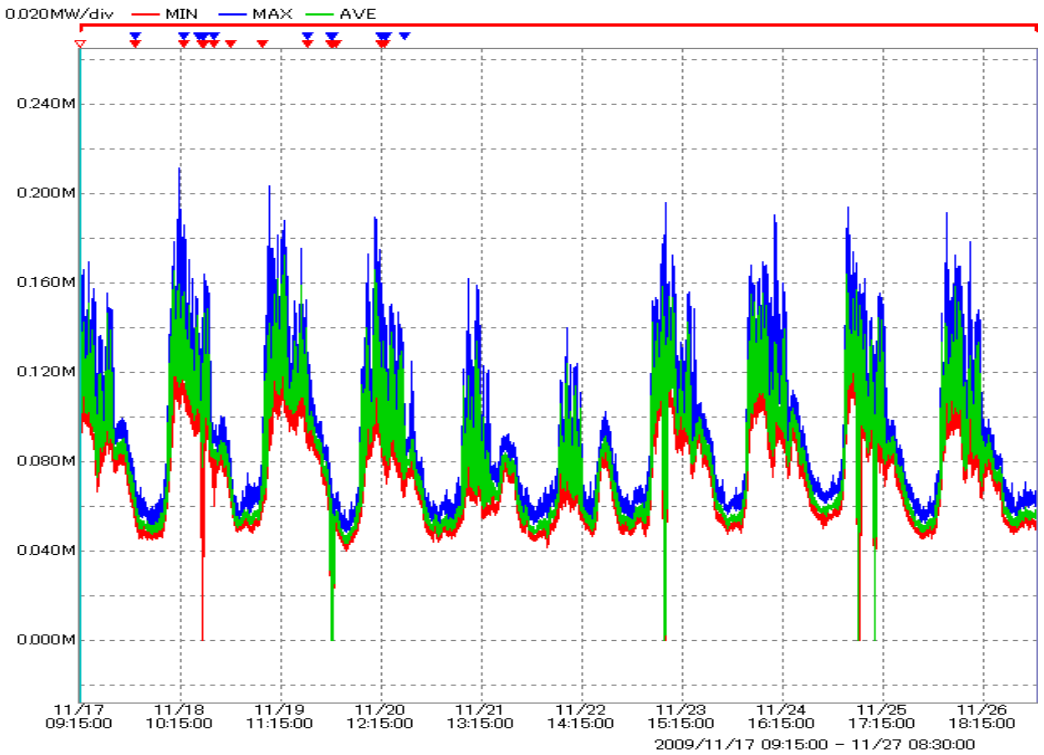


Figure 2-2-2-1 Example of Daily Load Curve at Interconnection Point

The capacity of the PV system is studied. The existing loads at CHUK by section are shown in Table 2-2-2-2. The load of CHUK is about 250kW in total. Actual electric power measured at the low voltage side of the transformer was about 212kW at maximum and 80kW on average. New medical equipment of about 25kVA was installed in 2009. Meanwhile, the available area for PV module installation is confirmed to accommodate 260kW PV modules.

As REGIDESO accepts the reverse power flow, the surplus of generated power will be sent back to the utility grid and serve the general consumers.

Therefore, the capacity of the PV system in this Project was determined to be 260kW.

Output of the 260kW system was estimated using software RETScreen published by Natural Resources Canada as actual measurement of insolation available was not sufficient. The estimated annual energy to be produced is approximately 340MWh, which is about 60% of the annual energy consumption of CHUK (580MWh in 2008). However, under the condition of frequent blackout of grid power where the PV system automatically stops the operation, the actual energy will be lower than this estimation.

Load curves of CHUK have mountain shape with peaks of around 200kW at noon. Therefore, most of the power generated by the PV system will be used to meet the demand in the hospital. This would amount to 70 to 80 percent on weekdays according to the

preliminary study. Considering lower demand on weekends and being conservative, about 50 to 60% of annual energy generated is expected to be consumed in the hospital.

Some additional area for installation of another 40 to 50kW of PV module had been identified to the further south of the PV installation area. But the system capacity was finally determined to be 260kW in consideration of the project budget assumed at the project formulation stage.

Table 2-2-2-2 Loads of CHUK

		Three-phase Load	One-phase Load	Sub Total
1	Sterilizing Room	8,900	1,430	10,330
2	Department of Ophthalmology	2,812	440	3,252
3	ORC Department	3,812	440	4,252
4	Administration	33,232	17,615	50,847
5	Department of Research	18,312	13,695	32,007
6	Academic Department	16,400	24,865	41,265
7	Surgery	16,182	4,090	20,272
8	Department of Gynecology	18,450	4,855	23,305
9	Rehabilitation Institute	2,350	4,260	6,610
10	Department of Physiology	-	2,575	2,575
11	Department of Obstetrics and Gynecology	4,562	1,165	5,727
12	ICU	2,326	5,855	8,181
13	X-ray Room	7,430	3,865	11,295
14	Water Tank and Communication	5,400	275	5,675
15	Others	10,000	10,000	20,000
Total		**150,168**	**95,425**	**245,593**

Unit :VA

Source: CHUK information edited by JICA Team

2) Type of PV Module

There are various types of solar cells depending on semiconductors used. Main types of solar cells are silicon and compound. Silicon type has been and is the majority in the market. Silicon type is further classified into crystal and thin film types. Silicon type is made of once melted and molded matrix sliced into thin wafers. Thin film type is made of extremely thin silicon film developed on a sheet of glass by plasma. Although thin film has the advantage of larger production scale, it still has some technical issues compared to crystalline type [3].

With regard to the conversion efficiency, a recent technical report shows that thin film

[3] New Energy and Industrial Technology Development Organization of Japan

yields higher efficiency measured in annually produced energy, a few percentage points higher, than crystalline type due to the atmosphere temperature and conversion efficiency relationship: the higher the temperature the lower the efficiency. The disadvantage of thin film is that it requires about 1.4 times larger installation area than crystalline type.

As the available area for PV module installation is limited at the Site, PV module in this Project should be of crystalline type.

3) Electric Equipment

a) PV module

Type of PV module is of silicon crystalline type. Capacity of total PV modules is over 260kW using the 10kW unit (only as a guide) sub-arrays. PV modules are connected to junction boxes by special cables.

Spare parts of PV modules are 2% of installed number (decimal place is cutoff).

PV module specifications, number and unit of sub-arrays must satisfy the following conditions.

- To lay out PV modules without significant change in the design fence and gate alignment,
- To match the input voltage of power conditioners with PV output,
- To design sub-array rectangular and use dummy modules if there are sub-arrays with uneven number of modules in order to look coherent,
- To use cables with allowable voltage drop less than 2% to connect the output terminals of PV modules to power conditioners.

Layout of equipment and fence and gate alignment are shown in Outline Design Drawing No.03.

b) Junction box

Each series circuit of PV modules is connected to both positive and negative terminals of a junction box.

One junction box collects approximately 10kW of PV module output in nominal term. Junction boxes are equipped with a circuit breaker, anti- reverse flow diode, and arrester for each input.

c) Power Conditioner Cubicle

Outline

Power Conditioner shall consist of four main equipment shown below. These equipment shall be encased in one or a few boards.

- Power Conditioner
- Low Voltage Switchboard

- Branch Switchers for PV Array
- System Controller

All the boards shall be furnished with space heaters inside.

<Power Conditioner>

This equipment converts direct current collected from PV modules, supply the load with alternate current in connection with the utility grid power supply.

Direct current circuit is designed to operate under inflow voltage of 500V or higher.

AC circuit is designed to synchronize the PV generated power to the utility grid power by Maximum Power Point Tracking (MPPT) method.

Power Conditioners shall be installed in multiple units, added by an extra stand-by unit. The stand-by unit shall be placed inside Electrical Facility Cubicle. The system shall be designed in a way that when some units are broken down, remaining unit(s) shall work within the capacity then available. This design is to ensure the maximum lifetime of the system.

<Low Voltage Switchboard>

Low Voltage Switchboard connects AC output of power conditioners to the utility grid at the low voltage side of the existing transformer via a rotable phase-adjusting transformer. It also has the distribution function to supply electric power to selected loads where individual loads can be switched by breakers.

An AC 3 phase arrester is installed at the grid-connection point. This equipment is also furnished with transformers and distributors for the System's own use.

The breaker for the interconnection can be tripped by a cut-off signal transmitted from outside.

< Branch switchers for PV arrays>

Branch Switchers for PV Array equipment is equipment that collects output of PV modules. Output from sub-arrays through collection boxes all converges at this board.

MCCB (Molded Case Circuit Breaker) is equipped inside the board for each junction box input. An arrester is equipped inside the board for each junction box input. Main DC circuits are designed for applied voltage of DC500V or over.

<System Controller>

This equipment embodies various functions such as sequences and inter-locks, to operate the photovoltaic system properly and safely. The functions included are shown below.

- Start and stop of the PV system
- Interlock

- Protection
- Monitoring function
- Display function
- Recording function

Display function is to be realized by a set of displays set up to show the users and visitors of the facility the working and its effect of PV system. Two locations were identified in the facility which better attract attentions; one on the road side of PV module installation area, the other near the entrance of the main building for the staff, patients and visitors of the hospital to see on daily basis. The number of units and locations of installation were confirmed with CHUK in the Second Phase Site Survey.

Components of this equipment are shown in the table below.

Table 2-2-2-3 List of Components (System Controller)

No.	Device	Specification	Quantity
1	System Control Panel		Complete set
2	Display Equipment (outside)	Display of generating power (current and cumulative output, etc.)	2 complete sets

d) Meteorological observation device

Meteorological Observation Device includes such instruments as a solar irradiation meter and thermometer to observe and record the climate conditions of the photovoltaic module installation area.

Components of this device are shown in Table 2-2-2-4.

Table 2-2-2-4 List of Components (Meteorological observation device)

No.	Component	Specification	Quantity
1	Pyrheliometer (Outside installation)		1
2	Thermometer (Outside installation)		1
3	Transducer (Outside storage box)	For each of 1 and 2 above	2 sets

e) PV connection panel

This equipment connects the output of the System to the distribution of the power from the transformer.

f) High Voltage Measurement panel

This equipment encloses the high voltage measuring device, and be installed at high voltage side (6.6kV).

- Number of device : for receive power and reverse power (1 set each)

- Voltage : 6.6 kV
- Wiring system : 3 phases-4 wires
- Type of measuring device : Precision active power meter, reactive power meter, maximum demand power meter
- Others : Reverse-Rotation Lock Function, Tested by authorized independent testing institute in Japan (no testing necessary in REGIDESO),
  2 sets of active power meter.

Also OVGR (Over Voltage Ground Relay) should be installed, which will have the PV system disconnected from REGIDESO grid in case of fault detected at the grid.

g) Electrical Facility Cubicle

Electrical Facility Cubicle of the PV System encloses the equipment below. The cubicle shall be furnished with air conditioning system to keep the equipment inside from overheating.

- Power Conditioner
- Low Voltage Switchboard
- Branch Switchers for PV Array
- System Controller

h) Support Structure for PV modules

A Support Structure for PV module sets up a sub-array of PV modules arranged in series and in parallel to attain required voltage of sending power. The Support Structure is furnished with fittings for environment monitoring instruments and Junction Boxes to be attached to the Support Structure.

The material is finished with hot dip zinc galvanizing. For the fastening used in the cradle, a countermeasure shall be taken against larceny.

- Type of installation: ground installation
- Direction and Slope: north, 10 degrees
- Materials: steel
- Coating: Hot dip zinc galvanized

i) Concrete Foundation of equipment

The foundations of supporting structures, electric facility cubicle, fences and gates are constructed.

♦ Foundation type

There is information that there is a dilative clay layer existing underground below the main building (building C) of CHUK, which appears as a displacement of ground level. However, there is no information suggesting such displacement is also

seen at the PV installation area. The design of the foundation of PV modules should be on the safe side. Each foundation concrete is assumed to be of U-shaped type, a horizontal member connecting two vertical members. Further there should be raft foundation; a slab concrete of the size of footprint of a sub-array of PV modules connecting all U-shaped foundations of the sub-array.

j) Materials of wiring and earthing

♦ Wiring

Exterior cables are of armored type and directly buried underground. Materials of cables are copper, which has large allowable power and flexibility in installation. For insulation general-purpose cross-linked polyethylene is used.

Exterior cable route was designed and decided, considering the information on the existing cables obtained from the Facility, confirmed in-situ with technicians and the director in charge of maintenances, so as not to interfere with the existing cables and future expansion plans of buildings, etc. Cable layout is shown in Outline Design Drawing No.04.

♦ Earthing

Following earthing fixtures are installed in this Project.
- Earthing of metal objects and electrical equipment to prevent the electric shock
- Earthing of fences and gates
- Independent earthing of control panels and meteorological observation devices, as required

Earthing resistance should be 10 ohms or lower.

k) Fence, gate and gravel surfacing

♦ Fence and Gates

PV installation area is situated outside the existing fence surrounding the hospital buildings, which calls for tighter security measures against burglary even under 24 hour station of guards. The PV installation area is also accessible to passers-by. Therefore safety measures including that against electric shocks should also be considered. Therefore, the fence for security and safety shall be constructed as a part of the PV system by the Project.

The height of the fence shall be 2m to fend off intruders.

Considering the environment of the hospital, obtrusive materials such as barb-wire should not be used. The fence should be similar to those seen at important facilities in Bujumbura, sturdy vertical gratings with overpassing bafflers.

The alignment of the fence should be designed considering the shade it makes on PV modules, a space for maintenance works, and tamperproof from outside. Also, it

should not enclose unnecessarily large plot of land to make it out of use for the facility.

There should be two sets of gates, smaller one is for everyday use of operators, the larger one for periodical maintenance allowing the entrance of motor vehicles.

- Gravel surfacing of PV module area

PV module area should be gravel-surfaced in order to stabilize the surface, control the growth of weeds and facilitate the maintenance works. Before the placement of gravel, surface soil should be removed for approximately 10cm in depth and replaced by gravel layer. The area will be enveloped with curbstones or similar concrete blocks to keep gravels within the area. Gravels should be of the size of 20 to 40mm, strong enough to withstand the use of long years.

l) Storm water drainage system

The Site (Bujumbura) has an annual precipitation of around 800mm deep and in wet season it experiences occasional intense rainfall. PV module will be laid on mildly sloped ground which calls for adequate treatment of rain water run-off.

As explained elsewhere, PV module area will be gravel surfaced. Therefore, the area should be furnished with rain water drainage system consisting of a gutter along the lower rim of the area, connected to a pit at the downstream end, and buried pipe which drains the rain water collected at the pit down to the road side drainage ditch.

m) LED Lamp posts

PV installation area is situated outside the existing fence surrounding the hospital buildings, which calls for tighter security measures against burglary even with the 24 hour guard station. There should be lighting for the area.

As the PV system does not produce any electric power during the night, the lighting equipment, which consumes electricity during the nights, should be those using low-electricity-consumption LED lamps. LED lamps, although at the moment should be imported from Japan, have advantages of lower energy consumption, longer life, and low CO_2 emission resulting from these, which is suitable in view of the objective of the Project. The Project should also provide a set of replacement lamps. If these replacement lamps have run out, the lamp-holding top parts of a lamp post should be able to be replaced with locally available products, leaving no concerns about the sustainability of the installation.

Lamp/rated output	: LED lamp with lens / 15W or more (each unit)
Number	: 18 sets

Location of lighting is shown in Outline Design Drawing No.07.

2-2-2-5 Outline Specification of Main Equipment

Table 2-2-2-5 Specification of Main Equipments (1)

Equipment	Outline Specification	Quantity
PV Module	Capacity: maximum output 260kW Type: mono/poly-crystal silicon, on-ground type (public/industrial use presumed) Conversion efficiency: around 14% presumed Unit capacity of a module: around 210W presumed	1 complete set
Junction Box	Circuit breaker, anti-reverse flow diode, arrester for each input.	1 complete set
Branch switchers for PV arrays	MCCBs for each junction box input Arrester for each junction box input Main DC circuits with applied voltage DC500V.or higher	1 complete set
Power conditioner for grid interconnection	AC rated voltage: Three-phase three-wire system 400V (line-to-line voltage) or 200V ±10% AC rated frequency: 50Hz ±3% AC rated output : Over 260kW DC voltage range: DC0V ~ 500V or higher DC control voltage range DC320V(or lower) to 400V (or higher) Conversion efficiency 93% or higher (at Rated operation) Harmonic current Distortion Factor total 5% or less At each order 3% or less (at Rated operation) External communication equipped Operation mode Normal operation (Maximum power point tracking for grid connection)	1 complete set
Low voltage Switchboard	MCCB (for interconnection point, PCS, board's own use) Uninterrupted power supply (UPS) Grid-interconnection Protection Relays Over Current Relay(OC) Over Voltage Relay(OV) Under Voltage Relay (UV) Over Frequency Relay (OF) Under Frequency Relay (UF) Island Operation Detection Function; both active and passive detections adopted Rotable phase-adjusting transformer (3 phase-3 line to 3 phase-4 line)	1 complete set

Table 2-2-2-6 Specification of main equipments (2)

Equipment	Outline Specification	Quantity
System controller	Main functions - Start and stop of PV system - Interlock - Protection - Monitoring function - Display function - Recording function	1 complete set
Meteorological observation device	Irradiation meter (exterior) 1 unit Thermometer (exterior) 1 unit Transducers(exterior storage box) one for each of above meters	1 complete set
PV connection panel	MCCB (For interconnection point and diesel generator)	1 complete set
High Voltage Measurement panel	Devices - Voltage : 6.6 kV - Wiring system : 3 phases-4 wires - Type of measuring device : Precision active power meter, reactive power meter, maximum demand power meter - Tested by authorized independent testing institute in Japan (no testing necessary in REGIDESO), OVGR (Over Voltage Ground Relay) should be installed	1 complete set
Electrical facility Cubicle	With Air conditioning (power supplied from Low Voltage Switchboard) Protection Class: IP54 or equivalent	1 complete set
Support structure for PV modules	Hot dip zinc galvanized fittings for meteorological devices fittings for junction boxes	1 complete set
Materials of wiring and earthing	Wiring Form: low voltage 2-4core copper cable, XLPE insulation, PVC sheath Applicable standard: IEC Accessory: material for terminal dressing	1 complete set
Fence, gate and gravel surfacing	Fence Height: 2m Gate Height: 2m Gravel surfacing Grain size: about 2-4cm Gravel layer thickness: 10cm or more	1 complete set

XLPE:cross-linked polyethylene , PVC: polyvinyl chloride

2-2-3 Outline Design Drawing

Number	Title
BU-01	SINGLE LINE DIAGRAM (CHUK)
BU-02	SINGLE LINE DIAGRAM (PV SYSTEM)
BU-03	GENERAL LAYOUT PLAN
BU-04	CABLE LAYOUT PLAN
BU-05	EQUIPMENT LAYOUT (EMERGENCY DIESEL GENERATOR ROOM)
BU-06	EQUIPMENT LAYOUT (REGIDESO TRANSFORMER ROOM)
BU-07	LED OUTDOOR LIGHTING SYSTEM

2-2-4 Implementation Plan

2-2-4-1 Implementation Policy / Procurement Policy

(1) Procurement Policy

This Project is implemented by Japan's Programme Grant Aid for Environment and Climate Change with a procurement agent. The Government of Burundi shall employ the agent for the procurement of products and services, following the exchange of notes between the two governments concerning the Programme Grant Aid. The Consultant and the Contractor shall provide their services and products on contract with the Agent.

The organization chart of the Project is shown in the figure below.

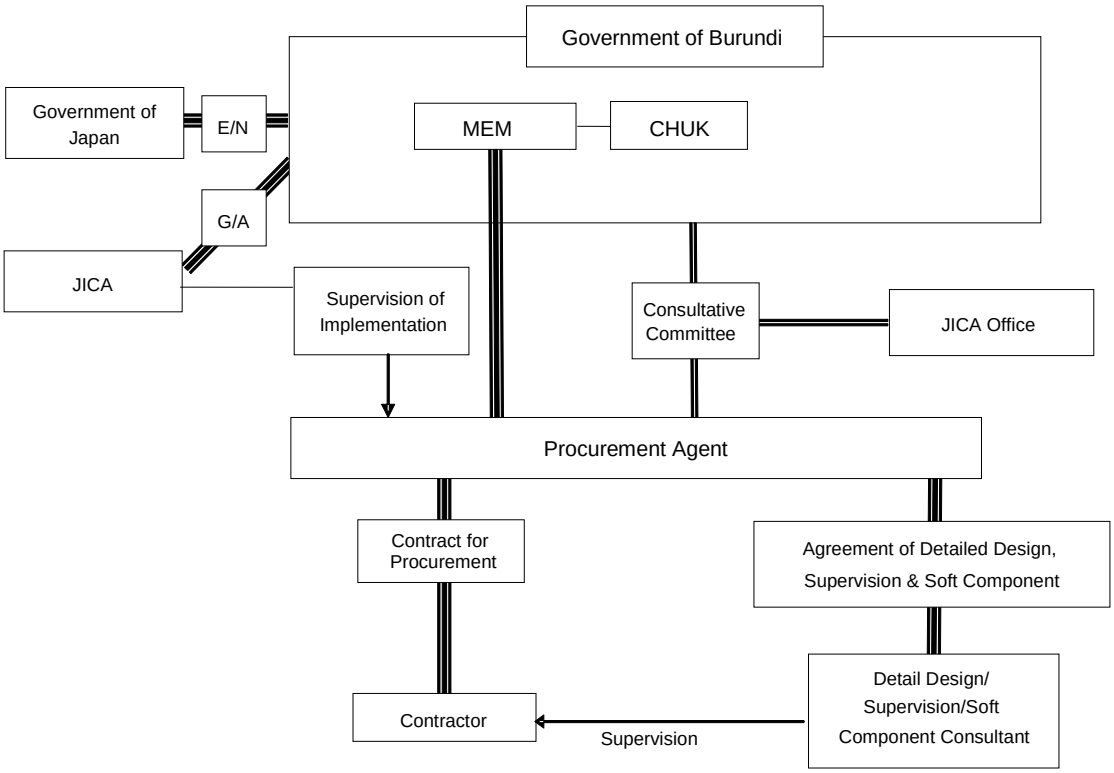


Figure 2-2-4-1 Organization Chart of Implementation

1) The Organization of Recipient Side

The organization of recipient side is; Ministry of Energy and Mines as a responsible organization and an executing agency, and CHUK as the Site.

2) The Procurement Agent

On Japan's side, it is the procurement agent who will make into the agent agreement with the recipient to undertake tendering, contracting and manage the whole procurement

business. In addition the agent will implement the settlement for consultants and the contractor and fund administration instead of Recipient side.

3) Consultants

The Consultant will assist the procurement agent in his undertaking of tendering, supervise the works of the Contractor, issue certificates for taking over after the completion of procurement/installation works and for the end of defect liability scheduled one year after the taking over. He also will provide training to people concerned so that the equipment will be properly operated and managed.

4) The Contractor

The Contractor, according to the contract made into with the Agent, designs, manufactures and transports the products, installs and commissions the products, and gives guidance to operators for the operation and maintenance of the products. From a perspective of quality and reasonable implementing policy, the Contractor will implement the procurement of equipment and installation on the package.

(2) Implementation Policy

For installation works, local contractors will be utilized in the works under Japanese prime contractor's supervision. The main works for the project are civil works (earthworks and concrete foundation works), steel works (assembling of support structures for PV modules) and electrical works (electrical wirings and installation of PV modules).

In principle, Japanese standards are applicable in this Programme since the PV system is one of the first of its kind to be built in Burundi. However, adequate methods normally used in the country may be utilized for the installation works.

In principle, the construction methods normally practiced in Burundi shall be utilized for the installation works. Local contractors will be utilized as much as possible in the works under Japanese prime contractor's supervision. It is difficult to reduce the number of Japanese engineers, if the contractor is to keep both the quality of equipment that meets the required standards for Japanese grant aid projects, and with a suitable management. However, number of the engineer can be as small as possible, without compromising with the quality of the work, by adopting the local standards for the design and specification where possible.

2-2-4-2 Procurement/Installation Conditions

(1) Construction Business in the Recipient Country

Although some local companies have experiences of implementation of solar home system projects for international organizations such as UNDP (United Nation Development

Programme) and GTZ (German Technical Cooperation), no company has experience in installation of large-scale PV system as large as 200kW. On the other hands, there are many capable local electrical companies in Bujumbura that have experiences in general electrical works commissioned by local public sectors such as REGIDESO. Although these companies have never engaged in a large-scale PV project, constructions that meets the required standards for Japanese grant aid projects is expected to be achieved through management and quality control by Japanese engineers and through proper technical guidance to the local contractor. In addition, some capable civil contractors such as Belgium's contractors are identified in the city.

There are some companies dealing with rental of construction machines in the city. However, the conditions of the machines are confirmed to be unfavorable and the available numbers are limited. In addition, it is known that many cracks have grown in the hospital structures, allegedly because of the existence of soft clay layer underground. Therefore, construction methods that do not need heavy machines should be applied as much as possible in order not to induce further weakening of the structures.

(2) Installation Conditions

- Bujumbura is located in high altitude, and it often experiences heavy rain during rainy seasons. Therefore, measures such as avoiding concrete works in rainy seasons should be considered in planning the construction schedule.
- As the Project Site CHUK is accessible by hospital staff and patients, safety measures during the Works shall be carefully planned and executed.

2-2-4-3 Scope of Work

The work demarcation between the Japanese and the Burundi sides is as follows.

Table 2-2-4-1 Allocation of Chief Responsibility

	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed urgently		●
3	To construct gates and fences in and around the site		●
4	To construct a parking lot if necessary		●
5	To construct roads		
	1) Within the site	●	
	2) Outside the site and Access road		●
6	To construct the facility and install the equipment	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities if necessary:		
	1)Electricity		
	a. The power distribution line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer for the site	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for conveying storm water, sewage, etc. from the site)		●
	b. The drainage system within the site (for sewage, ordinary waste, storm water, etc.)	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions applied by the bank in Japan for banking services based upon the Bank Arrangement (B/A):		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure prompt unloading and customs clearance at the entry to the recipient country		
	1) Marine or air transportation of the products from Japan or third countries to the recipient	●	
	2) To exempt or bear tax and customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
10	To accord Japanese nationals and / or nationals of third countries, including persons employed by the agent whose services may be required in connection with the Components such facilities as may be necessary for their entry into recipient country and stay therein for the performance of their work.		●
11	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the Components and to the employment of the Agent will be exempted by the Government of recipient country		●
12	To maintain and use properly and effectively the facilities that are constructed and the equipment that is provided under the Grant.		●
13	To bear all the expenses, other than those covered by the Grant and its accrued interest, necessary for the purchase of the Components as well as for the agent's fees.		●
14	To ensure environmental and social consideration for the Programme.		●

2-2-4-4 Consultant Supervision

This Project will be started according to the rules of Japan's Programme Grant Aid, after the exchange of notes (E/N) between the two countries which follows the design carefully considered on the basis of the outline design, and its assessment for the appropriateness by the Government of Japan. During the installation works, synchronized with the progress of civil and electric works, the Consultant will send at least one resident engineer for the management of schedule, quality and safety of the Works. The Consultant also witnesses shop and pre-shipment inspections of equipments and materials procured in Japan to avoid any problems from happening, which may appear after the equipment from Japan have arrived at the Site.

(1) Basic Policy on Supervision of the Installation Works

The Consultant shall look after the progress of the works and ensure that the works be finished within a given time-frame. He shall also supervise and guide the Contractor to ensure both the quality of the Works as the Contract Documents stipulate, and the safety of the Works. To attain this objective, the Consultant sends two construction supervisors, one an electric equipment specialist and the other a civil engineer, to the Site coordinated with the progress of the Works.

The main important points in installation work supervision are shown below.

1) Schedule Control

The consultant will compare the implementation schedule originally prepared by the prime Contractor with the progress of the work in terms of the following items every month and every week. If the progress of the work is considered behind the original schedule, the consultant will issue warning and request remedy plans to the Contractor to complete the installation works within a given time-frame.

- confirmation of quantity of work done,
- confirmation of arrivals of equipment and materials,
- comparison between planned and actual turn-out of engineers, technicians and laborers.

2) Safety Control

The consultant will supervise the Contractor through frequent meetings and cooperation to prevent accidents and hazards at the Site from happening.

As PV modules produce electricity while they receive sunlight, countermeasures to avoid incidents of electrical shocks are particularly important.

The following safety aspects are to be focused on in this project.

The main important points in safety control at the Site are shown below.

- setting up safety rules and appointment of safety managers,
- conducting regular inspections of construction machines to prevent accidents,
- pre-planning routes for heavy vehicles and construction equipment and transportation, enforcing maximum speed role
- promoting welfare measures for workers and observe working schedule with holidays.
- practice countermeasures to avoid incidents of electrical shocks

(2) Programme Implementation System

Organization and relationships between parties related to the Programme including the installation supervision are shown in the figure below.

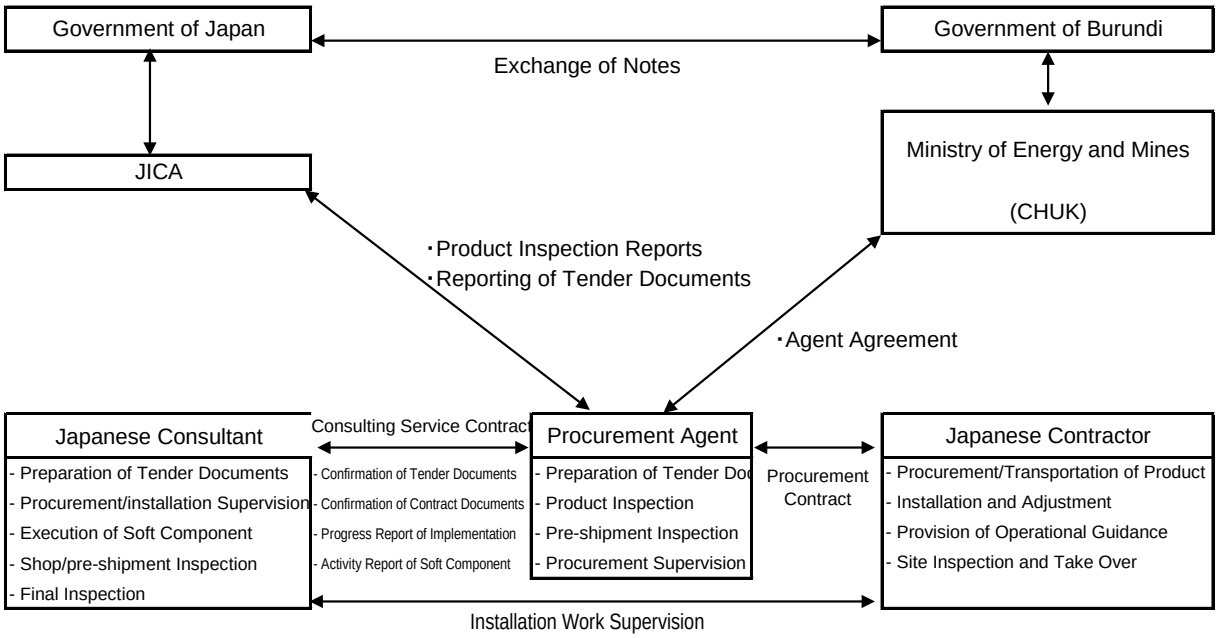


Figure 2-2-4-2 Programme Implementation System Chart

2-2-4-5 Quality Control Plan

The Installation work supervisor of the Consultant conducts the supervision by the items shown below to confirm whether the quality of equipment and installation satisfies the relevant stipulations in the Contract Documents (Technical Specifications and Drawings, etc.). If the qualities of the works are questionable, the Consultant will request the Contractor remedies, changes and/or adjustments.

- checking shop drawings and specifications of the equipment and materials,
- witnessing shop inspection or verifying the test reports,

- checking installation procedure statement, site test, adjustment and site inspection procedure statement, and shop drawings,
- supervising the installation work and witnessing test run, adjustment and inspection,
- verifying the shop drawings,
- checking the finished work against the shop drawings. .

2-2-4-6 Procurement Plan

(1) Procurement in Japan

Among various items of the Products to be procured in the Project, PV modules and power conditioners shall be of made in Japan.

(2) Transportation Plan

The PV related electrical items procured in Japan will arrive at the largest port in Tanzania, Dar es Salaam Port. The port is an international port which covers an area some 2.1km east-west and 0.6km north-south with the depth of between 8m and 17m. The maximum capacity of bulk silos are 120,000ton. The maximum capacity of the mobile crane is 60ton, which are well beyond the needed capacity of 20ton for this Programme. There are many experienced transport companies in Bujumbura. They also have their offices in Tanzania. Therefore, there is no concern related to the land transport of the electrical items from the port to the Site.

2-2-4-7 Operational Guidance Plan

(1) Objectives

Operational Guidance shall be given to those engineers and technicians who will be in charge of operation and maintenance of the PV system so that the system, which is the first case of this size, will be operated and maintained properly, even under emergency situations.

There has been no experience and knowledge of grid-connection of renewable resources such as PV systems in Burundi, and technical information and data concerning the quality of electricity of the grid to which the PV system will be connected are not available. Under these circumstances, adjustment of PV equipment for the commissioning should be finalized with careful observation of the actual connection for a certain time. Meanwhile, the state of maintenance of the existing electrical equipment in CHUK is not quite up to the standard required for the PV system. Other local conditions are also negative factors in long-term maintenance of PV equipment which uses sensitive components such as semiconductors. Considering these, it is proposed that the Contractor conduct inspection of the PV equipment three month after the commissioning.

(2) Planning of Operational Guidance

When designing specifications and the grade of PV system, the current technical level of practices in the Recipient country and the knowledge and experiences of people in charge of generating equipment in the Facility are assessed and taken into consideration. There are some differences between PV system equipments and the existing generating equipments, like a diesel engine generator. In addition, as this is first opportunity to introduce the grid connected PV system in Burundi, related parties should not be considered to have capacities for operation and maintenance of PV systems of this scale. Therefore, the Contractor is obliged by the Contract to provide operational guidance to related people concerning the operation and maintenance of the PV system during installation works.

1) Plan for guidance of operations and maintenances during installation works

The program is outlined below

a) Time[4] and location of guidance

Lectures and exercises : approximately one week (at the Site)

b) Instructors

The engineer(s) in charge of supervising installation works, pre-commissioning and adjustment, dispatched by the manufacturer of the PV system are assumed to be the instructor(s) of the guidance.

c) Trainees

The trainees who receive the guidance are mainly technicians in charge of operations and maintenances at the Site after the commissioning. The implementing organization appoints trainees specifically before the installation works start.

Table 2-2-4-2 Organization Control of Operations and Maintenances

Person in charge		number	Main role
Control technician		1	Responsible official and decision making
Operation	Electric technician	1	Management of PV system based on technical knowledge of electric equipment and PV system
	Electric technician	About 2	Normal operation
Maintenance	Electric technician	1	Handling of PV system in troubles based on technical knowledge of electric equipment and PV system
	Electric technician	2	Daily inspection
	Sanitation worker	Few persons	Cleaning of PV moudules

[4] Time includes traveling time of the lecturer between Japan and Burundi.

d) Contents of guidance

i) lectures

Using Operation and Maintenance Manuals, lectures on basic knowledge of the PV system will be given.

- Explanation of Operation and Maintenance Manuals
- Basic Knowledge of Operation and Maintenance (operation scheduling, control, basic knowledge of preventive maintenance, functions of the system, basic knowledge of malfunctions and their handling, spare parts and tools, management of drawing and documents)

ii) Exercises at the Site

During the period of installation works and pre-commissioning, following items will be taught at the Site.

- Methods of start up and shut down of the system
- Explanations on meters on the boards and parts
- Methods of emergency shut down of the system
- Methods and subjects of observations and inspections
- Methods of cleaning of cables, etc.
- Methods of maintenance of electric equipment (including cleaning of PV modules)

2-2-4-8 Soft Component (Technical Assistance) Plan

(1) Background

For Burundi, this Project will be the first-ever experience to have a PV system with grid interconnection, although Burundi has a number of cases of independent off-grid solar systems, those for medical facilities and schools, etc. Therefore, it is important to train those CHUK technicians who will be actually operating and maintaining the equipment. At the same time, it is also important to inform officers in the Ministry of Energy and REGIDESO, and other people who will be involved in the Project, regarding the technical features and institutional issues relevant to PV systems and their interconnection to the utility grid, to prepare them to handle renewable projects in the future.

This training program will be carried out in two separate periods, the first one during the commissioning of the equipment and the other three months after the commissioning. The PV system to be provided by the Project will be interconnected to the utility grid. The quality of electricity from the grid is not quite stable or reliable in the recipient country, which makes the adjustment work of the PV equipment in pre-commissioning to be very important. To improve the stability and reliability of the PV system under such circumstances, the Project proposes to require the Contractor to carry out three-month inspection. Although the

Contactor shall conduct an operational guidance during the commissioning period, this three-month inspection is a good occasion for expert(s) of the manufacturer to come back to the Site and give the reviewing guidance to the operators, who then will find more relevance in the guidance after three months of experience in actual operation and maintenance, which will help ensure the transfer of knowledge to, and its establishment in, the operators and other related people. The training program, in the mean time, shall be planned and carried out in coordination with the operational guidance, dealing with wider topics in the related technical fields to transfer, aiming at more sustainable and propagating effects on the operation.

(2) Objectives in Training Program

The aims are to enable the receipt country stakeholders to do things as shown below.

For operations and maintenances technicians at project site;

- To operate and maintain PV system under normal and emergency conditions, with sufficient knowledge of the function of PV system in connection with the existing electric equipment in the facility,
- To deal with the daily and periodical inspection and maintenance, fully understanding their meaning and importance, and also to change and procure the spare parts and consumables,
- To consider routine activities of operation and maintenance and prepare an operation and maintenance management plan,
- To have basic knowledge that empowers them to give trainings to novice operators within and outside the facility,
- To explain the system to the visitors using publicity leaflets prepared in the program.

For officials in governments and electric company

- To understand the PV system theories, technical characteristics, and institutional issues,
- To have technical knowledge relevant in preparing agreements between private owners of power generators and the electric utility company,
- To acquire the knowledge for the development and guidance of new operations and maintenances staff,
- To promote the use of PV using the publicity leaflets prepared in the program.

(3) Outcome of Training Programs

- the operation and maintenance management plan has been established, and the PV system procured is operated and maintained autonomously and sustainably,
- O&M activities are followed up by using check sheets,
- Technical officers at the Ministry of Energy and REGIDESO are equipped with knowledge on the method of planning and on the institutional provisions for interconnection of renewable power generation systems,

- Use of PV is being promoted using the publicity leaflets prepared in the program.

(4) Outcome Confirmation and Evaluation

Most tangible outcome will be the operation and maintenance management plan. The operation and maintenance management plan is a plan to be made on the basis of manuals and guidance provided by the Contractor, listing activities of O&M in short-term (daily activities), mid-term (a few months to a few years) and long-term (seven years, an interval of long term maintenance), specifically scheduling the activities, with check sheets for these activities, to make sure the activities are carried out as planned and desired. As discussed below, the training programs are divided into two periods, the first during the commissioning of the equipment and the other three months after the commissioning. The operation and maintenance management plan will be drafted in the first-period program and revised in the second, taking into account the actual experiences in three months.

Also, a trouble shooting manual is to be prepared in the training programs by participants. It is a summary of operators' experiences, and responses sought in discussions in consultation with trainers. The material prepared can be useful as well in similar projects elsewhere.

Publicity Leaflet will be designed and prepared in the programs, with due consideration to the current status of renewable energy use in the recipient country, to be used and distributed to public in order to introduce the PV system procured in the Project and to promote the use of renewable energy.

Other outcomes in the first-period program will be evaluated in the following manners at the beginning of the second-period program. The whole program will also be evaluated with the materials presented at the Work Shop to be held at the end of the programs, further supplemented by questionnaires.

- Evaluation of operation records and daily check sheets for three months,
- Evaluation of problem-response records for three months,
- Evaluation of communication and discussions in Trouble Shooting sessions in the second-period program,
- Evaluation of knowledge acquisition concerning the system-wide management, through Exercises, Workshop and its handouts prepared,
- A questionnaire conducted at end of the training programs

(5) Planning of Training Program

1) Content

Training program is planned to consist of a series of lectures, exercises, and OJTs led by Japanese consultants. The program is to be carried out in two separate periods; one during the commissioning of the equipment, and the other three months after the commissioning.

There will also be O&M training provided by the Contractor of the Project. Therefore, the consultant will coordinate with the Contractor and plan the details of his training program so that the necessary techniques and knowledge are effectively transferred to the participants of the program. Those training items with a symbol (*) below are the ones presumably provided by the Contractor. The consultants will provide additional information for such items, if necessary, to make them more relevant, not just "how to operate", in the context of understanding of PV systems.

Before commissioning (approximately starting 4 weeks before commissioning)

Lectures on basic knowledge

- Basic theory of photovoltaic generation
- Utilization of photovoltaic generation
- Grid-interconnection and its planning
- Understanding surplus and reverse current
- Supply of power to Hospital from the grid
- Power demand and loads in Hospital
- Workings of PV equipment during blackout
- Planning PV systems
- Arrangement between PV owner and power utility

Lectures on construction planning

- Installation of PV equipment
- Power distribution in a facility and connection of PV system
- Electric equipment in the facility and connection of PV system
- Scheduling works
- Work supervision and inspection, take-over

OJT program

- Witnessing connection works
- Witnessing pre-commissioning/commissioning tests

After commissioning of PV system (continued from "before commissioning" program)

Training provided by the Contractor

- Starting, stopping, restarting the system (*)
- Daily inspection and maintenance (*)
- Periodical inspection and maintenance (*)
- Consumables and replacement work (*)
- Occurrence of faults and actions (*)

Planning O&M works on the basis of Operation Manuals (exercises)

- Making daily check sheet/log sheet form
- Making failure/accident record form

- Maintaining PV equipment in a good condition
- Making Operation and Maintenance Management Plan

For promotion of renewable energy use

- Design and preparation of publicity leaflet

It is very often experienced, in Japan and in other countries as well, that initial setting of the equipment and/or the lack of familiarity of operation lead to malfunction or unsatisfying performance of the equipment. Therefore, it is necessary to carry out revisory training program a certain period after the commissioning. This revisory training program is proposed to consider three month experience of actual operation and maintenance of PV equipment, operation issues unique in the implementation and in CHUK circumstances, to discuss problems and questions arose, and to revise the operation and maintenance management plan. This process aims for the establishment of more pragmatic and steady method of operation.

On top of these, the records of power generation and reverse flow are to be analyzed to provide exercise materials for more advanced operation planning and brief financial assessment, in order to build a capability for planning and management of PV systems in wider applications. The three month inspection carried out by the Contractor engineer will be video-recorded and be used later or outside the facility. This aims at the promulgation of Project's positive effect in time and in space, resulting in the realization of initial objectives of the Project.

The following contents are being considered.

Three months after the commissioning

Evaluation of Establishment of Techniques

- Evaluation of knowledge of basic operation methods
- Evaluation of knowledge of basic maintenance works

Revision of Operation and Maintenance Activities

- Evaluation of 3 month experience of operation and maintenance (as input)
- Trouble shooting sessions (by questionnaire, Q&A session, discussion)
- Revising daily operation and check sheets (exercise)

Improvement of Operation and Maintenance Methodology for Long-run

- Planning operation with considerations on seasonal changes (to consider changes in output of PV system by seasons and resulting operation methods)
- Witnessing three month inspection (there will be demonstration of replacement of parts, such as fuses by manufacturer's engineer)
- Recording the three month inspection (video-taped and recorded on DVD media)

Preparation of Trouble Shooting Manual

- Discussion on the problems experienced and responded in three months, finding better responses and solutions, compiling information into " Trouble Shooting Manual ",

Support for establishing advanced organization for operation and maintenance

- Brief financial assessment of the generation equipment (comparison of income and expenses)
- Improvement of management of equipment for better financial performance of the equipment,
- Planning better use of PV system responding to the increase in power demand,

Round up Exercises

- Revising the operation and maintenance management plan
- Questionnaire

Workshop

- Presenting revised operation and maintenance management plan and Trouble Shooting Manual,
- Reporting results of brief financial assessment and operation records.

2) Participants

Candidate participants to the training sessions are as follows.

CHUK technicians:	Those who will be actually operating the PV system
REGIDESO officers:	in distribution, power purchasing or power plant management related departments, with engineering background (preferably having a degree in electric engineering)
MEM officials:	in regulatory planning, facility management or facility planning related departments, preferably with engineering background
Other	If there are requests from other ministries or organizations, they may appoint persons in charge of public facility planning and/or its maintenance to join the program.

Preliminary assignment for these participants is shown in the table below.

Table 2-2-4-3 Program Contents and Participants

Activities	Technicians (3-4person)	REGIDESO (2-3person)	Ministries (2-3person)	others (2-3person)
Before commissioning				
Lectures on basic knowledge	○	○	○	○
Lectures on construction planning	○	○	○	
OJT program	○	○	○	
After commissioning				
Reinforcement of Contractor Guidance	○	○		
Planning O&M works	○			
For promotion of renewable energy use	○	○	○	
Three month after commissioning				
Establishment of Techniques	○	○		
Revision of O&M Activities	○			
Improvement of O&M for Long-run	○			
Preparation of Trouble Shooting Manual	○	○		
Advanced Organization for O&M	○		○	
Round up Exercises	○	○	○	○
Workshop	○	○	○	○

3) Schedules

The schedule for the abovementioned program is shown below.

Table 2-2-4-4 Training Program before/after Commissioning

		-4w	-3w	-2w	-1w	0w	1w	2w	3week
Activities	Preparation								
	Basic knowledge lectures								
	Construction exercise								
	OJT								
	Reinforce Contractor Guidance								
	O&M Management Planning								
	Promotion Material								
Participant	CHUK technicians								
	REGIDESO officers								
	Ministry Officials								
Lecturers	Consultant (leader)								
	Consultant (assistant)								
	Interpreter								

Table 2-2-4-5 Training Program Three Months after Commissioning

		1w	2w	3w	4w
Activities	Establishment of Techniques	―			
	Revision of O&M Activities		―		
	Improvement of O&M for Long-run			―	
	Preparation of Trouble Shooting Manual		―		
	Advanced Organization for O&M			―	
	Round up Exercises				―
	Workshop				▼
Participant	CHUK technicians	―	―	―	―
	REGIDESO officers		―		―
	Ministry Officials			―	―
Lecturer	Consultant (leader)	―	―	―	―
	Consultant (assistant)		―	―	―
	Interpreter	―	―	―	―

(6) Resources for the Training Program

As already mentioned, this PV system with grid interconnection is first-ever experience in Burundi. Therefore, Japanese consultants are assumed to undertake the implementation of training programs. Consultants to be assigned should have adequate experiences in planning of PV system with grid interconnection.

There will be two Japanese consultants, one leader and one assistant, to be lecturers to the programs of both periods. National consultants are not considered as the recipient country does not have an experience in similar projects.

As the official foreign language of the country is French, and the participants may not be good at speaking English, translation/interpretation service is necessary. But French-English interpretation service available in the country will have problems in technical terms and expressions. If consultants give a lecture in English and an interpreter translates to French, it is most likely to cause confusion and misunderstanding. Therefore, the translation between Japanese and French is more desirable, and the interpreter should be sought in Japan. Hiring Japanese-French interpreter has some other advantages; such as translating additional materials obtained from the Contractor to use in the lectures, which are very likely written in Japanese.

(7) Schedule of Training Programs

Work schedule of training programs is as shown below, assuming that the agreement between procurement agents and contractors will be concluded in December 2010.

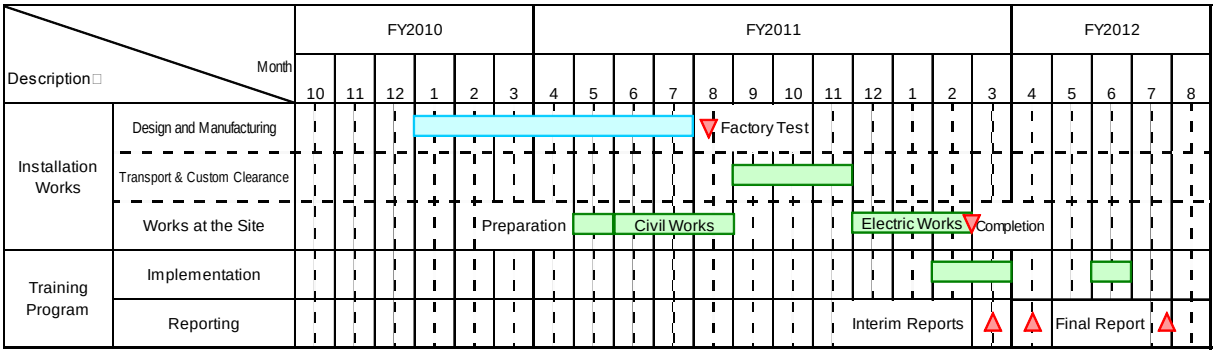


Figure 2-2-4-3 Training Program Implementation Schedule

(8) Products of Training Programs

Products of training programs are outlined below.

- A training program textbook prepared by the Consultant
- Output of Exercises (A single line diagram of the facility, etc.)
- Publicity Leaflet
- Progress reports
- Visual record (DVD) of Periodical Inspection (three month inspection)
- Operation and Maintenance Management Plan (with revision)
- Trouble Shooting Manual
- Workshop materials
- Results of questionnaires
- Final report (including evaluations of operation records and trouble shootings)

(9) The Responsibility of Receipt Country

It is important that participants take part in the training programs in full for the achievement of program objectives, which, however, requires the participants of being away from their work places for weeks. Therefore, there must be an official designation as a participant given by the section/department management who appreciates the usefulness of the programs. It is also important that government agencies appoint persons who will be in charge of PV and renewable energies in the future.

2-2-4-9 Implementation Schedule

In making up the implementation schedule, it is necessary to take the grant aid cooperation into full consideration and set up a proper project implementation system with the work schedule.

The execution schedule is as follows:

(1) Exchange of Notes (E/N)
(2) Consultant Agreement
(3) Tender document preparation
(4) Tendering and signing of contract with the selected contractor
(5) Manufacture and procurement of materials and equipments
(6) Installation of PV equipment
(7) Implementation of soft component
(8) Completion and hand-over

The project will be implemented in about 27 months upon conclusion of the E/N. The law specifies a maximum 48-hour workweek with a maximum 8-hour workday. Sunday is the weekly day of the rest and the total numbers of official public holidays in Burundi is 15 days a year. The whole period of implementation of the Project consists of design and manufacturing, transportation, foundation work, installation work, pre-commissioning and adjustment. The foundation work can be implemented while the electrical items are manufactured in Japan. Burundi has two rainy seasons from March to May and from September to November. During the rainy seasons, heavy downpours are not uncommon. Therefore, the concrete work must be implemented during the dry seasons from June to August.

Based on the grant aide scheme of Japan, preliminary implementation schedule is drawn up as shown below.

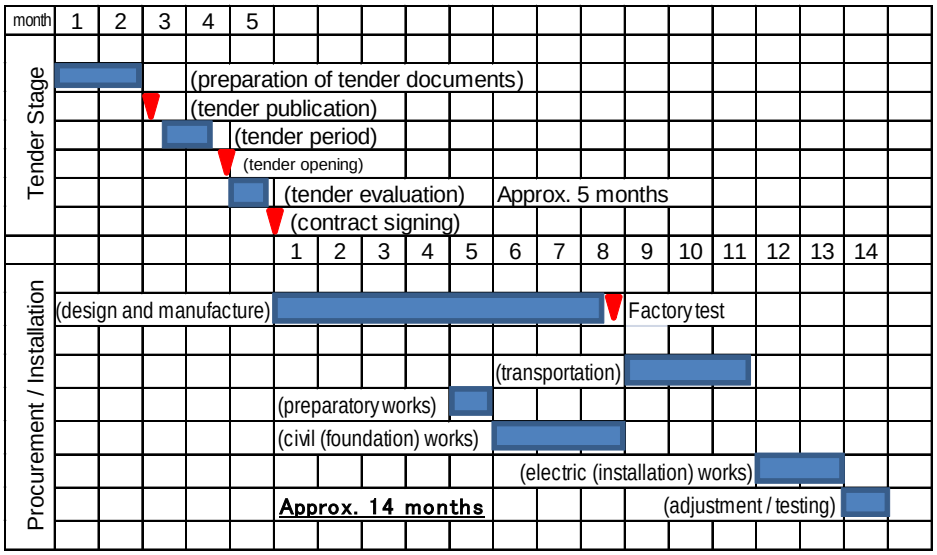


Figure 2-2-4-4 Implementation Schedule of the Project

2-3 Obligations of Recipient Country

Undertakings required of the Recipient Country had been confirmed by the minuets of discussion concluded in First Phase Study of the Project. The specific items required for implementation are listed below.

- To secure the land (done)
- To clear and level the area for PV module installation
- To install fence and gate to PV system installation space
- To conclude a bank arrangement with Japanese bank and pay commission
- To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the Components and to the employment of the Agent will be exempted by the Government of recipient country
- To accept the personnel of our country in charge of this project
- To do required procedure for construction of the electric generating equipment
- To ensure the personnel and financial resource for the operation and maintenances of PV system in the future
- To select and send adequate persons for training program, from the Ministry of Energy, REGIDESO, other relevant government organizations

2-4 Project Operation Plan

2-4-1 Basic Concept of Operation and Maintenance of Generating Equipment

The generating equipment to be procured in this Project is designed to be operated and maintained by CHUK on daily basis. In the long-run, the executing agency Ministry of Energy and Mines and REGIDESO may have to cooperate in the maintenance works. REGIDESO should also be involved in the agreement necessary for the grid-interconnection and reverse current.

The recipient is expected to implement the preventive measures and proper maintenances of the generating equipments to keep the performance, function, and continuous supply of power, on the basis of improvement of reliability, safety, and efficiency.
Basic concept of maintenance is shown in the figure below.

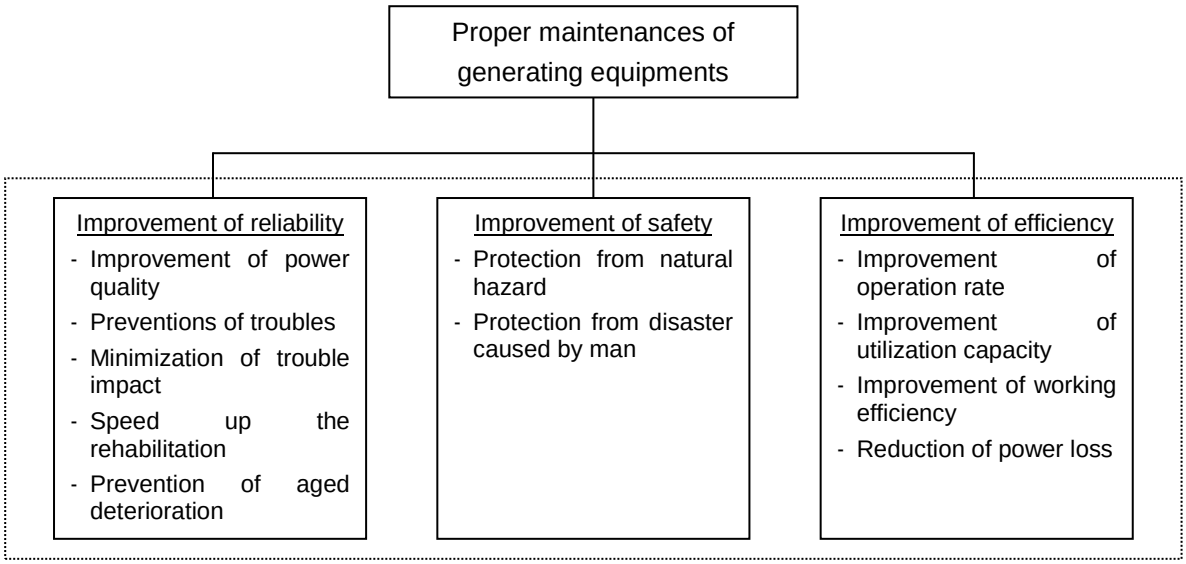


Figure 2-4-1-1 Basic Concept of Generating Equipments Maintenances

Keeping the basic concept in mind, the recipient country should operate and maintain the PV system, utilizing the O&M techniques transferred during the Contract through OJT by Contractor's experts and through training programs by the Consultant, and according to Operation and Maintenance Manuals.

2-4-2 Periodical Inspection

Relevant parties in the Recipient country should draw up an O&M Plan for the PV system on the basis of the standard daily and periodic inspection lists shown in tables below and O&M Manuals presented by the Manufacturer, and execute the O&M works efficiently meeting the power demand.

(1) Daily Inspections

Daily inspections are mainly visual inspections conducted daily. Recommended inspection items are shown in Table 2-4-2-1. In the case of any anomalies detected, consult with a responsible engineer of the Facility.

Table 2-4-2-1 Standard Daily Inspection Items and Findings

Category	Items		Findings
PV array	Visual	a) Surface of arrays	Stain and damage
		b) Support stands	Corrosion and rust
		c) Connecting cable	Damage
Junction box	Visual	a) Boxes	Corrosion and rust
		b) Connecting cables	Damage
Power Conditioner Cubicle	Visual	a) Outside boxes	Corrosion and rust, energized part being covered
		b) Connection cables	Damage
		c) Vent hole (air shaft, filters etc)	Aeration, Filter clogging
		d) Condition	Abnormal sound, vibration, odor, and overheating
		e) Control panel	Signal of errors
		f) Power generating	Errors of power generating condition on control panel

(2) Bi-monthly Inspections

Bi-monthly inspections are advisable to be conducted once every two months. Recommended inspection items are shown in Table 2-4-2-2.

Table 2-4-2-2 Standard Bi-monthly Inspection Items and Findings

Category	Items		Findings
PV Sub-array[5]	Visual and touch	Earthing wires and grounding terminals	Junction with Earthing wires Loose screws
Junction box	Visual and touch	a) Boxes	Corrosion and damage
		b) Connecting cables and terminals	Anomaly in wiring Loose screws
		c) Earthing wires and connecting terminals	Anomaly in wiring Loose screws
	Measurement and test	a) Insulating resistance	<PV − Earthing wires> 0.2MΩ[6] or over, measured voltage DC500V (Measure all circuits) <Output Terminals − Earthing wires> 1MΩ or over Measured voltage DC500V
		b)Open circuit voltage	Specified voltage, Polarity （Measure all circuits）
Power conditioner Cubicle	Visual and touch	a) Outside boxes	Corrosion and damage
		b) Connecting cables and terminals	Anomaly in wiring Loose screws
		c) Earthling wires and connecting terminals	Anomaly in wiring Loose screws
		d) Vent hole (air shaft, filters etc.)	Aeration, Filter clogging
		e)Condition	Abnormal sound, vibration, odor, and overheating
		f) Control panel	Signal of errors
	Measurement and test	a) Insulating resistance (Power conditioner - Earthing)	1MΩ or over Measured voltage DC500V
		b) Control panel	Operation checks (Display and power generating)
		c) Re-starting Timer	Confirmation of automatic start-up
Switch for PV	Visual and touch	a) Connecting terminals of switch	Loose screws
	Test	a) Insulating resistance	1MΩor over Measured voltage DC500V

2-4-3 Long Term Operation and Maintenance

Although the expected operation life of PV modules and power conditioners, the main components of PV system, varies by manufacturers, PV modules would last for 20 years[7] and

[5] PV modules should be checked for the following points
- Smudges on the surface, cracks and discolorations on the surface, etc,
- Deformation of support structure, rust, loosened bolts, etc.

[6] Allowable Insulating resistance
0.4MΩ or over for Insulating resistance of 300V or over.

[7] Japan Photovoltaic Energy Association.

power conditioners 15 years[8], under the proper O&M and favorable environment. Actual operation life, however, depends on the execution of inspections and daily operation/maintenance conditions. There are some parts inside the equipment that have to be replaced before operation life of the equipment.

Those maintenances including the replacement of major worn-out parts are generally called "full-scale maintenance", "detailed maintenance" or overhaul, in this Project defined as "long term maintenance". Frequency of long term maintenance is once every five to seven years.

Long term maintenance can be the most expensive maintenance work related to PV system, because major parts may have to be purchased and replaced, and in some unfortunate cases a dispatch of manufacturer's engineers have to be requested. Therefore, unlike regular maintenances and periodic inspections, some special provision for long term maintenance is needed. Regular maintenances and periodic inspections are assumed to be implemented by the technicians and on the current operation budget at the Facility. Long term maintenance, therefore, requires, among others, financial support from the implementing/responsible ministries/agencies of the government. Also, there are some cases which require the involvement of electricity utility company as the PV system is interconnected to the utility grid.

Table 2-4-3-1 Organization Control of Long Term Maintenance

	Responsible organization	Periodical and Daily Inspection	Long Term Maintenance
Project site	CHUK	Operation of PV system Planning and implementation	Planning and implementation
Implementing Agency	MEM	Monitoring of operation and effect on PV system	Financial support
Electric Power Company	REGIDESO	Monitoring of grid interconnection and reverse power flow condition	Technical support

It is desirable for sustainable supply of electric power by the PV system to have a proper supporting program especially targeting long term maintenance. Within this Project, the following measures are proposed.

1. Provision of spare parts needed up to the first long term maintenance
2. Provision of a dedicated section in O&M Manuals that explains how to use spare parts

As specification of spare parts and maintenances varies by manufacturers, detailed lists are proposed by bidders and finally will be fixed after tendering.

[8] According to the interviews to several manufacturers.

2-4-4 Spare Parts

Spare parts for the PV system are classified into two categories; standard components for periodic replacements and components for unscheduled replacements. Owners of the PV system have to purchase these parts for periodic inspections and maintenances.

It is planned that the spare parts necessary up to the first long term maintenance are procured by this Project. The Recipient country himself has to meet subsequent needs for spare parts. The lists of spare parts and tools proposed to be procured in the Project are shown in the table below.

Table 2-4-4-1 Spare Parts and Tool List for PV System

NO.	Item	Quantity
Spare parts		
(1)	Periodic replacement	
	1) Low-tension circuit fuses	200%
	2) Lamps	200%
	3) Indication Lamps	200%
	4) Flour lamps, Glow lamps	200%
	5) Lightning arrester	200%
(2)	Unscheduled replacement	
	1) MCCBs	1 complete set
	2) Relays	1 complete set
	3) Capacitors	200%
	4) Funs	200%
	5)PV modules	2%
	6)Power Conditioner (stand-by unit)	1 set
	7) Lamps for LED	100%
Tool kits		
(1)	Measuring equipments	
	1) AC clamp meter	1 unit
	2) Insulating resistance tester 500V	1 unit
	3) Simple resistance meter	1 unit
	4) Phase indicator	1 unit
	5) Voltmeter for low voltage	1 unit
	6) Digital multimeter	1 unit
(2)	Tools	
	1) Flathead screwdrivers	2 pcs
	2) Phillps screwdrivers	2 pcs
	3) Nippers	2 pcs
	4) Pinchers	2 pcs
	5) Crimp contact pinchers	2 pcs
	6) Card Circuit tester	1 pc
	7) Wire Stripper	2 pcs
	8) Cable cutters	2 pcs
	9) Torque Wrench	1 pc

2-5 Project Cost Estimation

2-5-1 Initial Cost Estimation

(1) The Cost of Burundi Side

The obligations of the Recipient side were discussed in Chapter 2 of this report, among which the following items may require explicit expenditures.

- Clearing and leveling of the Site
- Sending trainees of Ministries and REGIDESO to the Training Programs to be held in CHUK

As for the clearing and leveling, the Site is at the moment open and flat, and does not specifically require such works. The Training Program is planned to be held at CHUK and there is no travel expenses involved in the participation

(2) Condition of Calculation

1.	Time of calculation	December, 2009
2.	Exchange rates of foreign currencies	US$ 1 = JPN 93.97 BIF 1 = JPN 0.0754
3.	Time of the Event	as shown in Figure 2-2-4-4
4.	Remarks	Calculation is done according to the rules for Japan's Grand Aid Programmes

2-5-2 Operation and Maintenance Cost

(1) Estimation of Cost of Operation and Maintenance

The following cost factors are considered here.

1. Cost for daily operation
2. Cost for personnel in operation and maintenance
3. Cost for spare parts to be required
4. Cost for renovation

Cost estimation in this section does not consider unlikely, but still possible, breakdown of equipment and resulting repair cost. Also, repair cost after vandalism or sabotage is not considered. Further, the cost of requesting Japanese manufacturer's engineers to be present at the Site for repair and/or diagnosis works is not considered.

1) Cost for Daily Operation

As a PV system does not consume any fuels, there would be very few expenses under this

category. To be very precise, there are expenses for water used in cleaning of PV modules, electricity for system monitoring and air conditioning during not-generating hours of the day, which are small enough to be negligible.

2) Cost for Personnel in Operation and Maintenance

The PV system to be procured in the Project can be, and will be operated and maintained by the existing maintenance staff of the facility. Therefore, operating and maintaining the PV system does not require additional persons to be employed by the facility.

Meanwhile, part of working hours of the maintenance staff will be taken up by operation and maintenance activities, it is converted to monetary terms for reference purpose. (Daily cost of a person is assumed to be US$ 15.0.)

- Daily inspection (modules and cubicle) 0.5 hours per day
  0.5hr/8hr [daily working hrs] times US$15.0 = US$ 0.9 per day

- Cleaning of modules (1hr per month per 10kW of modules) 30hours per month
  30hrs/30days/8hr [daily working hrs] times US$15.0 = US$ 1.5 per day

Adding these two, we get daily cost at US$ 2.4. To convert this to annual cost,

2.4 times 365 = US$ 876 per year

876 times 93.97[JPY/US$] divided by 0.0754 [JPY/BIF] = BIF 1,092,000 per year

3) Cost for Spare Parts to be required

A PV system to be procured in this Project is in general considered to have an expected operation life of fifteen to twenty years. PV modules require little maintenance cost as they have no moving parts, hence less possibility of break down. In particular, Japanese made PV modules have reputation of lower rate of deterioration of conversion efficiency compared to products of other countries. On top of this, there will be a few per cent extra modules to be procured in the contract as spare parts. There will be no spare parts of PV modules to be purchased by the Recipient in the future, leaving necessity of purchasing only those parts related to power conditioners.

As discussed in Section 2-4-3, the procurement contract for the Project is planned to include provision of spare parts to be necessary up to the first long-term maintenance work. This will relieve the recipient from the expenses of purchasing spare parts until the first long-term maintenance work. The first long-term maintenance work will take place, with some variation among manufacturers, about seven years after the commissioning of the equipment.

There is an exception to the above, the parts related to air conditioners is not included in the list of spare parts provided by the Contractor.

In summary, the cost of spare parts will be for those for air conditioners until the first

long-term maintenance, which will be added with those for power conditioners thereafter. Roughly speaking, and on average, these costs are estimated as in the table below.

Table 2-5-2-1 Expenses for Spare Parts

	Aggregate for a period of Long-term Maintenance	Average Annual cost
Power Conditioner related (applicable only after the First Long-term Maintenance)	Approx. 3,150,000	Approx 450,000
Air Conditioner related	Approx. 1,050,000	Approx 150,000
Total (after the First Long-term Maintenance)	Approx. 4,200,000	Approx 600,000

(Unit: Japanese Yen)

Remarks : As mentioned before, these costs do not include that for dispatch of engineers from abroad. These costs are subject to large variation due to the environment and conditions of operation and maintenance.

Converting these figures into BIF, we have the expected purchase cost of spare parts as below.

Before the First Long-term Maintenance

JPN150,000/0.0754[JNP/BIF] = BIF 1,989,000 per year

After the First Long-term Maintenance

JPN 600,000/0.0754[JNP/BIF] = BIF 7,968,000 per year

4) Cost for Renovation

As mentioned in the previous section, PV modules have long expected life with slow deterioration rate. Therefore, PV modules do not require replacement during the lifetime of the whole PV system.

The power conditioners on the other hand are just like ordinary equipment in the power utility industry and some of their parts have statutory service lives. Those parts that have been deteriorated should be, on occasions of periodical and/or long-term maintenance, replaced with the spare parts considered in the previous section. Beyond this, overall replacement of the equipment or renovation is considered out of scope of this Project.

(2) Financial Resources for Operation and Maintenance

A financial benefit of having PV equipment accrues to a party who pays electricity bills, that is, CHUK. As the tariff of electricity is relatively high in Burundi, the benefit will be larger than the maintenance cost mentioned above, even when the additional benefit possibly

generated by reverse flow is omitted. Therefore, the source of the fund for future maintenance cost will be covered by the value of the energy generated by the PV system.

The energy to be generated by the PV system is estimated to be around 340 MWh per year at most, out of which, 50 to 60% would be possibly consumed in the hospital as shown before. Electricity rate for CHUK is BIF122/kWh, as of 2008, while the dealing of reverse flow must be determined by parties concerned. Thus, the financial benefit can be estimated on the basis of conservative assumptions; 1) 50% of generated energy will be consumed in the hospital and contribute to the reduction of purchased power, and 2) the value of reverse flow of power is ignored. This conservative estimate exceeds the annual cost mentioned above.

50% of 340MWh times BIF122 = BIF 20,740,000 per year.

2-6 Other Relevant Issues

For this Project to be carried out without problems the following matters should be observed.

(1) Preparation of the Site

The plot of land to be used for the installation of PV equipment has been confirmed to fall within the land that CHUK is officially entitled to use. This installation area requires no major earth works as it has been an open land. However, there are some minor obstacles to be removed, such as some trees.

(2) Handling of Reverse Current

In Burundi, REGIDESO is the sole power producer and there are no laws and regulations that govern the reverse power sent back to the grid by the PV system, which are yet to be determined by the Burundi side. Considering the future possibility of similar projects, the Burundi side should consider appropriate method of handling reverse power.

(3) Organization of Operation and Maintenance

The PV equipment to be procured and installed in the Project will be handed over to CHUK after the completion of the Project, and CHUK will be operating and maintaining the equipment with the Ministry of Higher Education being co-responsible for securing budget necessary for long-term maintenance works. Meanwhile the Ministry of Energy and REGIDESO are expected to provide support to CHUK, particularly important in long-term maintenance. These latter organizations should be well aware of their task and build a capacity within to supervise the maintenance of the equipment. They should send appropriate personnel to the training programs to be provided by the Program, and sustain the capacity in the organizations.

(4) Tax Exemption

Exemption of taxes and duties demanded by the Project to Burundi side will be handled by the Ministry of Energy and provide support to the Japanese side. This process must be done properly and timely for the Project to proceed without delay.

CHAPTER 3

PROJECT EVALUATION

Chapter 3 Project Evaluation

3-1 Recommendations

3-1-1 Prerequisite to Project Implementation

There are prerequisites for the Project to be implemented without impediments, which are shown below.

(1) Preparation of the Site

The installation area of PV modules requires no major earth works as it has been an open land. However, there are some minor obstacles to be removed, such as some trees.

(2) Handling of Reverse Current

Handling of reverse flow of surplus energy is yet to be determined by the related parties on Burundi side.

(3) Organization of Operation and Maintenance

CHUK will be operating and maintaining the equipment with the Ministry of Higher Education being co-responsible for securing budget necessary for long-term maintenance works. The Ministry of Energy and REGIDESO are expected to provide support to CHUK and should send appropriate personnel to the training programs to be provided by the Program.

(4) Tax Exemption

Exemption of taxes and duties demanded by the Project to Burundi side will be handled by the Ministry of Energy and provide support to the Japanese side. This process must be done properly and timely for the Project to proceed without delay.

3-1-2 External Conditions to Achievement of Project Objectives

Burundi side should work on the following things for the Project's to take effects in sustainable manner.

(1) Promotion of Renewable Energy Use

This Project provides Burundi with grid-interconnected PV system but its direct effect is

limited the size of the Project. For this Project to contribute to Burundi both in reduction of greenhouse gas emission and in economic development in larger scale, the Project's impacts have to propagate, as in the activation of renewable projects in the Ministry of Energy, and in dissemination of recognitions among private sector and wider public, resulting in the spread of renewable energy use. This project is aware of this propagation effects and provide a publicity materials to be prepared in the training programs, along with lectures in theories and planning of the use of solar power. The Ministry of Energy is expected to make full use of these opportunities.

In particular, to promote private investment in the fields of renewable energy, it is important to provide information on long term generation and operation and maintenance data with some analyses, with which investors can value and manage the risks involved in such investments. The Ministry of Energy can utilize the information made available by the Project.

(2) Technical Assistance, Cooperation with Other Donors

In the promotion of solar energy use mentioned in (1) above, it is often the lack of financial resources that are impediment factors of its spread in many countries. Burundi needs support from donors in this regards, but the most of the cases will be in the form of independent solar systems and/or SHS, to provide power to schools and medical facilities in rural areas away from the national power grid.

Considering the technical advantages of Japan, what Burundi would demand Japan to provide in the form of technical assistance are;

1) to prepare necessary institutions and markets to promote private investment in rural electrification, 2) to improve planning, installing, operating and maintaining single/ grid-interconnected solar facilities, 3) to use and interconnect other renewable resources together with solar generation.

The policy document published in July 2006 with an assistance from UNDP "Programme d'Action National d'Adaptation aux Changements Climatiques (PANA)" does not include elaborated description on the use of renewable energy, and there are not specific strategies or plans formulated in the country. Therefore, technical assistance from Japan for any of 1), 2) and 3) above is effective and desirable.

Burundi Government should take a lead, with cooperation from Japanese side, to realize assistance projects like these.

3-2 Project Evaluation

3-2-1 Validity of the Project

The Project is considered valid on the basis of following points.

(1) Consistency with Higher Policy

Burundi Government has an intention to promote the use of solar energy in both its energy policy and climate change adaptation measures. In rural areas using independent solar system such as SHS, and to diversify the energy resources under the drier climate observed, are the cases in point.

However, the use of solar power has remained in its primitive stage. Among the main reasons for this is the requirement of sizable initial investment as in any other countries and also the low level of recognition of the effectiveness of the technology among people. This Project will provide the PV equipment which dispenses with the initial investment. Also, the Site is chosen at the place very visible to wider public, which will have demonstration effect, further reinforced by the publicity leaflet to be prepared in the training program. These efforts combined together will push the government's policy forward.

(2) Financial Weight of Operation and Maintenance

The energy expected to be produced by the PV system of the Project can be valued on the basis of electricity tariff charged to the Hospital, which is much larger than the long-term cost of operation and maintenance. Therefore, the Project will not put a burden, but contribute to the finance of the Country.

(3) Socio-Environmental Considerations

The Ministry Water, Environment, Territorial Management and Urbanization has expressed its understanding that that the Project will have very limited socio-environmental impacts, if any, because it provides clean energy, the size of the Project is small, and the Site is within the land of the beneficiary. The Study Team explained its judgment that the Project is within category C, and the Ministry confirmed that the Project would require no EIA process before the implementation.

(4) Benefit from Advanced Technology of Japanese Products

PV equipment consists mostly of PV modules, power conditioners and their peripherals. Especially, PV modules and power conditioners made by Japanese manufacturers have technical advantages over other countries in their efficiency, longevity, reliability, etc. in the

market. As this Project is limiting the country of origin of this equipment to Japan, the Project will be able to offer advanced technology of Japanese products.

3-2-2 Effectiveness of the Project

(1) Overall Effect

The installation of the PV system of the Project will provide the national power network of REGIDESO an additional power source. Although hydropower facilities of REGIDESO are mostly managed with certain regulation capacity of reservoirs, they sometimes fail to generate electricity due to inadequate reserve of water due to less rainfall observed in recent years. Power generation by PV systems is limited to during daytime, but saves the use of water at hydropower facilities which can be in turn used even in night time. This will check the use of diesel power plant which is limited to emergency use in power deficiency situations. In this way the Project will contribute to the power supply with clean energy, which is in line with the objectives of Cool Earth Partnership.

On top of this, installation of solar generation equipment of the largest kind in the capital will have demonstration effects on the country and around, and enlightenment and educational effects that will work positively on active involvement of private sector.

There is a secondary effect of diversification of energy resources. And at CHUK the generated energy will reduce the electricity bills, and lead to more efficient use of financial resources.

(2) Quantitative Effects

Among the effects mentioned above, those that can be quantified are described below.

1) Generated Energy

As mentioned in 2-2-2-4, there will be 340MWh at most of electric energy expected to be generated at CHUK, which amounts to approximately 60% of CHUK (583MWh in 2008) and 0.2% of annual electricity sales of REGIDESO.

2) Financial Benefit

About 50 to 60% of the generated energy mentioned above will be consumed in CHUK, and the remaining part will be sent back to the REGIDESO network and consumed by wider public. Therefore, the values of financial benefit accrued to CHUK will be highly dependent on how the reverse current is handled in financial term. If we assume that the reverse current is valued at nil in terms of money for conservativeness, the value accrues to CHUK will be BIF 20 million, which is much larger than the long term cost of maintenance of the equipment.

3) Reduction of CO_2 Emission

Unit emission of CO_2[9]

The effect of CO_2 emission reduction is calculated here in the following manner,

- To apply the method of CDM, which in the first place assumes the Baseline, and considers the change from the baseline of CO_2 emission with the PV system to be the reduction in CO_2 emission,
- The baseline is defined by the alternative generation method without the PV system.
- The alternative generation method should be of approximately the same scale, and practically possible power plant or generator in the country.
- CO_2 emission of the alternative power plant or generator above for the estimated energy generation of the Project is considered as the reduction of CO_2 emission by the Project.

For a small scale generation unit below 15MW, UNFCCC/CDM has its rule to use a diesel engine generator for the baseline. Burundi uses hydro resource for electric generation, but prepares diesel generation equipment for emergency use. Therefore, it is a diesel generator that can be considered as the alternative in the baseline for the analysis.

Unit CO_2 emission of a diesel generator can be calculated using "Guideline for Calculation of Greenhouse Gas Emission (March/2007)" published by the Ministry of Environment, Japan as below;

Specific gravity of diesel fuel	0.86
Mass of diesel fuel for 1L	860g
Fuel consumption of diesel generator	0.235g/kWh
Generation for diesel fuel 1 L	3.66kWh/L (0.860g/L / 0.235g/kWh)
Unit CO_2 emission by combustion of diesel fuel	2.62kg-CO_2/L
Unit CO_2 emission per kWh	0.716kg-CO_2 (2.62kg-CO_2/L / 3.66kWh/L)

Multiplying this unit onto the annual generated energy of the PV system, 340MWh, we obtain the reduction of CO_2 emission

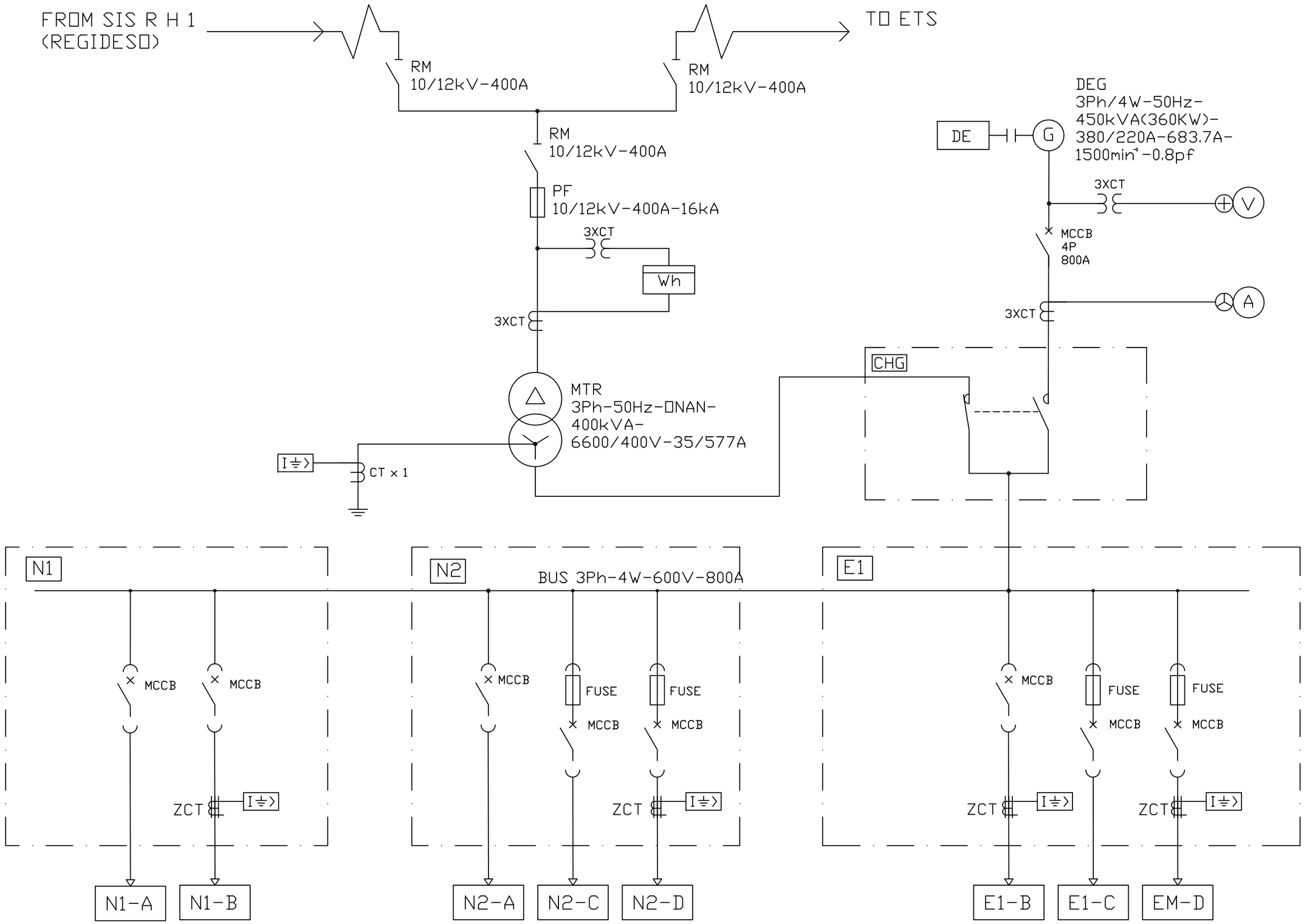
Annual CO_2 emission reduction by the Project ＝243 t-CO_2

[9]UNFCCC Web Page (http://cdm.unfccc.int/index.html)

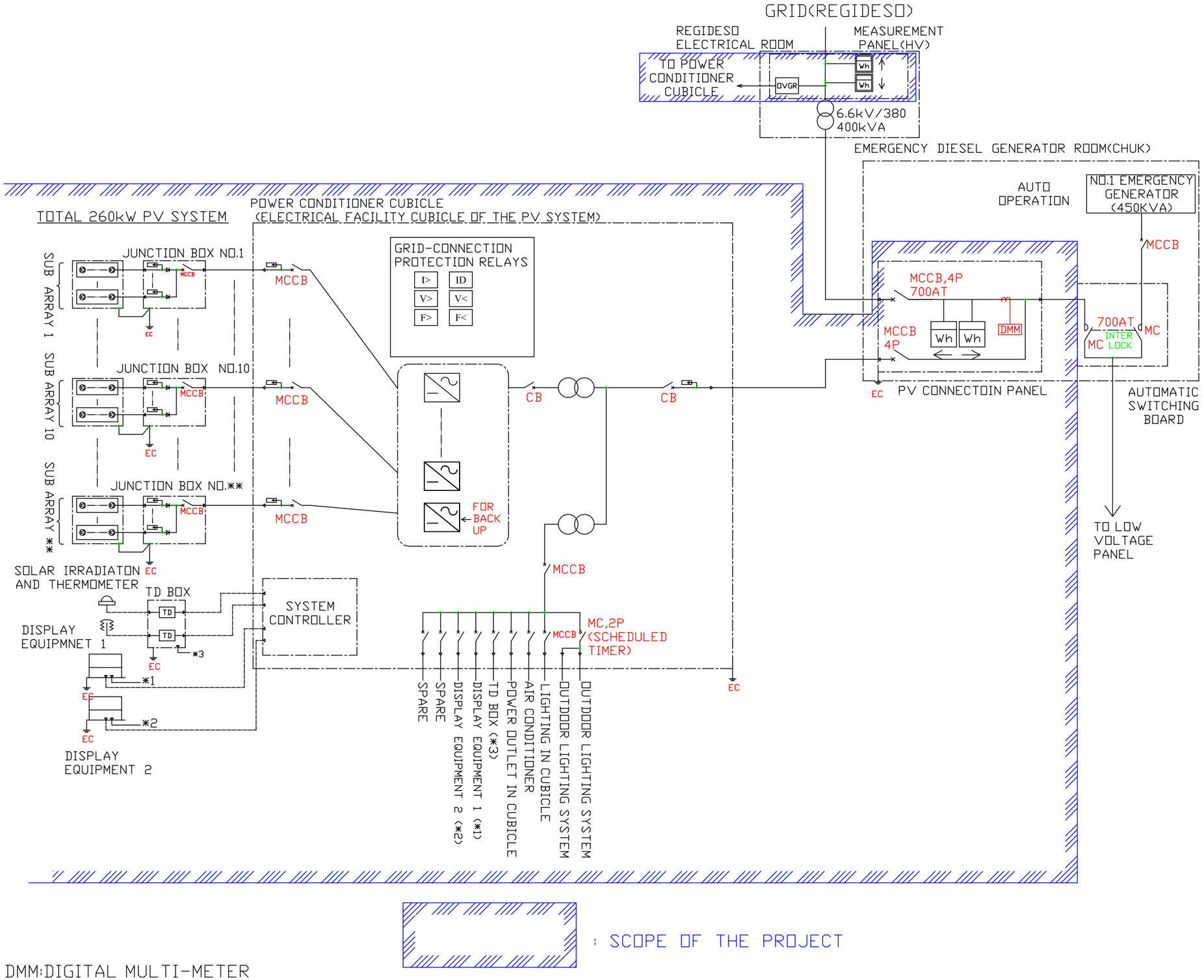
DRAWINGS

DRAWINGS

Number	Title
BU-01	SINGLE LINE DIAGRAM (CHUK)
BU-02	SINGLE LINE DIAGRAM (PV SYSTEM)
BU-03	GENERAL LAYOUT PLAN
BU-04	CABLE LAYOUT PLAN
BU-05	EQUIPMENT LAYOUT (EMERGENCY DIESEL GENERATOR ROOM)
BU-06	EQUIPMENT LAYOUT (REGIDESO TRANSFORMER ROOM)
BU-07	LED OUTDOOR LIGHTING SYSTEM



DRAWING NO. 01 SINGLE LINE DIAGRAM (CHUK)

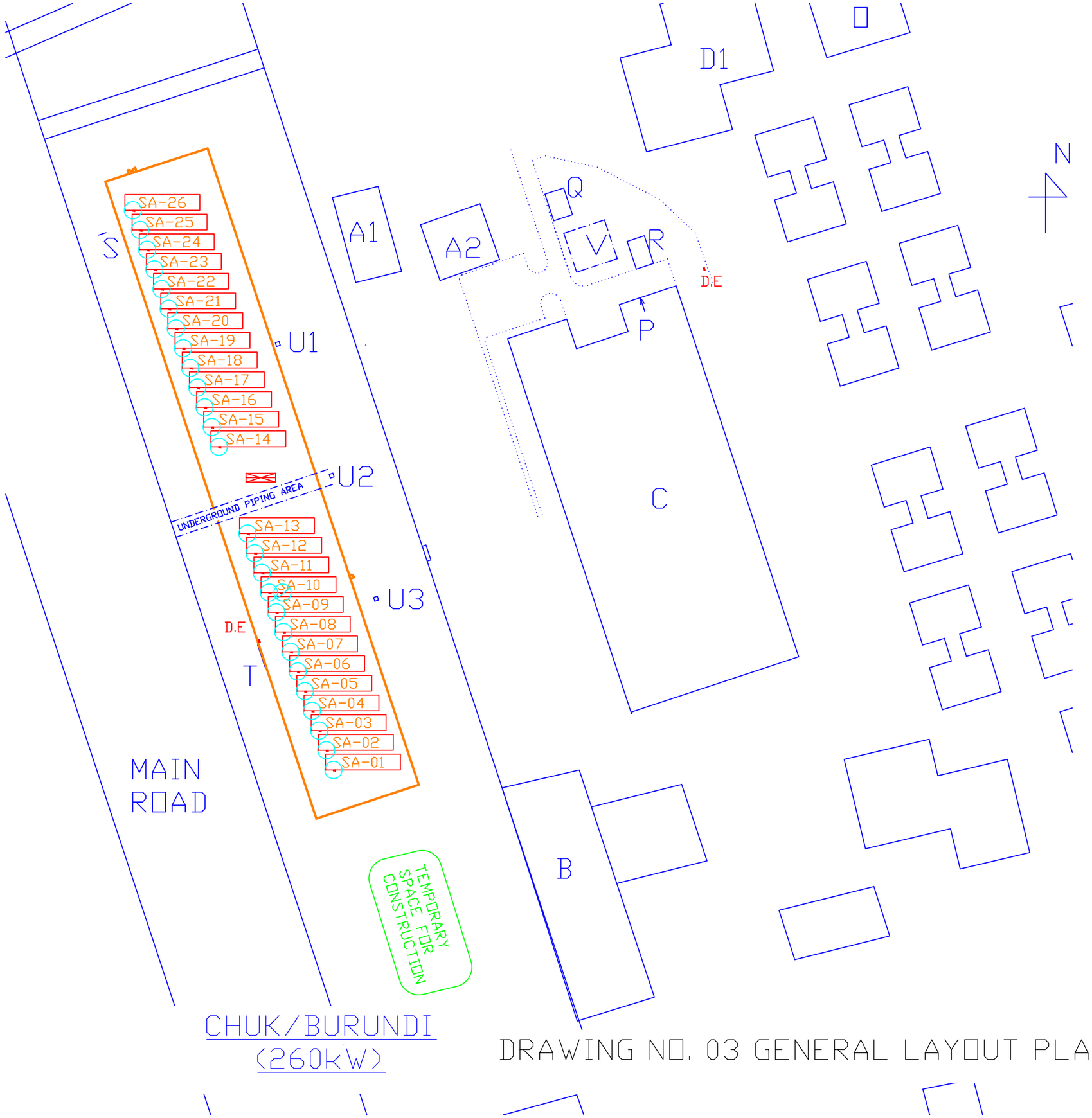


: SCOPE OF THE PROJECT

DMM:DIGITAL MULTI-METER

THE CONTRACTOR SHALL CARRY OUT NECESSARY SURVEY ABOUT THE EXISTING ELECTRICAL FACILITIES.

DRAWING NO. 02 SINGLE LINE DIAGRAM (PV SYSTEM)



LEGEND

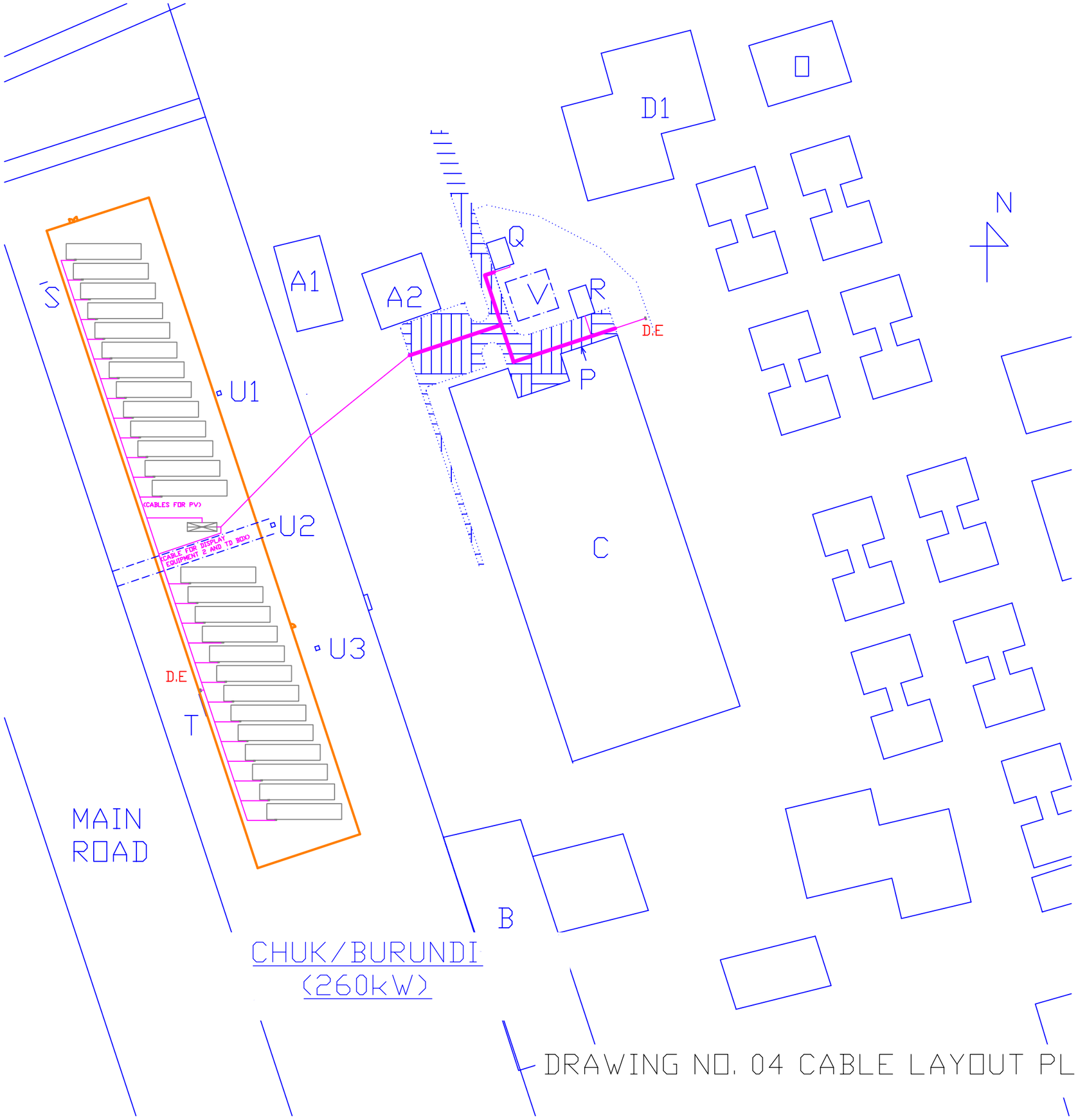
- : ELECTRICAL FACILITY CUBICLE OF THE PV SYSTEM [E.C.FOR PV]
- : PV SUB ARRAY (APPROPRIATE 10kW) [SA]
- : DISPLAY EQUIPMENT[D.E]
- : JUNCTION BOX [J.B]
- : TRANSDUCER BOX FOR METEOROLOGICAL OBSERVATION [T.D. BOX]
- : FENCE
- : GATE

BUILDING NAME LIST

A1: RECEPTION FOR OUTPATIENT DEPARTMENT(PEDIATRICS)
A2: RECEPTION FOR OUTPATIENT DEPARTMENT(GYNECOLOGY)
B: RECEPTION FOR OUTPATIENT DEPARTMENT (INTERNAL MEDICINE,ENT(EAR, NOSE AND THROAT))
C: MAIN WARD
D1: PEDIATRICS AND MATERNITY
D: LAUNDRY
P: ELECTRIC ROOM(CHUK)
Q: EMERGENCY DIESEL GENERATOR ROOM(CHUK)
R: TRANSFORMER ROOM (REGIDESO)
S: ADVERTISING PILLAR
T: STONE MARKER
U1-U3: MANHOLE
V: WATER TANK&FUEL TANK(UNDERGROUND)

CHUK/BURUNDI
(260kW)

DRAWING NO. 03 GENERAL LAYOUT PLAN



LEGEND

: ELECTRICAL FACILITY CUBICLE OF THE PV SYSTEM [E.C.FOR PV]

: PV SUB ARRAY (APPROPRIATE 10kW) [SA]

: DISPLAY EQUIPMENT[D.E]

: JUNCTION BOX [J.B.]

: TRANSDUCER BOX FOR METEOROLOGICAL OBSERVATION [T.D. BOX]

: FENCE

: GATE

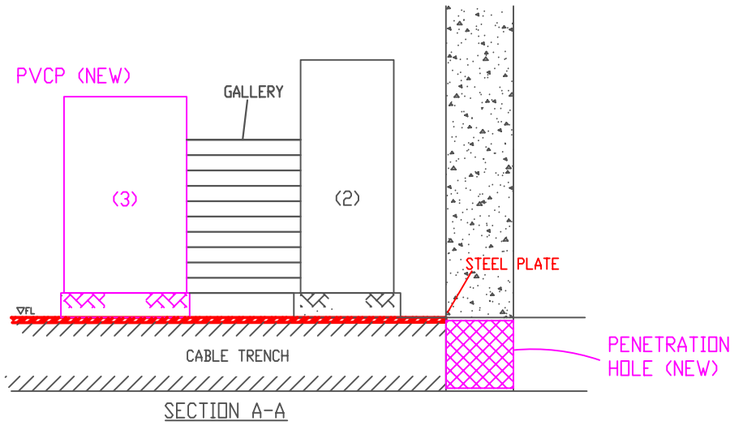
: HAND HOLE

: ASPHALT

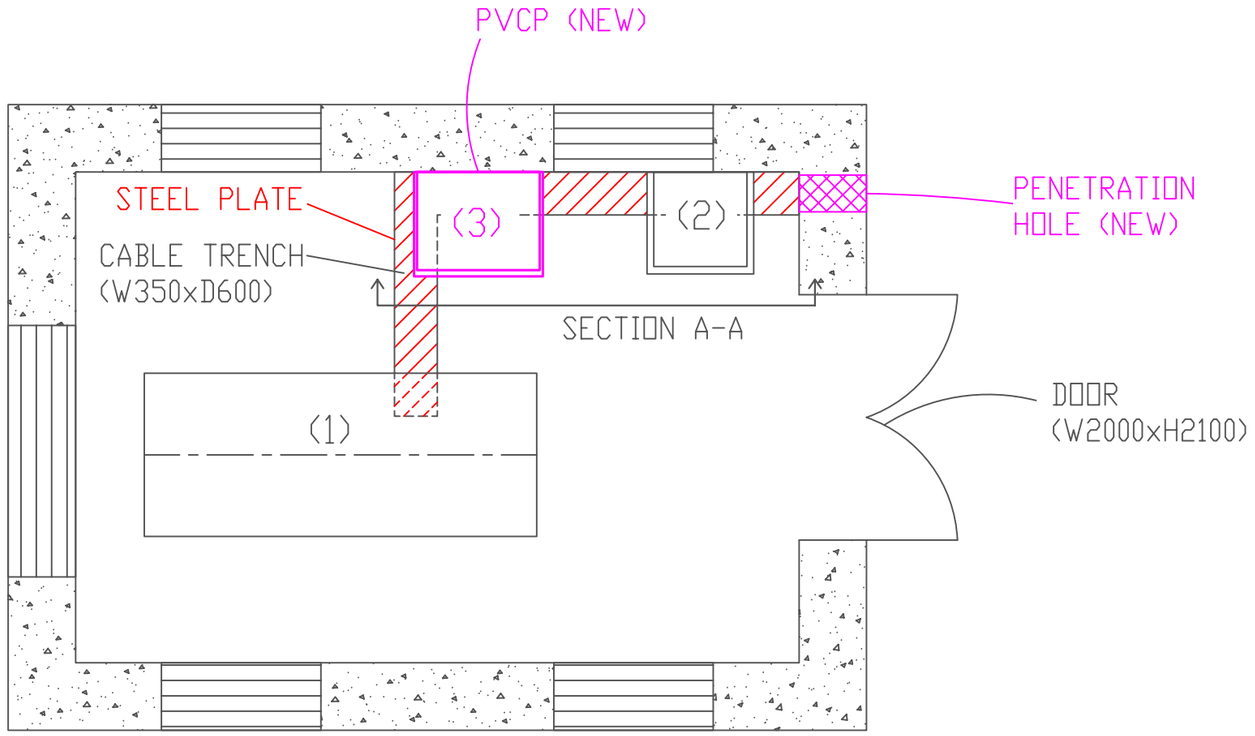
BUILDING NAME LIST

A1: RECEPTION FOR OUTPATIENT DEPARTMENT(PEDIATRICS)
A2: RECEPTION FOR OUTPATIENT DEPARTMENT(GYNECOLOGY)
B: RECEPTION FOR OUTPATIENT DEPARTMENT (INTERNAL MEDICINE,ENT(EAR, NOSE AND THROAT))
C: MAIN WARD
D1: PEDIATRICS AND MATERNITY
D: LAUNDRY
P: ELECTRIC ROOM(CHUK)
Q: EMERGENCY DIESEL GENERATOR ROOM(CHUK)
R: TRANSFORMER ROOM (REGIDESO)
S: ADVERTISING PILLAR
T: STONE MARKER
U1-U3: MANHOLE
V: WATER TANK&FUEL TANK(UNDERGROUND)

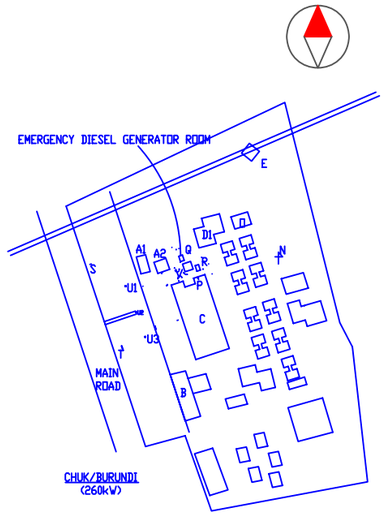
DRAWING NO. 04 CABLE LAYOUT PLAN



SECTION A-A



PLAN



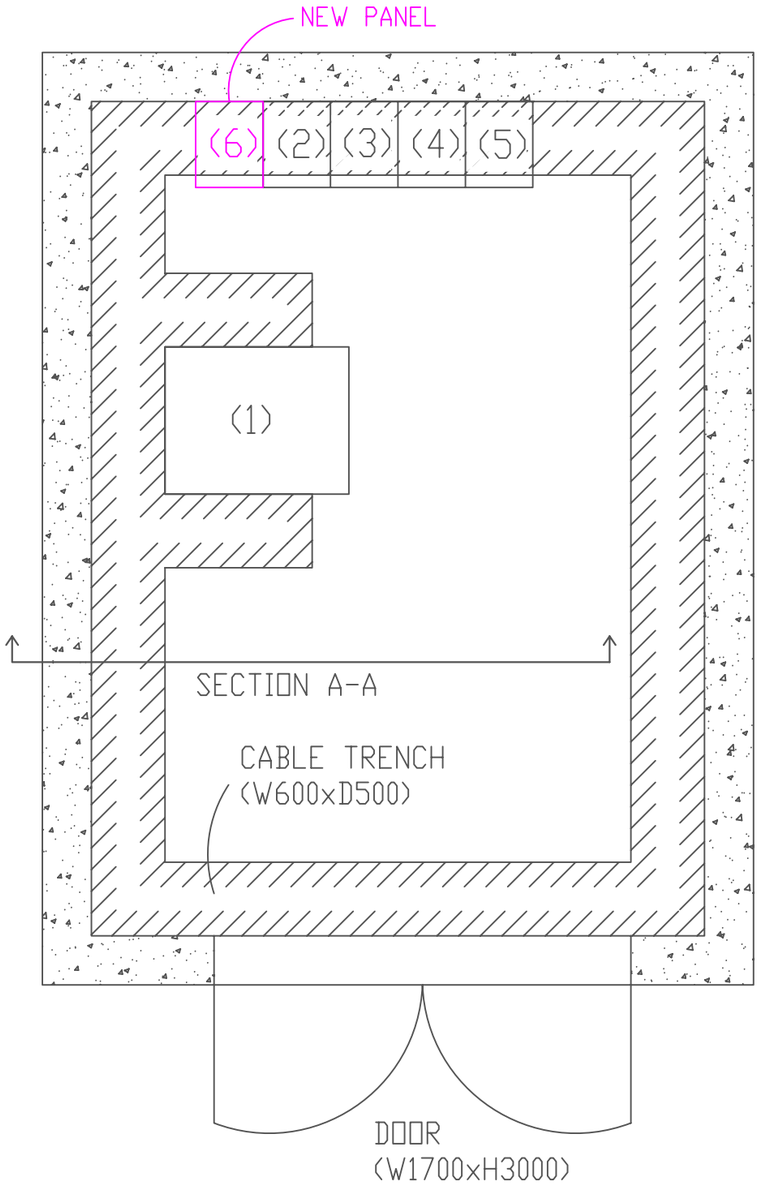
NOTE

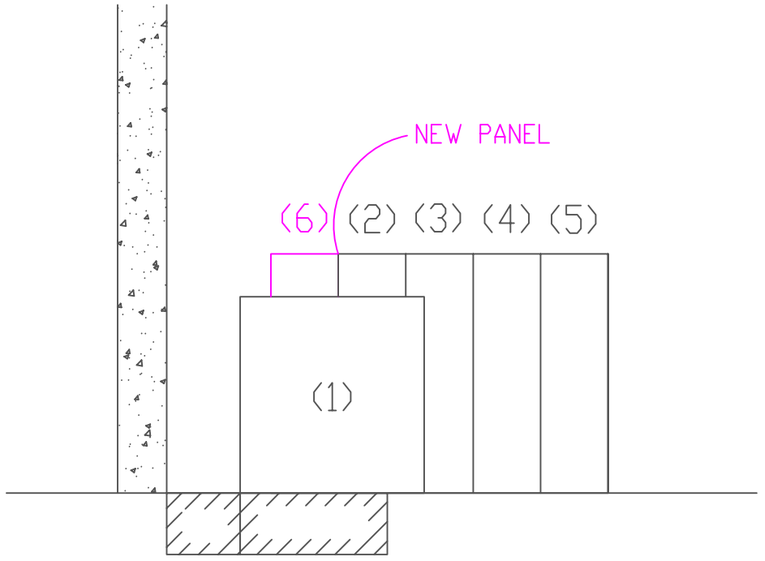
- : CONCRETE
- : CABLE TRENCH
- : STEEL PLATE
- : GALLERY
- : PENETRATION HOLE

ELECTRICAL EQUIPMENT LIST

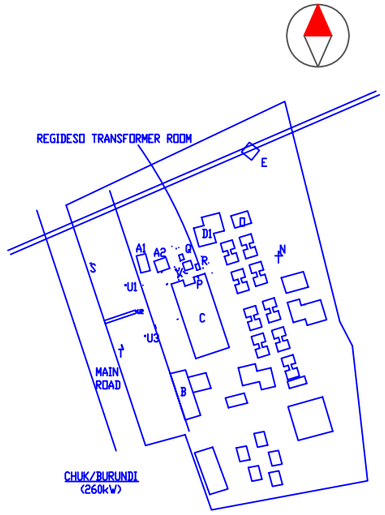
No.	EQUIPMENT	DESCRIPTION	QUANTITY	DIMENSION & WEIGHT [APPROX.]				REMARKS
				WIDTH [mm]	DEPTH [mm]	HEIGHT [mm]	WEIGHT [kg]	
(1)	No.1 EMERGENCY GENERATOR	DIESEL ENGINE GENERATOR-450kVA(360kW)-3Ph-50Hz-380/220V-683.7A-1500min^{-1} -SELF-COOLED WITH RADIATOR-30℃AMB., ENGINE:PERKINS-3000SERIES (ZWART TECHNIEK / NETHERLANDS)	1	1,330	3,200	2,050	580	EXISTING
(2)	GENERATOR CONTROL PANEL FOR No.1 EMERGENCY GENERATOR	METAL ENCLOSED, SELF-STANDING TYPE CONSISTING OF MODULE-TYPE CONTROL DEVICE, MAGNETIC CONTACTORS, INSTRUMENTATION AND OTHERS.(TUEX b.v./NETHERLANDS)	1	830	760	1,900	-	EXISTING
(3)	PV CONNECTION PANEL (PVCP)	-	1	-	-	-	-	NEW

DRAWING NO. 05 EQUIPMENT LAYOUT (EMERGENCY DIESEL GENERATOR ROOM)





SECTION A-A



NOTE

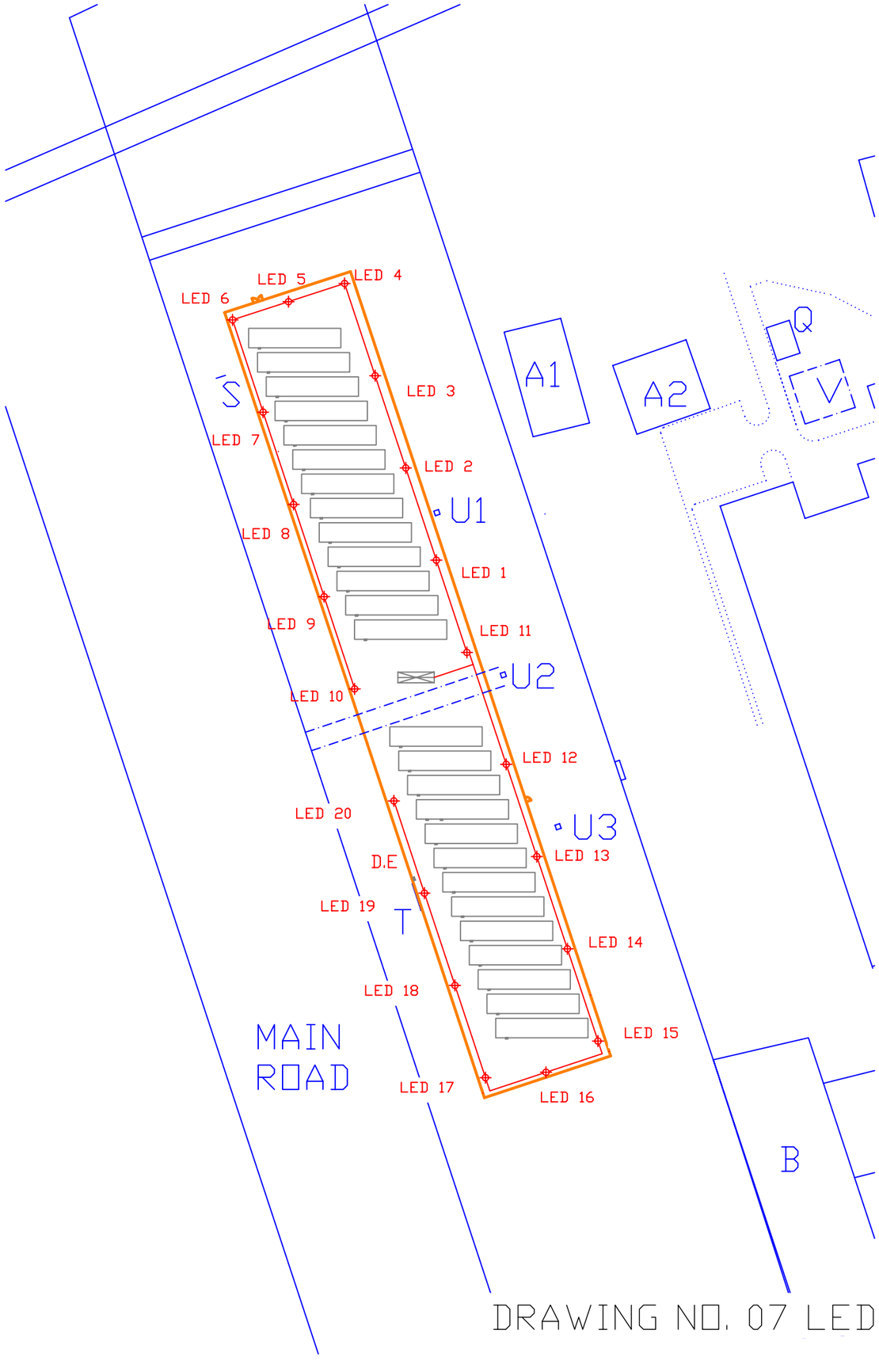
: CONCRETE

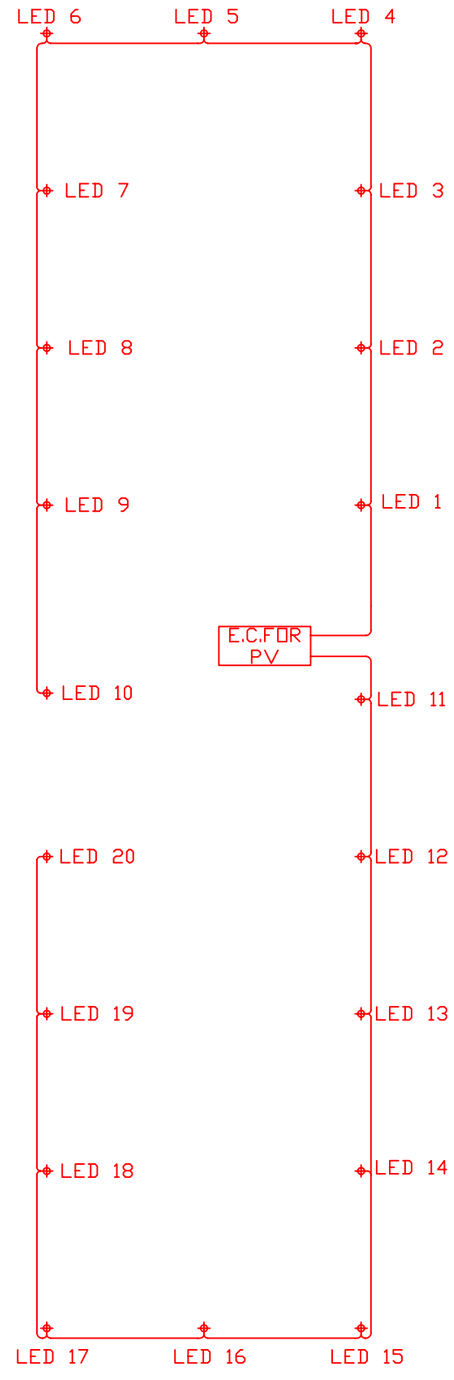
: CABLE TRENCH

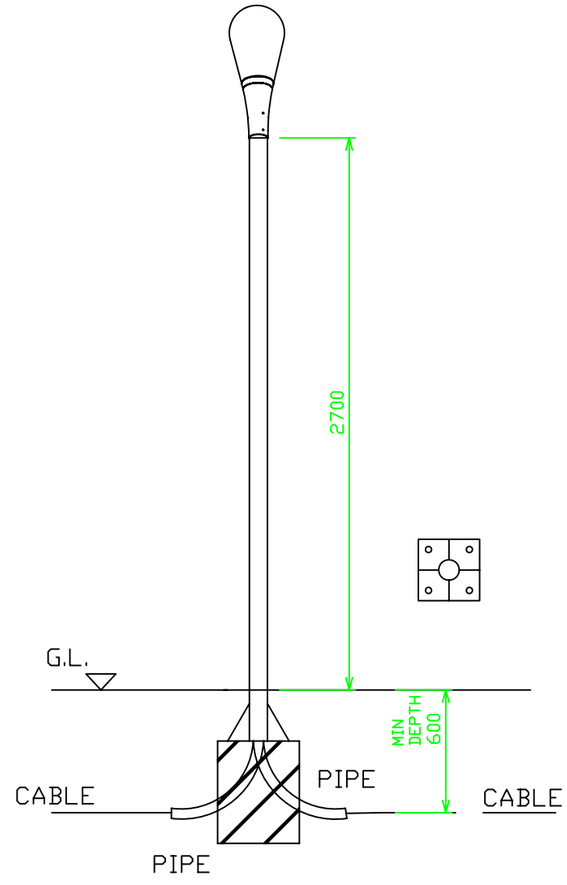
ELECTRICAL EQUIPMENT LIST

No.	EQUIPMENT	DESCRIPTION	QUANTITY	DIMENSION & WEIGHT [APPROX.]				REMARKS
				WIDTH [mm]	DEPTH [mm]	HEIGHT [mm]	WEIGHT [kg]	
(1)	REGIDESO TRANSFORMER	-	1	1,500	1,200	1,500	-	EXISTING
(2)	HIGH VOLTAGE MEASUREMENT PANEL	CT*3, VT	1	550	700	1,950	-	EXISTING
(3)	RING MAIN UNIT1	-	1	550	700	1,950	-	EXISTING
(4)	RING MAIN UNIT2	-	1	550	700	1,950	-	EXISTING
(5)	RING MAIN UNIT3	-	1	550	700	1,950	-	EXISTING
(6)	WATT HOUR PANEL	-	1	-	-	-	-	NEW

DRAWING NO. 06 EQUIPMENT LAYOUT (REGIDESO TRANSFORMER ROOM)







DRAWING NO. 07 LED OUTDOOR LIGHTING SYSTEM

APPENDICES

1. MEMBER LIST OF THE STUDY TEAM
2. STUDY SCHEDULE
3. LIST OF PARTIES CONCERNED IN THE RECIPIENT COUNTRY
4. MINUTES OF DISCUSSIONS
5. SOFT COMPONENT (TECHNICAL ASSISTANCE) PLAN
6. REFERENCES

1. MEMBER LIST OF THE STUDY TEAM

Appendix 1 Member of the Study Team

1st Survey

No.	Name	Position	Affiliation
1	Mr. Hiroyuki KINOMOTO	Team Leader	Financing Facilitation and Procurement Supervision Department, JICA
2	Mr. Masahiko EGAMI	Planning Management	Financing Facilitation and Procurement Supervision Department, JICA
3	Ms. Hideko TAKAHASHI	Procurement Planning & Management	Crown Agents
4	Mr. Masaru NISHIDA	Chief Consultant / PV Planning	NEWJEC Inc.
5	Mr. Kenichiro YAGI	Grid Connection PV System	NEWJEC Inc.
6	Mr. Nobuo KOMIYA	Electric Equipment	NEWJEC Inc.
7	Mr. Tetsuo TSURUSHIMA	Procurement/Cost Estimate	Japan Techno Co., Ltd.
8	Mr. Shoji TAKAMATSU	Institutional/Socioeconomic Expert	Japan Techno Co., Ltd.
9	Mr. Takao SHIRAISHI	Grid Connection and Operation	NEWJEC Inc.
10	Mr. Sho SHIBATA	Coordinator	NEWJEC Inc.
11	Ms. Naoko HIRAMATSU	Interpreter	JICE

2st Survey

No.	Name	Position	Affiliation
1	Mr. Masaru NISHIDA	Chief Consultant / PV Planning	NEWJEC Inc.
2	Mr. Kenichiro YAGI	Grid Connection PV System	NEWJEC Inc.
3	Mr. Nobuo KOMIYA	Electric Equipment	NEWJEC Inc.
4	Mr. Kazuhiro ARITA	Procurement/Cost Estimate	Japan Techno Co., Ltd.
5	Mr. Shoji TAKAMATSU	Institutional/Socioeconomic Expert	Japan Techno Co., Ltd.
6	Mr. Takao SHIRAISHI	Grid Connection and Operation	NEWJEC Inc.
7	Mr. Sho SHIBATA	Coordinator	NEWJEC Inc.

3rd Survey

No.	Name	Position	Affiliation
1	Mr. Tadayuki OGAWA	Team Leader	JICA
2	Mr. Masaru NISHIDA	Chief Consultant / PV Planning	NEWJEC Inc.
3	Mr. Kenichiro YAGI	Grid Connection PV System	NEWJEC Inc.
4	Mr. Takao SHIRAISHI	Grid Connection and Operation	NEWJEC Inc.
5	Mr. Sho SHIBATA	Coordinator	NEWJEC Inc.
6	Ms. Kumiko YODA	Interpreter	JICE

2. STUDY SCHEDULE

1st Survey

	Date	Day	JICA			Consultant							
			Team Leader	Planning Management	Procurement Planning & Management	Chief Consultant/ PV Planning	Grid Connection PV System	Electric Equipment	Procurement/Cost Estimate	Institutional/Socioeconomic Expert	Grid Connection and Operation	Coordinator	Interpreter
			Mr.Kinomoto JICA	Mr.Egami JICA	Ms. Takahashi Crown Agents	Mr. Nishida NEWJEC	Mr. Yagi NEWJEC	Mr. Komiya NEWJEC	Mr. Tsurushima Japan Techno	Mr. Takamatsu Japan Techno	Mr. Shiraishi NEWJEC	Mr. Shibata NEWJEC	Ms. Hiramatsu JICE
0	6-Aug-09	Thu	Move to Kenya										
1	7-Aug-09	Fri	Move to Kenya / Courtesy Call (JICA Kenya Office,EoJ)										
2	8-Aug-09	Sat	Planning the Project										
3	9-Aug-09	Sun	Move to Burundi / Site Survey (CHUK, PLR, PRC)										
4	10-Aug-09	Mon	Courtesy Call (JICA Burundi FO, MoFAIC, MoF, MoEM, MoPH)										
5	11-Aug-09	Tue	Discussion on Minutes (MoEM) Site Survey (CHUK, PLR, PRC)						Discussion on Minutes Discussion with Constructors Discussion on the Project (MoEM)		Discussion on Minutes Site Survey (CHUK, PLR, PRC)		
6	12-Aug-09	Wed	Discussion on Minutes (MoEM, MoF)			Discussion on the Project (MoE, MoEM, REGIDESO)	Discussion on the Project (MoEM, REGIDESO)		Discussion on the Project (MoEM) Discussion with Constructors	Discussion on the Project (MoEM, MoE) Discussion with Constructors	Discussion on the Project (MoEM, REGIDESO)	Discussion on Minutes (MoEM,, MoF)	
7	13-Aug-09	Thu	Discussion on Minutes (MoEM, MoF, MoPH) Reporting the Results of 1st Survey (JICA Burundi FO)			Discussion on Minutes		Site Survey (CHUK, PLR)	Discussion with Constructors Discussion on the Project (MoE)		Discussion on Minutes	Site Survey (CHUK, PLR)	Discussion on Minutes
8	14-Aug-09	Fri	Signing of Minutes (MoEM)			Discussion on the Project (MoEM) Signing of Minutes	Site Survey (CHUK, PLR)		Discussion on the Project (MoEM)	Discussion on the Project (MoE)	Discussion on the Project (MoEM) Signing of Minutes	Site Survey (CHUK, PLR)	Discussion on the Project (MoEM) Signing of Minutes
9	15-Aug-09	Sat	Move to Japan		Move to UK	Planning the Project							
10	16-Aug-09	Sun	Move to Japan		Move to UK	Planning the Project							
11	17-Aug-09	Mon				Discussion on the Project (MoEM)	Site Survey (CHUK, PLR)		Discussion on the Project (MoEM)	Discussion on the Project (MoE)	Discussion on the Project (MoEM)	Discussion on the Project (MoEM)	Site Survey (CHUK, PLR)
12	18-Aug-09	Tue				Discussion on the Project (MoEM, REGIDESO)	Site Survey (CHUK, PLR)		Discussion on the Project (MoEM, REGIDESO)	Discussion on the Project (MoE)	Discussion on the Project (MoEM, REGIDESO)	Planning the Project	Site Survey (CHUK, PLR)
13	19-Aug-09	Wed				Discussion on the Project (MoEM, REGIDESO) / Reporting the Results of 1st Survey (JICA Burundi FO)							
14	20-Aug-09	Thu				Move to Kenya							
15	21-Aug-09	Fri				Reporting the Results of 1st Survey (JICA Kenya Office, EoJ)							
16	22-Aug-09	Sat				Move to Japan							
17	23-Aug-09	Sun				Move to Japan							

2nd Survey

	Date	Day	Consultant						
			Chief Consultant/ PV Planning	Grid Connection PV System	Electric Equipment	Procurement/Cost Estimate	Grid Connection and Operation	Coordinator	Institutional/Socioeconomic Expert
			Mr. Nishida NEWJEC	Mr. Yagi NEWJEC	Mr. Komiya NEWJEC	Mr. Arita Japan Techno	Mr. Shiraishi NEWJEC	Mr. Shibata NEWJEC	Mr. Takamatsu Japan Techno
1	14-Nov-09	Sat	Move to Burundi / Planning the Project						
2	15-Nov-09	Sun	Planning the Project						
3	16-Nov-09	Mon	Discussion on the Project (JICA Burundi FO) Courtesy Call (CHUK, MoEM, MoPH)	Discussion on the Project (JICA Burundi FO) Courtesy Call (CHUK) Site Survey (CHUK)	Discussion on the Project (JICA Burundi FO) Courtesy Call (CHUK)	Discussion on the Project (JICA Burundi FO) Courtesy Call (CHUK)	Discussion on the Project (JICA Burundi FO) Courtesy Call (CHUK, MoEM, MoPH)	Discussion on the Project (JICA Burundi FO) Courtesy Call (CHUK) Site Survey (CHUK)	Discussion on the Project (JICA Burundi FO) Courtesy Call (CHUK, MoEM)
4	17-Nov-09	Tue	Planning the Project	Site Survey (CHUK) Discussion on the Project (REGIDESO)	Site Survey (CHUK)	Discussion with Constructors	Site Survey (CHUK) Discussion on the Project (REGIDESO)	Site Survey (CHUK)	Planning the Project
5	18-Nov-09	Wed	Site Survey (CHUK) Planning the Project	Site Survey (CHUK)		Discussion with Constructors	Site Survey (CHUK) Planning the Project	Site Survey (CHUK)	Discussion on the Project (MoE)
6	19-Nov-09	Thu	Discussion on the Project (MoEM)	Site Survey (CHUK)		Discussion with Constructors	Discussion on the Project (MoEM)	Site Survey (CHUK)	Discussion on the Project (IGEBU)
7	20-Nov-09	Fri	Discussion on the Project (CHUK) Planning the Project	Site Survey (CHUK) Planning the Project		Discussion with Constructors Planning the Project	Discussion on the Project (CHUK) Planning the Project	Site Survey (CHUK) Planning the Project	Discussion on the Project (MoE) Planning the Project
8	21-Nov-09	Sat	Planning the Project						
9	22-Nov-09	Sun	Planning the Project						Move to Japan
10	23-Nov-09	Mon	Discussion on the Project (MoEM)	Site Survey (CHUK)		Discussion with Constructors	Discussion on the Project (MoEM)	Site Survey (CHUK)	
11	24-Nov-09	Tue	Site Survey (CHUK)			Discussion with Constructors	Planning the Project	Site Survey (CHUK)	
12	25-Nov-09	Wed	Discussion on the Project (CHUK) Courtesy Call (MoHENE)	Site Survey (CHUK)		Discussion with Constructors	Discussion on the Project (CHUK) Courtesy Call (MoHENE)	Site Survey (CHUK)	
13	26-Nov-09	Thu	Discussion on the Project (CHUK, MoEM)	Site Survey (CHUK)		Site Survey (CHUK) Discussion with Constructors	Discussion on the Project (CHUK, MoEM)	Site Survey (CHUK)	
14	27-Nov-09	Fri	Planning the Project	Site Survey (CHUK)		Discussion with Constructors	Planning the Project	Site Survey (CHUK)	
15	28-Nov-09	Sat	Planning the Project						
16	29-Nov-09	Sun	Planning the Project						
17	30-Nov-09	Mon	Site Survey (CHUK) Discussion on Basic Design (CHUK)			Discussion with Constructors Discussion on Basic Design (CHUK)	Site Survey (CHUK) Discussion on Basic Design (CHUK)		
18	1-Dec-09	Tue	Reporting the Results of 2nd Survey (MoEM)	Site Survey (CHUK)		Discussion with Constructors	Reporting the Results of 2nd Survey (MoEM)	Site Survey (CHUK)	
19	2-Dec-09	Wed	Courtesy Call (MoFAIC) Discussion on the Project (MoEM) Signing of Minutes (CHUK)	Signing of Minutes (CHUK)			Courtesy Call (MoFAIC) Discussion on the Project (MoEM) Signing of Minutes (CHUK)	Signing of Minutes (CHUK)	
20	3-Dec-09	Thu	Discussion on the Project (MoEM) Reporting the Results of 2nd Survey (JICA Burundi FO)	Reporting the Results of 2nd Survey (JICA Burundi FO)			Discussion on the Project (MoEM) Reporting the Results of 2nd Survey (JICA Burundi FO)	Reporting the Results of 2nd Survey (JICA Burundi FO)	
21	4-Dec-09	Fri	Reporting the Results of 2nd Survey (JICA Kenya Office, EoJ)						
22	5-Dec-09	Sat	Planning the Project						
23	6-Dec-09	Sun	Move to Kenya						

3rd Survey

	Date	Day	JICA	Consultant				
			Team Leader	Chief Consultant/ PV Planning	Grid Connection PV System	Grid Connection and Operation	Coordinator	Interpreter
			Mr. Ogawa JICA	Mr. Nishida NEWJEC	Mr. Yagi NEWJEC	Mr. Shiraishi NEWJEC	Mr. Shibata NEWJEC	Ms. Yoda JICE
1	8-May-10	Sat	Move to Bangkok					
2	9-May-10	Sun	Move to Burundi					
3	10-May-10	Mon	Discussion on the Project (CHUK, MoEM, REGIDESO, JICA Burundi FO, MoF, MoPH)					
4	11-May-10	Tue	Discussion on Minutes (MoEM, MoHENE, CHUK, REGIDESO) Courtesy Call (MoFAIC) Discussion on the Project (REGIDESO)					
5	12-May-10	Wed	Site Survey (REGIDESO Station) Discussion on Minutes (MoEM, MoHENE, CHUK, REGIDESO) Signing of Minutes					
6	13-May-10	Thu	Reporting the Results of 1st Survey (JICA Burundi FO)					
7	14-May-10	Fri	Move to Kenya					
8	15-May-10	Sat	Move to Japan	Planning the Project				

3. LIST OF PARTIES CONCERNED IN THE RECIPIENT COUNTRY

APPENDIXS 3 List of Parties Concerned in the Recipient Country

Name and Organization	Position
Ministry of Energy and Mine	
Mr. Hakizimana Godefroy	Adviser of Minister
Mr. Idi-Buhansa Pressadi	Director General for Water and Energy
Mr. Barampanze Pierre	Director for Energy Department
Mr. Makuwa Moise	Adviser of Renewable Energy
Mr. Sahiri Alois	Technical Adviser
Mr. Sinzinkaya Jeremie	Technical Adviser
Ms. Nahimana Francine	Technical Adviser
Mr. Ndayihaye Nolasque	Electrotechnician
Ministry of Higher Education and Scientific Research	
Mr. Daniel Bitagoye	Adviser for Cabinet Secretariat
CHUK (Centre hospitalo-Universitaire de Kamenge)	
Mr. Novat Twungubumwe	Director General
Ms. Lyduine Baradahana	Vice Director
Mr. Sindayikengera Jean-Marie	Chief of Maintenance and Technology
Mr. Guy Claude Nkundabahizi, Ing.	Sub Chief of Maintenance and Technology
Ministry of Public Health	
Mr. Barambonerenye Cyprien	General Director for Resources
Ministry of Foreign Affairs and International Cooperation	
Mr. Bashikako Ferdinand	Director for Bilateral Relations with the States of Asia and Oceania
Mr. Nsabimana Hypax	Officer for Bilateral Relations with the States of Asia and Oceania
Ministry of Finance	
Mr. Joseph NDAYIKEZA	Chief of Staff
Mr. Simbahwanya Emery-Gaspard	Technical Adviser for Cabinet Secretariat
Mr. Nzeyimama Thacien	Officer for Cabinet Secretariat
Mr. Nimenya Nicodene	Commissioner for Domestic Tax

Ministry of Water and Environment, Territorial Management and Urbanization

Mr. Liberat Nahimana	Officer for Cabinet Secretariat
Ms. Kabura Marie Rose	Director General for Environment and Forest
Mr. Ndikumugisha Kibungere Fabien,	Expert for Environment of Tropical Forest
Mr. Ngenzebuhoro Emmanuella	Technical Expert

REGIDESO (Regié de Prodiction et de Distribution d'Eau et d'Electricité)

Mr. Celestin Nuwamungu	Director General
Mr. Charlesn Kumwami	Chief of Commercial Department
Mr. Sunzu Audare	Chief of Electricity Department
Mr. Baruvura Augustin	Chief of Maintenance
Mr. Nizigirimana Ponetie	Chief of Service
Mr. Karoriro Eugeil	Chief of Equipment
Mr. NtynzwenimanaN	Chief of Power Generation

IGEBU (Institut Géographique du BURUNDI)

Mr. Aloys Rurantije	Director for Climate

JICA Kenya Office

Mr. Kyosuke Kawazumi	Senior Representative
Ms. Tomoko Maekawa	Representative

JICA Burundi Office

Mr. Yoshihiro Norikane	Programme Director
Ms Izumi Tsuchihata	Chief of Mission
Ms. Yoko Hironaka	Programme Director
Mr. Kimararungu Alphonse	National Staff

4. MINUTES OF DISCUSSIONS

Procès-verbal des discussions
sur l'Étude Préparatoire
du Projet de Promotion de l'Énergie Propre
en utilisant le Système Solaire Photovoltaïque
en République du Burundi

Le Gouvernement du Japon (ci-après dénommé « le GDJ ») a établi le "Partenariat Cool Earth" comme un mécanisme financier nouveau. À travers ce dernier, le GDJ coopère activement avec les pays en voie de développement faisant des efforts en vue de réduire les émissions de gaz à effet de serre (GES), tels que la promotion de l'énergie propre. Une nouvelle modalité d'aide financière non remboursable, "Programme d'aide financière non remboursable pour l'environnement et le changement climatique", a aussi été créée par le GDJ comme une composante de ce mécanisme financier. Suivant l'initiative du Partenariat Cool Earth, l'Agence Japonaise de Coopération Internationale (ci-après dénommée « la JICA »), en concertation avec le GDJ, a décidé de mener une étude préparatoire (ci-après dénommée « l'Étude ») pour le Projet de Promotion de l'Énergie Propre en utilisant le Système Solaire Photovoltaïque en République du Burundi (ci-après dénommé « le Projet »).

La JICA a envoyé une équipe d'étude (ci-après dénommée « l'Équipe ») en République du Burundi, dirigée par Monsieur Hiroyuki KINOMOTO, Directeur Général Adjoint du Département d'aide au financement et de supervision des passations de marché de la JICA. L'Équipe y séjournera du 9 au 20 août 2009.

L'Équipe a tenu une série de discussions avec une équipe de Cadres du Gouvernement de la République du Burundi (ci-après dénommé « la Partie burundaise ») et a effectué des visites sur le terrain.

À l'issue de ces discussions et visites sur le terrain, les deux Parties se sont convenues des points mentionnés dans le document joint au présent procès-verbal.

Fait à Bujumbura, le 14 août 2009

Hiroyuki Kinomoto
Chef d'Équipe de l'Étude Préparatoire
Agence Japonaise de Coopération
Internationale
JAPON

Godefroy Hakizimana
Conseiller au Cabinet
Ministère de l'Énergie et des Mines
République du Burundi

Cyprien Baramboneranye
Directeur Général des Ressources
Ministère de la Santé Publique
République du Burundi

DOCUMENT JOINT

1. Situation actuelle

La République du Burundi manque d'électricité chroniquement à cause de l'insuffisance de la capacité de production. La capacité actuelle d'alimentation en électricité au Burundi est seulement de 37,63 mégawatts (MW). Et le déficit d'alimentation est de 12,9MW pendant la saison des pluies et de 23,5 MW pendant la saison sèche lorsque la centrale hydraulique principale du pays fonctionne à capacité réduite. Par conséquent, la population souffrait de la coupure de courant planifiée dans la zone urbaine. La Partie burundaise a essayé de renforcer la capacité d'alimentation du pays, d'étendre le réseau national et d'introduire le système d'énergie renouvelable pour régler le problème.

Dans cette situation, les deux Parties ont confirmé la nécessité du Projet qui introduit un/des système(s) photovoltaïque(s) (PV) connecté au réseau national, et elles se sont mis d'accord pour mener une étude sur le Projet.

2. Objectif du Projet

Le Projet a pour but de promouvoir l'utilisation d'énergies propres et d'arriver à réduire les émissions de gaz en mettant en place un/des système(s) photovoltaïque(s) connecté au réseau national.

3. Organisme responsable et organe d'exécution

L'organisme responsable et l'organe d'exécution est le Ministère de l'Énergie et des Mines (ci-après dénommé « le MEM ») dont l'organigramme est joint en Annexe-1.

4. Éléments requis par le gouvernement du Burundi

4-1. La Partie burundaise a demandé initialement les trois (3) hôpitaux comme sites/installations cibles pour la mise en place du système PV, à savoir l'Hôpital Prince Régent Charles (PRC), l'Hôpital Prince Louis Rwagasore (PLR) et le Centre hospitalo-universitaire de Kamenge (CHUK). Le PRC a été exclu après l'étude sur le terrain menée ensemble par l'Équipe et ses homologues du MEM à cause du manque de terrain suffisant pour l'installation du système PV. L'Équipe a recommandé à la Partie burundaise de donner l'ordre de priorité aux sites demandés. Cependant, la Partie burundaise a expliqué que le CHUK et le PLR, indiqués en

Annexe-2, étaient tous les deux au même niveau où la priorité était élevée.

Nom de l'hôpital	Capacité PV
CHUK	200 kW
PLR	50 kW

Les deux Parties ont convenu de continuer la première phase de l'Étude Préparatoire sur ces deux sites. Cependant, la Partie burundaise a compris qu'il serait possible qu'un seul site soit sélectionné pour le Projet.

4-2. L'Équipe évaluera la pertinence de la demande et fera un compte rendu des résultats de l'Étude au siège de la JICA et au GDJ qui décidera quel(s) hôpital/hôpitaux serait/seraient adopté(s) pour le Projet au point de vue de la limite du budget, la nécessité, la viabilité technique et financière, la durabilité et l'efficacité par rapport au coût.

4-3. La Partie burundaise a compris que les composantes finales et la conception du Projet devront être déterminées (confirmées) au moment de la deuxième phase de l'Étude Préparatoire.

4-4. La Partie burundaise a expliqué qu'il n'y a pas de chevauchements entre le contenu du Projet et celui des plans mis en œuvre par d'autres bailleurs de fond ou par elle-même.

5. Programme japonais d'Aide Financière Non Remboursable pour l'Environnement et le Changement Climatique

La Partie burundaise a compris le Programme japonais d'Aide Financière Non Remboursable pour l'Environnement et le Changement Climatique expliqué par l'Équipe (décrit en Annexe-4, 5, 6, 7 et 8).

6. Calendrier de l'Étude

6-1. L'Équipe effectuera une étude approfondie en République du Burundi jusqu'au 20 août 2009 comme 1ère phase de l'Étude Préparatoire.

6-2. Si le Cabinet du GDJ approuve le Projet basé sur les résultats de l'Étude Préparatoire, la JICA mènera la deuxième phase de l'Étude Préparatoire pour la conception du Projet.

7. Autres points importants discutés/abordés

7-1. Terrain pour l'installation du système PV

Les deux Parties ont confirmé que les terrains pour le Projet indiqués en Annexe-2 sont respectivement les propriétés du CHUK et du PLR. La copie de registre du cadastre jointe en

Annexe-3 approuve la propriété du terrain du PLR. Concernant celle du CHUK, la Partie bunrundaise a promis de la présenter à l'Équipe avant le 19 août 2009.

7-2. Fourniture d'équipements

L'Équipe a expliqué que, conformément à la politique du GDJ, des produits japonais seront fournis pour les équipements principaux dans le cadre du Projet. La Partie burundaise a donné son accord/approbation.

7-3. Coordination avec les institutions concernés

En vue de la mise en oeuvre du Projet, le MEM sera le point focal et il sera responsable pour la coordination avec des institutions concernées, tels que le Ministère des Relations Extérieures et de la Coopération Internationale, le Ministère des Finances, la Régie de Production et de Distribution d'Eau et d'Électricité (REGIDESO), le Ministère de la Santé Publique, le Ministère de l'Enseignement Supérieur et de la Recherche Scientifique, la Banque de la République du Burundi et l'hôpital/les hôpitaux concerné(s). La Partie burundaise a donné son accord afin d'établir un comité consultatif pour coordonner avec la Partie japonaise qui se constitue de l'Ambassade du Japon au Kenya, le bureau de la JICA au Kenya et l'Agent d'approvisionnement. Les attributions dudit comité sont détaillées en Annexe-9.

7-4. Application des lois et des règlements concernés

Puisqu'il n'existe ni lois ni réglements en matière de connexion au réseau national d'énergies renouvelables à présent, la Partie burundaise n'a pas contesté que le MEM procède et exploite le système PV et qu'il fasse la connexion au réseau national ainsi que l'injection du surplus d'énergies produites par ledit système au réseau. Il y aura une convention signée entre l'hôpital/ les hôpitaux et la REGIDESO concernant le règlement de la facture d'électricité à la suite de l'exploitation du système PV.

7-5. Considérations environnementales et sociales

L'Équipe a expliqué à la Partie burundaise l'aperçu des directives des considérations environnementales et sociales de la JICA (ci-après dénommé "les Directives de la JICA"). La partie burundaise en a pris en considération et elle suivra des procédures nécessaires.

Au cours de la première phase de l'Étude Préparatoire, les deux Parties ont confirmé avec le Ministère de l'Environnement que la mise en oeuvre du Projet ne nécessitera aucune procédure en matière d'évaluation de l'impact sur l'environnement.

7-6. Exploitation et Maintenance

La Partie burundaise a convenu d'acquérir et d'accorder le budget ainsi que le personnel nécessaires pour l'exploitation et la maintenance des installations fournies et mises en place dans le cadre du Projet. Elle a exprimé son souhait d'organiser la formation des agents de maintenance des installations.

7-7. Exonération des droits de douane et des taxes

La Partie burundaise a convenu d'assumer la responsabilité de l'exonération de tous les droits de douane, taxes intérieures, levées fiscales et devoirs dans le pays pour la mise en œuvre du Projet. Les deux Parties ont convenu que tous ces droits de douane, taxes intérieures, levées fiscales et devoirs dans le pays soient exemptés et que le nouveau système fiscal, qui a introduit le système de remboursement pour la détaxe, mis en vigueur le 1er juillet 2009, ne soit pas applicable au Projet.

Le MEM assume la responsabilité pour faire des actions nécessaires afin d'assurer que l'exonération de droits ou de taxes soit appliquée au Projet.

7-8 Commissions bancaires

Les deux Parties ont convenu que le paiement de commissions bancaires nécessaires pour la mise en oeuvre du Projet doit être assuré par la Partie burundaise. L'Équipe a expliqué que c'est l'une des conditions préalables à remplir pour bénéficier de l'Aide Financière Non Remboursable du Japon et qu'il n'y a donc aucune exception à cette condition pour le Burundi.

7-9. La Partie burundaise doit assurer la sécurité de tous les ressortissants japonais concernés qui travaillent pour le Projet, si c'est nécessaire.

7-10. La Partie burundaise doit fournir un nombre nécessaire d'homologues à l'Équipe pendant la durée de son étude en République du Burundi.

7-11. La Partie burundaise remettra toutes les réponses au Questionnaire présenté par l'Équipe avant le 17 août 2009.

< Liste des Annexes >

Annexe-1 Organigramme du MEM

Annexe-2 Site/ Site cible du Projet

Annexe-3 Copie de registre du cadastre du site cible du Projet

Annexe-4 Programme d'Aide Financière Non Remboursable pour l'Environnement et le Changement Climatique

Annexe-5 Circulation générale du Programme d'Aide Financière Non Remboursable pour l'Environnement et le Changement Climatique

Annexe-6 Système de mise en œuvre du Projet

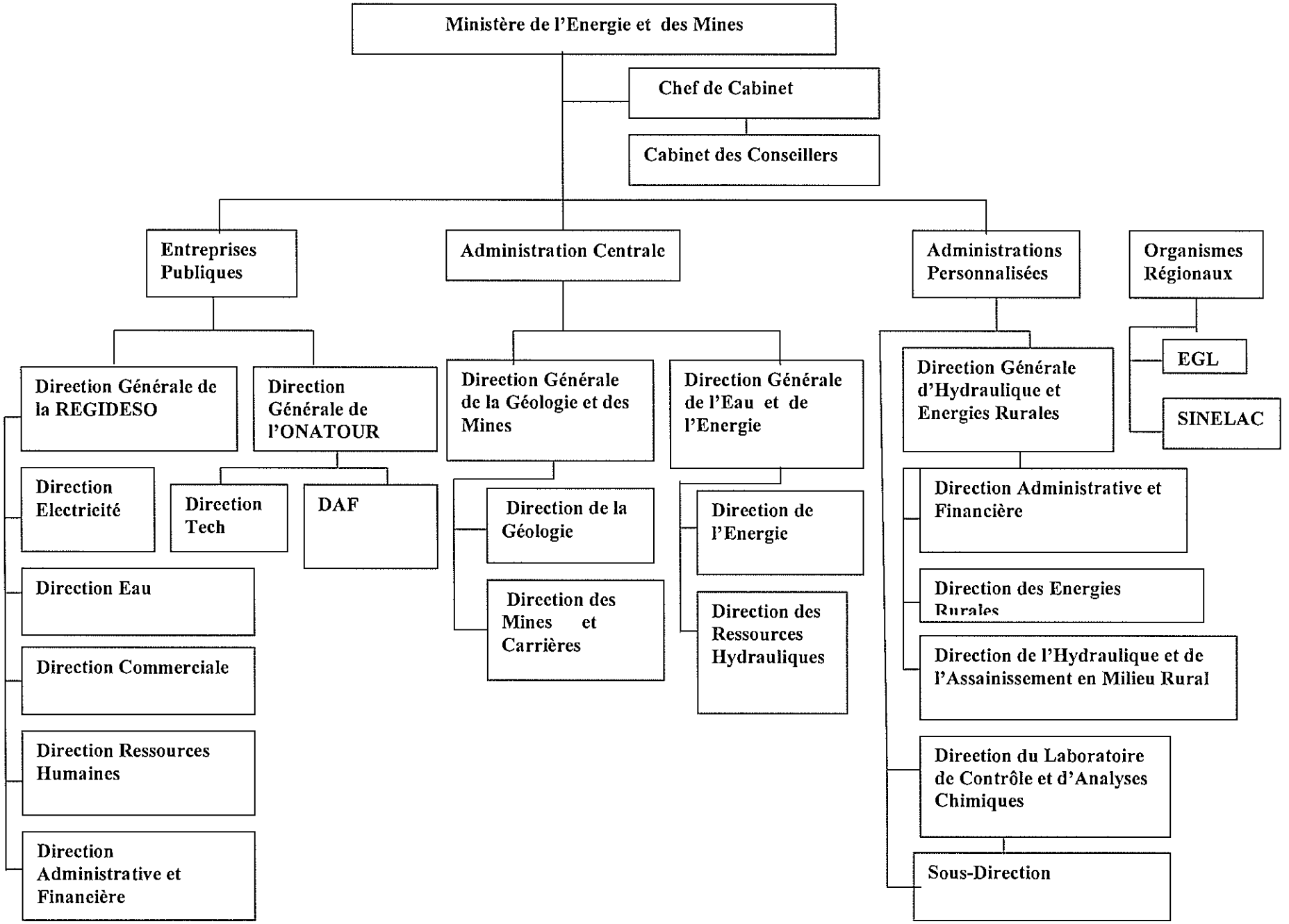
Annexe-7 Circulation de fonds pour la mise en œuvre du Projet

Annexe-8 Mesures principales à prendre par chaque gouvernement

Annexe-9 Attributions du Comité

ORGANIGRAMME DU MINISTERE DE L'ENERGIE ET DES MINES

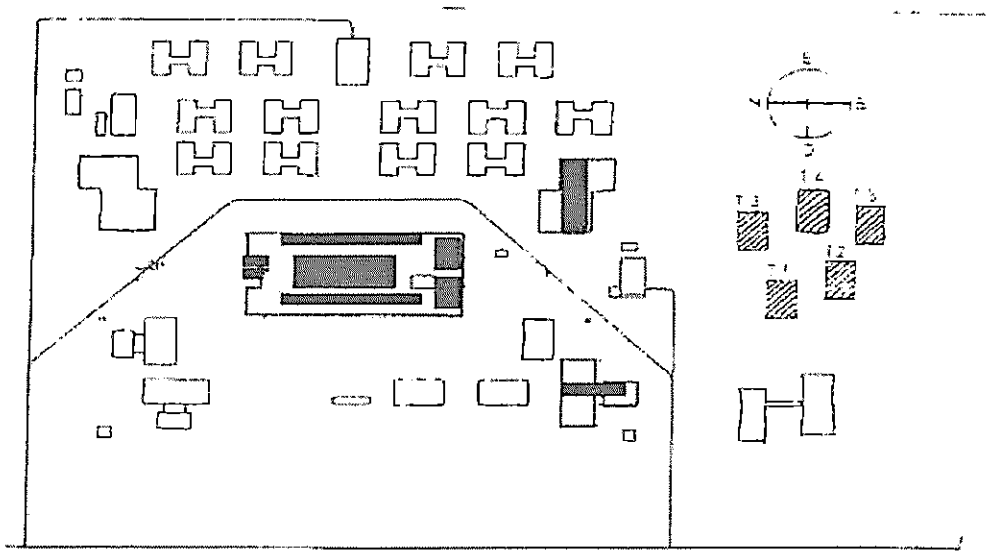
Annexe-1



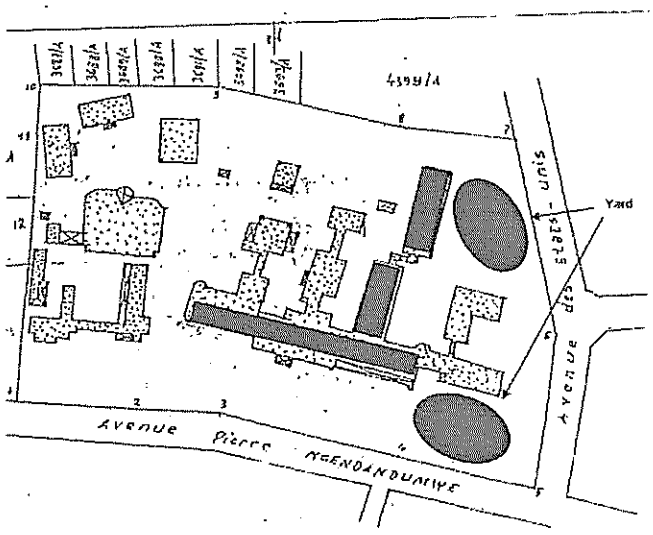
Annexe-2

Site/ Site cible du Projet

Hospitalo-Universitaire De Kamenge (CHUK)



Hospital Prince Louis Rwagasore (PLR)



BURUNDI

Certificat d'enregistrement d'une propriété foncière

Annexe-3

Livre d'enregistrement

Commune de Bujumbura

Vol. ECLXXII folio 72

L'HOPITAL CLINIQUE PRINCE LOUIS RWAGASORE, ayant son siège social à Bujumbura

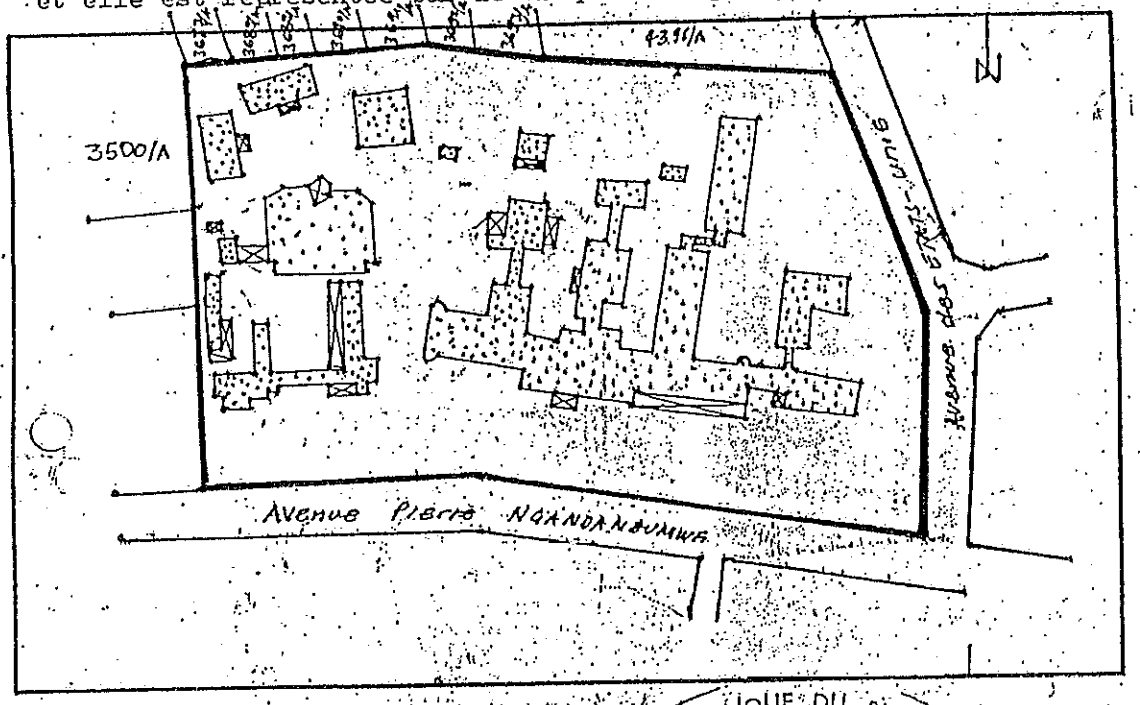
est enregistré comme étant en vertu du contrat de cession gratuite intervenu le douze Mai deux mille cinq avec l'Etat du Burundi et reçu le seize Mai deux mille cinq au Registre-Journal sous les numéros d'ordre général 1830/2005 et spécial A.5462, ----------

propriétaire de l'immeuble indiqué ci-après : une parcelle des terre destinée à un usage d'équipement, située à Bujumbura quartier HOHERO I, contiguë au Nord aux parcelles numéros 3687, 3688, 3689, 3690, 3691, 3692, 3693 et 4398 Division A, à l'Est à l'Avenue des Etats-Unis, au Sud à l'Avenue Pierre NGENDANDUMWE et à l'Ouest aux parcelles non enregistrées et à la parcelle numéro 3500 Division A. Des maisons à usage social en matériaux durables composant l'Hopital y étaient érigées le jour du mesurage officiel.----------

Cette propriété est cadastrée sous le numéro 853 Division A.----------

D'après le procès-verbal d'arpentage et de bornage numéro 25.558 dressé le quinze Mars deux mille cinq, elle a une superficie de cinq hectares trente-neuf ares quatre-vingt-trois centiares (5ha.39a.83ca.),----------

et elle est représentée par le croquis ci-après, fait à l'échelle de 1/2500.-



Les charges qui grèvent cette propriété sont indiquées d'autre part

Délivré à Bujumbura, le seize Mai

deux mille Cinq

Le Conservateur des Titres Fonciers

Célestin [illegible]

REPUBLIQUE DU BURUNDI
MINISTERE DE LA JUSTICE
CONSERVATION DES TITRES FONCIERS.

Localité : ...ROHERO.I.
Parcelle : ..853/A.....
Usage : EQUIPEMENT

CONTRAT DE CESSION GRATUITE.

A: 5462

du.12/..5../2.005

L'Etat du Burundi, représenté par le conservateur des Titres Fonciers, CEDE GRATUITEMENT en propriété à... L'HOPITAL CLINIQUE PRINCE LOUIS... ...RWAGASORE.C.P.L.R.....,qui accepte aux conditions spéciales qui suivent ,un terrain à usage .....EQUIPEMENT.....situé à .ROHERO.I.....étant la parcelle cadastrée sous le n°.....853/A.... d'une superficie de ..5...ha.39..a..83..ca.56...%.

La nature ainsi que les limites du terrai sont parfaitement connues du cessionnaire.

CONDITIONS SPECIALES.

Articles 1 : Le terrain cédé devra servir exclusivement à la construction.....
..... D'UN COMPLEXE HOSPITALIER.....

Article 2 : Le cessionnaire a l'obligation de maintenir l'affectation prévue au présent contrat est soumis aux dispositions restreignant l'exercice des droits fonciers dans l'intérêt général.

Article 3 : Le cessionnaire s'engage à soumettre aux autorités compétentes tous les plans de construction, à respecter toutes les dispositions réglementaires en la matière et à se soumettre notamment à toutes les prescriptions d'ordre esthétique, technique et urbanistique que l'Etat estimerait de voir appliquer.

Article 4 : En aucun cas, le terrain cédé ne peut être cédé, morcelé, sous-loué en tout ou en partie sans l'autorisation écrite et préalable de l'autorité compétente.

Article 5 : L' inexécution d' une des conditions spéciales ci-avant énumérées fera opérer d'office la résiliation du présent contrat.

Fait à Bujumbura, le.12../..5.../2.005.

LE CESSIONNAIRE.

L'HOPITAL CLINIQUE PRINCE ...C.P.L.R.

REPUBLIQUE DU BURUNDI
LE CONSERVATEUR DES TITRES FONCIERS.
Célestin KARUHARIWE
Direction des ... et du Cadastre
MINISTERE DE LA JUSTICE

Province : BUJUMBURA Commune : BUJUMBURA

Zone : ROHERO Localité : ROHERO I

Procès-verbal d'arpentage et de bornage N° 25 - 558 (1)

L'an deux mille Cinq, le 8 Mars (2)

Nous, NDIKUMAGENGE Tharcisse et BIGIRINDAVYI Emmanuel (3)

géomètre du cadastre (4)

certifions avoir procédé au mesurage et au bornage de la parcelle décrite ci-après, à la demande de

de l'Hôpital Clinique Prince Louis RWAGASORE C.P.L.R.

la parcelle est située à ROHERO I

Elle est contiguë (5) Voir indications au broquis

Elle fait l'objet de la parcelle cadastrée sous le N° 853/A

et enregistrée volume E. CLXX II folio 72 (6)

Elle provient du morcellement de la parcelle cadastrée sous le N°

et enregistrée volume folio (6)

Les constructions suivantes y sont érigées à ce jour (7) Des maisons à usage social construites en matériaux durables composant l'hôpital

Instruments employés pour le mesurage : Une boussole d'arpenteur TOPOCHAIX et un ruban en acier de 50 mètres

(1). Réservé à l'administration.
(2). Date de mesurage et de bornage.
(3). Nom, prénoms et domicile.
(4). Barrer l'inscription qui ne convient pas.
(5). Renseigner les propriétés contiguës au Nord, à l'Est, au Sud et l'Ouest.
(6). Barrer l'annotation qui ne convient pas et, le cas échéant les deux annotations.
(7). Maisons d'habitations, magasins ou annexes, etc. (nature des matériaux).

N.B. : Aucune rature ni surcharge ne peuvent être faites au présent procès-verbal.
Les erreurs doivent être rectifiées par des annotations datées et signées par le géomètre-arpenteur.

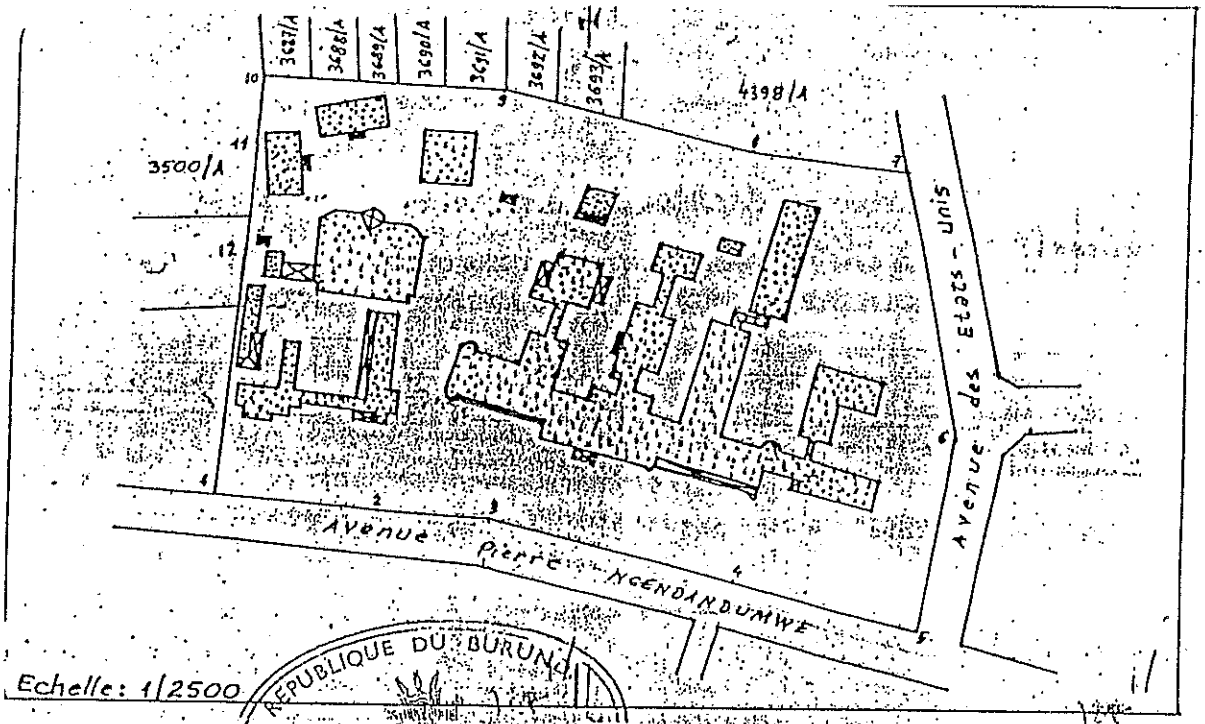
Sommets du périmètre et leur description	Longueur des côtés réduite à l'horizon (1)	Angles aux sommets Grades (2) (1)	Autres renseignements éventuels permettant le calcul de la superficie, l'établissement, l'orientation du croquis (azimut ou gisement ou orientation d'un côté) ainsi que le repérage des sommets	Description des côtés	Tenants et aboutissants
1. Borne		99.74			
	66.87				
2. "		208.32			
	48.18				
3 "		204.76			
	102.52				
4. "		198.58			
	78.47				
5. "		91.56			
	91.89				
6. "		178.86			
	117.05				
7. "		120.75			
	64.45				
8. "		208.21			
	103.48				
9. "		185.36			
	99.39				
10. "		101.73			
	29.92				
11. "		200.60			
	40.92				
12. "		201.53			
	107.03				
1. (déjà décrit)					

(Tous les côtés sont des droites)

(Voir les indications au croquis)

1. D'après mesure ou calcul
2. Barrer l'inscription qui ne convient pas.

N.B. Les renseignements imposés par les colonnes 1, 2, 3 et 6 sont indispensables



Echelle: 1/2500

REPUBLIQUE DU BURUNDI
MINISTERE DE LA JUSTICE

Superficie : 05 ha 39 a 83 ca 96 % (2)

cinq hectares, trente-neuf ares, quatre-vingt trois centiares, nonante six

pourcent

Observations du géomètre-arpenteur

. relatives au bornage (4) Des bornes mitoyennes existaient aux sommets 1,2,3,4,5,6,7

8,9,10,11 et 12

. autres observations (5) Néant

Nous certifions sur notre honneur que les informations fournies ci-dessus

ont sincères et conformes à la réalité.

ressé en triple exemplaires à BUJUMBURA le 15/3/2005

) Le géomètre du cadastre

Le propriétaire

CHANCELLERIE PRIMOR
B.P. 252
Bujumbura
Louis RWAGASORE

. L'échelle doit être choisie de manière à inclure clairement tout le croquis dans le cadre. Si ce n'est pas possible, le croquis à plus grande échelle sera annexé au procès-verbal et le réservé au croquis devra mentionner les mots : voir plan annexé ci-joint.

Superficie calculée numériquement, en chiffres,

idem en toutes lettres,

Des bornes mitoyennes ont été placées au sommet _____ Des bornes mitoyennes existaient aux sommets

Impossibilité matérielle de placer une borne au sommet _____ cause : _____ ; repérage au sommet non borné, etc.

Servitude éventuelles ; discordance constatée, d'après bornes existantes, entre côtés communs, etc.

. Barrer l'inscription qui ne convient pas.

Certificat d'enregistrement établi à la suite du procès-verbal.

Vol 6 CLXXII Fo 72

BUJUMBURA LE 16/03/05

LE CHEF D'ANTENNE CHEF

NTIRUKIRYA ADRIEN

Renseignement du service du cadastre

A la suite du présent procès-verbal, la parcelle est cadastrée sous le N° 853/A

BUJUMBURA, le 16/MAR/2005

LE CHEF DU SERVICE DU CADASTRE NATIONAL,

Service du Cadastre National

Evidence

Annexe-4

L'Aide Non Remboursable pour l'Environnement et le Changement Climatique

(Provisoire)

Le Gouvernement du Japon (ci-après dénommé "le GDJ") est la mise en œuvre des réformes structurelles pour améliorer la qualité des opérations de l'Assistance Publique pour le Développement (APD), et dans le cadre de ce réalignement, la nouvelle loi de la JICA est entré en vigueur le 1 Octobre, 2008. Sur la base de la loi et la décision du GDJ, l'Agence japonaise de coopération internationale (ci-après dénommé «la JICA») est devenue l'agence d'exécution du Programmatique Coopération financière non remboursable (ci-après dénommé « le Don ») pour l'Environnement et les Changements climatiques (ci-après dénommé «la CFEC»).

La Don fournit un pays bénéficiaire (ci-après dénommé «le Bénéficiaire») avec des fonds non remboursables pour se approvisionner des installations, des équipements et des services (services d'ingénierie et de transport des produits, etc.) pour le développement économique et social du pays en vertu des principes en accord avec les lois et règlements du Japon. Le Don n'est pas fourni par l'intermédiaire du don des matériaux comme tels.

La CFEC vise à réduire des émissions vers tels que la réalisation d'économies d'énergie et le contrôle de dégradation de l'environnement à cause du changement climatique. Plusieurs composantes peuvent être combinées pour répondre efficacement aux besoins. Des contractants, des fournisseurs ou des consultants ne se limitent pas seulement à des entreprises japonaises, et la construction peut se faire sur la base du mode local.

1. Procedures de CFEC

La CFEC est exécuté par les procédures suivantes.

L'Application (Requête faite par le Bénéficiaire)
L'Étude (étude de conception sommaire réalisée par la JICA)
L'Évaluation et d'approbation (Evaluation par le GDJ et l'approbation par le Conseil des ministres)
La Détermination de la mise en oeuvre (les Notes échangées entre le GDJ et le Bénéficiaire)
L'Accord de Don (ci-après dénommé « le A/D ») (l'accord conclu entre la JICA et le Bénéficiaire)

Premièrement, la formule de candidature ou la requête pour un CFEC programme soumise par un pays Bénéficier est examinée par le GDJ (le Ministère des Affaires Etrangères) pour porter un jugement sur son éligibilité pour CFEC.

Deuxièmement, la JICA exécute l'étude de concept sommaire (ci-après dénommé « l'Étude »), en principe sous contrat avec un ou des bureau(x) japonais.

Troisièmement, le GDJ évalue le programme pour voir s'il est adéquat au système de la CFEC, sur la base du rapport de l'Étude préparée par la JICA et les résultats sont par la suite soumis au Conseil des ministres pour approbation.

Quatrièmement, le programme, une fois approuvé par le Conseil des ministres, dévient officiel

par l'Échange de Notes signé par le GDJ et le gouvernement du pays bénéficiaire. Simultanément, le Don sera rendu disponible après la conclusion du A/D entre le gouvernement du Bénéficiaire ou de son autorité désignée et la JICA.

La JICA est désignée par le Gouvernement japonais comme une organisation chargée de l'exécution de Don.

L'agent d'approvisionnement (ci-après dénommé « l'Agent ») est désigné à effectuer des services d'approvisionnement et des services (y compris la gestion de fond, la préparation des offres, des contrats et ainsi de suite) pour la CFEC au nom du Bénéficiaire. L'agent est un organisme impartial et spécialisé et doit rendre des services en fonction de l'accord d'agent avec le Bénéficiaire. L'agent est recommandé au Bénéficiaire par le GDJ et par convenue entre les deux gouvernements dans le procès-verbal convenus (« P / V »).

2. L'Étude de Concept de Sommaire

1) Contenu de l'Étude

Le but de l' Étude effectuée par la JICA sur un programme requis (ci-après dénommé « le programme » est de fournir un document de base nécessaire à l'évaluation du Programme par le GDJ. Le contenu de l'Etude est le suivant :

(1) Confirmer l'arrière-plan, les objectifs et les effets du Programme ainsi que les capacités de maintenance du pays bénéficiaire de l'exécution du Programme.
(2) Évaluer la pertinence du Programme à être exécutée sous le système de coopération financière non remboursable aux points de vue technologique, social et économique.
(3) Confirmer les éléments convenus par les deux Parties, relatifs au concept de sommaire du Programme.
(4) Préparer un plan de concept de sommaire du Programme
(5) Estimer les coûts du Programme.

Le contenu de la requête n'est pas obligatoirement approuvé en tant que contenu du Don. Le Concept de Sommaire du Programme doit être confirmé par rapport au cadre d'aide financière non remboursable du Japon. Le GDJ demande au Bénéficiaire de prendre toutes les mesures qui pourraient s'avérer nécessaires pour assurer son indépendance lors de l'exécution du Programme. Ces mesures doivent être garanties même si elles n'entrent pas dans la juridiction de l'organisme du pays bénéficiaire en charge de l'exécution du Programme. Par conséquent, l'exécution du Programme doit être confirmée par toutes les organisations concernées du pays bénéficiaires par la signature du Procès-verbal des Discussions.

2) Sélection de consultants

En vue de la bonne exécution de l'Etude, la JICA effectue une sélection parmi les consultants enregistrés auprès de la JICA après avoir procédé à un examen des propositions soumises par ces derniers. Le consultant sélectionné procède à l'étude du concept de sommaire afin d'assurer une cohérence technique entre l' Étude et le plan détaillé.

3. Exécution du CFEC après de l'E/N

1) L'E/N et l'A/D)

La CFEC est mise à disposition conformément aux notes échangées par les deux gouvernements concernés, dans lesquelles les objectifs du programme, la période d'exécution, les conditions et le montant du Don, etc., sont confirmés. La conclusion de l'A/D entre la JICA et le Bénéficiaire sera suivie pour définir la procédure nécessaire pour mettre en œuvre le programme tel que les conditions de paiement, les responsabilités du Bénéficiaire et les conditions d'approvisionnement.

2) Procédures détaillées

Les procédures détaillées sur l'approvisionnement de produits et de services sous la CFEC seront convenues entre le Bénéficiaire et la JICA au moment de la signature de l'E/N et A/D.

Les points essentiels à convenir sont décrits comme suit:

a) La JICA est en mesure d'accélérer la bonne exécution du Programme.

b) Les produits et services doivent être achetés et fournis conformément aux " Directives de l'Approvisionnement pour l'Aide Non-Remboursable pour l'Environnement et le Changement Climatique de la JICA (Type I-E) (ci-après dénommées «les Directives de l'Approvisionnement»).

c) Le Bénéficiaire doit conclure un contrat de travail avec l'agent.

d) L'agent est le représentant agissant au nom du Bénéficiaire concernant les transferts de fonds à l'Agent.

3) Points focaux du «Directives de l'Approvisionnement

a) L'Agent

L'agent est l'organisation qui fournit des services d'approvisionnement de produits et de services pour le compte du Bénéficiaire en fonction de l'agent avec l'accord du Bénéficiaire. L'agent est recommandé au Bénéficiaire par le GDJ et est convenu entre les deux gouvernements dans les Modalités d'Application (ci-après dénommé « le M/A »).

b) L'Accord d'Agent

Le Bénéficiaire doit conclure un accord de l'agent, dans un délai de deux mois après la date d'entrée en vigueur de l'E/N et l'A/D, conformément au M/A. L'étendue des services de l'Agent doit être clairement spécifiée dans l'accord d'agent.

c) Approbation de l'Accord d'Agent

L'accord d'agent, qui est établi que deux documents identiques, sera soumis à la JICA par le Bénéficiaire par le biais de l'Agent. La JICA confirme ou non l'Accord d'Agent est conclu en conformité avec l'A/D et les Directrices d'Approvisionnement, et approuve l'accord.

L'accord d'Agent conclu entre le Bénéficiaire et l'Agent prend effet après l'approbation par la JICA sous forme écrite.

d) Les méthodes de paiement

L'Accord d'Agent doit stipuler que «le Bénéficiaire nommera un agent d'approvisionnement comme représentant agissant au nom du bénéficiaire. concernant tous les transferts des fonds au Compte d'Approvisionnement conformément à l'E/N et à l'A/D ».

L'Accord d'agent doit indiquer clairement que le paiement à l'agent doit être faite en yen japonais et de l'avance que le paiement final à l'agent doit être effectuée lorsque le montant restant est inférieur à trois (3%) du Don et ses intérêts courus.

e) Produits et services éligibles pour l'approvisionnement

Les produits et services qui seront achetés doivent être choisis parmi ceux définis dans l'A/D.

f) Les firmes

En principe, un firme de toute nationalité peuvent être contracté si le firme satisfait aux conditions énoncées dans le dossier d'appel d'offre.

Le firme, avec l'approbation de la JICA, peut être des nationaux japonais et les produits qui seront achetés peuvent être des produits fabriqués au Japon ou produites ou fabriquées par le fabricants japonais et / ou son (leur) affilié (s) dans quelque pays.

g) Les experts d'assistance technique

Les expert(s) pouvant être envoyés pour mettre en œuvre l'assistance technique. L'expert (s) pouvant être recommandé par la JICA lorsque la cohérence conceptuelle de l'Etude est exigé. En principe, les expert (s) est / sont préférables à des nationaux japonais, si approprié.

h) Méthode d'approvisionnement

Dans l'exécution d'approvisionnement, il doit faire attention suffisante afin qu'il n'y ait pas d'injustice parmi les soumissionnaires qui sont éligibles pour l'achat de produits et de services.

À cette fin, on applique l'appel d'offres, en principe.

i) Les dossiers d'appel d'offres

Les dossiers d'appel d'offres doivent contenir toutes les informations nécessaires pour permettre aux soumissionnaires de préparer des offres valables pour les produits et services dans la CFEC.

Les droits et obligations du Bénéficiaire, l'Agent et les fournisseurs des produits et services doit être stipulé dans le dossier d'appel d'offres qui sera établi par l'Agent. En outre, il faut élaborer le dossier d'appel d'offres en consultation avec le Bénéficiaire.

j) L'examen de préqualification des soumissionnaires

L'Agent peut effectuer une préqualification des soumissionnaires à l'avance d'appel l'offres afin qu'il peut attendre l'invitation aux soumissionnaires éligibles. Il doit effectuer la préqualification seulement en ce qui concerne la question de savoir si ou non les soumissionnaires potentiels ont la capacité de réaliser les contrats concernés sans faute. Dans ce cas, les points suivants devraient être pris en considération:

(1) L'expérience et le rendement passé des contrats de même nature
(2) Propriété fondation ou la crédibilité financière
(3) l'existence de bureaux, etc. à préciser dans les dossier d'appel d'offres.

k) L'évaluation des offres

L'évaluation des offres devrait être mis en œuvre sur la base des conditions stipulées dans le dossier d'appel d'offres.

Ces offres substantiellement conformant aux spécifications techniques, et sont sensibles à d'autres dispositions des dossier d'appel d'offres, doivent être jugés, en principe, sur la base de ces prix soumis, et le soumissionnaire qui propose le prix le plus bas doit être désigné comme adjudicataire.

L'Agent rédigera un rapport détaillé d'évaluation des offres, de clarifier les raisons de la réussite de l'offre et la récusation et soumet au Bénéficiaire pour obtenir la confirmation avant de conclure le contrat avec l'adjudicataire.

L'Agent doit fournir la JICA à un rapport d'évaluation détaillé de l'offre, en donnant les raisons de l'acceptation ou le rejet des offres.

l) Fournissement additionnel

S'il existe un fond additionnel après l'appel d'offres concurrentiels et / ou sélectifs et / ou la négociation directe d'un contrat, et le Bénéficiaire désire un fournissement additionnel, il est permis à l'Agent d'effectuer un fournissement additionnel, à la suite des points mentionnés ci-dessous:

(1) Fournissement des mêmes produits et services

Lorsque les produits et services à fournir sont identiques à l'appel d'offres initial et un appel d'offres à la concurrence est jugée défavorable, le fournissement additionnel peut être mis en œuvre par un contrat direct avec l'adjudicataire de l'appel d'offres initial.

(2) Autres fournissements

Lorsque les produits et services autres que ceux mentionnés ci-dessus (1) doivent être obtenus, les fournissement devra être mis en œuvre par le biais d'un appel d'offre à la concurrence. Dans ce cas, les produits et services pour fournissement additionnel doit être choisi parmi ceux qui, conformément à l'A/D.

m) Conclusion des contrats

Dans le but de fournir des produits et des services en conformité avec les Directives d'approvisionnement, l'Agent doit conclure des contrats avec des firmes sélectionnées par l'appel d'offres ou d'autres méthodes.

n) Modalités de paiement

Le contrat doit indiquer clairement les modalités de paiement. L'Agent doit effectuer le paiement des "Avances", en échange de la soumission des documents nécessaires du firme sur la base des conditions stipulées dans le contrat, après que les obligations du Firme ont été remplies. Lorsque les services sont l'objet de fournissement, l'Agent peut payer certaine partie du montant du contrat à l'avance pour les firmes sur les conditions que ces firmes de présenter au paiement à l'avance une valeur de garantie du montant de l'avance à l'Agent.

4) Les obligations pour le gouvernement du pays bénéficiaire

Dans la mise en œuvre de la subvention du programme, le gouvernement du pays bénéficiaire prendra les mesures nécessaires pour :

a) acquérir [un parcel] / [des parcels] de terrain nécessaire[s] pour la mise en œuvre du Programme et [l'/les]aménager;
b) fournir les installations hors du terrain mentionné à (a) ci-dessus telles que les systèmes d'alimentation en eau et en électricité, et d'écoulement des eaux ainsi que d'autres installation auxiliaires nécessaires pour la mise en œuvre du Programme;
c) assurer les établissements avant le fournissement dans le cas de l'installation de l'équipement
d) assurer le déchargement et le dédouanement rapides aux ports de débarquement du Bénéficiaire et faciliter leur transport intérieur / le dédouanement rapide et faciliter leur transport intérieur dans le pays bénéficiaire des produits;
e) assurer que des droits de douane, des taxes intérieures et d'autres charges fiscales qui pourraient être imposés au pays bénéficiaire à l'égard de l'achat des produits et services, ainsi que de l'emploi de l'Agent seront exonérés / seront supportés par l'autorité désignée par le gouvernement du pays bénéficiaire sans utiliser le Don et son intérêt couru;
f) accorder aux nationaux japonais et/ou nationaux des pays-tiers, y compris les nationaux employés par l'Agent, dont les services pourraient être nécessaires pour la fourniture des Composants, les facilités nécessaires pour leurs entrées et séjours au pays bénéficiaire, afin qu'ils puissent effectuer leur travail (Le terme «les nationaux» dans l'Accord signifie les personnes physiques japonaises ou les personnes morales japonaises contrôlées par les personnes physiques japonaises dans le cas des nationaux japonais, et les personnes physiques ou morales des pays-tiers dans le cas des nationaux des pays-tiers.);
g) assurer que [les Etablissements]/[les Etablissements et les Composants] seront entretenus et utilisés d'une manière convenable et efficace pour la mise en oeuvre du Programme;
h) supporter tous les frais nécessaires pour la mise en œuvre du Programme, à part les frais qui sont couverts par le Don et son intérêt couru; et
i) tenir dûment compte des questions environnementales et sociales dans la mise en œuvre du Programme.

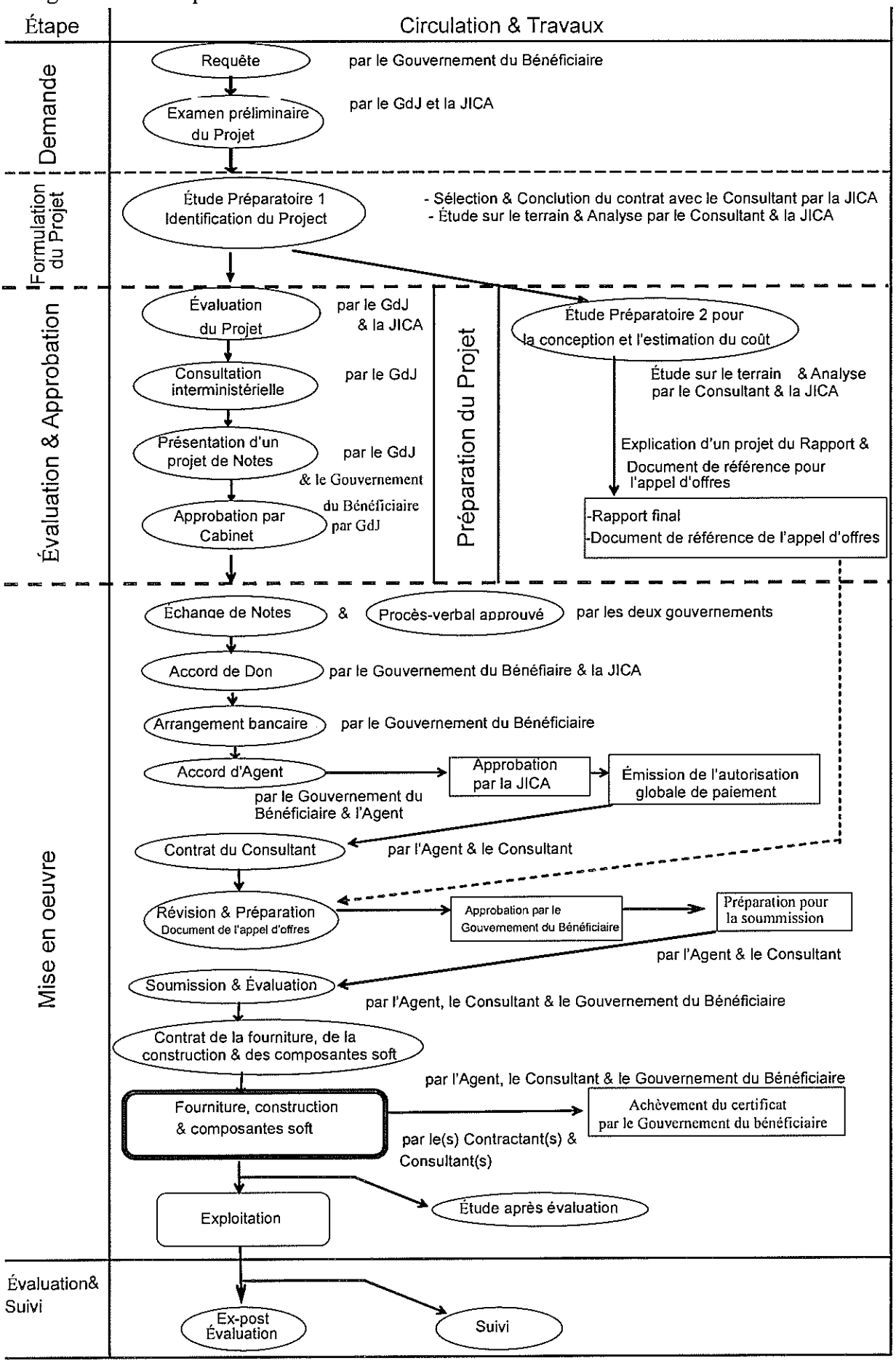
5) Utilisation approprié

Il exige au Bénéficiaire d'exploiter et maintenir les installations construites et les équipements achetés dans le cadre du Don adéquatement et efficacement et d'assigner le personnel nécessaire pour cette opération et de maintenance ainsi que de supporter tous les frais autres que ceux couverts par le Don.

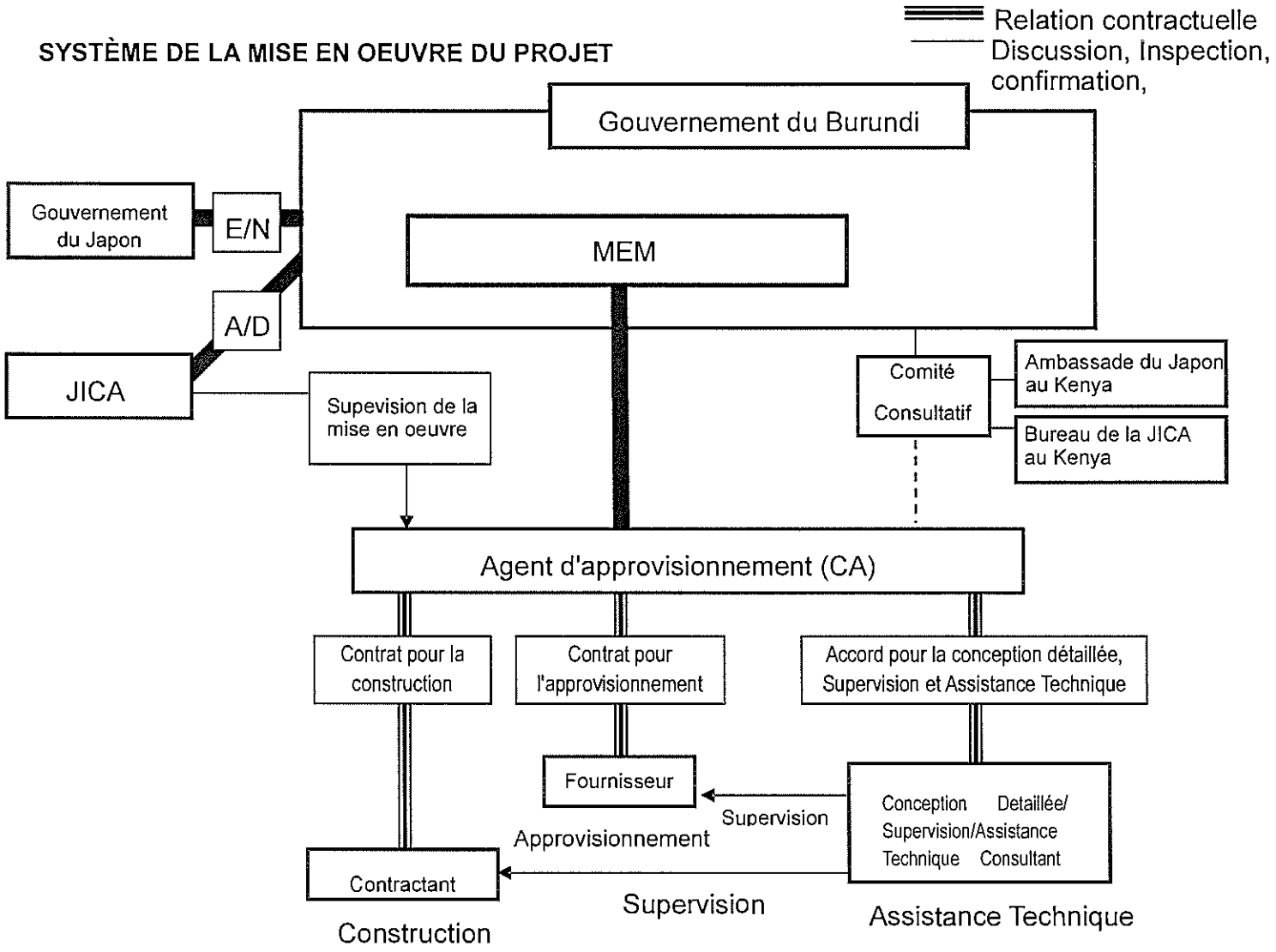
6) Réexportation

Le produits achètes sous le Don ne seront ni exportés ni réexportés du pays bénéficiaire.

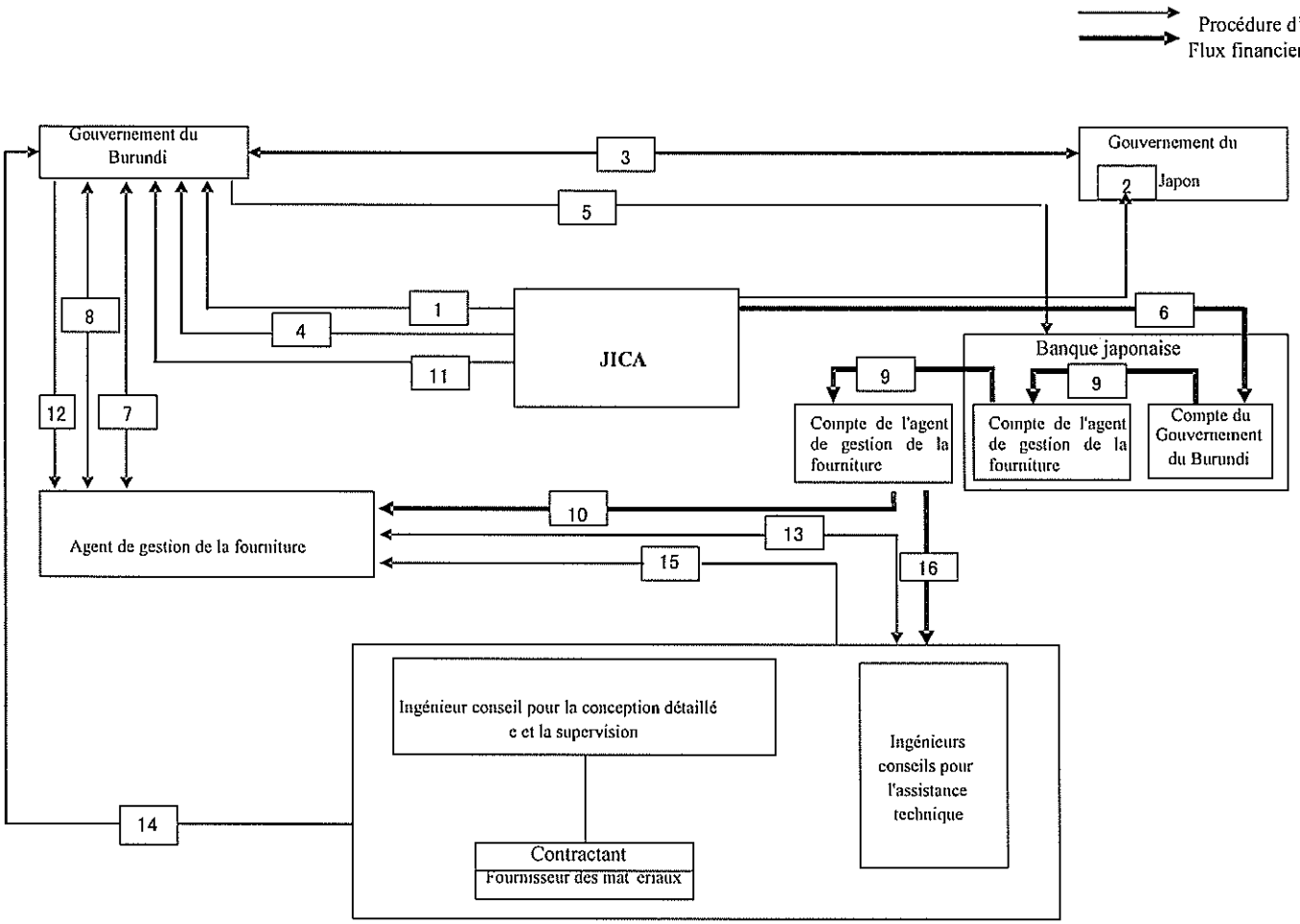
Circulation générale du Programme d'aide financière non remboursable pour l'environnement et le changement climatique



Circulation de fonds pour la mise en œuvre du Projet



Système de mise en œuvre du Projet



1 Etude préparatoire/Matériaux pour la conception générale

2 Approbation du Cabinet

3 Signature de l'Echange de Notes (E/N)

4 Signature de l'Accord de Don (G/A)

5 Arrangement bancaire

6 Paiement du fonds du Gouvernement du Japon

7 Signature de l'Accord d'Agent (A/A)

8 Décision des composants du projet

9 Transferts de fonds (Avances)

10 Paiement de rémunération de l'Agent

11 Recommandation d'ingénieur conseil pour la conception détaillée et la supervision (JICA → Gouvernement du Djibouti)

12 Recommandation d'ingénieur conseil pour la conception détaillée et la supervision (Gouvernement du Djibouti → Agent de fourniture)

13 Conclusion du Contrat

14 Construction, fourniture, et assistance technique

15 Demande de paiement

16 Paiement

Annexe-8

Mesures à prendre par chaque gouvernement (Version CFEC)

	Eléments	à couvrir par le Don	à couvrir par la partie bénéficiaire
1	Obtenir une superficie de terrain suffisante		•
2	Défrichage, mise à niveau et récupération du terrain si nécessaire		•
3	Construction de portails et des clôtures autour du terrain		•
4	Construction de parking		•
5	Construction de la route		
	1) A l'intérieur du site	•	
	2) A l'extérieur du site		•
6	Construction de bâtiment	•	
7	Fournir les installations pour la distribution d'électricité, l'eau courante, l'égout et les autres installations accessoires :		
	1) Electricité		
	a. La ligne de distribution jusqu'au site		•
	b. Le câblage de branchement et le câblage interne sur le site	•	
	c. Le disjoncteur du circuit principal et le transformateur	•	
	2) Alimentation en eau		
	a. Conduite principale d'eau courante urbaine jusqu'au site		•
	b. Système d'alimentation sur le site (réservoir de réception et château d'eau)	•	
	3) Drainage		
	a. Conduite principale urbaine d'égout(pour évacuer l'eau de pluie, les eaux d'égout etc. du site)		•
	b. Système d'égout sur le site (pour les eaux d'égout, les déchets ordinaires, l'eau de pluie etc.)	•	
	4) Alimentation en gaz		
	a. Conduite principale urbaine de gaz jusqu'au site	Néant	Néant
	b. Système d'alimentation en gaz sur le site	Néant	Néant
	5) Téléphone		
	a. Ligne téléphonique de jonction jusqu'au répartiteur d'entrée (MDF) du bâtiment		•
	b. MDF et extension après le répartiteur	•	
	6) Mobilier et équipement		
	a. Mobilier ordinaire		•
	b. Equipements du projet	•	

8	Prise en charge des commissions suivantes de la banque japonaise pour les services bancaires basés sur les arrangements bancaires (B/A):		
	1) Commission de notification de l'autorisation de paiement (A/P)		•
	2) Commission de paiement		•
9	Déchargement et dédouanement à l'entrée du pays bénéficiaire		
	1) Transport vers le pays bénéficiaire par mer (air) de produits	•	
	2) Exonération d'impôt et dédouanement des produits au port de débarquement		•
	3) Transport à l'intérieur du pays entre le port de débarquement et le site	•	
10	Accorder à toutes les personnes concernées dont les services pourraient être requis en relation avec la fourniture des produits et les services sous le contrat, toute l'aide nécessaire pour assurer leur arrivée dans le pays bénéficiaire et y permettre leur séjour afin qu'ils puissent exécuter lesdits services.		•
11	Exonération de droits de douane, taxes intérieures et ou autres levées fiscales imposées dans le pays bénéficiaire au nom des parties concernées à l'égard de la fourniture des produits et les services sous le contrat		•
12	Exploitation et maintenance correcte et efficace des installations construites et des équipements fournis dans le cadre de Don		•
13	Prise en charge de toutes dépenses, autres que celles couvertes par le Don, nécessaires à la construction des installations, au transport et à la mise en place des équipements.		•
14	Tenir dûment compte des questions environnementales et sociales dans la mise en œuvre du Programme.		•

Annexe-9

Les attributions du Comité

1. confirmer un calendrier de la mise en oeuvre du [Projet] / [Programme] afin d'utiliser le Don et son intérêt couru sans retard et de façon efficace;

2. discuter sur les modifications du [Projet] / [Programme], y compris les modifications de plan des Etablissements;

3. échanger des vues sur la répartition du Don et son intérêt couru ainsi que sur les utilisateurs finaux potentiels;

4. identifier des problèmes qui pourraient retarder l'utilisation du Don et son intérêt couru et chercher les solutions à de tels problèmes;

5. échanger des vues sur la publicité concernant l'utilisation du Don et son intérêt couru et

6. discuter sur toutes autres questions qui pourraient surgir de ou en relation avec l'Accord.

Minutes of Discussions
on the Preparatory Survey
on the Project for Clean Energy Promotion Using Solar Photovoltaic System
in the Republic of Burundi

The Government of Japan (hereinafter referred to as “GoJ”) has established Cool Earth Partnership as a new financial mechanism. Through this, GoJ is cooperating actively with developing countries' efforts to reduce greenhouse gasses emissions, such as efforts to promote clean energy. A new scheme of grant aid, "Program Grant Aid for Environment and Climate Change," was also created by GoJ as a component of this financial mechanism. According to the initiative of Cool Earth Partnership, the Japan International Cooperation Agency (hereinafter referred to as “JICA”), in consultation with GoJ, decided to conduct a Preparatory Survey (hereinafter referred to as “the Survey”) on the Project for Clean Energy Promotion Using Solar Photovoltaic System in Burundi (hereinafter referred to as "the Project").

JICA sent to the Republic of Burundi the Preparatory Survey Team (hereinafter referred to as "the Team”), headed by Mr. Hiroyuki Kinomoto, Deputy Director General of Financing Facilitation and Procurement Supervision Department, JICA, and is scheduled to stay in the country from August 9 to August 20, 2009.

The Team held discussions with the concerned top officials of the Government of Burundi and conducted a field survey.

In the course of discussions and field survey, both sides confirmed the main items described in the attached sheets.

Bujumbura, August 14, 2009

Hiroyuki Kinomoto
Leader
Preparatory Survey Team
Japan International Cooperation Agency
JAPAN

Hakizimana Godefroy
Conseiller au Cabinet
Ministry of Energy and Mines
The Republic of Burundi

Baramboneranye Cyprien
Directeur General des Ressources
Ministry of Health
The Republic of Burundi

ATTACHMENT

1. Current Situation

Burundi has a chronic shortage of electricity due to the lack of supply capacity. The current power supply capacity in Burundi is only 37.63 megawatts (MW) and the supply deficit is 12.9MW during the rain season and 23.5 MW during the dry season when the country's main hydropower plants are running at reduced capacity. As a result, people have been suffering from scheduled blackouts in the city area. The Burundi side has tried to increase the country's power supply capacity, expand the national power grid and introduce renewable energy systems to settle the problem.

In this situation, both sides confirmed the necessity of the Project, which introduces the photovoltaic (PV) system(s) connected to the national power grid, and agreed to proceed with the study on the Project.

2. Objective of the Project

The objective of the Project is to promote clean energy utilization and achieve emissions reductions by installing (a) PV system(s) to be connected to the national grid.

3. Responsible Organization and Implementing Agency

The responsible organization and the implementing agency is the Ministry of Energy and Mines (hereinafter referred to as the "MOEM," whose organization chart is shown in Annex-1.)

4. Items Requested by the Government of Burundi

4-1. The Burundi side had originally requested three public hospitals, namely Hospital Prince Regent Charles (PRC), Hospital Prince Louis Rwagasore (PLR), and Hospitalo-Universitaire De Kamenge (CHUK), as candidate sites/facilities for installation of the PV system. The Hospital Prince Regent Charles (PRC) was excluded, after the joint survey conducted by the Team and MOEM counterparts, due to lack of the sufficient space for PV system installation.

The Team recommended the Burundi side to set up the priority order of the requested sites. However the Burundi side explained that CHUK and PLR, as shown in Annex-2, were put on the high and same level priority.

Name of Hospital	PV Capacity
CHUK	200kW
PLR	50kW

Both sides confirmed to continue the 1st phase of Preparatory Survey on the two sites. However, the Burundi side understood that it would be possible to select only one site for the Project.

4-2. The Team will assess the appropriateness of the request and report the findings to the JICA Headquarters and the GoJ who will decide which hospital(s) shall be adopted for the Project. from the viewpoint of limitation of the budget, necessity, technical and financial viability, sustainability and cost-effectiveness.

4-3. The Burundi side understood that the final component and the design of the Project shall be

determined (confirmed) at the timing of 2nd phase of the Preparatory Survey.

4-4. The Burundi side explained that there is no overlap between requested contents of the Project and any other plans implemented by other donors or the Burundi side.

5. Japan's Program Grant Aid for Environment and Climate Change

The Burundi side understood the Japan's Program Grant Aid for Environment and Climate Change scheme explained by the Team (as described in Annex-4, 5, 6, 7 and 8).

6. Schedule of the Study

6-1. The Team will proceed to further survey in the Republic of Burundi until August 20, 2009 as the 1st phase of the Preparatory Survey.

6-2. If the Cabinet of GoJ approves the Project based on the results of the Preparatory Survey, JICA will conduct the 2nd phase of Preparatory Survey for the designing of the Project.

7. Other Relevant Issues

7-1 Land for Installation of the PV system

Both sides confirmed that the lands for the Project shown in Annex-2 are owned by CHUK and PLR. The attached copy of the estate register in Annex-3 verifies the ownership of the land by PLR as aforementioned. The copy of the estate register which verifies the ownership of the land by CHUK shall be submitted by Burundi side to the Team before 19 August, 2009.

7-2 Procurement of Equipment

The Team explained that, in accordance with the policy of GoJ, products of Japan shall be procured for major equipment in the Project. The Burundi side understood/agreed.

7-3 Coordination with Related Institutions

For the implementation of the Project, MOEM shall be the focal point and responsible for the coordination with the related institutions, such as the Ministry of External Affairs and International Cooperation, the Ministry of Finance, the Burundi Water and Electricity Production and Distribution Authority (REGIDESO), the Ministry of Health, the Ministry of Education, the Central Bank of the Republic of Burundi and concerned hospital. The Burundi side agreed to establish a consultative committee in order to coordinate with the Japanese side which consists of the Embassy of Japan in Kenya, the JICA Kenya office and the procurement agent. Terms of References of the Consultative Committee is detailed in Annex-9.

7-4 Application of the Related Laws and Regulations

As there is no laws and regulations concerning the grid connection of renewable energy power sources at present, the Burundi side has no objections for MOEM to own and operate the PV system, and to have it connected to the national grid and to send the surplus of the power generated by the system back to the grid. There will be an agreement made between the hospital(s) and REGIDESO concerning the settlement of electricity bills after the commencement of the operation of the PV system(s).

7-5 Environmental and Social Considerations

The Team explained the outline of the JICA Environmental and Social Considerations Guideline

(hereinafter referred to as the “JICA Guideline”) to the Burundi side. The Burundi side took the JICA Guideline into consideration, and shall follow its necessary procedures.

As a result of the 1st phase of Preparatory Survey, both sides confirmed, with the Ministry of Environment, that the implementation of the Project does not require any procedure concerning the evaluation of impact on environment.

7-6 Operation and Maintenance

The Burundi side agreed to secure and allocate the necessary budget and personnel for the operation and maintenance of the facilities procured and installed under the Project.

The Burundi side requested to organize the training for the maintenance.

7-7 Customs and Tax exemption

The Burundi side agreed that the Burundi side shall be responsible for the exemption of all customs, domestic tax, levies and duties incurred in Burundi for implementation of the Project. Both sides agreed that the all customs, domestic tax, levies and duties incurred in Burundi for implementation of the Project shall be exempted, and that the new tax system, which introduces the reimbursement system for tax-free, effected on 1 July, 2009 is not applicable for the Project.

MOEM is responsible to take necessary actions to assure that customs and tax exemption is applied to the Project.

7-8. Banking Commission

Both sides understood that the payment for banking commission necessary for implementation of the Project shall be covered by the Burundi side. The Team explained that this is one of the conditions to receive the Japan’s Grant Aid, therefore there is no exception for Burundi to this condition.

7-9. The Burundi side shall ensure the security of all concerned Japanese nationals working for the Project, if deemed necessary.

7-10. The Burundi side shall provide necessary numbers of counterpart personnel to the Team during the period of their studies in Burundi.

7-11. The Burundi side submit all the answers to the Questionnaire, which the Team handed to the Burundi side, by 17 August, 2009.

<List of Annex>

Annex-1 Organization Chart of MOEM

Annex-2 Project site / Candidate site of the Project

Annex-3 Copy of the Land Title Deed of the Project Site

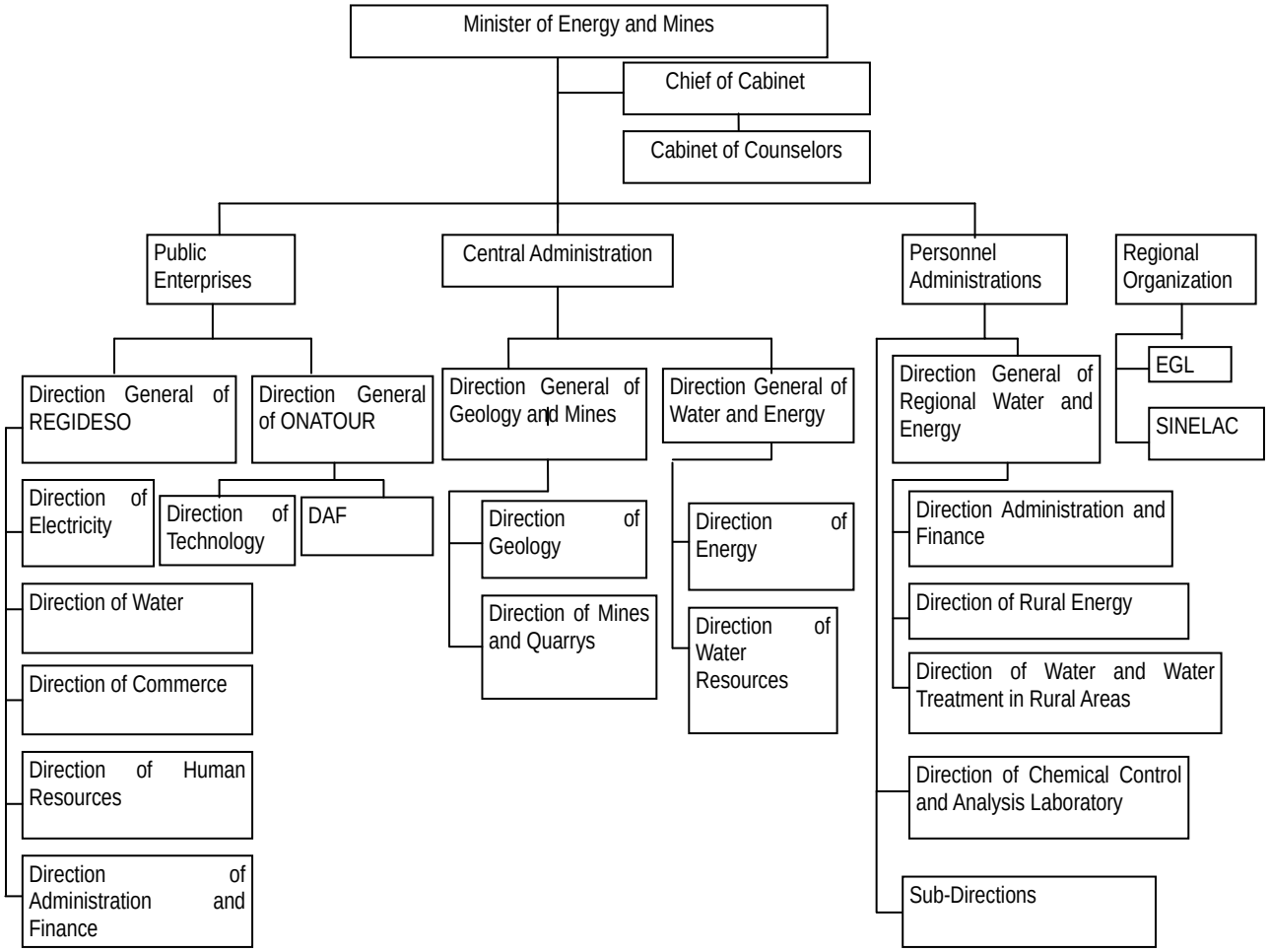
Annex-4 Program Grant Aid for Environment and Climate Change

Annex-5 General Flow of Program Grant Aid for Environment and Climate Change

Annex-6 Project Implementation System

Annexe-1

Organization Chart of MOEM

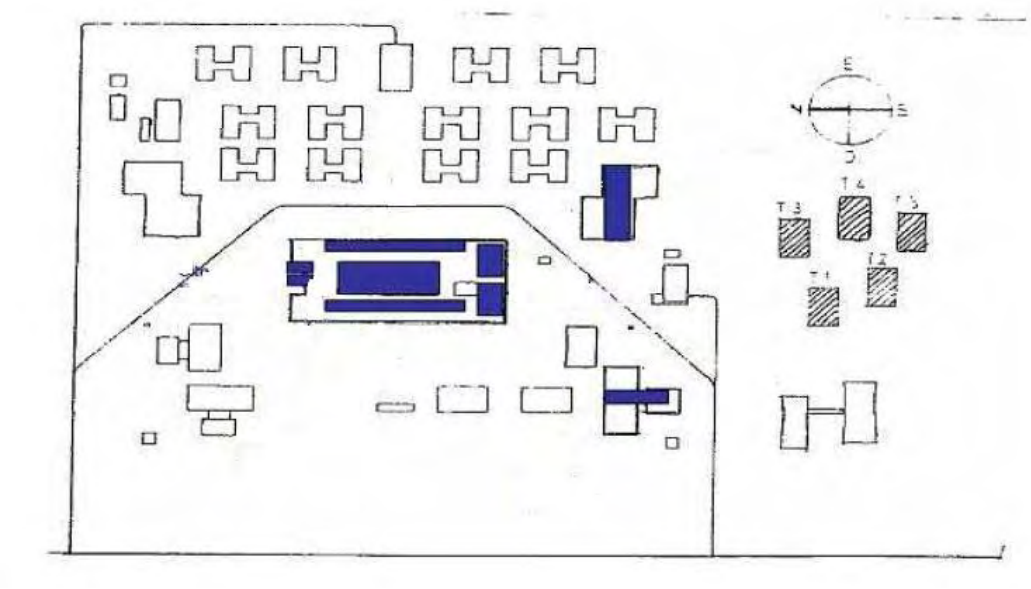


ORGANIGRAM OF MINISTRY OF ENERGY AND MINES

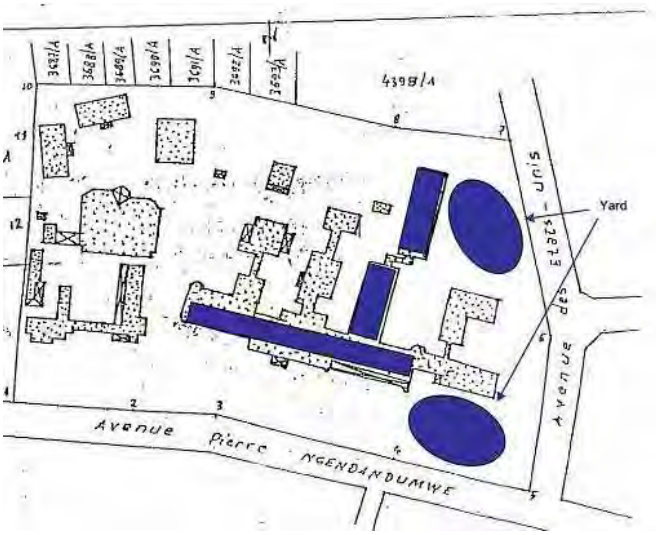
Annexe-2

Site/ Site cible du Projet

Hospitalo-Universitaire De Kamenge (CHUK)



Hospital Prince Louis Rwagasore (PLR)



Annexe-3

Copy of the Land Title Deed of the Project Site

Program Grant Aid for Environment and Climate Change of the Government of Japan
(Provisional)

日本政府は、ODA事業の質的向上を図るため組織改革を行っているが、その一環として、新 JICA 法が 2008 年 10 月 1 日に施行された。この法律及び日本政府の決定に基づき、日本国際協力機構（以下、「JICA」）は環境と気候変動に関するプログラム無償援助（以下、「環境プログラム無償」）の実施機関となった。
この無償援助は、被援助国に対し、国の経済・社会開発を目的とし日本の法制度に合致した施設、機器、サービス（エンジニアリングサービスや製品の輸送等）を調達するための返済不要の資金を提供するものである。この無償援助は、物品の寄付といったものを通じて実施されるものとは性格を異にする。
環境プログラム無償は、例えば省エネ化の推進（環境緩和策）や気候変動に伴う災害抑制を目指している。環境プログラム無償は、これらの目的に効率的に対応するため、複数の施策の組み合わせで構成することが可能である。建設請負業者、資材供給業者、コンサルタント等は日本企業に限られるものではなく、また建設は地域の手法によって実施することも可能である。

1. 環境プログラム無償の手順

環境プログラム無償は、以下の手順により実施される。

要請	：非援助国より要請を提出
調査	：概略設計調査を JICA が実施
審査と承認	：日本政府による審査と内閣による承認
実施にかかる決定	：日本政府と被援助国の間での交換文書
無償合意 (以下、 G/A)	：JICA と被援助国の間の合意

第1に、被援助国から提出された環境プログラム無償の要請やリクエストについて、日本政府（外務省）が環境プログラム無償事業としての適格性を審査する。

第2に、要請が適切であるとみなされる場合は、JICA が日本のコンサルタント企業を使用して概略設計調査を実施する。

第3に、日本政府は、JICA が作成した概略設計調査報告書に基づいてプロジェクトが環境プログラム無償事業として適切であるかを審査し、その結果を閣議承認に諮るために提出する。

第4に、閣議決定されたプロジェクトは、日本政府および被援助国の交換公文（E/N）への署名を持って公式なものとなる。同時に、日本政府と被援助国又は被援助国が指名する機関との間で Grant Agreement（以下、G/A）を締結することにより、無償資金が利用可能となる。

JICA は、日本政府により指名されて同無償資金の責任組織となる。

無償事業により調達される機材及びサービスの調達サービス（資金管理、入札準備、契約等）を実施する調達代理機関が指名され、被援助国の代理人となる。調達代理機関は、中立で専門的な機関であり、被援助国との Agent Agreement に基づいてサービスを提供する。この調達機関は、日本政府が推薦し、両政府間に結ばれる Agreed Minutes（以下、A/M）において両政府の合意を得る。

2 概略設計調査

1)調査の内容
要請されたプログラムについて JICA が実施する概略設計調査（以下、調査）の目的は、日本政府によ

るプログラムの審査に必要な基本的な文書を準備することである。調査の内容は以下のとおりである。

（1） プログラムの背景、目的、裨益、実施に必要となる被援助国の政府機関やコミュニティの制度的対応能力の確認
（2） プログラムが環境プログラム無償事業として実施されることに関する、技術的、社会的、経済的観点からの妥当性の評価
（3） プログラムの基本的コンセプトに関連し両者が合意して事項についての確認
（4） プログラムの概略設計の準備
（5） プログラムの費用の推定

当初の要請内容は、無償援助プログラムとしてそのまま承認されるとは限らない。プログラムの概略設計は、日本の無償援助スキーム関するガイドラインにしたがって確認される。

日本政府は、被援助国政府に対し、被援助国が自立的にプログラムを実施するよう、必要となるあらゆる手段を講じることを要請する。このような手段は、被援助国側の実施機関の管轄業務を超えるものであったとしても保証されなければならない。このため、プログラムの実施に関しては、被援助国側のすべての関係機関により、協議記録（Minutes of Discussions）において確認される。

2) コンサルタント企業の選定
調査の円滑な実施のため、JICA は登録コンサルタント業者を用いて調査を実施する。JICA は当該コンサルタントを、調査実施に関心を持つ企業に提出させた提案書の評価を持って選定する。選定されたコンサルタントは、JICA が示した業務仕様書に基づき概略設計調査を実施し報告書を作成する。
E/N 以降にプログラムの実施のために雇用されるコンサルタントは、原則として、入札図書に示される条件を満たす限りその国籍は問わない。

3. 交換公文以降の環境プログラム無償事業の実施

1) E/N と G/A
環境プログラム無償事業は、両国政府が交換した E/N に基づいて実施される。E/N においては、プログラムの目的、実施時期、条件、無償資金の額等の事項が確認される。JICA と被援助国政府の間に G/A が締結された後、プログラム実施のための必要事項、支払い条件、被援助国政府の責任、調達条件等が定められる。

2) 手続きの詳細
環境プログラム無償による調達やサービスの具体的手順は、被援助国政府と JICA の間で、E/N 及び G/A 署名時に合意される。

合意される主要な事項の概要は以下のとおりである。
a) JICA はプログラムが適切に実施されること促進する立場にある。
b) 機材やサービスの調達は、JICA の「環境プログラム無償の調達ガイドライン」に基づいて調達、供与される。
c) 被援助国は、調達代理機関と雇用契約を結ぶ。
d) 調達代理機関は、調達代理機関へのすべての資金の転送について、被援助国の代理人として機能する。

3) 「環境プログラム無償の調達ガイドライン（タイプ I-E）」の要点は以下のとおりである。
a) 調達代理機関
調達代理機関は、被援助国との Agent Agreement に基づいて、被援助国の代理として製品とサービスの調達を実施する。調達代理機関は、日本政府が被援助国に対し推薦し、A/M において両政府が合意する。

b) Agent Agreement
被援助国は、A/M に従い、E/N 及び G/A 署名後 2 ヶ月以内に Agent Agreement を締結する。調達代理機関の業務内容は、Agent Agreement に明確に規定される。

c) エージェントアグリーメントの承認
エージェントアグリーメントは同一のものを2部作成し、被援助国により調達代理機関を通じて JICA に提出される。JICA は、Agent Agreement が G/A および「環境プログラム無償の調達ガイドライン」にしたがっていることを確認のうえ、Agent Agreement を承認する。
被援助国と調達代理機関の間で結ばれた Agent Agreement は、JICA による書面の確認をもって有効となる。

d) 支払いの方法
エージェントアグリーメントには、「すべての資金の調達代理機関への転送について、被援助国は調達代理機関を被援助国の代理人に指定し、被援助国の口座から調達口座への資金の転送（以下、アドバンス）を実施するための総括的支出権限（BDA）を発行する。」ことが規定される。
エージェントアグリーメントには、前払いからの調達代理機関への支払いが日本円で行なわれ、また調達代理機関への最終支払いは、総残額が無償供与額に利息を加えた額の 3%を下回った時点でなされることが明記される。

e) 調達対象となる機材やサービス
調達対象となる機材やサービスは、G/A に示された事項から選定される。

f) 企業
企業は、入札図書に示される条件を満たす限りにおいて、原則としていかなる国籍の企業でも契約相手とすることが可能である。
企業は、JICA の承認のもと、日本国籍の人、及び日本企業または所在国を問わず日本企業の関連企業で生産されたものとすることが可能である。

g) 技術支援専門家
技術支援を実施する目的で、専門家を雇用することが可能である。この専門家は、調査との計画上の一貫性を確保する必要性がある場合には、JICA により推薦されたものとなる場合がある。適切性に応じ、原則として専門家は日本国籍の人とすることが望ましい。

h) 調達の方法
調達が実施される際には、調達される製品やサービスについて応札資格を持つ企業の間に不公平が生じないよう、十分な配慮がなされるべきである。
またこのために、原則として競争入札方法が適用される。

i) 入札図書
入札図書は、環境プログラム無償事業で調達される製品やサービスの応札者が有効な札を準備するために必要となるすべての情報を含まねばならない。
被援助国、調達代理機関、製品やサービスを提供する企業それぞれの権利と責任については、調達代理機関が作成する入札図書に規定される。
また、入札図書は、被援助国との協議を通じて作成される。

j) 応札者の事前資格審査
調達代理機関は、入札への招聘が適格な企業のみに行なわれるよう、入札に先立って応札者の事前資格審査を行なうことがある。事前資格審査は、応札を希望する企業が契約を全うすることが可能であるかどうかのみの観点で実施される。このことに関して、次の事項が検討対象となされるべきである。
(1) 類似契約の経験と過去の実績

(2) 財務的基盤、または財務的信頼性
(3) 入札図書に示される事業所の所在他の条件

k) 入札の評価
入札の評価は、入札図書に示された条件に基づき実施される。
入札は、技術仕様を実質的に満たしかつ入札図書に示される他の条件に適合するものについて、原則として入札額により評価される。最も低い入札額を提示した応札者が落札者に指名される。
調達代理機関は、落札者との契約前に、落札者および失格者の理由を説明した詳細な評価報告書を作成し被援助国に提出し、確認を受ける。
調達代理機関は、札の受領または失格についての理由を説明した詳細な評価報告書を提出する。

l) 追加的調達
競争入札、指名入札或いは直接指名交渉による契約のあと予算残があり、かつ被援助国が追加的な調達を希望する場合には、調達代理機関は以下の事項に従い追加的な調達を実施することができる。
(1) 同じ機材やサービスの調達
追加的に調達される機材やサービスが当初の入札のものと同一で新たに競争入札を行なうことが非効率であると考えられる場合は、追加的調達は当初入札の落札者との交渉により契約し実施することができる。
(2) 他の機材やサービスの調達
上記(1)に該当しない機材やサービスを調達する場合には、調達は競争入札を通じて実施されなければならない。この場合、追加的に調達される機材やサービスは、G/A に示されるものの中から選ばれる。

m) 契約の締結
G/A に従って機材やサービスの調達を実施するため、調達代理機関は、入札や他の方法で選定された企業と契約を締結する。

n) 支払い条件
契約には支払い条件が明示される。調達代理機関は、契約書に示された条件に従い、契約先企業の責務が満たされた後、契約先企業からの必要な書類に提出に対応して前払い金から支払いを行なう。調達の対象となるものがサービスである場合は、契約先企業が前払い額に対応する前払い保証を調達代理機関に提出することを前提に、契約先企業の契約額の一部を前払いすることができる。

4) 被援助国政府により実施されるべき事項
無償援助により実施されるプログラムにおいては、被援助国は次のような必要措置を講じることを求められる。
a) プログラム実施に先立ち、サイトの土地を確保し、伐採、整地、埋め立て等を実施すること
b) サイトとその周辺において電力、水、排水、その他の仮設的設備を供給すること
c) 機材設置が必要な場合には、調達に先だって建物を確保すること
d) 物資の入国の際に港での荷揚げ、通関が早急に行われるよう措置し、国内輸送を支援すること
e) 購入される部品や調達代理機関のサービス等に関する輸入関税、国内税、その他被援助国で適用される課税等について、被援助国政府の免除措置が実施されること
f) 契約のもと供給される機材やサービスに関連して業務を提供するすべての関係機関について、被援助国への入国とその業務実施のための滞在について必要な便宜を供与すること
g) プログラムの実施のために、設備及び／又は機材が適切かつ効率的に維持され使用されるよう措置を講ずること
h) 無償資金及びその利息によりカバーされる部分以外にプログラム実施に必要とされる支出を受け持つこと
i) プログラムの実施に関して、環境及び社会的配慮を十分に行うこと

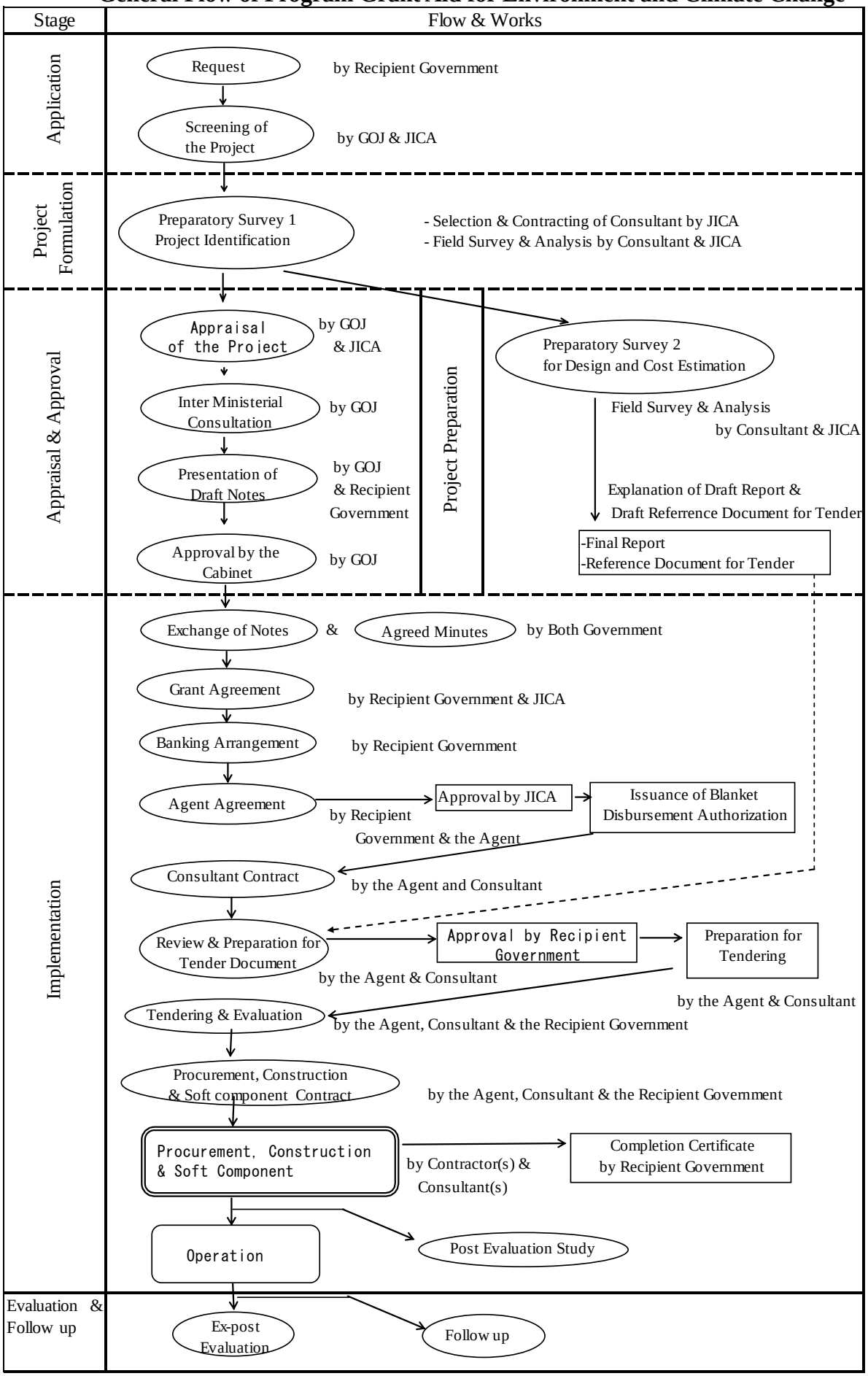
5) **適切な使用**

被援助国は、無償支援により建設された施設或いは購入された機材を適切かつ効率的に運用管理し、そのために必要な人員を配置し、無償援助で支払われない費用を負担することが求められる。

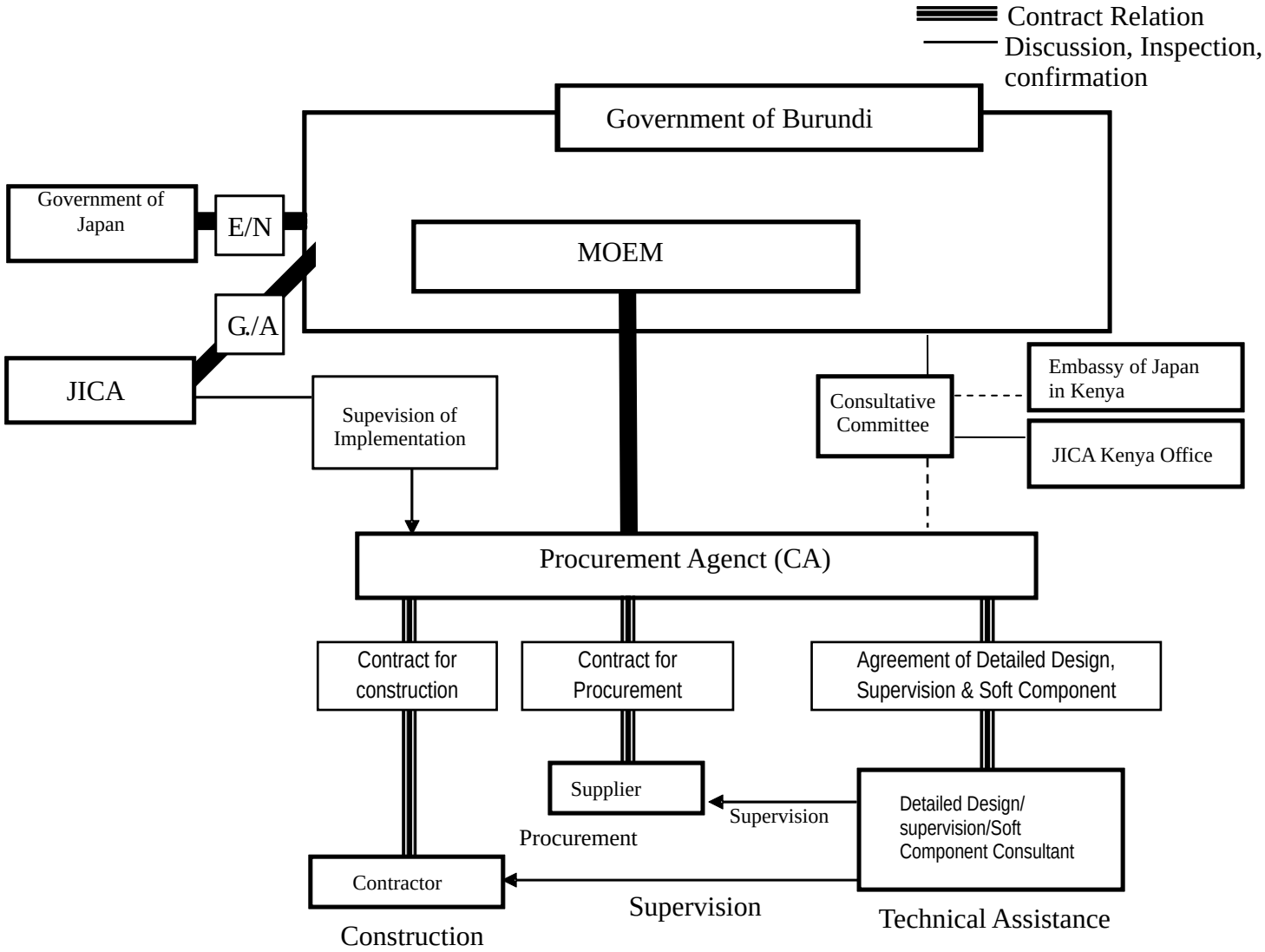
6) **再輸出**

無償援助により購入された機材は被援助国から再輸出されてはならない。

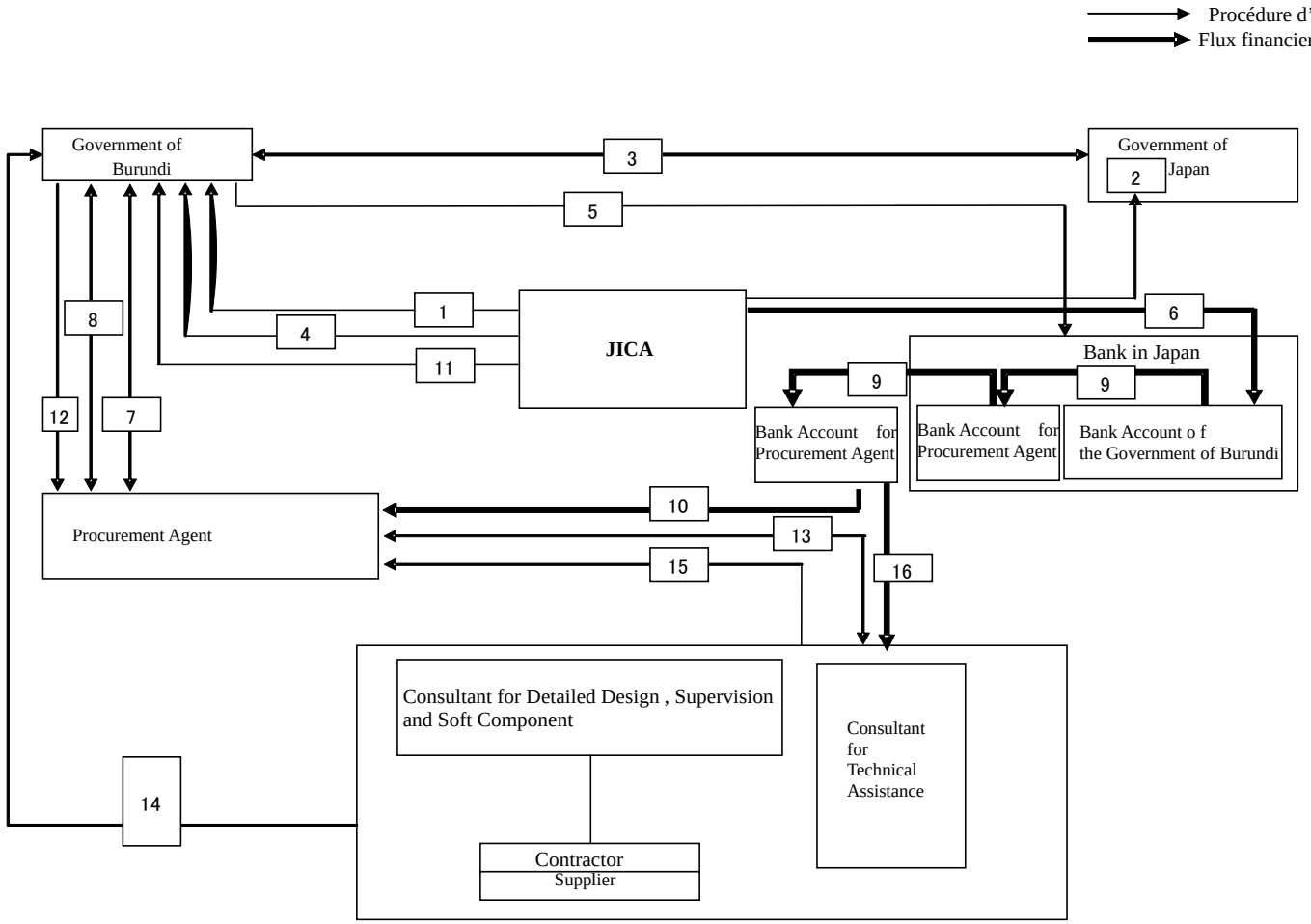
General Flow of Program Grant Aid for Environment and Climate Change



Project Implementation System



Flow of Funds for Project Implementation



1 Preparatory Survey / Reference Document for Tender

2 Approbal of Cabinet

3 Signature of Exchange of Notes (E/N)

4 Signature of Grant Aid (G/A)

5 Banking Arrangement (B/A)

6 Disbursement of Funds from the Government of Japan

7 Signature Agent Agreement (A/A)

8 Decision of Project Components

9 Transferts of funds

10 Payment of Remuneration for Agent

11 Recommendation of Consultant for Detailed Design/Supervision
(JICA →Government of Burundi)

12 Recommandation d'ingénieur conseil pour la conception détaillée et la supervision
(Government of Burundi → Procurement Agent)

13 Conclusion of Contract

14 Construction and Procumrement

15 Application for Payment

16 Payment

Annex-8

Major undertakings to be taken by each Government (GAEC version)

No.	Items	To be covered by Grant Aid	To be covered by Recipient Side
1	To secure land		●
2	To clear, level and reclaim the site when needed urgently		●
3	To construct gates and fences in and around the site		●
4	To construct a parking lot if necessary		●
5	To construct roads		
	1) Within the site	●	
	2) Outside the site and Access road		●
6	To construct the facility and install the equipment	●	
7	To provide facilities for the distribution of electricity, water supply, drainage and other incidental facilities if necessary:		
	1)Electricity		
	a. The power distribution line to the site		●
	b. The drop wiring and internal wiring within the site	●	
	c. The main circuit breaker and transformer for the site	●	
	2) Water Supply		
	a. The city water distribution main to the site		●
	b. The supply system within the site (receiving and elevated tanks)	●	
	3) Drainage		
	a. The city drainage main (for conveying storm water, sewage, etc. from the site)		●
	b. The drainage system within the site (for sewage, ordinary waste, storm water, etc.)	●	
	4) Gas Supply		
	a. The city gas main to the site		●
	b. The gas supply system within the site	●	
	5) Telephone System		
	a. The telephone trunk line to the main distribution frame/panel (MDF) of the building		●
	b. The MDF and the extension after the frame/panel	●	
	6) Furniture and Equipment		
	a. General furniture		●
	b. Project equipment	●	
8	To bear the following commissions applied by the bank in Japan for banking services based upon the Bank Arrangement (B/A):		
	1) Advising commission of A/P		●
	2) Payment commission		●
9	To ensure prompt unloading and customs clearance at the entry to the recipient country		
	1) Marine or air transportation of the products from Japan or third countries to the recipient	●	
	2) To exempt or bear tax and customs clearance of the products at the port of disembarkation		●
	3) Internal transportation from the port of disembarkation to the project site	●	
10	To accord Japanese nationals and / or nationals of third countries, including persons employed by the agent whose services may be required in connection with the Components such facilities as may be necessary for their entry into recipient country and stay therein for the performance of their work.		●
11	To ensure that customs duties, internal taxes and other fiscal levies which may be imposed in the recipient country with respect to the purchase of the Components and to the employment of the Agent will be exempted by the Government of recipient country		●
12	To maintain and use properly and effectively the facilities that are constructed and the equipment that is provided under the Grant.		●
13	To bear all the expenses, other than those covered by the Grant and its accrued interest, necessary for the purchase of the Components as well as for the agent's fees.		●
14	To ensure environmental and social consideration for the Programme.		●

Annex-9

Terms of Reference of the Consultative Committee (Provisional)

1. To confirm an implementation schedule of the Programme for the speedy and effective utilization of the Grant and its accrued interest.

2. To discuss the modifications of the Programme, including modification of the design of the facility.

3. To exchange views on allocations of the Grant and its accrued interest as well as on potential end-users.

4. To identify problems which may delay the utilization of the Grant and its accrued interest, and to explore solutions to such problems.

5. To exchange views on publicity related to the utilization of the Grant and its accrued interest.

6. To discuss any other matters that may arise from or in connection with the G/A.

Procès-Verbal des Discussions
sur l'Etude Préparatoire
pour le Projet de Promotion de l'Energie Propre en utilisant le Système Solaire Photovoltaïque
en République du Burundi
(Explication sur le Projet de Rapport Final)

En août et de novembre à décembre 2009, l'Agence Japonaise de Coopération Internationale (désignée ci-dessous « JICA ») a envoyé des Missions d'Etude Préparatoire pour le Projet de Promotion de l'Energie Propre en utilisant le Système Solaire Photovoltaïque (désigné ci-dessous « le Projet ») en République du Burundi, et à la suite de discussions, d'études sur le terrain et d'analyses techniques de résultats des études au Japon, la JICA a préparé un Projet Final de Rapport de Conception Sommaire.

En vue d'expliquer les composantes du Projet Final de Rapport aux officiels concernés du Gouvernement du Burundi et de s'entretenir avec eux, la JICA a envoyé une Mission d'Etude Préparatoire pour l'Explication sur le Projet Final de Rapport (désignée ci-dessous « la Mission »), dirigée par M. Tadayuki Ogawa, Conseiller supérieur, JICA, du 9 au 14 mai 2010.

Au terme des discussions, les deux parties ont confirmé les principaux éléments indiqués dans le document attaché.

Fait à Bujumbura, le 12 mai 2010

Tadayuki Ogawa
Chef de Mission d'Etude Préparatoire
Agence Japonaise de Coopération Internationale
Japon

Godefroy Hakizimana
Conseiller au Cabinet
Ministère de l'Energie et des Mines
République du Burundi

Daniel Bitagoye
Conseiller au Cabinet
Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
République du Burundi

Dr. Novat TWUNGUBUMWE
Directeur
Centre Hospitalo-Universitaire de Kamenge
République du Burundi

DOCUMENT ATTACHE

1. Composantes du Projet

Après explication du contenu du Projet de Rapport Final par la Mission, la partie burundaise et la partie japonaise ont convenu des composantes du Projet contenus dans ledit rapport. Cependant la partie burundaise a émis des observations et commentaires contenus dans le présent procès-verbal.

2. Programme d'Aide Financière Non-Remboursable pour l'Environnement et le Changement Climatique du Gouvernement du Japon

La partie burundaise a confirmé les composantes définies dans le Procès-Verbal des Discussions signé par les deux parties le 14 août 2009 (désigné ci-dessous « le P/V précédent ») et prendra les mesures nécessaires y relatives, afin que le Projet soit exécuté de manière régulière, suivant la procédure du Programme d'Aide Financière Non-Remboursable pour l'Environnement et le Changement Climatique du Gouvernement du Japon comme décrit en **Annexe 4, 5, 6, 7 et 8 du P/V précédent**.

3. Calendrier de l'Etude

La JICA terminera la rédaction du Rapport Final conformément aux éléments confirmés et l'enverra au Ministère de l'Energie et des Mines (désigné ci-dessous « MEM ») en août 2010.

4. Confirmation du progrès fait depuis le P/V précédent

4-1. Site du Projet et capacité des modules photovoltaïques

Les deux parties ont confirmé que le site du Projet est le Centre Hospitalo-Universitaire de Kamenge (désigné ci-dessous « CHUK »). La Mission a expliqué que la charge de pointe maximale du CHUK est de 210kW. En plus, sur la base de la superficie et du financement disponible, la capacité de conception de modules photovoltaïques est de 260kWc.

4-2. Application des Lois et Régulations Concernées

En se basant sur le P/V précédent, la Mission a confirmé que la partie burundaise avait convenu que le système photovoltaïque serait installé et raccordé au réseau national de distribution et y injecterait le surplus d'électricité produite par ce système. Il a été également confirmé par les deux parties qu'aucune procédure officielle concernant l'autorisation pour l'installation et l'exploitation du système photovoltaïque raccordé au réseau national n'est requise.

S'agissant de l'injection du courant électrique depuis le système photovoltaïque du CHUK au réseau national de la Régie de Production et de Distribution d'Eau et d'Electricité (désigné ci-dessous « REGIDESO »), le CHUK et la REGIDESO doivent discuter et convenir d'un accord sur les modalités de compensation sur les consommations du CHUK pour l'énergie injectée au réseau en consultation avec le MEM avant fin 2011. La partie japonaise pourrait assister la partie burundaise pour établir le règlement concerné à travers l'assistance technique au cours de la mise en œuvre du Projet.

4-3. Accreditation et Installation de compteurs d'énergie électrique

Pour permettre la compensation de l'énergie échangée, mentionnée ci-dessus à 4-2, les résultats suivants ont été confirmés entre la Mission et la REGIDESO :

1. La REGIDESO a approuvé et a accepté les compteurs d'énergie électrique (Classe 1,0, Normes Industrielles Japonaises (JIS)) accrédités au Japon fournis par le Contractant ;
2. La REGIDESO va remplacer les compteurs d'énergie électrique existants situés au côté primaire du transformateur de distribution par un compteur électronique qui affiche l'énergie active, réactive et la pointe, doté de fonction de blocage de l'énergie inverse fourni par le Contractant.

5. Equipements à fournir

La Mission a expliqué que les éleménts d'équipement à fournir comme montrés en Annexe-1. Au terme des discussions, les deux parties ont confirmé que les principaux équipements tels que modules photovoltaïques composées de cellules photovoltaïques et armoire d'onduleur devaient être de produits japonais, et les produits de pays tiers pourraient être acceptés pour les autres équipements qui font partie de composants.

6. Assistance technique (Composante Soft)

La Mission a expliqué que les modules suivants seront considérés dans le cadre de l'assistance technique du Projet.

- Cours sur les Connaissances de Base
- Exercices de Planification de Construction
- Exercices de Méthodes d'Exploitation et de Maintenance
- Formation sur le tas (assistance aux Essais et Inspections)
- Planification du Management sur l'Exploitation et la Maintenance
- Organisation pour le meilleur management
- Préparation des matériels pour la sensibilisation à l'énergie renouvelable auprès du public

- Atelier de travail

7. Conception du Système photovoltaïque (fonction du fonctionnement autonome « Stand-Alone Operation»)

Les deux parties ont convenu que le système photovoltaïque à fournir et à installer par le Projet ne sera pas doté de fonction du fonctionnement autonome.

8. Coûts du Projet

La partie burundaise a été informé que le coût du Projet ne devait pas dépasser le montant limite convenu dans l'Echange de Notes (désigné ci-dessous « E/N ») et l'Accord de Don (désigné ci-dessous « A/D »). Les deux parties ont également confirmé que le coût du Projet comprend l'approvisionnement en équipements, le transport jusqu'au Site du Projet, la pose d'installation, le paiement de l'Agence pour l'Approvisionnement (désigné ci-dessous « Agence ») et du consultant pour la mise en œuvre du Projet et pour la composante soft de l'assistance technique au niveau de l'exploitation et de la maintenance des équipements et de l'ensemble du système photovoltaïque.

La partie burundaise a retenu que le Coût Estimatif du Projet attaché en Annexe-2 n'est pas une version finale, et qu'il pourrait être modifié selon les résultats d'examen à travers la révision de l'Etude de Conception Sommaire.

9. Calendrier de la mise en œuvre du Projet

La révision du calendrier a été confirmé par les deux parties.

10. Organisme d'Exécution

Le MEM est l'Organisme d'Exécution du Projet.

11. Propriété et responsabilité vis-à-vis de l'exploitation et de la maintenance

La partie burundaise a confirmé que le MEM cède les équipements solaires au CHUK qui en devient le propriétaire. Le CHUK sera également le responsable de l'exploitation et de la maintenance, et doit affecter un personnel nécessaire requis. Le CHUK sera également responsable pour la maintenance à long-terme avec l'appui technique de la part du MEM et de la REGIDESO.

Pendant l'exploitation et la maintenance du système, l'intervention du MEM pour l'appui technique et financier est requise de même que l'assistance technique par la REGIDESO.

La partie burundaise a pris acte du coût estimatif pour l'exploitation et la maintenance décrit dans le Projet de Rapport Final, et a convenu que le CHUK et le Ministère de l'Enseignement Supérieur et de la Recherche Scientifique va assurer conjointement le budget nécessaire.

Conformément à la requête soumise officiellement le 11 juin 2009 de la part de la République du Burundi au Gouvernement du Japon, en cas de grosse réparation, l'intervention et la responsabilité du MEM sont requises.

12. Processus de l'Approvisionnement du Projet

Les deux parties ont confirmé que le processus de l'approvisionnement sera sous la supervision de l'Agence en consultation nécessaire avec le Comité Consultatif (désigné ci-dessous « Comité »). Les deux parties ont également confirmé les rôles à jouer par l'Agence comme les suivants :

(1) L'Agence fournira les services stipulés dans les clauses de l'A/D ainsi que de l'E/N du Projet ;
(2) L'Agence sera chargée de processus de l'approvisionnement nécessaire au Projet suivant les clauses de l'A/D, de l'E/N et d'autres lignes directrices concernées ;
(3) La JICA fournira le Projet de Rapport Final et le Rapport Final à l'Agence et
(4) L'Agence entamera l'approvisionnement sur la base du contenu du Rapport Final de Conception Sommaire.

La Mission a expliqué que si le montant de l'appel d'offres dépassait celui qui avait été convenu dans l'A/D et l'E/N, la quantité ou/et les élements d'équipement pourraient être réduits jusqu'à ce que le coût du Projet baisse à celui convenu dans l'A/D et l'E/N.

La partie burundaise a convenu que s'il y avait le montant qui reste pour le Projet après l'appel d'offres, les éléments d'équipement pourraient être ajoutés pour le Projet sur la base des listes inclues dans le Rapport Final.

La partie burundaise a également été informée que la décision d'addition ou de réduction des équipements à fournir serait faite à travers la consultation nécessaire parmi les membres du Comité.

13. Le Comité Consultatif

La partie burundaise a rappelé que le MEM présidera le Comité en vue de faciliter la consultation et le processus de l'approvisionnement. Les Termes de Références du Comité sont fixés dans l'Annexe 9 du P/V précédent.

Les membres du Comité sont les suivants :

(1) Représentant du MEM (président)
(2) Représentant du CHUK
(3) Représentant du Ministère des Relations Extérieures et de la Coopération Internationale
(4) Représentant du Ministère de l'Enseignement Supérieur et de la Recherche Scientifique
(5) Représentant du Ministère des Finances

(6) Représentant de la REGIDESO

(7) Représentant du Bureau de JICA Kenya

La première réunion du Comité doit être organisée immédiatement après la signature du contrat entre l'Agence et le consultant.

Les réunions ultérieurs seront organisées soit sur demande de la partie burundaise, soit sur celle de la partie japonaise. En cas de nécessité, les deux parties se réfèreront à l'Agence.

14. Tâches requises au pays bénéficiaire

La Mission a demandé à la partie burundaise de respecter les tâches à assumer par la partie burundaise mentionnées ci-dessous en plus des principaux éléments indiqués dans le P/V précédent. La partie burundaise s'est mise d'accord de l'assumer.

(1) Acquisition du terrain/espace pour installer le système photovoltaïque

Le propriétaire du terrain où seront installés les équipements et matériels mentionnés ci-dessous du système photovoltaïque est le CHUK. Le CHUK a déjà convenu d'offrir son terrain pour l'installation de ce système. Aucune procédure n'est requise concernant l'utilisation du terrain du CHUK pour la mise en œuvre du Projet.Ces équipements et matériels sont :

1) Modules photovoltaïques
2) Câbles enfouis entres les équipements
3) Armoire d'onduleur
4) Parc de stockage provisoire

(2) Préparation du Site

Le MEM doit enlever des arbres proches de l'espace d'installation photovoltaïque dans les trois (3) mois après la conclusion du Contrat.

(3) Considérations environnementales et sociales

Il a été confirmé que le Projet ne demanderait aucune procédure concernant l'évaluation des impacts environnementaux dans le P/V précédent. En date du 20 novembre 2009, le Ministère de l'Eau, de l'Environnement, de l'Aménagement du Territoire et de l'Urbanisme a confirmé au responsable en charge des considérations environnemnetales et sociales de l'Equipe de l'Etude de JICA qu'il n'est pas nécessaire de mener une étude d'impact environnemental détaillée compte tenu de la nature du Projet et de sa dimension. Cette observation sera confirmée par le MEM en collaboration avec le Ministère en charge de l'Environnement avant fin mai 2010.

(4) Autorisation de construction

Les deux parties ont confirmé que le CHUK devrait obtenir les autorisations nécessaires pour la construction avant octobre 2010, le cas échéant.

(5) Affectation de l'homologue

1) Gestion de l'ensemble du Projet

La partie burundaise a affecté le personnel suivant la gestion de l'ensemble du Projet et la coordination au sein de chaque organisme.

- MEM : Directeur Général de l'Eau et de l'Energie
- CHUK : Chef du Service Technique

2) L'assistance technique (programme de formation)

La partie burundaise a convenu d'affecter le personnel nécessaire conformément au plan de l'exécution de l'assistance technique proposé par la Mission.

La partie burundaise va informer les noms des homologues principaux des organismes suivants à la JICA lors de la première réunion du Comité.

- MEM
- CHUK
- REGIDESO
- Autres

Autre personnel sera affecté de la part de chaque organisme selon la demande lors de l'installation.

(6) Dédouanement et exonération des impôts

Il a été confirmé que les droits d'importation et le TVA imposés au Burundi pour la mise en œuvre du Projet seraient exemptés, et que le nouveau système fiscal, qui a introduit le système de remboursement pour la détaxe, mis en vigueur le 1er juillet 2009 ne serait pas appliqué au Projet. La partie burundaise a convenu que le MEM assisterait la partie japonaise pour avoir l'exonération de tels droits et taxes mentionnés ci-dessus pour la mise en œuvre du Projet.

15. Confidentialité du Projet

Les deux parties ont confirmé que toutes les informations liées à ce Projet ne devraient être communiquées à l'extérieur avant la conclusion de tous le(s) contrat(s) pour le Projet, car ce sont les documents confidentiels qui contiennent les informations relatives à l'appel d'offres.

Ces informations contiennent les suivantes :

a) Plans détaillés, spécifications et autres informations techniques des matériels et équipements ;

b) Coût estimatif ;

c) Projet de Rapport Final et

d) Rapport Final.

« Annexes »

Annexe-1. Liste des équipements

Annexe-2. Coût estimatif du Projet (Confidentiel)

Annexe-1

Liste des principaux équipements

Equipement		Quantité
Système de production d'électricité photovoltaïque		1 système
1-1.	Modules photovoltaïques	260 kW
1-2.	Boîte de jonction	1 jeu
1-3.	Armoire d'onduleur	1 jeu
1-4.	Appareil d'observation météorologique	1 unité
1-5.	Armoire de jonction photovoltaïque	1 unité
1-6.	Châssis pour les modules photovoltaïques	1 jeu
1-7.	Divers matériels	1 jeu
1-8.	Pièces de rechange, consommables et outillages	1 jeu
1-9.	Matériels pour le câblage et la mise à la terre	1 jeu
1-10.	Clôture, portes et gravier	1 jeu

Annexe-2

Coût Estimatif du Projet (Confidentiel)

Ce coût estimatif est provisoire et sera examiné ultérieurement par le Gouvernement du Japon pour l'approbation du Don.

1. Coût pris en charge par la partie japonaise:

2. Coût pris en charge par la partie burundaise

La taille étant faible, l'estimation n'a pas été effectuée, il y a deux choses à faire de la part de la partie burundaise :

1. Enlèvement des arbres proches de l'installation des modules photovoltaïques par le MEM ;
2. Remplacement du compteur kWh situé du côté primaire du transformateur de distribution possédé par la REGIDESO par le nouveau compteur fourni par le Contractant.

3. Coût pris en charge par la partie burundaise pour l'exploitation et la maintenance (chaque année)

(1) Frais de personnel	Environ BIF 1 092 000
(2) Consommables et pièces de rechange à court terme	Environ BIF 1 989 000
(2') Consommables et pièces de rechange à long terme	Environ BIF 7 968 000
(3) Total (à court terme)	Environ BIF 3 081 000
(3') Total (à long terme)	Environ BIF 9 060 000

Les équipements à fournir par le Projet pourront être exploités et entretenus par le personnel existant de l'établissement (CHUK). Les services pour l'exploitation et la maintenance vont prendre un peu de temps consacré par le personnel tous les jours, ce qui est évalué en terme de monnaie.

Parfois les équipements demandent le remplacement des pièces et des consommables usés. A court terme, la plupart des pièces et des consommables nécessaires seront couverts par l'approvisionnement du Projet, seuls les articles mineurs et disponibles localement seront acquis par la partie burundaise. Une fois usé l'approvisionnement du Projet, les articles nécessaires à acquérir par la partie burundaise seront augmentés.

4. Conditions de l'estimation

(1) Période d'estimation:	Novembre 2009
(2) Taux d'échange :	USD 1,00 = JPY 93,97
	BIF 1,00 = JPY 0,0754

(3) Autres: Cette estimation ci-dessus a été faite conformément aux régulations et aux lignes directrices du Don japonais.

Minutes of Discussions
on the Preparatory Survey
on the Project for Introduction of Clean Energy by Solar Electricity Generation System
in the Republic of Burundi
(Explanation on Draft Final Report)

In August and from November to December 2009, the Japan International Cooperation Agency (hereinafter referred to as "JICA") dispatched the Preparatory Survey Teams on the Project for Clean Energy Promoting Using Solar Photovoltaic System (hereinafter referred to as "the Project") in the Republic of the Burundi (hereinafter referred to as "Burundi"), and through discussions, field surveys and technical examination of the results of the surveys in Japan, JICA prepared a Draft Final Report of the Outline Design.

In order to explain and to consult with the concerned officials of the Government of Burundi on the component of the Draft Final Report, JICA sent Burundi the Preparatory Survey Team for Draft Final Report Explanation (hereinafter referred to as "the Team"), which is headed by Mr. Tadayuki Ogawa, Senior Advisor of JICA, from May 9th to 14th, 2010.

And as a result of discussion, both sides confirmed the main items described on the attached sheets.

Bujumbura, May 12, 2010

Tadayuki Ogawa
Leader
Preparatory Survey Team
Japan International Cooperation Agency
JAPAN

Godefroy Hakizimana
Counselor of Cabinet
Ministry of Energy and Mines
The Republic of Burundi

Daniel Bitagoye
Counselor of Cabinet
Ministry of Higher Education and Scientific Research
The Republic of Burundi

Dr Novat TWUNGUBUMWE
Director
Central University Hospital of Kamenge
The Republic of Burundi

ATTACHMENT

1. Project Components

After the explanation of the contents of Draft Final Report by the Team, the Burundi side and Japanese side agreed the project components included in it. However, the Burundi side made observation and comments on it which are included in this Minutes of Discussion.

2. Program Grant Aid for Environment and Climate Change of the Government of Japan

The Burundi side confirmed the components defined in the Minutes of Discussion signed by both sides on 14th August, 2009 (hereinafter referred to as "the previous M/D"), and would take the necessary related measures for smooth implementation of the Project following procedures of the Program Grant Aid for Environment and Climate Change of the Government of Japan as described in **Annex-4, 5, 6, 7 and 8 of the previous M/D**.

3. Schedule of the Study

JICA will complete the final report in accordance with the confirmed items and send it to the Ministry of Energy and Mines (hereinafter referred to as the "MOEM,") by August 2010.

4. Confirmation of progress made for the previous M/D

4.1. Project site and capacity of PV module

Both sides confirmed that the project site is Central Hospital of Kamenge University (hereinafter referred to as the "CHUK"). The Team explained that the maximum demand of CHUK shall be 210kW. In addition, based on the area and available fund, the design capacity of Photovoltaic (PV) module is 260kWp.

4.2. Application of the Related Laws and Regulations

Based on the previous M/D, the Team reconfirmed that Burundi side has agreed to install the PV system, and to have it connected to the national grid and to send the surplus of the power generated by the system back to the grid. It was also confirmed by both sides that any official procedures concerning the permission for the installation and operation of the PV system to be connected to the national grid are not required.

Regarding the reverse power flow from PV system in CHUK to the national grid of the Burundi Water and Electricity Production and Distribution Authority (hereinafter referred to as the "REGIDESO"), CHUK and REGIDESO should discuss and agree upon the method of compensation of the power consumption at CHUK taking the reverse power into consideration in consultation with MOEM by the end of 2011. The Japanese side could assist the Burundi side to set the relevant rule through soft component during the implementation of the Project.

4.3. Accreditation and Installation of Electric Power Meters

For the compensation of power exchange mentioned in 4.2 above, following issues have been confirmed between the Team and REGIDESO;

1. REGIDESO will approve and accept Electric Power Meters (class 1.0, Japan Industrial Standard) accredited in Japan procured by the Contractor,
2. REGIDESO will replace the existing Electric Power Meters at the primary side of the distribution transformer with the Electric Power Meter which display real power, reactive power and maximum demand with reverse power lock function procured by the Contractor.

5. Items of Equipment to be procured

The Team explained that the items of equipment to be procured as shown in Annex-1. After discussion, both side confirmed that the major equipment such as PV modules consist of PV cells and Power Conditioners should be products of Japan, and products of third country could be acceptable for other equipment as a part of components.

6. Soft Component

The Team explained that the following modules are included in the soft component of the Project.

- Lectures on Basic knowledge
- Exercises on Construction Planning
- Exercise on Method of Operation and Maintenance
- On the Job Training (witnessing Tests and Inspections)
- Operation and Maintenance Management Planning
- Organization for better management
- Preparation of materials for public awareness of clean energy
- Workshop

7. Design of PV System (Function for Stand-Alone Operation)

Both sides agreed that the PV system procured and installed in the Project will not possess the function for Stand-Alone Operation.

8. Project Cost

The Burundi side was informed that the Project cost should not exceed the upper limit of amount agreed on in E/N and G/A. Both sides also confirmed that the Project cost contains procurement of equipment, the transportation up to the Project Site, installation, the payment for Procurement Agent and the consultant that includes implementation and soft component for the technical assistance of operation and maintenance of the equipment and PV system as a whole.

The Burundi side understood that the Project Cost Estimation attached as Annex-2 is not final and is subject to change by the result of examination through revision of the Outline Design Study.

9. Project Implementation Schedule

Both sides confirmed the revision of implementation schedule.

10. Implementing Agency

MOEM is the implementing agency.

11. Ownership and Responsibilities for Operation and Maintenance

The Burundi side has confirmed that MOEM will transfer the PV equipment to CHUK who will be the owner. CHUK will be responsible for Operation and Maintenance (O&M) activities of daily basis, and should assign necessary personnel required therein. CHUK should also be responsible for the long-term maintenance with technical support from the MOEM and REGIDESO.

During the period of O&M of the PV system, the intervention by MOEM for technical and financial assistance as well as technical assistance by REGIDESO is required. The Burundi side understood the estimated cost for O&M described in the Draft Final Report and agreed that CHUK and Ministry of Higher Education and Scientific Research will jointly secure necessary budget. In accordance with the official request letter submitted by the Government of Republic of Burundi to the Government of Japan on 11th June, 2009, the intervention and the responsibility by MOEM are required in case of large-scale repair.

12. Procurement Process of the Project

Both sides reconfirmed that procurement process would be supervised by the Procurement Agent (hereinafter referred to as "the Agent") in necessary consultation with the Consultative Committee (hereinafter referred to as "the Committee"). And both sides also reconfirmed roles of the Agent as follows;

(1) The Agent renders the services stipulated in the provisions of the G/A as well as the E/N for the Project;
(2) The Agent will undertake the procurement procedure necessary for the Project according to the provisions of the G/A and E/N and any other concerned guidelines;
(3) JICA will provide the Draft Final Report and Final Report to the Agent; and
(4) The Agent will commence the procurement according to the contents of the Final Report of the Outline Design.

The Team explained that if tender price exceeds the amount agreed on G/A and E/N, quantity or/and items of the equipment would be reduced until the cost for the Project comes down to the amount agreed on G/A and E/N.

The Burundi side agreed that if there is a remaining amount of the cost for the Project after tenders, additional items of equipment would be procured based on an equipment lists which will be set in the Final Report.

The Burundi side is also informed that decision on addition or reduction of the equipment to be procured would be made through necessary consultation among members of the Committee.

13. The Consultative Committee

The Burundi side was reminded that the MOEM will chair the Committee in order to facilitate consultation and procurement process. The Terms of Reference of the Committee was settled in Annex-9 of the previous M/D.

The members of the Committee are as follows:

(1) Representative of MOEM (Chair)
(2) Representative of CHUK
(3) Representative of the Ministry of External Relations and International Cooperation
(4) Representative of the Ministry of Higher Education and Scientific Research
(5) Representative of the Ministry of Finance
(6) Representative of the REGIDESO
(7) Representative of JICA Kenya Office

The first meeting of the Committee shall be held immediately after the signing of the contract between the Agent and the consultant.

Further meetings shall be held upon request of either the Burundi side or the Japanese side. If necessary, both sides will refer to the Agent.

14. Undertakings required by the Recipient Country

The Team requested the Burundi side to abide by the following undertakings by the Burundi side in addition to major undertakings described in the previous M/D. The Burundi side agreed to do so.

(1) Allocation of land/space for installation of PV system

The owner of the land where the following equipment and materials for PV system will be installed is CHUK. The CHUK had already agreed to offer its land for the installation of the system. No procedure is required concerning the use of the land space within CHUK for the implementation of the Project. The systems are;

1) for PV Modules
2) for underground cables between equipments
3) for Power Conditioner Cubicle
4) for Temporary stockyard

(2) Preparation for the Site

MOEM should remove trees near PV module installation area within three (3) months after the conclusion of the Contract.

(3) Environment and Social Considerations

It was confirmed that the Project does not require any procedure the evaluation of impact on environment in the previous M/D. In the letter issued on 20th November 2009, Ministry of Water and Environment, Territorial Management and Urbanization confirmed to the responsible member in charge of environmental and social consideration of JICA Study Team that it is not necessary to conduct the detailed environmental impact study in consideration of the nature and scale of the Project. This observation will be confirmed by MOEM in collaboration with the Ministry in charge of environment by the end of May 2010.

(4) Construction permissions

Both sides confirmed that the CHUK should obtain necessary permissions for the construction by October 2010, if necessary.

(5) Assignment of Counterpart Personnel

1) Overall project management

The Burundi side assigned following personnel for overall project management and coordination in each organization.

MOEM	: Director General of Water and Energy
CHUK	: Chief of Technical Service

2) Soft Component (Training Programme)

The Burundi side agreed to assign necessary personnel in accordance with the soft component implementation plan proposed by the Team.

The Burundi side shall inform the name of the focal Counterpart Personnel from the following organizations to JICA at the first Consultative Committee meeting.

- MOEM
- CHUK
- REGIDESO
- Others

Other personnel will be assigned from each organization as required at the time of installation.

(6) Customs and Tax Exemption

It was confirmed that import duties and VAT incurred in Burundi for implementation of the Project shall be exempted, and that the new tax system, which introduces the reimbursement system for tax-free, affected on 1 July, 2009 is not applicable for the Project. The Burundi side agreed that the MOEM shall assist the Japanese side in obtaining exemption of such duties and taxes mentioned above for the implementation of the Project.

15. Confidentiality of the Project

Both sides confirmed that all the information related to the Project shall not be released to any outside parties before conclusion of all the contract(s) for the Project because they are confidential document that contains information related to the tender.

Such information includes the followings:

a) detailed drawings, specifications, and other technical information of the facilities and equipment;

b) cost estimation;

c) the Draft Final Report;

d) the Final Report

<List of Annex>

Annex-1 List of Equipments

Annex-2 Project Cost Estimation (Confidential)

List of Major Equipments

Equipment		Quantity
Photovoltaic Generating System		1 system
	1-1. Photovoltaic (PV) Module	*260 kW*
	1-2. Junction Box	*1 lot*
	1-3. Power Conditioner Cubicle	*1 lot*
	1-4. Meteorological Observation Device	*1 unit*
	1-5. PV Connection Panel;	*1 unit*
	1-6. Support Structure for PV module	*1 lot*
	1-7. Miscellaneous Materials	*1 lot*
	1-8. Spare Parts, Consumables and Tools	*1 lot*
	1-9.Materials of wiring and earthing	*1 lot*
	1-10.Fence, gate and gravel surfacing	*1 lot*

Project Cost Estimation (Confidential)

This cost estimate is provisional and would be further examined by the Government of Japan for the approval of the Grant Aid.

1. Cost to be borne by the Japanese side:

2. Cost to be borne by the Burundi side:
Although small in scale and not estimated, there are two undertakings that should be done by the Burundi side:

(1) Removal of trees near the PV module installation area by MOEM.
(2) Replacement of kWh meter at the primary side of distribution transformer owned by REIDESO with the new meter procured by the Contractor.

3. Cost to be borne by the Burundi side for Operation and Maintenance (every year)

(1) Personnel expenses	Approximately BF 1,092,000
(2) Expendable and replacement parts cost in the short run	Approximately BF 1,989,000
(2') Expendable and replacement parts cost in the long run	Approximately BF 7,968,000
(3) Total (in the short run)	Approximately BF 3,081,000
(3') Total (in the long run)	Approximately BF 9,060,000

The equipment to be procured in the Project can be operated and maintained by the existing maintenance staff of the facility (CHUK). The O&M work will take up a little time of the staff on daily basis, which is evaluated in money term.

At intervals the equipment will require replacement of worn out parts and consumables. In the short run, most of parts and consumables to be needed will be covered by those provided in the Project, only minor, locally available items have to be purchased by Burundi side. After the provisions of the Project have run out, necessary items that have to be purchased by Burundi side will increase.

4. Conditions for estimation

(1) Time of estimation:	November 2009
(2) Foreign exchange rate:	US$ 1.00 = JP¥ 93.97
	BF 1.00 = JP¥ 0.0754

(3) Others:

The above estimation was carried out in accordance with relevant rules and the guideline of Japan's Grant Aid.

5. SOFT COMPONENT (TECHNICAL ASSISTANCE) PLAN

(1) Background

The Project for Introduction of Clean Energy by Solar Electricity Generation System by the Government of the Republic of Burundi will procure a Photovoltaic Generation System with 260kW capacity, furnish it to Hospitalo-Universitaire De Kamenge (CHUK) and supply the generated energy to the hospital for its energy demand. For Burundi, this Project will be the first-ever experience to have a PV system with grid interconnection, although Burundi has a number of cases of independent off-grid solar systems. Therefore, it is important to train those CHUK technicians who will be actually operating and maintaining the equipment. At the same time, it is also important to inform officers in charge of facilities and technical matters of the public utility company REGIDESO, and the Ministry of Energy and Mines overseeing it, and other people who will be involved in the Project, regarding the technical features and institutional issues relevant to PV systems and their interconnection to the utility grid, to prepare them to handle renewable projects and to cooperate with private power producers in the future.

The contractor will be conducting an Operation Guidance for the purpose of furnishing the operators with practical methods of operation and maintenance of the equipment. However, the basic knowledge underlying these methods is crucial in nurturing capabilities of judgment and decision making in various occasions of operating and maintaining the equipment, which is also useful in development and application thereto of future similar projects.

The technicians at CHUK who will be operating the generating equipment have been managing the electric facilities in the Hospital, including a diesel generating unit, and kept the facilities in a good condition. But it will be the first time for them to handle large scale photovoltaic system with industrial-standard inverters. They must be trained to be able to operate the equipment properly on the basis of firm knowledge of the mechanism. Meanwhile, the officers of the Ministry of Energy and REGIDESO are, in theProject, tasked with formulating new rules for grid-interconnection and reverse current. Therefore, they are expected to acquire knowledge necessary for future formulation energy policy and designing of institutions, on the basis of the evaluation of effectiveness of renewable energy in the power system of the country, and the firm understanding of technical requirements of grid-interconnection including reverse current. At the same time, as REGIDESO is given a role to technically support the management activities conducted by CHUK, he should be very well informed of the equipment and workings of PV system.

The country has not had experience of interconnecting renewable energy generation to the national power grid and the quality of electricity thereof is not quite stable or reliable. Therefore, the Project proposes to require the Contractor to carry out three-month inspection after the commissioning of the Products. Considering the plan that the training program will have to proceed with evaluation of, and adoption to the capability of participants, it is very useful to take advantage of this occasion, to carry out the revisory training programs at the same time, to build up the knowledge, to deepen it,

and to secure the sustainability of firm operation and maintenance techniques.

(2) Target of Training Program

To achieve the objectives of the training programs, the specific targets are set as below.

[For operators of the equipment the Site]

- To operate and maintain PV system under normal and emergency conditions, with sufficient knowledge of the function of PV system in connection with the existing electric equipment in the facility,
- To deal with the daily and periodical inspection and maintenance, fully understanding their meaning and importance in the long run, and also able to change and procure the spare parts and consumables,
- To consider routine activities of operation and maintenance and prepare an operation and maintenance management plan,
- To have basic knowledge that empowers them to give trainings to novice operators within and outside the facility,
- To explain the system to the visitors using publicity leaflets prepared in the program.

[For officials of the Ministry and public electric company]

- To understand the PV system theories, technical characteristics, and institutional issues of grid-interconnection,
- To have technical knowledge relevant in preparing agreements between private owners of power generators and the public electric utility,
- To acquire the knowledge for the development of future projects and guidance of new operation and maintenance staff,
- To promote the use of PV using the publicity leaflets prepared in the program.

(3) Outcome of training programs

- the operation and maintenance management plan has been established, and the PV system procured is operated and maintained autonomously and sustainably,
- O&M activities are followed up by using check sheets,
- Technical officers at the Ministry and REGIDESO are equipped with knowledge on the method of planning and on the institutional provisions for interconnection of renewable power generation systems,
- Use of PV is being promoted using the publicity leaflets prepared in the program.

(4) Outcome confirmation and evaluation

Most tangible outcome will be the operation and maintenance management plan. The operation and

maintenance management plan is a plan to be made on the basis of manuals and guidance provided by the Contractor, listing activities of O&M in short-term (daily activities), mid-term (a few months to a few years) and long-term (seven years, an interval of long term maintenance), specifically scheduling the activities, with check sheets for these activities, to make sure the activities are carried out as planned and desired. As discussed below, the training programs are divided into two periods, the first during the commissioning of the equipment and the other three months after the commissioning. The operation and maintenance management plan will be drafted in the first-period program and revised in the second, taking into account the actual experiences in three months.

Also, a trouble shooting manual is to be prepared in the training programs by participants. It is a summary of operators' experiences, and responses sought in discussions in consultation with trainers. The material prepared can be useful in evaluating the degree of understanding of basic knowledge, and the process of preparation itself is helping the deepening of understanding. It also can be used in similar projects elsewhere.

The exercises above are to be started by the discussion among the participants. After evaluating the results, the lecturer joins the discussion, giving additional explanations and instructions as required. Then the participants proceed with the tasks given. These three steps enable the lecturer to evaluate the degree of understanding of the participants before and after the exercise sessions.

Publicity Leaflet will be designed and prepared in the programs, with due consideration to the current status of renewable energy use in the recipient country, to be used and distributed to public in order to introduce the PV system procured in the Project and to promote the use of renewable energy.

Other outcomes in the first-period program will be evaluated in the following manners at the beginning of the second-period program. The whole program will also be evaluated with the materials presented at the Work Shop to be held at the end of the programs, further supplemented by questionnaires.

- Evaluation of operation records and daily check sheets for three months,
- Evaluation of problem-response records for three months,
- Evaluation of communication and discussions in Trouble Shooting sessions in the second-period program,
- Evaluation of knowledge acquisition concerning the system-wide management, through Exercises, Workshop and its handouts prepared,
- A questionnaire conducted at end of the training programs

In preparing these questions, attentions should be paid to set particular questions and/or assignment concerning the key topics of the programs, which enable to assess the effectiveness of the training.

(5) Planning of training programs

1) Contents

Training program is planned to consist of a series of lectures, exercises, and OJTs led by Japanese consultants. The program is to be carried out in two separate periods; one during the commissioning of the equipment, and the other three months after the commissioning.

There will also be O&M training provided by the Contractor of the Project. Therefore, the consultant will coordinate with the Contractor and plan the details of his training program so that the necessary techniques and knowledge are effectively transferred to the participants of the program. Those training items with a symbol (*) below are the ones presumably provided by the Contractor. The consultants will provide additional information for such items, if necessary, to make them more relevant, not just "how to operate", in the context of understanding of PV systems.

Before commissioning (approximately starting 4 weeks before commissioning)

Lectures on basic knowledge

- Basic theory of photovoltaic generation
- Utilization of photovoltaic generation
- Grid-interconnection and its planning
- Understanding surplus and reverse current
- Supply of power to Hospital from the grid
- Power demand and loads in Hospital
- Workings of PV equipment during blackout
- Planning PV systems
- Arrangement between PV owner and power utility

Lectures on construction planning

- Installation of PV equipment
- Power distribution in the facility
- Electric equipment in the facility and connection of PV system
- Scheduling works
- Work supervision and inspection, take-over

OJT program

- Witnessing connection works
- Witnessing pre-commissioning/commissioning tests

After commissioning of PV system (continued from "before commissioning " program)

Training provided by the Contractor

- Starting, stopping, restarting the system (*)
- Daily inspection and maintenance (*)
- Periodical inspection and maintenance (*)
- Consumables and replacement work (*)
- Occurrence of faults and actions (*)

Planning O&M works on the basis of Operation Manuals (exercises)

- Making daily check sheet/log sheet form
- Making failure/accident record form
- Maintaining PV equipment in a good condition
- Making Operation and Maintenance Management Plan

For promotion of renewable energy use

- Design and preparation of publicity leaflet

It is very often experienced, in Japan and in other countries as well, that initial setting of the equipment and/or the lack of familiarity of operation lead to malfunction or unsatisfying performance of the equipment. Therefore, it is necessary to carry out revisory training program a certain period after the commissioning. Initial malfunctions and poor operation practices generally show up soon after the commissioning, but settle down as the countermeasures are taken. It is not wise to leave them for too long without doing anything, while too short an observation may overlook the problems or leave operators insufficient time and experiences. Therefore, the revisory training program is proposed to take place soon after approximately three month period since the commissioning, when certain experiences and operation records have built up. Then, the three month experience of actual operation and maintenance of PV equipment, operation issues unique in the implementation and in CHUK circumstances are reviewed to address problems and questions, and to revise the operation and maintenance management plan. This process aims for the establishment of more pragmatic and steady method of operation.

On top of these, the records of power generation are to be analyzed to provide exercise materials for more advanced operation planning and brief financial assessment, in order to build a capability for planning and management of PV systems in wider applications. It should be coordinated with the three month inspection carried out by the Contractor engineer, to make witnessing thereof part of training programs, and video-record the inspections, adjustments and changing of parts along with the conversations take place during the proceeding between Contractor engineer and program participants. The recorded material can be reviewed during later sessions of the program. The material should be brought back to Japan, edited and recorded on DVDs, which will be used later on such occasions as the guidance of new members of

operation staff, or that of similar projects outside the facility. This aims at the promulgation of Project's positive effect in time and in space, resulting in the realization of initial objectives of the Project.

The following contents are being considered.

Three months after the commissioning

Evaluation of Establishment of Techniques

- Evaluation of knowledge of basic operation methods
- Evaluation of knowledge of basic maintenance works

Revision of Operation and Maintenance Activities

- Evaluation of 3 month experience of operation and maintenance (as input)
- Trouble shooting sessions (by questionnaire, Q&A session, discussion)
- Revising daily operation and check sheets (exercise)

Improvement of Operation and Maintenance Methodology for Long-run

- Planning operation with considerations on seasonal changes (to consider changes in output of PV system by seasons and resulting operation methods)
- Witnessing three month inspection (there will be demonstration of replacement of parts, such as fuses by manufacturer's engineer)
- Recording the three month inspection (video-taped and recorded on DVD media)

Preparation of Trouble Shooting Manual

- Discussion on the problems experienced and responded in three months, finding better responses and solutions, compiling information into " Trouble Shooting Manual ",

Support for establishing advanced organization for operation and maintenance

- Brief financial assessment of the generation equipment (comparison of income and expenses)
- Improvement of management of equipment for better financial performance of the equipment,
- Planning better use of PV system responding to the increase in power demand,

Round up Exercises

- Revising the operation and maintenance management plan
- Questionnaire

Workshop

- Presenting revised operation and maintenance management plan and Trouble Shooting Manual,
- Reporting results of brief financial assessment and operation records.

2) Participants

Candidate participants to the training sessions are as follows.

CHUK technicians: Those who will be actually operating the PV system

REGIDESO officers: in distribution, power purchasing or power plant management related departments, with engineering background (preferably having a degree in electric engineering)

MEM officials: in regulatory planning, facility management or facility planning related departments, preferably with engineering background

Other If there are requests from other ministries or organizations, they may appoint persons in charge of public facility planning and/or its maintenance to join the program.

Preliminary assignment for these participants is shown in the table below.

Table 1 Program Contents and Participants

Activities	Technicians (3-4person)	REGIDESO (2-3person)	Ministries (2-3person)	Others (2-3person)
Before commissioning				
Lectures on basic knowledge	○	○	○	○
Lectures on construction planning	○	○	○	
OJT program	○	○	○	
After commissioning				
Reinforcement of Contractor Guidance	○	○		
Planning O&M works	○			
For promotion of renewable energy use	○	○	○	
Three month after commissioning				
Establishment of Techniques	○	○		
Revision of O&M Activities	○			
Improvement of O&M for Long-run	○			
Preparation of Trouble Shooting Manual	○	○		
Advanced Organization for O&M	○		○	
Round up Exercises	○	○	○	○
Workshop	○	○	○	○

3) Schedules

The schedule for the abovementioned program is shown below.

Table 2　Training program before/after commissioning

		-4w	-3w	-2w	-1w	0w	1w	2w	3week
Activities	Preparation								
	Basic knowledge lectures								
	Construction exercise								
	OJT								
	Reinforce Contractor Guidance								
	O&M Management Planning								
	Promotion Material								
Participant	CHUK technicians								
	REGIDESO officers								
	Ministry Officials								
Lecturers	Consultant (leader)								
	Consultant (assistant)								
	Interpreter								

Table 3　Training program three months after commissioning

		1w	2w	3w	4w
Activities	Establishment of Techniques				
	Revision of O&M Activities				
	Improvement of O&M for Long-run				
	Preparation of Trouble Shooting Manual				
	Advanced Organization for O&M				
	Round up Exercises				
	Workshop				▼
Participant	CHUK technicians				
	REGIDESO officers				
	Ministry Officials				
Lecturer	Consultant (leader)				
	Consultant (assistant)				
	Interpreter				

(6)　Resources for the training program

As already mentioned, this PV system with grid interconnection is first-ever experience in Burundi. Therefore, Japanese consultants are assumed to undertake the implementation of training programs. Consultants to be assigned should have adequate experiences in planning of PV system with grid

interconnection.

There will be two Japanese consultants, one leader and one assistant, to be lecturers to the programs of both periods. National consultants are not considered as the recipient country does not have an experience in similar projects.

As the official foreign language of the country is French, and the participants may not be good at speaking English, translation/interpretation service is necessary. But French-English interpretation service available in the country will have problems in technical terms and expressions. If consultants give a lecture in English and an interpreter translates to French, it is most likely to cause confusion and misunderstanding. Therefore, the translation between Japanese and French is more desirable, and the interpreter should be sought in Japan. Hiring Japanese-French interpreter has some other advantages; such as translating additional materials obtained from the Contractor to use in the lectures, which are very likely written in Japanese.

The work schedule of consultants is planned as below. The first period program takes forty days, and the second twenty days. After including return travels to and from the Site, the assignment should be two months and one month, respectively.

Table 4　Work Schedule of Consultants

Program	Work Description	Duration
Preparation　5 days	- Discussion on contents and materials with MEM and REGIDESO - Confirmation of contents with CHUK - Coordination with the Contractor - Preparation of materials	2days 1day 1day 1day
Before commissioning　15 days		
Lectures on basic knowledge	- Basic theory of photovoltaic generation - Utilization of photovoltaic generation - Grid-interconnection and its planning - Understanding surplus and reverse current - Supply of power to Hospital from the grid - Power demand and loads in Hospital - Workings of PV equipment during blackout - Planning PV systems - Arrangement between PV owner and power utility	10days in total
Lectures on construction planning	- Installation of PV equipment - Power distribution in Hospital - Electric equipment in Hospital and connection of PV system - Scheduling works - Work supervision and inspection, take-over	0.5days ↓ 1day 1.5days 1day
OJT program	・ Witnessing connection work and tests/inspection of the Contractor	（5days）
After commissioning　20 days		
Reinforcement of Contractor Guidance	- Following Operation Guidance of the Contractor; - additional explanations given on workings of PV system in the facility, using Operation and Maintenance Manual and the training materials, - discussions on findings of participants.	5days
Planning O&M works	- Proposing daily activities needs and making daily check sheet/log sheet form - Listing periodical inspection items, activity necessary, to make check sheet, - Listing long-term inspection items, activity necessary, to make inspection schedule	12days in total
Promotion of renewable energy use	- Planning the materials, editing, laying-out, and prepare the leaflets	5days
Three months after commissioning　20 days		
Establishment of Techniques	- Confirmation and evaluation of operation records by the Consultant, - Confirmation of basic operation knowledge and technique, - Discussions on daily operation and maintenance activities.	1day 1day 1day
Revision of O&M Activities	- Revision and evaluation of three-month experience of operation and maintenance, - Trouble shooting (extracting problems and solutions, through enquiries and discussions), - Revision of daily operation and maintenance check sheets.	1day 1day 1day
Improvement of O&M for Long-run	- Considering seasonal changes of demand and power generation, - Witnessing three-month inspection carried out by the Contractor(including changing of spare parts), - Recording the above on video.	1days 2days (half day) (2days)
Preparation of Trouble Shooting Manual	- Summarizing problems and solutions extracted in the above program to prepare Trouble Shooting Manual.	1day
Advanced Organization for O&M	- Simple financial analysis of PV equipment (cost and income related to PV operation), - Discussion on management of facilities and equipment, - Increase of demand, consumption of PV generated energy, and better use of energy in the facility.	1.5days 1days 1.5days
Round Up Exercises	- Updating Operation and Maintenance Management Plan, - Questionnaires on understanding, - Preparation of Work Shop presentation.	2days 1days 2days
Work Shop	- Presenting Operation and Maintenance Management Plan, Trouble Shooting Manual and reporting records of operation including financial performance.	1day

(7) Schedule of training programs

Work schedule of training programs is as shown below, assuming that the agreement between procurement agents and contractors will be concluded in 10/2010.

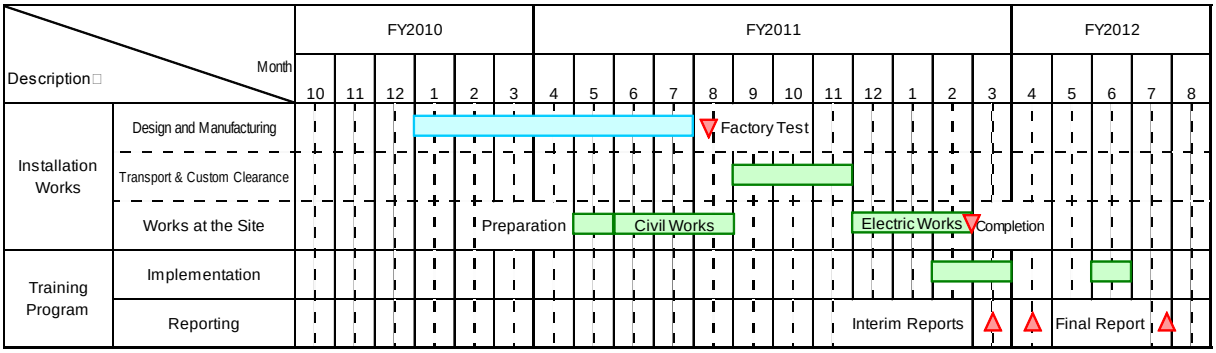


Figure 1 Management Guidance Implementation Schedule

(8) Products of training programs

Products of training programs are outlined below.

- A training program textbook prepared by the Consultant
- Output of Exercises (A single line diagram of the facility, etc.)
- Publicity Leaflet
- Progress reports
- Visual record (DVD) of Periodical Inspection (three month inspection)
- Operation and Maintenance Management Plan (with revision)
- Trouble Shooting Manual
- Workshop materials
- Results of questionnaires
- Final report (including evaluations of operation records and trouble shootings)

(9) The responsibility of receipt country

It is important that participants take part in the training programs in full for the achievement of program objectives, which, however, requires the participants of being away from their work places for weeks. Therefore, there must be an official designation as a participant given by the section/department management who appreciates the usefulness of the programs. It is also important that government agencies appoint persons who will be in charge of PV and renewable energies in the future.

6. REFERENCES

6.1 Technical Notes for Draft Basic Design

MINUTES OF MEETING

Project for Introduction of Clean Energy using Photovoltaic Power In The Republic of Burundi

In connection with the Project, JICA Study Team (the Team) visited Centre Hospitalo-Universitaire de Kamenge (the Hospital) in Bujumbura, Burundi for the period between November 16th and December 2nd, 2009, to carry out the Second Phase Survey and design work. The output of the survey and design work was presented to the Hospital on November 30, 2009, on the condition that the final scope of the PV system and the design of the Project shall be determined (confirmed) by the JICA Headquarters and the Government of Japan. Both parties discussed and agreed, with some amendments to the original presentation, as attached hereto.

Bujumbura, December 2, 2009

Masaru NISHIDA
Chief of Consultants,
JICA Solar Study Team
JAPAN

Dr Novat TWUNGUBUMWE
Director
Centre Hospitalo-Universitaire de Kamenge
République du Burundi

Discussion on Proposed PV Project at CHUK Hospital

Date: November 30th, 2009

Place: Centre Hospitalo-Universitaire de Kamenge (CHUK)

1. Scope of the Project

The Project proposed will provide **Centre Hospitalo-Universitaire De Kamenge (CHUK)** (the Hospital) with the works as shown below.

- Installation of the PV System with the capacity of 200kW
- Installation of the Electrical Facility Cubicle
- Installation of the PV Connection Board in the Emergency Generator Room and the Branch Switcher Board for Load in the Electrical Room
- Installation of the fences which surround the PV modules and the Electrical Facility Cubicle

The system under planning is also presented as in the Attachment 1 and the following drawing list.

[List of Drawings to be presented]

- BU-01 SINGLE LINE DIAGRAM (EXISTING)
- BU-03a SINGLE LINE DIAGRAM (PV SYSTEM)
- BU-04 GENERAL LAYOUT PLAN
- BU-12 CABLE LAYOUT PLAN (OUTSIDE)
- BU-15 EQUIPMENTS LAYOUT (GENERATOR ROOM)
- BU-16 EQUIPMENTS LAYOUT (EXISTING ELECTRICAL ROOM)
- BU-18 PAVING STONE PLAN
- BU-19 LAYOUT OF FENCE AND GATE
- BU-23 OUTDOOR LIGHTING SYSTEM

2. Operation of the PV System

(1) Operation under the normal condition

The PV System is designed to start sending electric power in the morning and stop in the late afternoon every day, by the scheduled timer.

If the power from REGIDESO (the Power Company) network is stopped (black out, etc.,), the PV System automatically shuts down. After the power is recovered, the system must be restarted manually.

(2) Stand-alone operation under power cut of Power Company

Upon the request from the Hospital, the PV System is designed to be equipped with "stand-alone operation function", which enables to supply electricity to the limited load of the Hospital during Stand-alone operation may be activated as follows:

- When the electricity supply from the Power Company is stopped, the PV System will be shut down automatically.
- Then, by manual operation, the system may be restarted to meet the limited load of the Hospital.
- "The limited load" is proposed to be those in Building A1, A2 (Reception for outpatient department [Gynecology, Pediatric]) and Building B1, B2, B3 (Reception for outpatient department [ENT (ear, nose and throat), Internal medicine, etc]).
- The PV System may not be able to meet the electric load in the whole Building A1,A2 and Building B1,B2,B3, as the PV System has inherent instability due to the weather condition. The electricity load of those part of the building to be supplied with power by the PV System during blackout can be selected by the switches in "Branch Switcher Board for Load in the Electrical Room".
- When the power from the Power Company is recovered, the PV System must be once shut down and restarted in normal operation mode manually.

(3) Maintenance

- Daily inspection will have to be done once a day by maintenance staff of the Hospital.
- Periodical inspections will be necessary, which may involve change of consumables and worn-out parts.

3. Construction

There are a few important matters that need to be understood about the construction work (the work).

(1) Interruption of power supply to the Hospital at the power system switch

Two electric boards, one in the Emergency Generator Room and the other in the Electrical Room of the Building C, will have to be installed. The installation work requires interruption of electric power supply from the Power Company to whole of the Hospital load.

There will be mobile diesel generator to be used by the Contractor as substitute source of electric power to the whole Hospital load. However, there will be entire electric power cut of the Hospital a few times during the Work and the switching of the electric power supply from/to the Power Company to/from mobile diesel generator.

Details of the Work will be planned, and submitted for approval of the engineer, by the Contractor.

(2) Need to Secure Temporary Storage of Materials and Equipment

The Hospital is requested to secure, free of charge, the space in the Hospital for storing materials and equipment transported from Japan. The area suitable for the purpose is shown in a green rectangle in Figure 1. The materials and the equipment must be stored safely during the Work under the responsibility of the Hospital.

(3) Temporary Storage of Construction Waste

The construction work will produce large amount of wastes. They will have to be stored temporally somewhere in the premise of the Hospital before the Contractor dispose of it in a proper and lawful way.

4. Preparation for the Project

(1) Application for the interconnection of the PV System to the Power Company network.

As the Hospital will become an owner of the PV System for his own use, and the PV System will be interconnected to the Power Company network, a necessary procedure, which may involve applying for a license and so on, will have to be initiated by the Hospital.

(2) Preparation of the Site

The following matters should be undertaken by the Hospital.

- To secure and keep the open space the space for PV system installation
- To clear and level the open space for PV system installation
- To clean up the inside of the electric rooms before the construction work starts

5. Project Schedule (tentative only)

- Preparation of contract with the Contractor : mid 2010
- Commencement of the Work at the Site : early 2011
- Completion of the Project and Commissioning : early 2012

Basic Specification of PV System (Draft)

Name of Site : Centre Hospitalo-Universitaire De Kamenge (CHUK)

Item	Specification
Type of the PV system	Grid connection (No Storage Battery)
Capacity of the PV System	200kW
Basic configuration of the PV system	Refer to Fig.1
Basic layout of the PV System	Refer to the drawing NO.BU-04
Electrical facility cubicle of the PV System	Refer to Fig.2
Grid connection point	Low voltage (At secondary side of the transformer)
Support stand of the PV module	Hot dip zincing steel
Reverse power flow	Supply surplus power to the Power Company network.
Protection Relay of Grid connection	Over current(OC), Over voltage(OV), Under voltage(UV), Over frequency(OF), Under frequency (UF), Islanding detector
Electric power supply in the case of power failure (blackout)	**Building A1, A2** (Reception for outpatient department [Gynecology, Pediatric]) and **Building B1, B2, B3** (Reception for outpatient department [ENT (ear, nose and throat), Internal medicine, etc]) is to be fed with power from the System during power failure (blackout) of the grid (REGIDESO network)
Display system	2 sets to be installed. Information to be displayed are 1) Current Output of the System (kW) 2) Energy Generated the day (kWh) 3) Estimated reduction of CO2 emission
Fence and Gate for PV system	Refer to the drawing NO.BU-19
Meteorological observation device	Solar radiation and Thermometer system at the PV panels
Language of operation and maintenance manuals	French

Note) Due to the instability of the PV System output, the PV System cannot supply power to the critical load such as life supporting equipment.

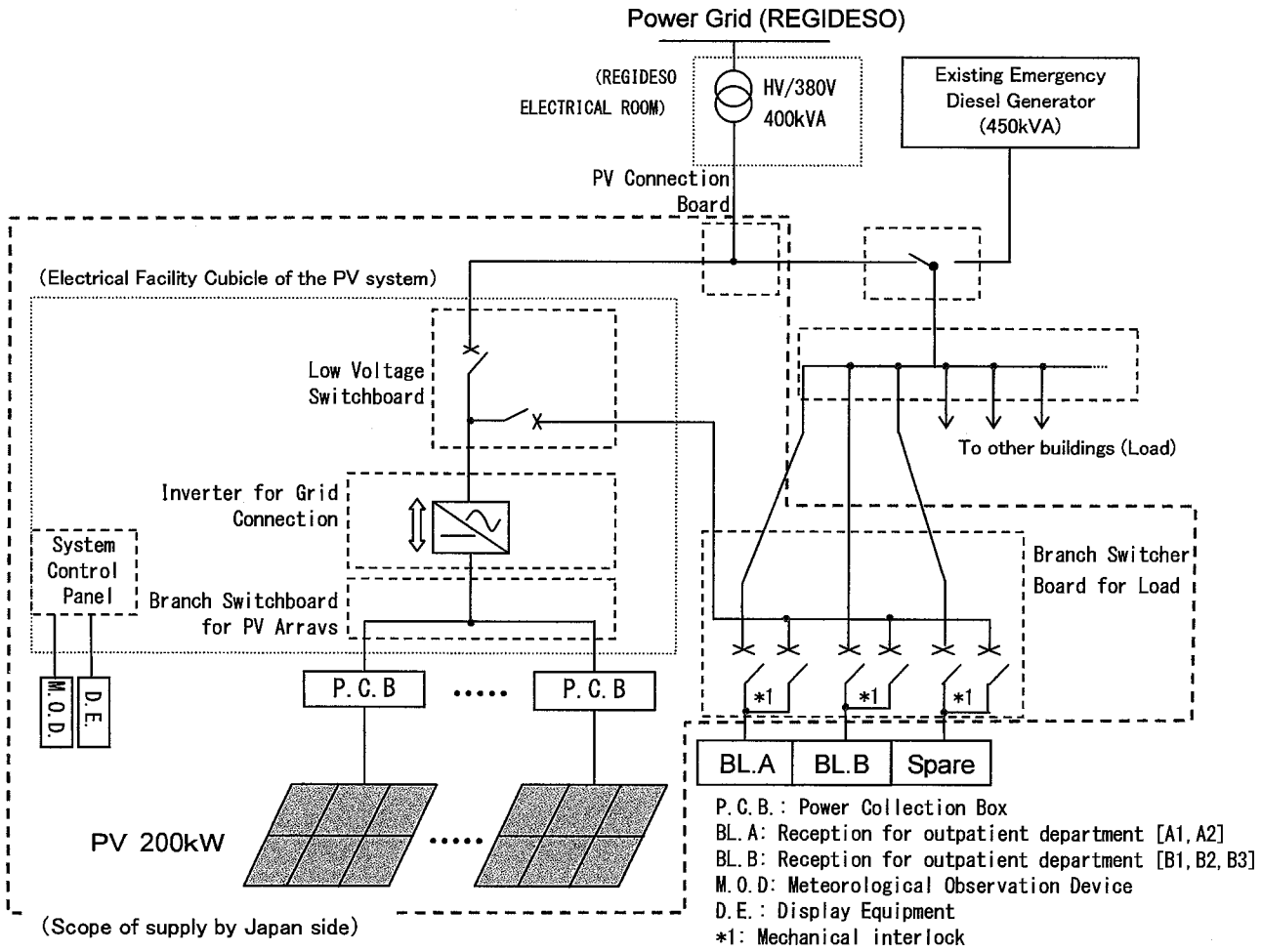
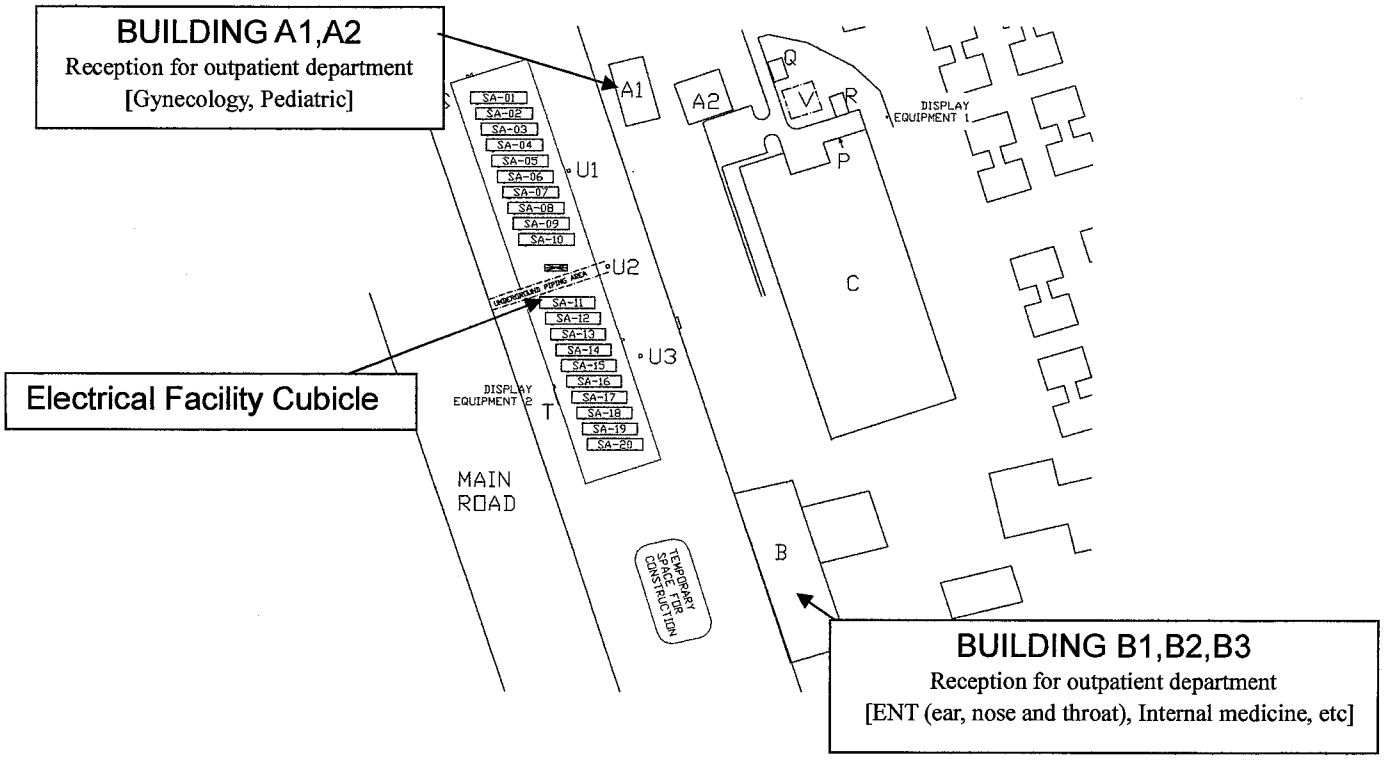


Fig. 1 Planned Configuration of PV system



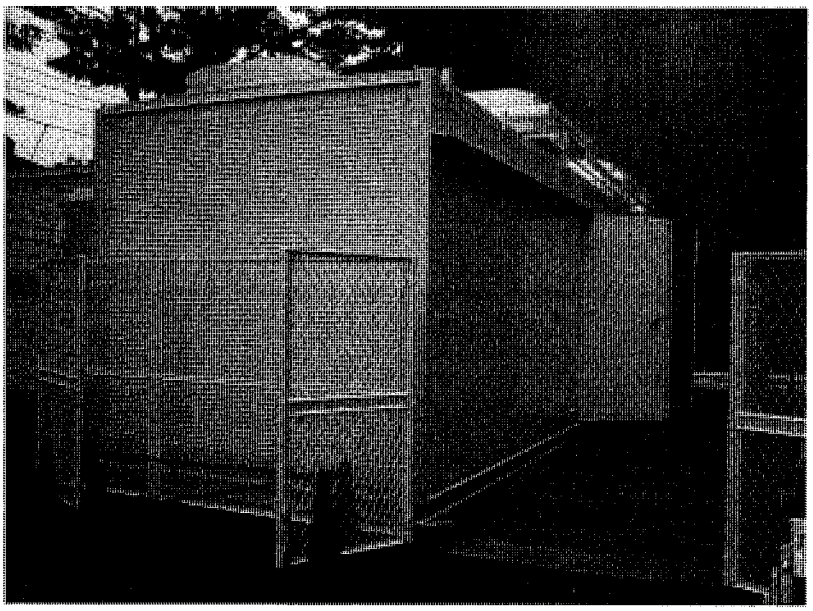
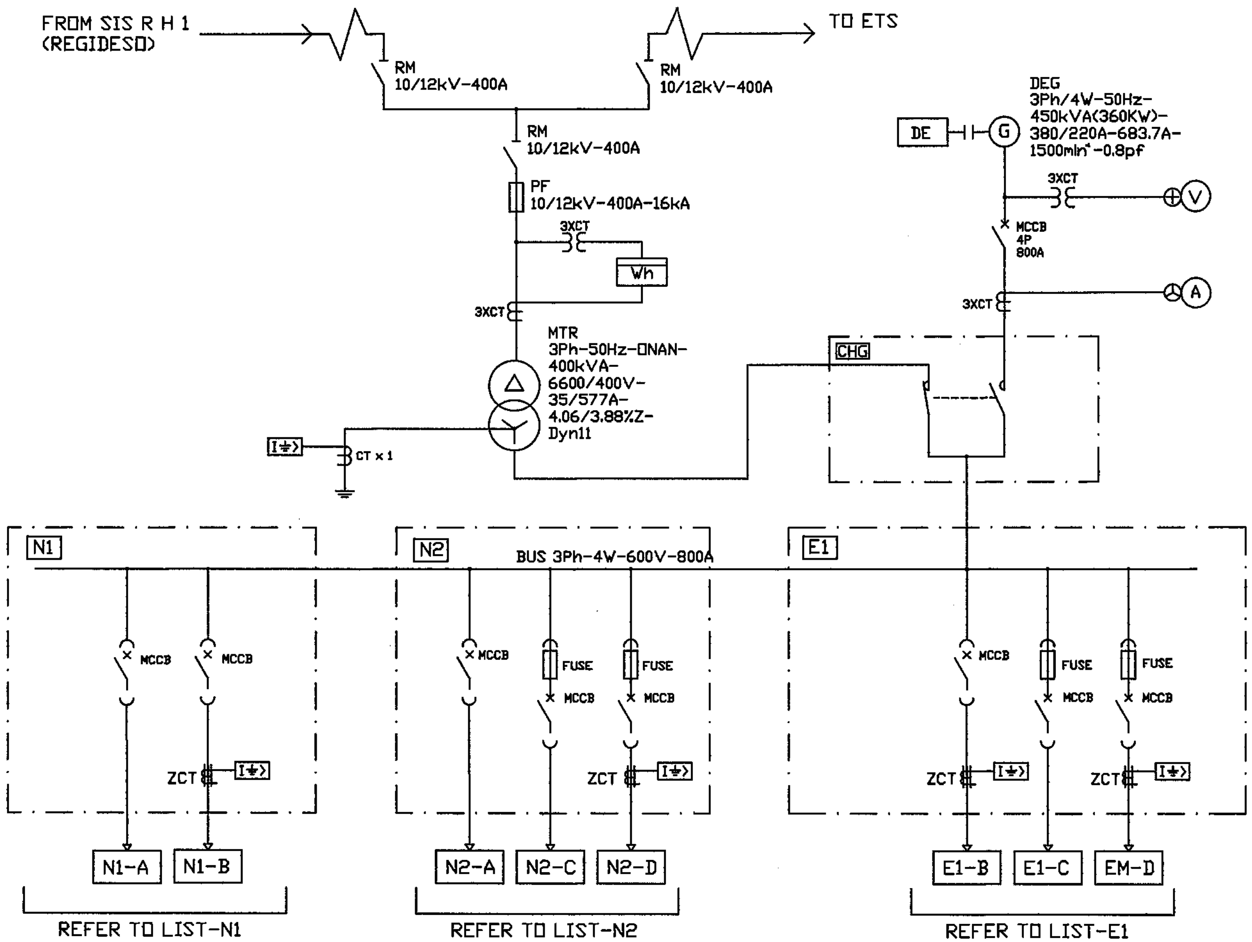


Fig.2 Example of Electrical Facility Cubicle of the PV system



SYMBOL	ABBREVIATION	DESCRIPTION
ISO	ISO	ISOLATOR
ES	ES	EARTHING SWITCH
	LBS	LOAD BREAK SWITCH
RM	RM	RING MAIN SWITCH
	LA	LIGHTNING ARRESTER
VCB	VCB	VACUUM CIRCUIT BREAKER
ACB	ACB	AIR CIRCUIT BREAKER
MCCB	MCCB	MOLDED CASE CIRCUIT BREAKER
VS	VS	VACUUM SWITCH
MC	MC	MAGNETIC SWITCH
PF	PF	POWER FUSE
F	F	FUSE
	TR	POWER TRANSFORMER
SR	SR	SERIAL REACTOR
SC	SC	STATIC CAPACITOR
U>	-	OVER VOLTAGE RELAY
U<	-	UNDER VOLTAGE RELAY
I>	-	OVER CURRENT RELAY
I<	-	UNDER CURRENT RELAY
Id/I>	-	DIRECTIONAL OVER CURRENT RELAY
I⏚>	-	OVER CURRENT GROUNDING RELAY
Id>	-	DIFFERENTIAL RELAY
3E	-	3-E RELAY (MULTI-FUNCTION MOTOR RELAY)
P←	-	REVERSE POWER RELAY
I←	-	REVERSE CURRENT RELAY
	-	OVER LOAD RELAY
	-	THERMAL RELAY
	VT	VOLTAGE TRANSFORMER
	EVT	EARTH VOLTAGE TRANSFORMER
	CT	CURRENT TRANSFORMER
	ZCT	ZERO PHASE CURRENT TRANSFORMER
V	V	VOLT METER
A	A	AMMETER
Hz	Hz	FREQUENCY METER
W	W	WATT METER
Wh	Wh	WATT HOUR METER
COSφ	PF	POWER FACTOR METER
var	Var	VAR METER
VD	VD	VOLTAGE DETECTOR
	VS	VOLT METER CHANGE-OVER SWITCH
	AS	AMMETER CHANGE-OVER SWITCH
	-	CABLE HEAD
	-	BUS DUCT

LIST : N1 LOW VOLTAGE DISTRIBUTION PANEL-1 FOR NORMAL LOADS

PANEL NAME		N1	N1	N1	N1	N1	N1	N1	N1	N1
POWER SOURCE		POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)
CIRCUIT NO.		01	03	05	12	22	24	11	13	14
CIRCUIT TYPE		N1-A	N1-A	N1-A	N1-B	N1-A	N1-A	N1-B	N1-B	N1-B
DISTRIBUTION BOARD (LOAD NAME)		C1.1, C2.1, C2.2, C3.1	C1.2, C1.3, C2.4, C3.2	C1.7, C2.7, C2.4, C1.5, C2.6	RADIO DIGESTIF-LOCAL 612	CUISINE-AMOIRE G1,F	BUANDERIE-AMOIRE H1,F	CONDITIONNEMENT-LOCAL 726	RADIO CB-LOCAL 621	RADIO POUMONS-LOCAL 657
MAJOR EQUIPMENT	FUSE RATING	-	-	-	-	-	-	-	-	-
	MCCB (FRAM AMP.)	4x250A	4x250A	4x250A	4x250A	4x250A	4x250A	4x250A	4x250A	4x250A
	MCCB (RATED AMP.)	Ir:100A	Ir:100A	Ir:100A	Ir:180A	2d:160A+Ir:65A	3d:210A+Ir:105A	Ir:140A	Ir:130A	Ir:130A
	EARTHING DETECTOR	-	-	-	300mA	-	-	300mA	300mA	300mA
CABLE SIZE	PHASE WIRE (CORE-sqmm)	4x25	4x25	4x25	4x50	3x95+1x50	3x150+1x70	4x50	4x35	4x35
	NEUTRAL (CORE-sqmm)	1x16	1x16	1x16	1x25	1x50	1x70	1x25	1x25	1x25
REMARKS					XRAY STATION	KITCHEN-FEEDER G1F	BUANDERIE-AMOIRE H1,F	AIR CONDITION	XRAY STATION	XRAY STATION

LIST : N2 LOW VOLTAGE DISTRIBUTION PANEL-2 FOR NORMAL LOADS

PANEL NAME		N-2	N-2	N-2	N-2	N-2	N-2	N-2	N-2	N-2	N-2	N-2
POWER SOURCE		POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)	POWER COMPANY (REGIDESO)
CIRCUIT NO.		26	18	19	20	22	21	16	17	15	07	09
CIRCUIT TYPE		N2-D	N2-C	N2-C	N2-C	N2-C	N2-C	N2-C	N2-C	N2-C	N2-A	N2-A
DISTRIBUTION BOARD (LOAD NAME)		ECLAIRAGE EXTERIEUR	D1,E, E13, E15, E16	E5, E6, E7, E8	D2, F	B3, B1, B2, B4	A1, A2	E3, E1, H1,E, J1	E4, E11, E2, E9	D1	C1,E, C2,E, C1.4, C3.3	STERILISATION-LOCAL 456
MAJOR EQUIPMENT	FUSE RATING	F-80A	F-80A	F-60A	F-80A	F-80A	F-40A	F-80A	F-80A	F-80A	-	-
	MCCB (FRAM AMP.)	4x100A	4x100A	4x100A	4x100A	4x100A	4x100A	4x100A	4x100A	4x100A	4x250A	4x250A
	MCCB (RATED AMP.)	Ir:40A	Ir:60A	Ir:40A	Ir:60A	Ir:40A	Ir:15A	Ir:60A	Ir:60A	Ir:60A	Ir:140A	Ir:120A
	EARTHING DETECTOR	300mA	-	-	-	-	-	-	-	-	-	-
CABLE SIZE	PHASE WIRE (CORE-sqmm)	5x4x2CIRUIT	4x50	4x35	4x35	4x25	4x6	4x35	4x50	4x16	4x70	4x35
	NEUTRAL (CORE-sqmm)	-	1x25	1x16	1x16	1x16	1x6	1x16	1x25	1x16	1x35	1x16
REMARKS		OUTSIDE LIGHTING										

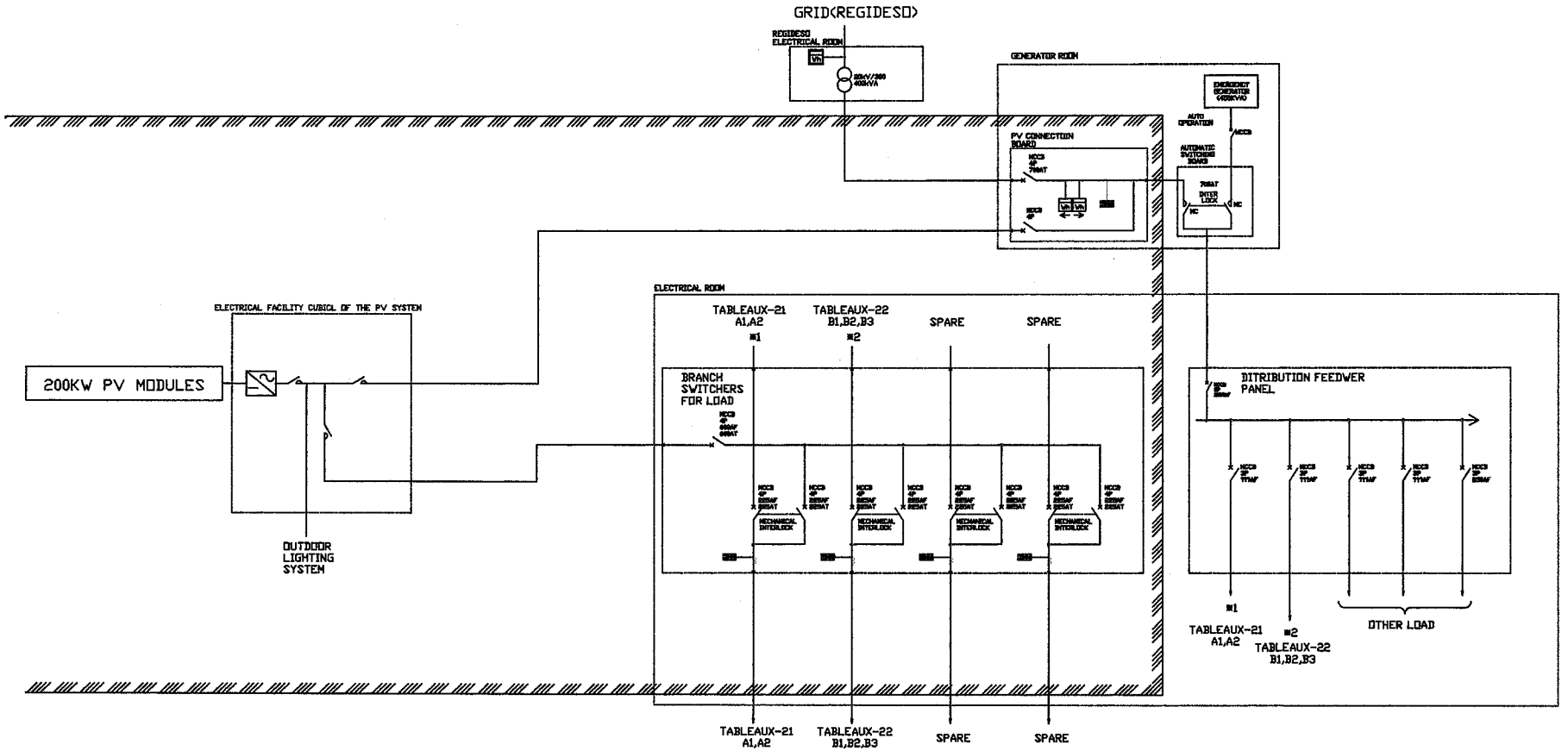
LIST : E1 LOW VOLTAGE DISTRIBUTION PANEL-1 FOR ESSENTIAL LOADS

PANEL NAME		E-1	E-1	E-1	E-1	E-1	E-1	E-1	E-1
POWER SOURCE		EMERGENCY GENERATOR	EMERGENCY GENERATOR	EMERGENCY GENERATOR	EMERGENCY GENERATOR	EMERGENCY GENERATOR	EMERGENCY GENERATOR	EMERGENCY GENERATOR	EMERGENCY GENERATOR
CIRCUIT NO.		28	04	02	06	25	10	08	27
CIRCUIT TYPE		E1-D	E1-C	E1-C	E1-C	E1-D	E1-C	E1-C	E1-B
DISTRIBUTION BOARD (LOAD NAME)		STATION EPURATION	C2.3	C1.1, C2.1, C2.2, C3.1	B0.6, B0.7, B0.8, B0.9	AUXILIARE OE LOCAL TRANSFO	STERILISATION-LOCAL 456	B0.1, B0.2, B0.3, B0.4, B0.5	100kvar STATIC CAPACITOR
MAJOR EQUIPMENT	FUSE RATING	F-80A	F-40A	F-80A	F-80A	F-40A	F-80A	F-80A	-
	MCCB (FRAM AMP.)	4x100A	4x100A	4x100A	4x100A	4x100A	4x100A	4x100A	3x400A
	MCCB (RATED AMP.)	Ir:30A	Ir:25A	Ir:60A	Ir:40A	Ir:15A	Ir:40A	Ir:60A	Ir:160A
	EARTHING DETECTOR (ZCT)	200mA	-	-	-	300mA	-	-	200mA
CABLE SIZE	PHASE WIRE (CORE-sqmm)	5x6	4x10	4x16	4x16	5x4	4x10	4x10	3x50
	NEUTRAL (CORE-sqmm)	-	-	-	-	-	-	-	1x25
REMARKS		GENERATOR ROOM				TRANSFORMER AREA			SECAUTO-CPTRIBANT

Project for Introduction Of Clean Energy using Photovoltaic Power

TITLE : SINGLE LINE DIAGRAM

DRAWING NO. BU-01			Rev.1
DATE		DRAWN	CHECKED
SCALE: Non.(A3)	Unit:		
NEWJEC	NEWJEC Inc. Osaka,JAPAN		



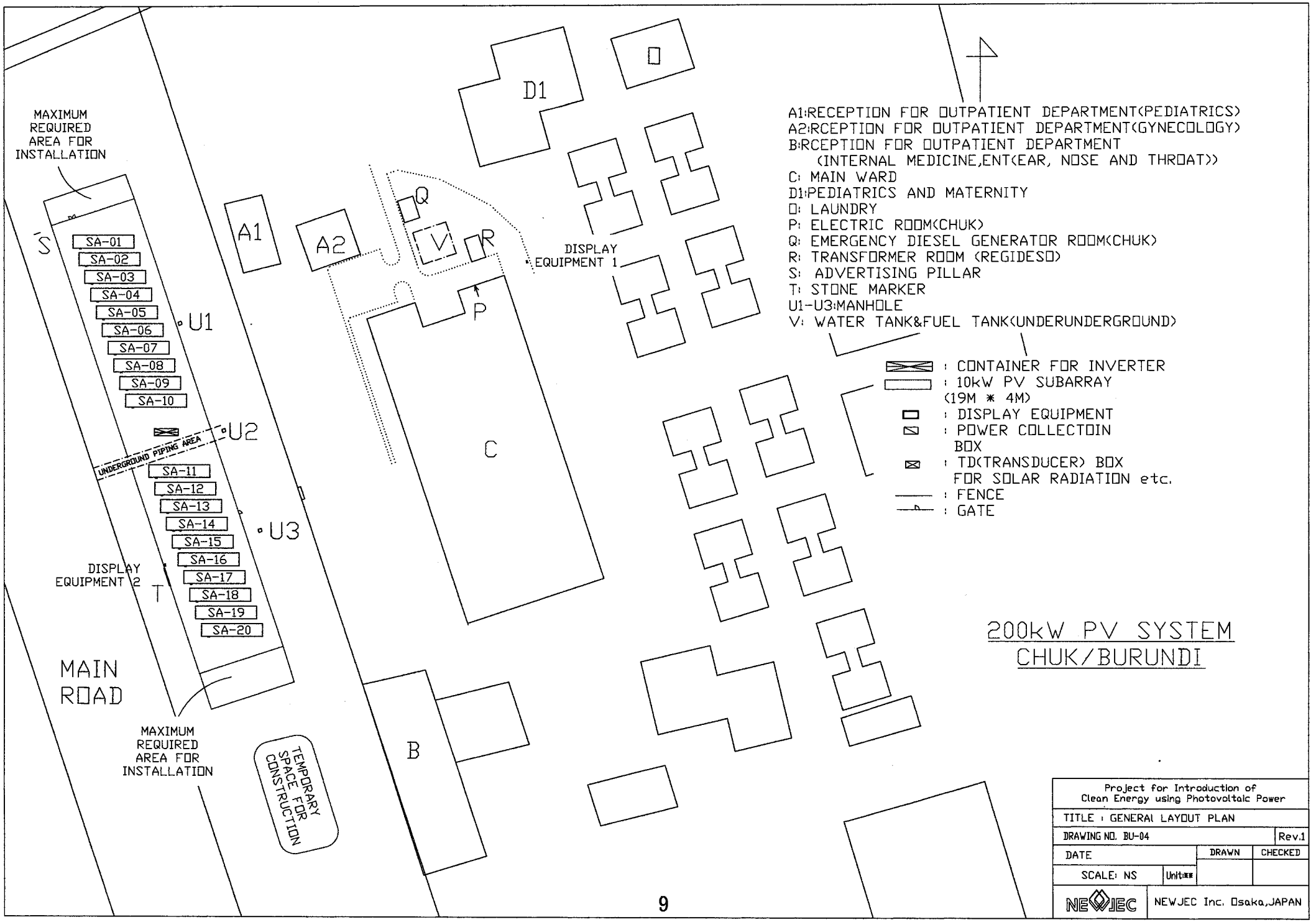
For Reference Only

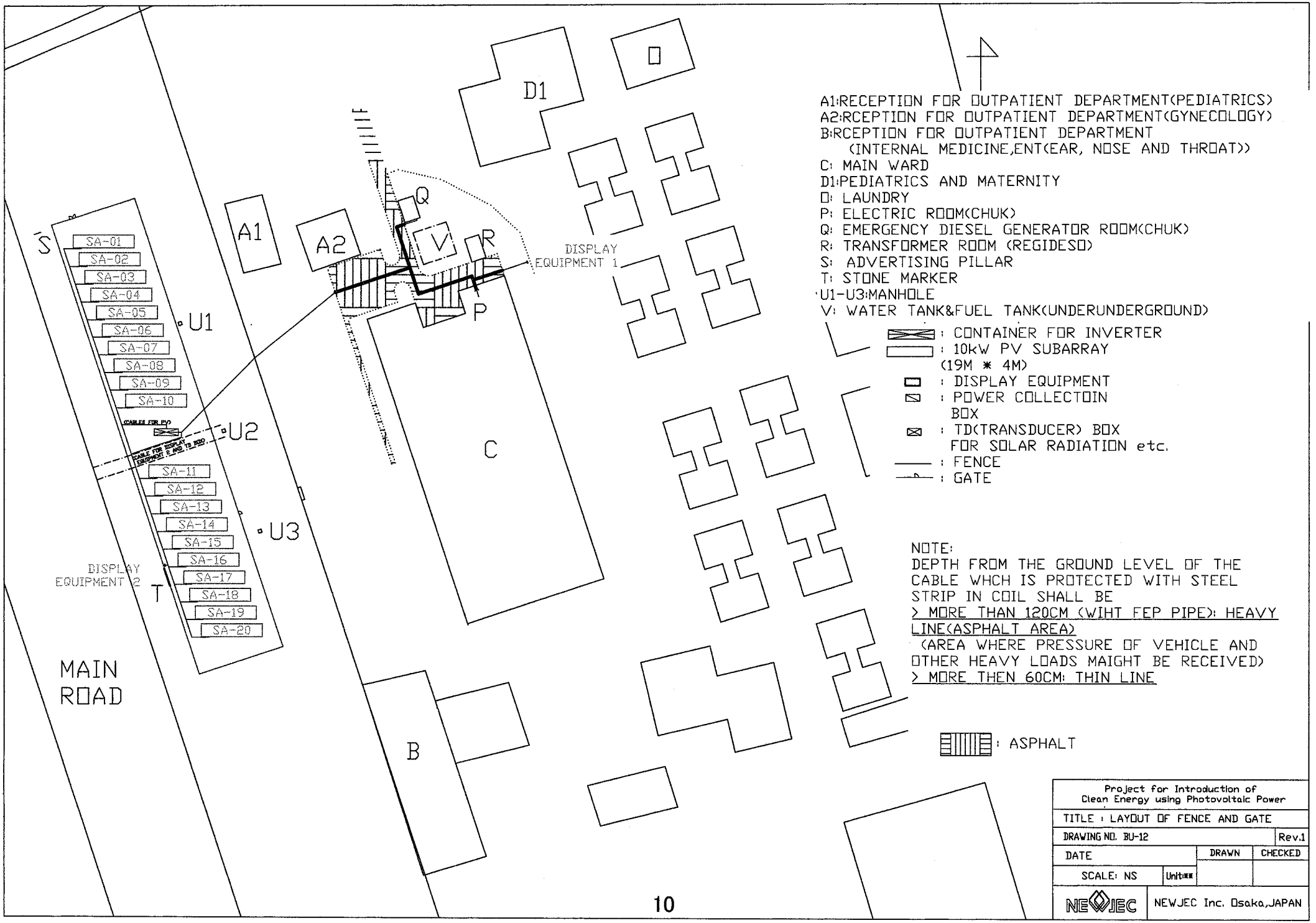
: SCOPE OF THE PROJECT

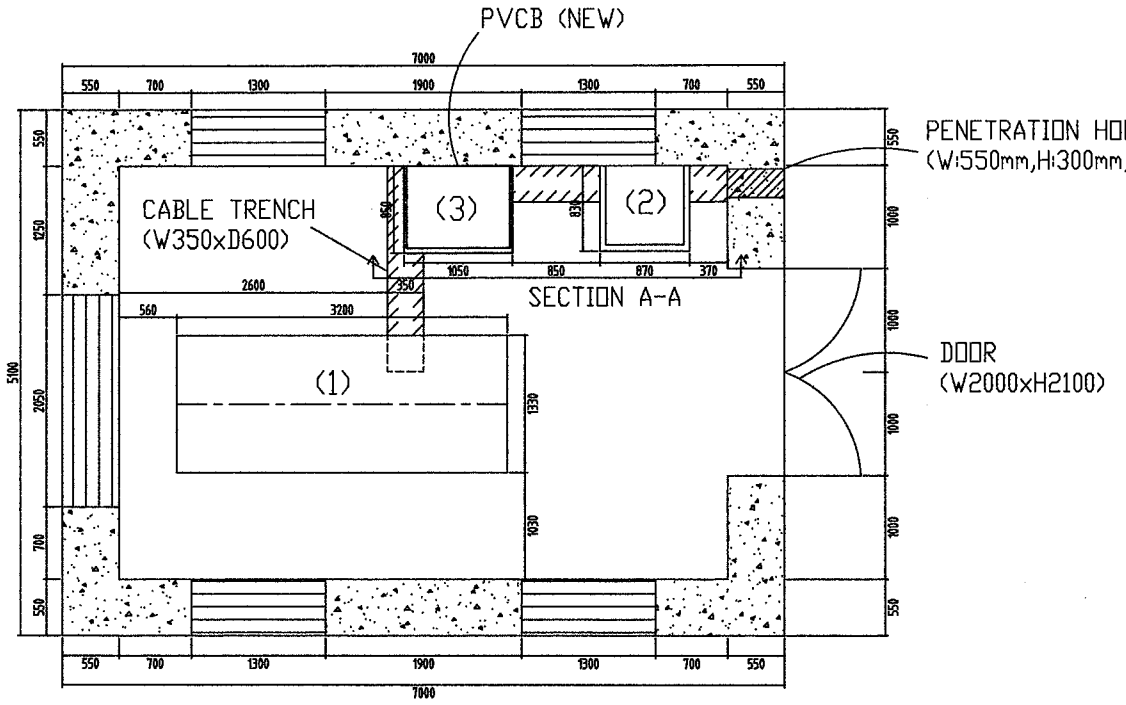
* The value will be reviewed by the detailed design result, if necessary.

D.B. :DISTRIBUTION BOARD
DMM:DIGITAL MULTI-METER

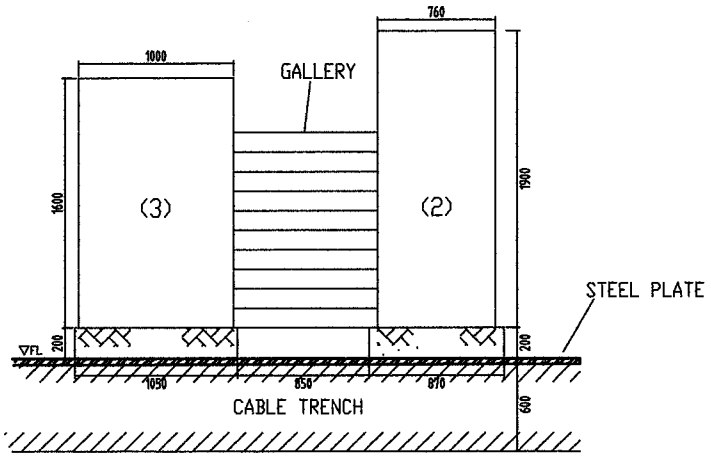
Project for Introduction of Clean Energy using Photovoltaic Power		
TITLE : SINGLE LINE DIAGRAM <PV SYSTEM>		
DRAWING NO. BU-03a		Rev.1
DATE	DRAWN	CHECKED
SCALE: Non.(A3) Unit		
NEWJEC	NEWJEC Inc. Osaka,JAPAN	


MAXIMUM REQUIRED AREA FOR INSTALLATION
S
SA-01
SA-02
SA-03
SA-04
SA-05
SA-06
SA-07
SA-08
SA-09
SA-10
U1
U2
UNDERGROUND PIPING AREA
SA-11
SA-12
SA-13
SA-14
SA-15
SA-16
SA-17
SA-18
SA-19
SA-20
U3
DISPLAY EQUIPMENT 2
T
MAIN ROAD
MAXIMUM REQUIRED AREA FOR INSTALLATION
TEMPORARY SPACE FOR CONSTRUCTION
A1
A2
Q
V
R
P
C
B
D1
D
DISPLAY EQUIPMENT 1
A1:RECEPTION FOR OUTPATIENT DEPARTMENT(PEDIATRICS)
A2:RECEPTION FOR OUTPATIENT DEPARTMENT(GYNECOLOGY)
B:RECEPTION FOR OUTPATIENT DEPARTMENT
(INTERNAL MEDICINE,ENT(EAR, NOSE AND THROAT))
C: MAIN WARD
D1:PEDIATRICS AND MATERNITY
D: LAUNDRY
P: ELECTRIC ROOM(CHUK)
Q: EMERGENCY DIESEL GENERATOR ROOM(CHUK)
R: TRANSFORMER ROOM (REGIDESO)
S: ADVERTISING PILLAR
T: STONE MARKER
U1-U3:MANHOLE
V: WATER TANK&FUEL TANK(UNDERUNDERGROUND)
: CONTAINER FOR INVERTER
: 10kW PV SUBARRAY (19M * 4M)
: DISPLAY EQUIPMENT
: POWER COLLECTOIN BOX
: TD(TRANSDUCER) BOX FOR SOLAR RADIATION etc.
: FENCE
: GATE
200kW PV SYSTEM
CHUK/BURUNDI
Project for Introduction of Clean Energy using Photovoltaic Power
TITLE : GENERAL LAYOUT PLAN
DRAWING NO. BU-04
Rev.1
DATE
DRAWN
CHECKED
SCALE: NS
Unit:
NEWJEC
NEWJEC Inc. Osaka,JAPAN


A1:RECEPTION FOR OUTPATIENT DEPARTMENT(PEDIATRICS)
A2:RCEPTION FOR OUTPATIENT DEPARTMENT(GYNECOLOGY)
B:RCEPTION FOR OUTPATIENT DEPARTMENT
(INTERNAL MEDICINE,ENT(EAR, NOSE AND THROAT))
C: MAIN WARD
D1:PEDIATRICS AND MATERNITY
D: LAUNDRY
P: ELECTRIC ROOM(CHUK)
Q: EMERGENCY DIESEL GENERATOR ROOM(CHUK)
R: TRANSFORMER ROOM (REGIDESO)
S: ADVERTISING PILLAR
T: STONE MARKER
U1-U3:MANHOLE
V: WATER TANK&FUEL TANK(UNDERUNDERGROUND)
: CONTAINER FOR INVERTER
: 10kW PV SUBARRAY (19M * 4M)
: DISPLAY EQUIPMENT
: POWER COLLECTOIN BOX
: TD(TRANSDUCER) BOX FOR SOLAR RADIATION etc.
: FENCE
: GATE
NOTE:
DEPTH FROM THE GROUND LEVEL OF THE CABLE WHCH IS PROTECTED WITH STEEL STRIP IN COIL SHALL BE
> MORE THAN 120CM (WIHT FEP PIPE): HEAVY LINE(ASPHALT AREA)
(AREA WHERE PRESSURE OF VEHICLE AND OTHER HEAVY LOADS MAIGHT BE RECEIVED)
> MORE THEN 60CM: THIN LINE
: ASPHALT
S
SA-01
SA-02
SA-03
SA-04
SA-05
SA-06
SA-07
SA-08
SA-09
SA-10
SA-11
SA-12
SA-13
SA-14
SA-15
SA-16
SA-17
SA-18
SA-19
SA-20
U1
U2
U3
CABLES FOR PV)
CABLE FOR DISPLAY EQUIPMENT 1 AND TO BOX
DISPLAY EQUIPMENT 2
T
MAIN ROAD
A1
A2
Q
V
R
P
DISPLAY EQUIPMENT 1
D1
D
C
B
Project for Introduction of Clean Energy using Photovoltaic Power
TITLE : LAYOUT OF FENCE AND GATE
DRAWING NO. BU-12
Rev.1
DATE
DRAWN
CHECKED
SCALE: NS
Unit:mm
NEWJEC
NEWJEC Inc. Osaka,JAPAN



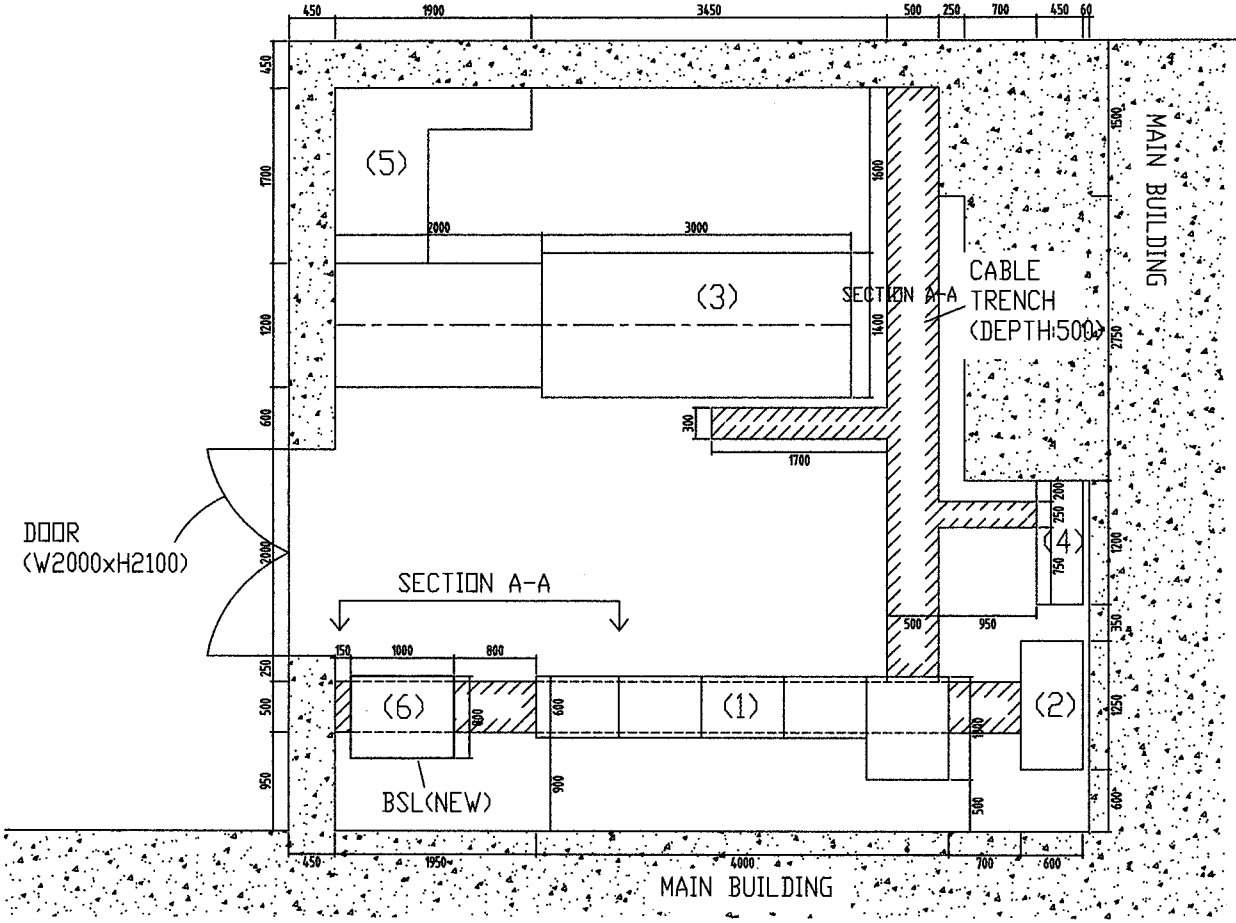
PLAN



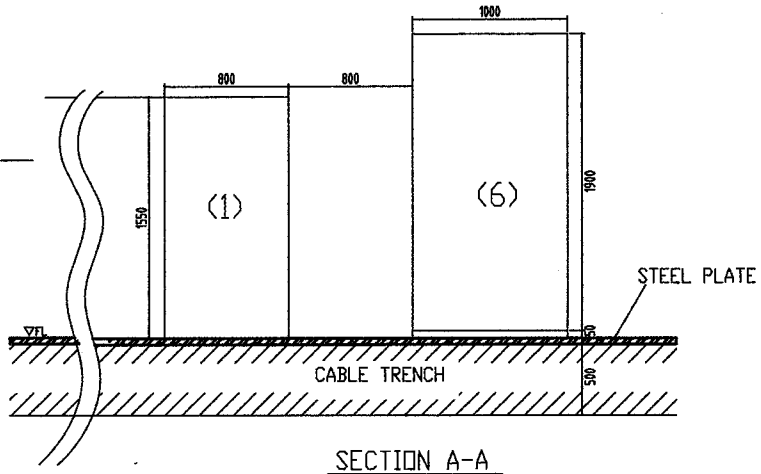
EQUIPMENT LIST

No.	EQUIPMENT	DESCRIPTION	QUANTITY	DIMENSION & WEIGHT (APPROX.)				REMARKS
				WIDTH (mm)	DEPTH (mm)	HEIGHT (mm)	WEIGHT (kg)	
(1)	No.1 EMERGENCY GENERATOR	DIESEL ENGINE GENERATOR-450kVA(360kW)-3Ph-50Hz-380/220V-683.7A-1500min^{-1} -SELF-COOLED WITH RADIATOR-30°cAMB., ENGINE:PERKINS-3000SERIES (ZWART TECHNIEK / NETHERLANDS)	1	1,330	3,200	2,050	580	EXISTING
(2)	GENERATOR CONTROL PANEL FOR No.1 EMERGENCY GENERATOR	METAL ENCLOSED, SELF-STANDING TYPE CONSISTING OF MODULE-TYPE CONTROL DEVICE, MAGNETIC CONTACTORS, INSTRUMENTATION AND OTHERS.(TUEX b.v./NETHERLANDS)	1	830	760	1,900	-	EXISTING
(3)	PV Connection Board (PVCB)	METAL ENCLOSED, SELF-STANDING TYPE CONSISTING OF MODULE-TYPE CONTROL DEVICE, MAGNETIC CONTACTORS, INSTRUMENTATION AND OTHERS.	1	1,000	800	1,600	-	EXTENTION (NEW)

	PROJECT TITLE	DRAWING TITLE	Scale :	Designed by	Checked by	Approved by	Date :
		EQUIPMENTS LAYOUT (GENERATOR ROOM)	1 : 100 (A3)				
				Draftman	Drawing No.		Edition / Sheet
			Date: 07.JULY.2008	HEAD	BU - 15		



PLAN

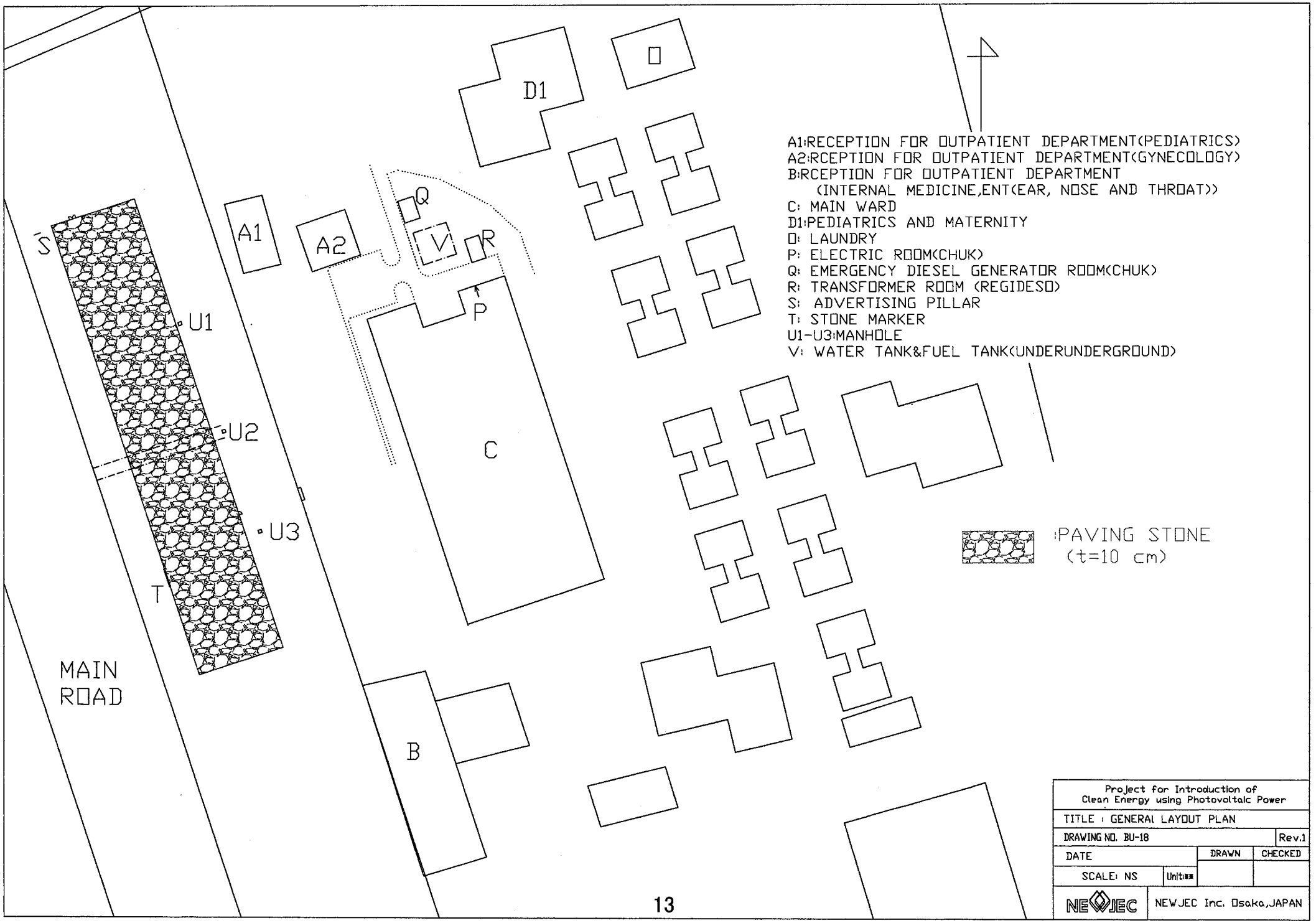


SECTION A-A

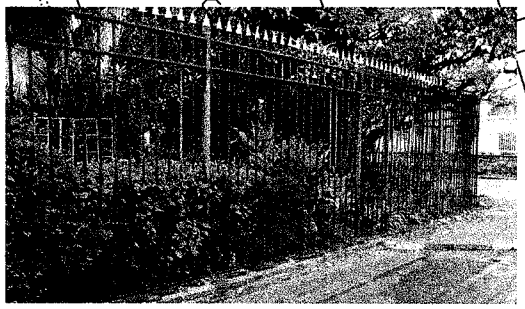
EQUIPMENT LIST

No.	EQUIPMENT	DESCRIPTION	QUANTITY	DIMENSION & WEIGHT (APPROX.)				REMARKS
				WIDTH (mm)	DEPTH (mm)	HEIGHT (mm)	WEIGHT (kg)	
(1)	LOW VOLTAGE DISTRIBUTION PANEL	METAL ENCLOSED, SELF-STANDING TYPE CONSISTING OF MOLDED CASE CIRCUIT BREAKER, MAGNETIC-TYPE CONTACTORS, INSTRUMENTATION AND OTHERS.	1	800	950	1,550	-	EXISTING
(2)	VOLTAGE REGULATOR PANEL	METAL ENCLOSED, SELF-STANDING TYPE CONSISTING OF MCCB, INSTRUMENTATION AND OTHERS.	1	1,250	830	1,000	-	EXISTING
(3)	No.2 EMERGENCY GENERATOR	DIESEL ENGINE GENERATOR-120kVA-3Ph-50Hz-380/220V-182/315A-1500min^{-1} - Cos=0.8-40°CAMB-IP23S, (LEROY-SOMER / FRANCE)	1	3,000	1,400	1,800	-	EXISTING
(4)	GENERATOR CONTROL PANEL FOR No.2 EMERGENCY GENERATOR	METAL ENCLOSED, SELF-STANDING TYPE CONSISTING OF MODULE-TYPE CONTROL DEVICE, MAGNETIC-TYPE CONTACTORS, INSTRUMENTATION AND OTHERS.	1	1,200	450	1,850	-	EXISTING
(5)	FUEL OIL SUPPLY SYSTEM FOR No.2 EMERGENCY GENERATOR	FUEL OIL TANK AND ACCESSORIES	1	1,900	1,700	1,300	-	EXISTING
(6)	BRANCH SWITCHERS FOR LOAD (BSL)	METAL ENCLOSED, SELF-STANDING TYPE CONSISTING OF MODULE-TYPE CONTROL DEVICE, MAGNETIC-TYPE CONTACTORS, INSTRUMENTATION AND OTHERS.	1	1,000	800	1,900	-	EXTENTION (NEW)

	PROJECT TITLE	DRAWING TITLE	Scale :	Designed by	Checked by	Approved by	Date :
		EQUIPMENTS LAYOUT (EXISTING ELECTRIC ROOM)	1 : 100 (A3)				
		12	Date: 07.JULY.2008	Draftman	Drawing No.		Edition / Sheet
					BU - 16		


A1:RECEPTION FOR OUTPATIENT DEPARTMENT(PEDIATRICS)
A2:RCEPTION FOR OUTPATIENT DEPARTMENT(GYNECOLOGY)
B:RCEPTION FOR OUTPATIENT DEPARTMENT
(INTERNAL MEDICINE,ENT(EAR, NOSE AND THROAT))
C: MAIN WARD
D1:PEDIATRICS AND MATERNITY
D: LAUNDRY
P: ELECTRIC ROOM(CHUK)
Q: EMERGENCY DIESEL GENERATOR ROOM(CHUK)
R: TRANSFORMER ROOM (REGIDESO)
S: ADVERTISING PILLAR
T: STONE MARKER
U1-U3:MANHOLE
V: WATER TANK&FUEL TANK(UNDERUNDERGROUND)
:PAVING STONE
(t=10 cm)
MAIN
ROAD
A1
A2
B
C
D1
D
P
Q
R
S
T
U1
U2
U3
V
Project for Introduction of
Clean Energy using Photovoltaic Power
TITLE : GENERAL LAYOUT PLAN
DRAWING NO. BU-18
Rev.1
DATE
DRAWN
CHECKED
SCALE: NS
Unit:mm
NEWJEC
NEWJEC Inc. Osaka,JAPAN

A1:RECEPTION FOR OUTPATIENT DEPARTMENT(PEDIATRICS)
A2:RCEPTION FOR OUTPATIENT DEPARTMENT(GYNECOLOGY)
B:RCEPTION FOR OUTPATIENT DEPARTMENT
(INTERNAL MEDICINE,ENT(EAR, NOSE AND THROAT))
C: MAIN WARD
D1:PEDIATRICS AND MATERNITY
D: LAUNDRY
P: ELECTRIC ROOM(CHUK)
Q: EMERGENCY DIESEL GENERATOR ROOM(CHUK)
R: TRANSFORMER ROOM (REGIDESO)
S: ADVERTISING PILLAR
T: STONE MARKER
U1-U3:MANHOLE
V: WATER TANK&FUEL TANK(UNDERUNDERGROUND)

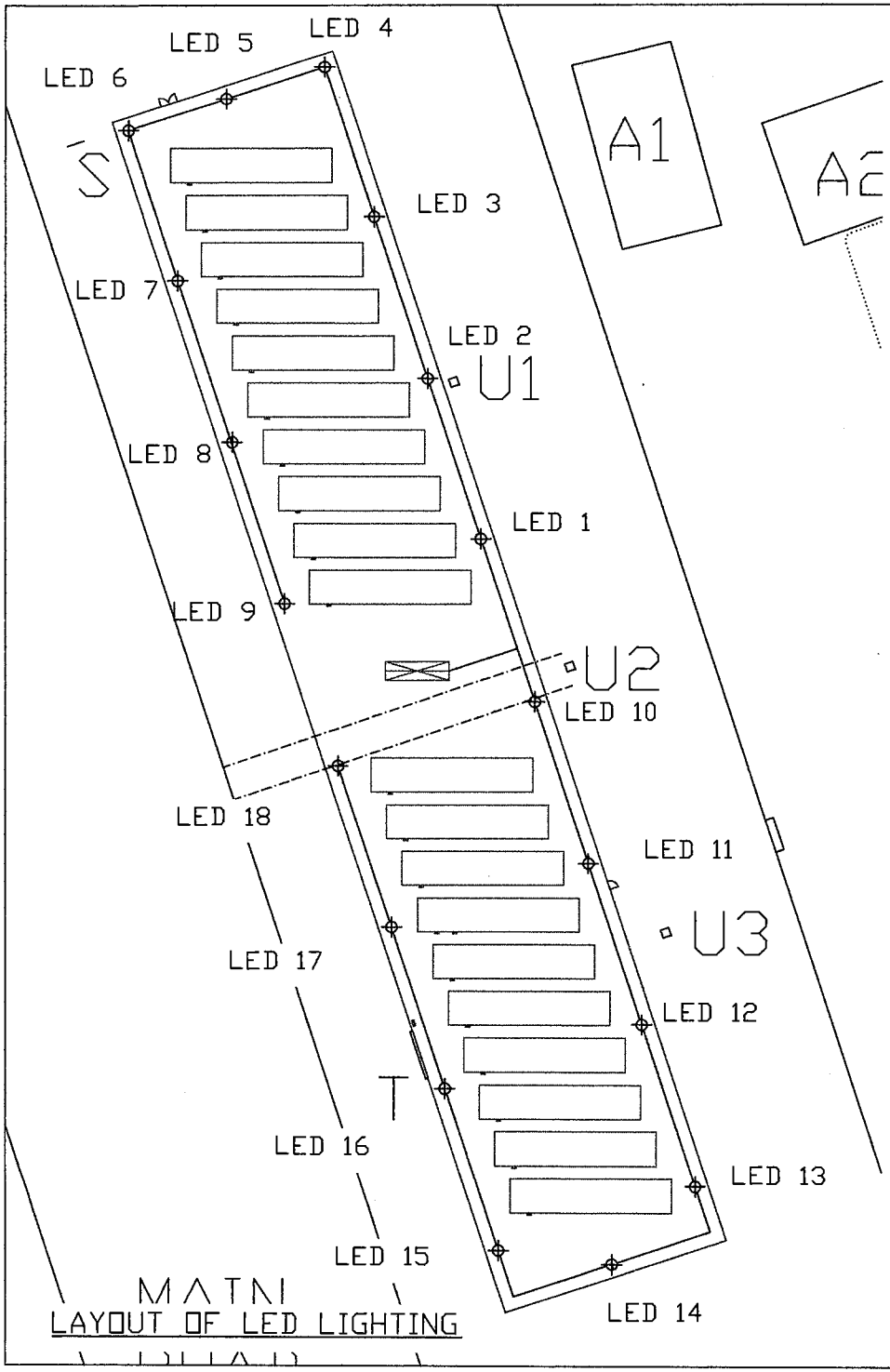


EXAMPLE OF FENCE (H=2M)

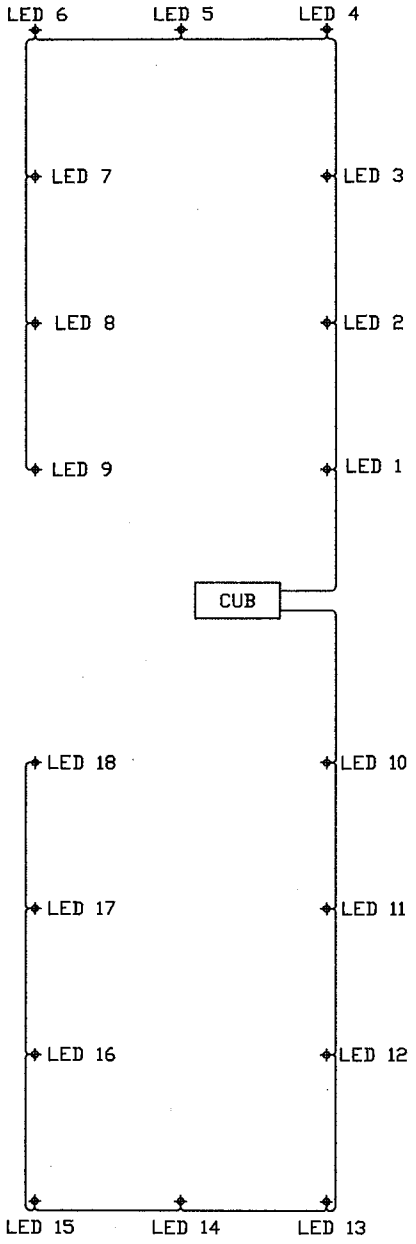
200kW PV SYSTEM
CHUK/Burundi

MAIN ROAD

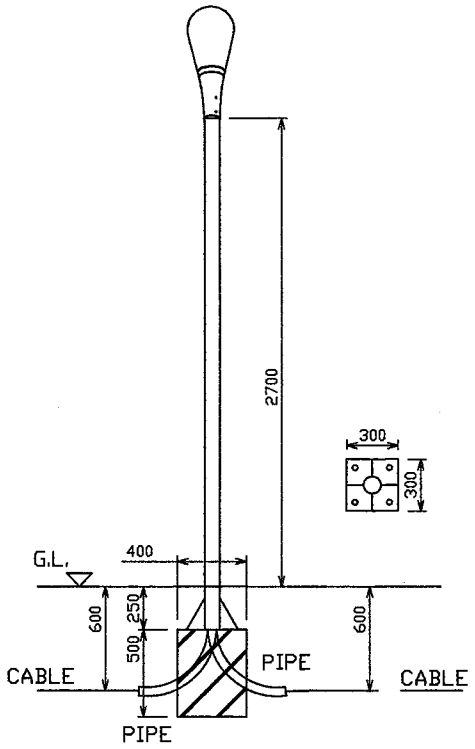
Project for Introduction of Clean Energy using Photovoltaic Power		
TITLE : LAYOUT OF FENCE AND GATE		
DRAWING NO. BU-19		Rev.1
DATE	DRAWN	CHECKED
SCALE: NS Unit:**		
NEWJEC	NEWJEC Inc. Osaka,JAPAN	



LAYOUT OF LED LIGHTING



BLOCK DIAGRAM FOR LED LIGHTING SYSTEM



LED LIGHTING(DETAIL)

Project for Introduction of Clean Energy using Photovoltaic Power		
TITLE : OUTDOOR LIGHTING SYSTEM		
DRAWING NO. BU-23		Rev.1
DATE	DRAWN	CHECKED
SCALE: NS Unit: mm		
NEWJEC	NEWJEC Inc. Osaka,JAPAN	

Attachment-2

Proposal on Training Programs for PV System
Project for Introduction of Clean Energy using Photovoltaic Power

JICA Solar Study Team

1. Background

For Burundi, this Project will be the first-ever experience to have a PV system with grid interconnection, although Burundi has a number of cases of independent off-grid solar systems, those for medical facilities and schools, etc. Therefore, it is important to train those CHUK technicians who will be actually operating and maintaining the facility. At the same time, it is also important to inform officers in the Ministry of Energy and REGIDESO, and other people who will be involved in the Project, regarding the technical features and institutional issues relevant to PV systems and their interconnection to the power grid, to prepare them to handle renewable projects in the future.

2. Training Program

Training program is planned to consist of a series of lectures, exercises, and OJTs led by Japanese consultants. The program is to be carried out in two separate periods; one during the commissioning of the facility, and the other three months after the commissioning.

There will also be O&M training provided by the Contractor of the Project. Therefore, the consultant will coordinate with the Contractor and plan the details of his training program so that the necessary techniques and knowledge are effectively transferred to the participants of the program. Those training items with a symbol (!) below are the ones presumably provided by the Contractor. The consultants will provide additional information for such items, if necessary, to make them more relevant, not just "how to operate", in the context of understanding of PV systems.

<u>Before commissioning</u> (approximately starting 4 weeks before commissioning)

Lectures on basic knowledge

- Grid interconnection and reverse current of PV system
- Characteristics of PV module output
- Planning PV systems
- Power demand, load in a facility (CHUK)
- Protection function of PV system in case of power failures
- Stand alone operation of PV system

Lectures on construction planning

- Power distribution in a facility and connection of PV system

Scheduling works

Construction of PV system

OJT program

Witnessing connection works

Witnessing precommissioning/commissioning tests

<u>After commissioning of PV system</u>

Training provided by the Contractor

Starting, stopping, restarting the system (!)

Daily inspection and maintenance (!)

Periodical inspection and maintenance (!)

Consumables and replacement work (!)

Occurrence of faults and actions (!)

Planning O&M works on the basis of Operation Manuals (exercises)

Making daily check sheet/log sheet form

Making failure/accident record form

Maintaining PV facility in a good condition

There will be also a training program provided three months after the commissioning, coordinated with Contractor's "three month inspection". After three month of operation and maintenance experience, there will be more relevant, in-depth questions to be asked. There may also be operation issues unique in CHUK circumstances. These questions and issues will be discussed and reflected to operation practice and check sheets, as another exercise.

<u>Three months after the commissioning</u>

Trouble shooting (by questionnaire, Q&A session, discussion) (!)

Witnessing three month inspection

Revising daily operation and check sheets

3. Participants

CHUK technicians:	Those who will be actually operating the PV system
REGIDESO officers:	in distribution, power purchasing or power plant management related departments, with engineering background (preferably having a degree in electric engineering)
MoEM officials:	in regulatory planning, facility management or facility planning related departments, preferably with engineering background

4. Schedules

Training program before/after commissioning

		-5w	-4w	-3w	-2w	-1w	0w	1w	2w
Activities	preparation	▬							
	Basic knowledge lectures		▬						
	Construction exercise			▬					
	OJT				▬	▬			
	Contractors training						▬		
	O&M Planning							▬	▬
Participant	CHUK technicians		▬	▬	▬	▬	▬	▬	▬
	REGIDESO, MEM officers		▬			▬	▬		
Lecturers	Consultant (leader)	▬	▬	▬	▬	▬	▬	▬	▬
	Consultant (assistant)	▬	▬	▬	▬	▬	▬	▬	▬
	Interpreter		▬	▬	▬	▬	▬	▬	▬

Training program three months after commissioning

		1w	2w	3w	4w
Activities	Review of logs (preparation)	▬			
	Trouble shooting		▬		
	Witnessing 3M inspection			▬	
	Revising check sheets				▬
Participant	CHUK technicians		▬	▬	▬
Lecturer	Consultants (leader)	▬	▬	▬	▬
	Interpreter		▬	▬	▬

6.2 The Letter for Environmental Impact Assessment

REPUBLIQUE DU BURUNDI

Bujumbura, le 20/11/2009

Ministère de l'Eau, de l'Environnement,
de l'Aménagement du Territoire et de l'Urbanisme

DIRECTION GENERALE DES FORETS ET DE L'ENVIRONNEMENT

B.P. 631 Bujumbura – Burundi
Tél : 22 25 42 55

Réf. : DGFE/.225../2009

A Monsieur Shoji Takamatsu
En Charge des considérations Environnementales
et sociales dans l' Equipe d'étude de JICA

à BUJUMBURA

Objet : Considérations Socio-Evironnementales de l'Installation du Système Photovoltaïque au Centre Hospitalo-universitaire de Kamenge (CHUK)

Monsieur,

Faisant suite à votre correspondance dont l'objet est repris en marge, j'ai l'honneur de vous informer que nous avons analysé avec intérêt les conclusions de votre étude préliminaire sur l'impact social et environnemental de votre projet sur l'installation du système photovoltaïque au Centre Hospitalo-universitaire de Kamenge dans le cadre de la Coopération Japonaise et avons aboutit à la même conclusion que ce qui a été mentionné dans votre document.

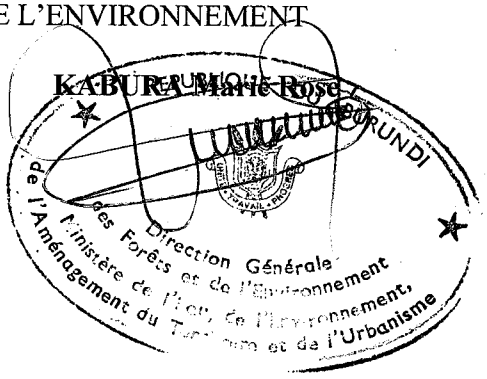
De ce fait, il ne nous semble pas nécessaire de mener une étude d'impact environnemental détaillée compte tenu de la nature du projet, et de sa dimension.
Toutefois, il est important que notre service soit associé pour un suivi éventuel surtout à la phase du premier aménagement et de construction.

En outre, nous avons apprécié que les directives du Japan International Cooperation Agency (JICA) ne soient pas en contradiction avec la démarche actuelle sur la réalisation des études d'impacts environnementaux exigées par notre pays.

Vous souhaitant bonne réussite, veuillez agréer Monsieur l'Expert, l'assurance de ma haute considération.

DIRECTION GENERALE DES FORETS
ET DE L'ENVIRONNEMENT

KABURA Marie Rose



C.P.I à :
-Monsieur le Ministre de l'Eau, de l'Environnement,
De l'Aménagement du Territoire et de l'Urbanisme
-Madame le Directeur de l'Environnement

A **BUJUMBURA**


JICA