

Appendix 3. List of Equipment

Substation for training
Measurment Equipments (1) Portable Cable Fault Locator(1set) (2) Oil Tester(1set) (3) Primary Current Injection Test Set(1set) (4) Secondary Injection Test Set (Relay Tester)(1set) (5) Portable Power Quality Analyzer(1set)
Softwares for distribution design (one licence, respectively) (1)CYMDIST(Distribution Analysis Base Package) (2)CYMSTAB(Transient Stability) (3)CYME/LONG-DYN(Long-Term Dynamics Analysis with DER) (4)CYME/RAM(Reliability Assessment) (5)CYME/MAP(Gepgraphic Overlay Module)
Bus for 30 people (Mitsubishi FusoRosa)
Four-wheel drive car(Toyota Fortuner)
ITmechines (1)Desktop PC 16 (2)Network Station 1 (3)UPS 18 (4)Color Printer 1 (5)Scanner 1

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Date of procurement	Name of the Equipment	Model/Type	Qty.			Name of the distributor	Installed in
				Cost (GHS)	Total (GHS)		
2013/9/20	Printer	hp Laserjet PRO 400 Color M451 dn	1	1,700.00	1,700.00	System Diagnostics Ltd.	Project office
2013/9/20	Personal Computer	Dell Latitude E5530	1	1,650.00	1,650.00	System Diagnostics Ltd.	Project office
2013/9/25	Safe	LEECO ES-20L 9000150	1	1,120.00	1,120.00	Kingdom Books and Stationery	Project office
2013/11/1	Cabinets	TG209	2	950.00	1,900.00	Kingdom Books and Stationery	Project office
2013/11/15	Photocopier	Canon IR C2220i	1	18,350.00	18,350.00	Oman Fofor Traiding Co. Ltd.	Project Office
2014/2/27	Antenna Booster	Omni Antenna & Radio (802.11B/G)	1	1,200.00	1,200.00	Cyndel Business Systems	ECG Training Centre
2014/10/3	File Server	TS-XH8.0L/R6VC5Y	1	JYN	157,500.00	Ricoh Japan	Project office
2014/10/3	UPS	BU1002RW	1	JYN	92,500.00	Ricoh Japan	Project office
2014/10/23	Projector	DELL 1610 HD	1	3,872.34	3,872.34	Dealer COS Company Ltd.	Project office

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## Appendix 5. Joint Coordinating Committee

### 5.1 The First Joint Coordinating Committee

#### (1) Date, Time, Place, Participants

Date : 9<sup>th</sup> December, 2013

Time: 10.00am~12.00pm

Venue: Conference room at the ECG Training Centre

Participants: (Ghana)

Ms.Flora Colerangle	ECG Headquarter Divisional Manager-Manpower Planning
Mr.George Yaw Marfo	ECG Training Centre Principal
Ms.Ama Otu-Ansah	ECG Training Centre Ag. Sectional Manager Training Centre
Mr. Isaac K. Nukpezah	ECG Training Centre Technical Instructor (Substation Maintenance)
Mr. Samuel Andoh	ECG Training Centre Technical Instructor (Overhead Lines)
(Japan)	
Mr. Hiroshi Sumiyoshi	JICA Ghana Office Senior Representative
Mr. Hajime Usukura	JICA Ghana Office Representative
Mr. Hiroshi Kurakata	EETA Project JICA Expert
Mr. Takamu Genji	EETA Project JICA Expert
Mr. Tatsuhiro Tamura	EETA Project JICA Expert
Mr. Tsuguhiko Yamada	EETA Project JICA Expert
Mr. Seiji Ito	EETA Project JICA Expert
Mr. Shinichi Tohjoh	EETA Project JICA Expert
Ms. Ritsuko Kawabe	EETA Project JICA Expert

#### (2) Major Objectives of Committee

- 1) To review the overall progress of the project and its activities carried out under the Annual Plan of Operation.
- 2) Report of project activities
- 3) Tentative Schedule of the Project in the First year
- 4) Revision of the Project Design Matrix

### 5.2. The Second Joint Coordinating Committee

#### (1) Date, Time, Place, Participants

Date: 16th July, 2014

Time: 11.30 am~13.30 pm

Venue: Conference room at the ECG Training Centre

Participants: (Ghana)

Ms.Flora Colerangle	ECG Headquarter Divisional Manager-Manpower Planning
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Mr. George Yaw Marfo	ECG Training Centre Principal
Ms. Ama Otu-Ansah	ECG Training Centre Ag. Sectional Manager Training Centre
Mr. Isaac K. Nukpezah	ECG ECG Training Centre Technical Instructor (Substation Maintenance)
Mr. Samuel Andoh (Japan)	ECG Training Centre Technical Instructor (Overhead Lines)
Mr. Hiroshi Sumiyoshi	JICA Ghana Office Senior Representative
Mr. Hajime Usukura	JICA Ghana Office Representative
Mr. Joshua Biliwi Mabe	JICA Ghana Office
Mr. Hiroshi Kurakata	EETA Project JICA Expert
Mr. Takamu Genji	EETA Project JICA Expert
Mr. Tatsuhiro Tamura	EETA Project JICA Expert
Mr. Tsuguhiko Yamada	EETA Project JICA Expert
Mr. Seiji Ito	EETA Project JICA Expert
Mr. Shinichi Tohjoh	EETA Project JICA Expert
Ms. Ritsuko Kawabe	EETA Project JICA Expert

(2) Major Objectives of Committee

- 1) To review the overall progress of the project and its activities carried out under the Annual Plan of Operation.
- 2) Report of project activities

5.3 The Third Joint Coordinating Committee

(1) Date, Time, Place, Participants

Date: 23rd July, 2015

Time: 10.00 am~12.00 pm

Venue: Conference room at the ECG Training Centre

Participants:

(Ghana)

Ms. Flora Colerangle	ECG Headquarter Divisional Manager-Manpower Planning
Mr. George Yaw Marfo	ECG Training Centre Principal
Ms. Ama Otu-Ansah	ECG Training Centre Ag. Sectional Manager Training Centre
Mr. Issac K. Nukpezah	ECG Training Centre Technical Instructor (Substation Maintenance)
Mr. Samuel Andoh	ECG Training Centre Technical Instructor (Overhead Lines)
Mr. Bless Agbi	ECG Training Centre Technical Instructor
Mr. Kingsford Amoako	ECG Training Centre Technical Instructor
Mr. Peter King Asare	ECG Training Centre Technical Instructor

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Mr. Maxwell Essel	ECG Training Centre Technical Instructor
Mr. Madina Adam (Japan)	ECG Training Centre Technical Instructor
Mr. Koji Makino	JICA Ghana Office Chief Representative
Mr. Tomonari Takeuchi	JICA Ghana Office Representative
Mr. Prince Bio	JICA Ghana Office Local Consultant
Mr. Hiroshi Kurakata	EETA Project Chief Advisor
Mr. Takamu Genji	EETA Project JICA Expert
Mr. Tatsuhiro Tamura	EETA Project JICA Expert
Mr. Tomohisa Fujita	EETA Project JICA Expert
Mr. Yukihiro Mikumo	EETA Project JICA Expert
Mr. Shinichi Tohjoh	EETA Project JICA Expert
Ms. Ritsuko Kawabe	EETA Project Project coordinator

(2) Major Objectives of Committee

1. Report of Project Activities in the second year

(1) Report of training courses

1) Training course for technicians of ECG

“Maintenance Techniques for Power Equipment and Implementation Produce” was conducted.

2) Training course for engineers of ECG

“System Protection & Control” was implemented

“Distribution Planning” was conducted

3) Training courses for technicians and engineers of the third countries

“Maintenance Techniques for Power Equipment”(Overhead Lines) was conducted from 30th June to 11<sup>th</sup> July 2014.

“Maintenance Techniques for Power Equipment (Underground Cable Maintenance)” and

“System Protection & Control” for engineers have been postponed due to the Ebola fever.

(2) Monitoring of training courses

1) Training course for technicians of ECG

“Maintenance Techniques for Power Equipment and Implementation Produce”

(Second)

2) Training course for engineers of ECG

“System Protection & Control” was implemented

“Distribution Planning” was conducted

(3) Report of procurement of equipment

1) Procurement of measurement instrument and devices (To March, 2015)

2) Construction of substation for training

(4) Achievement of output and modification of the implementation plan

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1) Achievement of output

2) Modification of PDM and PO

2. Plan of Project Activities in the third year

(1) Plan of technology transfer

(2) Plan of construction of substation for training

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## Appendix 5. List of Participants at the Meeting with MOP

Feb. 10, 2016 10:30- 11:30

Venue: Conference room at the MOP

<Participants>

NAME	POSITION/INSTITUTION
Mr. William Hutton-Mensah	Director, Distribution, MoP
Mr. William E. Sam-Appiah	Director, Generation & Transmission, MoP
Mr. Sulemana Abubakari	Deputy Director, Power/ Distribution, MoP
Mr. Chris Anaglo	Deputy Director, MoP
Mr. Reginald Wood	Engineer, MoP
Mr. Hanson Monney	MoP
Mr. Hiroshi Kurakata	Chief Advisor, EETA Project
Mr. Hiroaki Nagayama	Individual Consultant (Professor, Kyoto University)
Mr. Tomonari Takeuchi	Representative, JICA
Mr. Prince Bio	Local Consultant, JICA

Meeting with MOP



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Timeline	First Year												Second Year												Third Year												
	2013						2014						2015						2016																		
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug					
Technician	ECG (Overhead Line, Underground Line, Inspection Line) Maintenance Techniques for Power Equipment and Implementation Procedure	Training /Pre and post-Questionnaires (1st) (June 30th - July 11th) → Action Plan Follow-up (1st) (March) → Questionnaire for Trainees' Supervisors (1st) (February)												Training /Pre and post-Questionnaires (2nd) (June 22th - 28th) → Training (3rd) Implemented by ECG (July 2016)																							
		Training /Pre and post-Questionnaires (July) → Action Plan Follow-up												Questionnaire for Trainees' Supervisors																							
		Decision for Suspension (October)																																			
		Decision for Suspension (October)																																			
Engineer	System Protection and Control (ECG)	(May) Training in Japan												Training /Pre and post-Questionnaires (March) → Training (2/23~27)												Training (2nd) /Pre and post-Questionnaire Implemented by ECG (2nd) (February)											
		Training (1st) /Pre and post-Questionnaires (July) → 7/13~17												Training (1st) /Pre and post-Questionnaires by ECG (July)												Training (2nd) Implemented by ECG (July)											
		Decision for Suspension (October)												Training (1st) /Pre and post-Questionnaire (Feb)																							
ECG Training Centre	System Protection Control (13rd)	Monitoring skill transfer (July) →												Monitoring skill transfer (Nov) →																							



Appendix 7. Flow of Reports

Timeline	First Year												Second Year												Third Year											
	2013			2014			2014			2015			2015			2016			2016			2016			2016											
	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug
[Output1] Needs Survey	Training Needs Survey Report for the																																			
	Training Needs Survey Report for the																																			
[Output2] Training for Technicians	Syllabus and Curriculum for Technicians of ECG and Third Countries (March 2014)																																			
	Monitoring Report on Training Course for Technicians of ECG "Maintenance Techniques for"																																			
[Output3] Training for Engineer	Amendment of Teaching Material on "Maintenance Techniques for Power Equipment"																																			
	Result of the Questionnaire for Trainees' Supervisors (July, 2015 Revised Version) — for Technicians of Third Countries "Maintenance"																																			
[Output4] Improvement of monitoring and management capacity	Monitoring Plan for Training Courses																																			
	Monitoring Report on the Training Courses for ECG Engineers "System Protection and"																																			
Equipments Procurement	Amendment of Curriculum and Textbook for Engineers of ECG																																			
	Syllabus and Curriculum for Engineers of ECG (Aug.2015) — System Protection and																																			
JCC	Monitoring Manual for the ECG Training Course (June)																																			
	Technical Support for Procurement of Equipment to be																																			
Training in Japan	Training in Japan (June, 2014)																																			

**Minutes of the Fifth Joint Coordinating Committee for  
the Project on Electrical Engineers Training for African Countries (EETA)**

1. **Date:** 28<sup>th</sup> July, 2016
2. **Time:** 10.30 am ~ 12.30 pm
3. **Venue:** Conference room at the ECG Training Centre
4. **Participants:** As attached in Annex-1
  
5. **Major Objectives of the Committee**
  - To review the overall activities of the Project for three (3) years
  - To recommend the practical use of the Substation
  - To propose a means of achieving the overall goal of the Project

6. **Monitoring of training courses**

(1) Implementation of the training courses

Mr. Akpeloo, a technical manager made a presentation on the monitoring report on pre-training and post-training questionnaires related to the training courses implemented in the third year as given below.

1) Training course for technicians of ECG

The training course for technicians of the ECG entitled “Maintenance Techniques for Power Equipment and Implementation Procedure” was conducted from 11<sup>th</sup> to 15<sup>th</sup> July, 2016. The Human resource department of the ECG nominated ten trainees (10) from all ten regions. The curriculum of the course is herewith attached as Annex – 2.

2) Training course for engineers of ECG

The training course for engineers of the ECG entitled “Distribution Planning” was implemented from 18<sup>th</sup> to 20<sup>th</sup> July, 2016. Ten (10) from all ten regions were invited for the training course. ECG internal and external facilitators demonstrated the use of the software “CYMLIST” which JICA provided last year and allowed all trainees to operate the software of “NEPLAN” that was installed on their PC for practical training. The curriculum of the course is herewith shown in Annex – 3.

Mr. Mikumo, a monitoring expert, reported the results of the questionnaire for the trainees’ supervisors in connection with the following course.

3) The training course for engineers of the ECG

The training course for engineers of the ECG entitled “Distribution Design” was conducted from 15<sup>th</sup> to 17<sup>th</sup> February, 2016. Ten (10) trainees were nominated from all ten regions. The curriculum of the course is herewith attached as Annex 4.

7. **Review of project activities for three years**

Mr. Kurakata, a chief advisor of JICA expert team explained the whole activities of the project for three years as in the following.

(1) Result of the project

- 1) Assignment of experts and counterparts
- 2) Project activities

- 3) Procurement of equipment and the construction of substation
- 4) Achievement of project purpose
- 5) Output of the project
- 6) Revise the lessons by evaluation team

(2) Revision the lessons by the evaluation team in February 2016

- 1) The evaluation team pointed out that Indicators of Output 4 “monitoring and management capacity of ECG is improved” should be revised.

Corresponding to this instruction, expert team proposed to add the new indicators as Table-1 below and approved to revise from PDM 3.0 to PDM 4.0 in the 4<sup>th</sup> JCC held on 25<sup>th</sup> February 2016.

Table-1 Revised from PDM 3.0 to PDM 4.0

NARRATIVE SUMMARY	OBJECTIVELY VERIFIABLE INDICATORS	MEANS OF VERIFICATION
4. Monitoring and management capacity of ECG is improved.	<ul style="list-style-type: none"> <li>•Quality of revised texts</li> <li>•Quality of revised tools</li> <li>•Number of JCC meetings</li> <li>•Number of Monitoring Reports</li> <li>PDCA cycle of Monitoring Activities will be established.</li> </ul>	<ul style="list-style-type: none"> <li>•Quarterly Report of ECG and third countries</li> <li>•Project Progress Report</li> <li>•Manuals and tools</li> <li>Monitoring Reports</li> </ul>

- 2) The evaluation team pointed out the textbook’s sources should be clarified.

Corresponding to this instruction, expert team attached the reference for clarifying sources quoted in the textbook.

## 8. Recommendation from the expert team

(1) Practical training on substation

Mr. Aki, an expert for substation maintenance made some recommendations on the procedure for practical training on substation to enhance the training course. Inspection items and criteria of the patrol are explained in the textbook on “Maintenance for substation equipment”. Other implementations included periodical patrol at ECG training centre substation as shown in Annex - 5.

(2) Recommendation for achieving the overall goal

Mr. Kurakata made proposals for achieving the overall goal of the project as shown in Annex – 6

## 9. Others

All data created in the project for three years, such as syllabus, curriculums, textbooks was provided to the ECG training centre on hard disk

As a result of the meeting, both side confirmed the matters referred to in the documents attached hereto.

Tema, 28<sup>th</sup> July, 2016

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Mr. Norihito Yonebayashi  
Senior Representative  
Japan International Cooperation Agency  
Ghana Office

for: 

Mr. Robert Dwamena  
Managing Director  
Electricity Company of Ghana



Mr. Hiroshi Kurakata  
Chief Advisor  
JICA Expert Team



Dr. George Yaw Marfo  
Principal  
ECG Training Centre

**List of Participants**

**Annex - 1**

Name	Title	Organisation
Ama Engman	General Manager Personnel/ HIR	ECG Headquarters
George Yaw Marfo	Principal	ECG Training Centre
Clemence Akpeloo	Ag. Technical Manager	ECG Training Centre
Isaac K. Manu-Marfo	General Manager/ Maintenance	ECG Project Office
Felicia Ankrach-Quarm	AEE/ Network Project	ECG Project Office
Samuel Nortey	Network Project	ECG Project Office
Bless Agbi	Technical Instructor (Overhead Lines & Underground Cables)	ECG Training Centre
Samuel Andoh	Technical Instructor (Overhead Lines)	ECG Training Centre
Kingsford Amoako	Technical Instructor (Substation Maintenance)	ECG Training Centre
Isaac N. Nukpezah	Technical Instructor (Substation Maintenance)	ECG Training Centre
Peter King Asare	Technical Instructor (Underground Cables)	ECG Training Centre
Maxwell Essel	Technical Instructor (Metering and Protection)	ECG Training Centre
Norihito Yonebayashi	Senior Representative	JICA Ghana Office
Tomonari Takeuchi	Representative	JICA Ghana Office
Prince Bio	Local Consultant	JICA Ghana Office
Hiroshi Kurakata	Chief Advisor	EETA Project
Takamu Genji	JICA Expert (Power Distribution Planning/ Design)	EETA Project
Tatsuhiro Tamura	JICA Expert (Power Distribution System Operation)	EETA Project
Toshio Aki	JICA Expert (Substation Maintenance)	EETA Project
Yukihiko Mikumo	JICA Expert (Training Monitoring)	EETA Project
Ritsuko Kawabe	Project coordinator	EETA Project

## Curriculum of “Technique and Procedure for Maintenance of Power Equipment for ECG Engineers” (3rd batch)

DAYS	8:30 – 9:00	9:00 – 10:00	10:00-10:15	10:15 – 12:00	12:00-13:00	13:00 – 15:30
(Mon) 11 <sup>th</sup> July	Registration and Opening Ceremony	1. Orientation 2. Outline of power distribution facilities  <i>Samuel Andoh</i>	<b>B r e a k</b>	Deterioration mechanism of power distribution  <i>Samuel Andoh</i>	<b>B r e a k</b>	1. Inspection and preventive maintenance of distribution line (type and method) 2. Inspection on transformer  <i>Bless Agbi</i>
(Tue) 12 <sup>th</sup> July	Overhead line and underground cable  <i>Bless Agbi</i>	1. Management and application of maintenance data 2. Distribution line fault and investigation  <i>Peter Asare</i>		1. Procedure of cable fault location  <i>Peter Asare</i> 3. Operation and management of power distribution system a. Management of voltage and current b. Measurement of earth resistance  <i>Samuel Andoh</i>		
(Wed) 13 <sup>th</sup> July	Outline of substation equipment  <i>Kingsford Amoako</i>	<b>S n a c k</b>	Outline of equipment  <i>Kingsford Amoako</i>	Outline of distribution equipment  <i>Samuel Andoh</i>	<b>L u n c h</b>	1. Data management of substation equipment 2. Statistic and analysis of fault  <i>Isaac Nukpezah</i>
(Thu) 14 <sup>th</sup> July	Substation patrol/ periodic inspection  <i>Isaac Nukpezah</i>		Substation patrol/ periodic inspection  <i>Isaac Nukpezah</i>	Prevention of human error and safety  <i>Isaac Nukpezah</i>		
(Fri) 15 <sup>th</sup> July	1. Procedure of fault restoration 2. Overload operation of transformer  <i>Kingsford Amoako</i>					Prevention of human error and safety  <i>Isaac Nupezah</i>  Evaluation

<b>COURSE TITLE: DISTRIBUTION PLANNING FOR ECG ENGINEERS</b>						
<b>JICA - ECG TRAINING PROGRAMME</b>						
<b>DATE: 18TH TO 20 JULY 2016</b>						
<b>DATE/DAY</b>	<b>8:30 am - 9:00am</b>	<b>9:00am - 10:00am</b>	<b>10:00am - 10:15am</b>	<b>10:15am - 12:30pm</b>	<b>12:30pm - 1:30pm</b>	<b>1:30pm - 3:30pm</b>
<b>Monday 18th July 2016</b>	Registration and Opening Ceremony	Profiling of Participants and filling of Questionnaire	<b>Snack Break</b>	1. Purpose and Outline of Distribution Planning Tasks 2. Basic Configuration and Characteristics of Distribution Systems	<b>Lunch Break</b>	3. Configuration of Distribution Facilities in ECG 4. Quality of Power Distribution
<b>Tuesday 19th July 2016</b>	7. Analysis and Evaluation of System Characteristics			7. Analysis and Evaluation of System Characteristics		5. Load Characteristics of Distribution Lines 6. Demand Projection 7. Analysis and Evaluation of System Characteristics 10. How to proceed with Distribution Facilities Planning 11. Practice of Planning 11-1 Demand Projection
<b>Wednesday 20th July 2016</b>	11. Practice of Planning 11-2 Load Flow/ Optimization of networks 11-3 Estimation of Technical Losses			11. Practice of Planning 11-4 Short Circuit Analysis 11-5 Reliability Analysis		8. Reliability Analysis and Evaluation of the Distribution system 9. Economic Evaluation 11. Practice of Planning 11-6 Distribution Automation 11-7 Economic Engineering
	<b>FACILITATORS - Ing. GEORGE EDJUFUL &amp; ISSAH B. MAJEED</b>					

## JICA Programme for ECG Engineer Training on Distribution Design (Feb.2016)

DAYS	8:30am – 10:00am	10:00am-10:15am	10:15am – 12noon	12noon - 1pm	1:00pm – 3:30pm
15 <sup>th</sup> Feb	<ul style="list-style-type: none"> <li>- Registration</li> <li>- Opening Ceremony</li> <li>- Questionnaire</li> </ul> <p style="text-align: center;"><i>ECG Training center</i></p>	<b>S n a c k B r e a k</b>	<ol style="list-style-type: none"> <li>1. Introductory Lessons</li> <li>2. General conditions and requirements for design</li> <li>3. Overhead Line designs               <ol style="list-style-type: none"> <li>3.1 Mechanical designs</li> <li>3.2 Electrical designs</li> </ol> </li> </ol>	<b>L u n c h B r e a k</b>	<ol style="list-style-type: none"> <li>3. Overhead Line designs               <ol style="list-style-type: none"> <li>3.3 General guidelines for design of OHL</li> <li>3.4 ECG standard of OHL components</li> <li>3.5 Standard rules for OHL design</li> </ol> </li> <li>4. Underground network designs</li> <li>6. Protection &amp; Earthing               <ol style="list-style-type: none"> <li>6.4 Protection &amp; earthing for UGL</li> <li>6.5 Equipment earthing</li> <li>6.6 Lightning protection</li> </ol> </li> </ol>
16 <sup>th</sup> Feb	<ol style="list-style-type: none"> <li>5. Substation designs               <ol style="list-style-type: none"> <li>5.1 Types of Substations</li> <li>5.2 Equipment for each type of substations</li> <li>5.3 Sizing and Installation position of transformers</li> </ol> </li> <li>6. Earth Grid and Lightning Protection Modelling</li> </ol>	<b>S n a c k B r e a k</b>	<ol style="list-style-type: none"> <li>6. Protection &amp; Earthing               <ol style="list-style-type: none"> <li>6.1 Protection &amp; earthing for substations</li> <li>6.2 Neutral grounding system</li> <li>6.3 Protection &amp; earthing for OHL</li> </ol> </li> <li>7. Power quality issues for a distribution network</li> <li>8. Improvement of distribution network reliability</li> </ol>		<ul style="list-style-type: none"> <li>- Evaluation,</li> <li>- Making Action plan</li> <li>- Closing Ceremony</li> </ul> <p style="text-align: center;"><i>ECG Training center</i></p>
17 <sup>th</sup> Feb					



# Practical training using substation

Periodical patrol for substation equipment

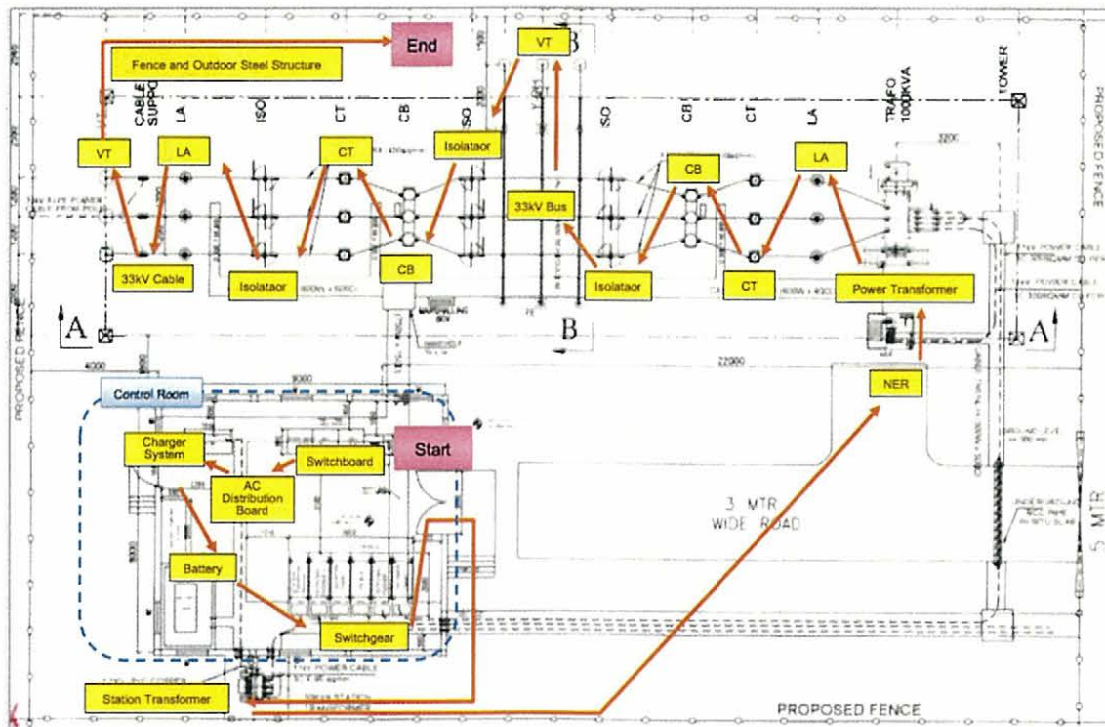
28<sup>th</sup> July, 2016

## 1. Patrol route & Patrol record

- Periodical patrol is a fundamental maintenance for substation equipment to keep them in a good condition.
- Periodical patrol is executed according to a patrol route and a patrol record where items to be checked and their confirmation points are described.
- Hands-on training on periodical patrol at the substation in ECG Training Center will be helpful to improve skill of personnel in charge of maintenance for substation equipment.

# 1. Patrol route & Patrol record

## Patrol route at the substation in ECG



## Substation in ECG Training Center



# 1. Patrol route & Patrol record

## Patrol record

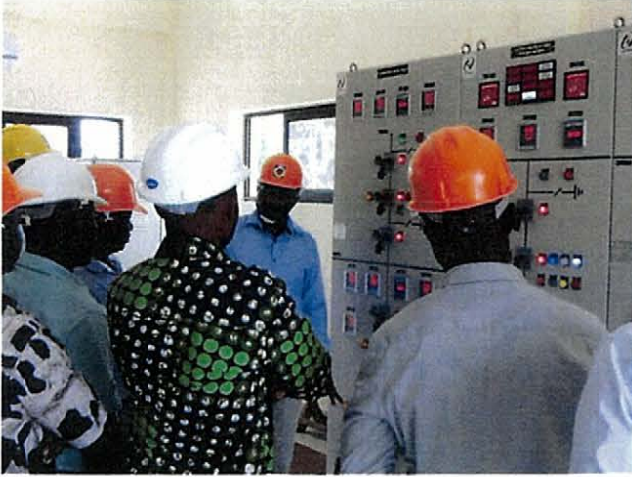
- Patrol record should clarify items to be checked and their confirmation points for each substation equipment.
- Recorded data in periodical patrol should be kept and organized to understand actual condition of each substation equipment.

# 1. Patrol route & Patrol record

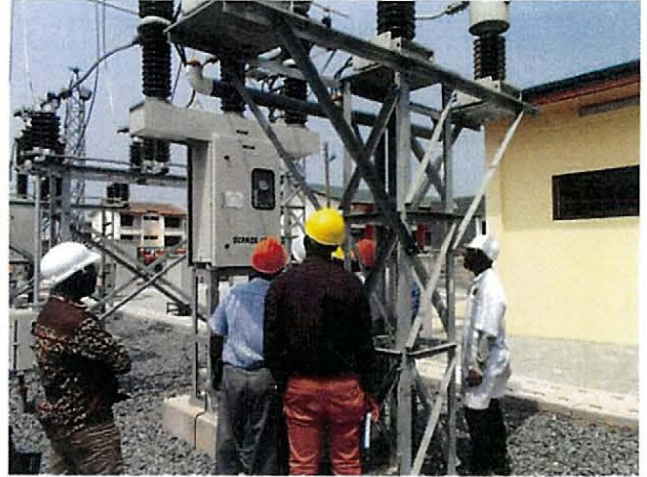
## Patrol record for the substation in ECG

Legend Symbol			Date
L: Good	X: Bad	O: Replacement	2019/02/23
Component	Component	Item	Check point
Environment, Weather	Control room temperature	Room temperature	Max(deg C)
Environment, Weather	Control room temperature	Room temperature	Current (deg C)
Environment, Weather	Control room temperature	Air conditioner	Operating condition
Environment, Weather	Fire alarm panel	Indicating lamp	Blowout or damage
RTCC Control Panel	Switchboard	Overall condition	Abnormal noise or smell, Moisture, Overheating
RTCC Control Panel	Switchboard	Indicator/indicating lamp	Blowout or damage
RTCC Control Panel	Switchboard	Relay	Damage, Power on, Condition of UV lamp
RTCC Control Panel	Switchboard	Switch	Position
RTCC Control Panel	Switchboard	Temperature indicator	Current value of oil temperature
RTCC Control Panel	Switchboard	Temperature indicator	Current value of winding temperature
RTCC Control Panel	Switchboard	Tap position indicator	Current value
Control and Relay Panel for 33kV/11kV Transformer	Switchboard	Overall condition	Abnormal noise or smell, Moisture, Overheating
Control and Relay Panel for 33kV/11kV Transformer	Switchboard	Indicator/indicating lamp	Blowout or damage
Control and Relay Panel for 33kV/11kV Transformer	Switchboard	Relay	Damage, Abnormal indication
Control and Relay Panel for 33kV/11kV Transformer	Switchboard	Transfer switch	Position
Control and Relay Panel for 33kV/11kV Transformer	Switchboard	Ammeter	Current value [A]
Control and Relay Panel for 33kV/11kV Transformer	Switchboard	Voltmeter	Current value [KV]
Control and Relay Panel for 33kV/11kV Transformer	Switchboard	Frequency meter	Current value [Hz]
Control and Relay Panel for 33kV/11kV Transformer	Switchboard	Multi Function Meter	Current value

## Hands-on training on periodical patrol at the substation in ECG



Control room

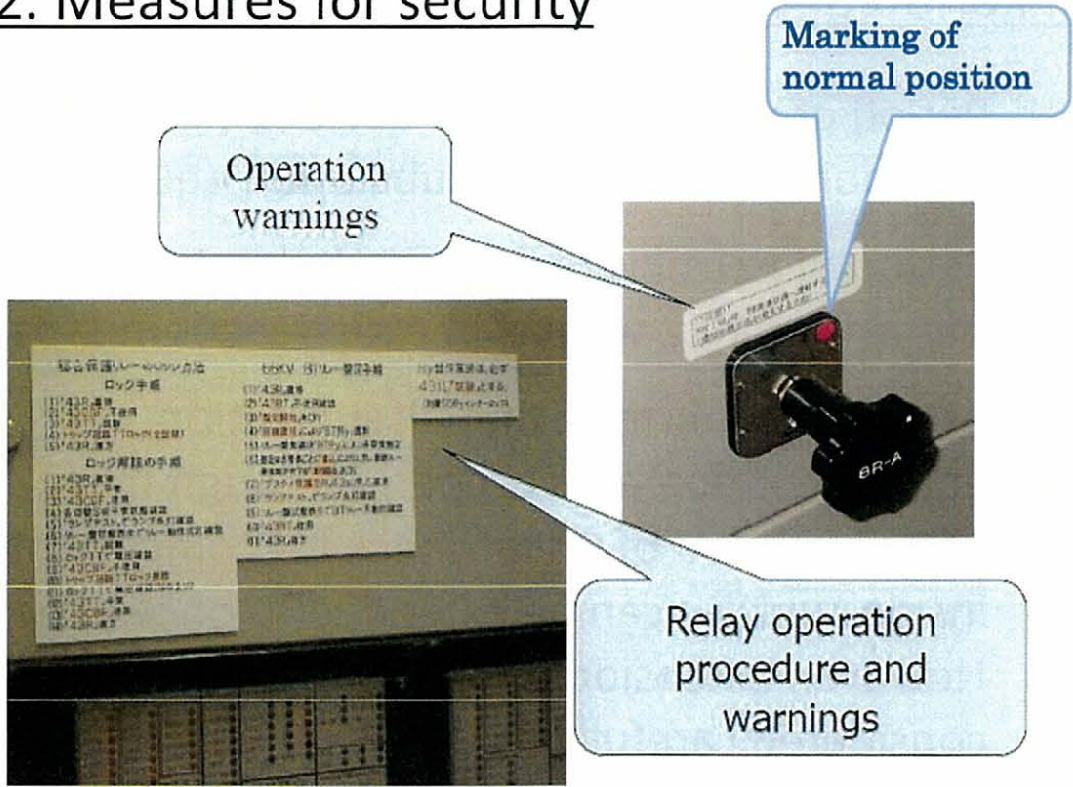


Outdoor equipment

## 2. Measures for security

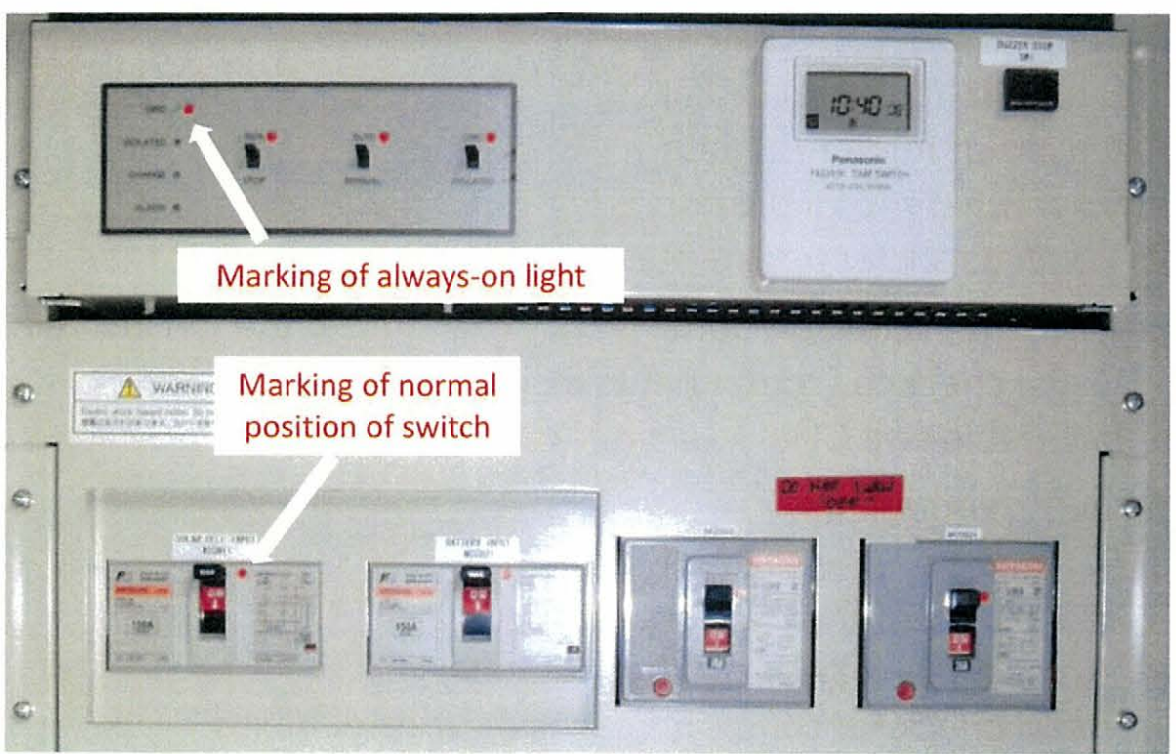
- It is important to prevent incorrect operation and false recognition for substation equipment while a periodical patrol.
- In order to avoid false recognition, marking on cubicles and control boards is adopted to clarify normal positions of switches and normal conditions of indicators.
- In order to avoid incorrect operation, procedures and instructions are shown at equipment to clarify correct operation of equipment.

## 2. Measures for security



1

## 2. Measures for security



### 3. Period of patrol

- Period of patrol should be decided from the viewpoint of security of substation equipment.
- Period of patrol is recommended to be twice a month (every 2 weeks) in experiences in Japan.
- After it is confirmed that all substation equipment operates properly through many patrols, period of visual check for components inside cubicles can be extended to once a month. However, extension of period of patrol should be considered carefully.

### 3. Period of patrol

Equipment/ Items to be checked	Period
Equipment in control room/ - Record of numerical data - Visual check for indicators - Visual check for apparent conditions	Twice a month
Equipment in control room/ - Visual check for components inside cubicles (Bus bar, Cable and CT)	Once a month
Outdoor equipment/ - Record of numerical data - Visual check for indicators - Visual check for apparent conditions - Visual check for components inside control boxes	Twice a month

Annex- 6 Recommendation for achieving the Overall Goal of the Project

Overall Goal: “Distribution System operation and maintenance in ECG and third countries is improved”.

1. Please continue the training courses for technicians and engineers of ECG.
2. Please restart the third countries training programs, when the Ebola disease is eradicated.  
Please get an advice from JICA Ghana Office concerning follow-up technical cooperation when ECG restart the third countries training programs
3. Please consider the times and number of candidates of the training courses flexibly.
4. Please utilize our textbooks, syllabus and curriculum effectively.
5. Please prepare the personnel expenses to invite the lecturers from outside of ECG Training Center.
6. Please try to assign ECG's staff as a lecturer of the training course.

And Several year after finishing this Technical Cooperation, Ex-post Evaluation will be implemented by JICA.

The Expert Team request ECG Training Center to submit the periodical report to JICA Ghana Office at the end of the year.

1. Annual Performance of training activities in ECG Training Center
2. Reports of the monitoring of the training courses below.
  - : Maintenance Techniques for Power Equipment and Implementation Procedure”
  - : “System Protection and Control”
  - : “Distribution Planning”
  - : “Distribution Design”
3. The performance and result if the third country training courses can be restarted

## Project Monitoring Sheet I (Revision of Project Design Matrix)

Project Title: The Project for Electrical Engineers Training for African Countries (EETA)

Version 1.0

Implementing Agency: Electricity Company of Ghana (ECG)

Dated Mar. 03, 2015

Target Group: Trainers of ECG

Period of Project: From Sep. 2013 to Sep.2016

Project Site: ECG Training Centre		Model Site:			
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	Achievement	Remarks
Overall Goal					
Distribution System operation and maintenance in ECG and third countries is improved.	- Distribution loss and SAIFI (The System Average Interruption Frequency Index ) will decrease in Ghana and third countries.	- Annual report of ECG and third countries	- There is no drastic change in Energy Policy in Ghana. - Necessary budget shall be allocated for the training.		
Project Purpose					
Training capacity on distribution system operation and maintenance for ECG and third countries is strengthened	- Number of training courses for technicians and engineers will increase. - Syllabus, curriculum and training materials will be revised or newly developed.	- Annual report of ECG and third countries - Quarterly Report of ECG and third countries	- Trained trainers continue to work for ECG. - Stakeholders fulfill their responsibilities in maintaining cooperation framework.		
Outputs					
1. Current situation of distribution system operation and maintenance is analyzed and training needs are identified	- Report compiled training needs	- Quarterly Report of ECG and third countries - Project Progress Report	- Trainees from third countries continue to participate in the training courses in ECG. - Equipment will be properly maintained for the training courses.	After surveying on training needs in ECG and the Third countries on September to November 2013, current situation of distribution system operation and maintenance was analyzed and training needs for technicians and engineers were identified.	
2. Training for technicians of ECG and the third countries is improved.	- Number of trainees for technicians courses will increase. - Number of certificated trainees (Ghana: a more than 30, third countries: more than 36)	- Quarterly Report of ECG and third countries - Project Progress Report - Syllabus, curriculums and Training materials for the training courses - Inventory list - Result of the Monitoring		- Syllabus, curriculum and training materials were developed and training courses for ECG and the Third countries were carried out on June to July 2014. - Monitoring of training courses was implemented in conjunction with organizing of training courses. According to the result of the monitoring, syllabus, curriculum and training materials were revised. - Installation of training equipment and facilities of ECG has not completed yet.	
3. Training for engineers of ECG and third countries is implemented	- Number of training courses for engineers will increase programs. - Number of trainees (Ghana: a more than 0, third countries: more than 12)	- Quarterly Report of ECG and third countries - Project Progress Report - Syllabus, curriculums and Training materials for the training courses - Result of the Monitoring		- Syllabus, curriculum and training materials for "System Protection and Control" and "Distribution Planning" were developed. - Training courses on System Protection and Control for ECG Engineers were organized on Feb. 2015 - Development and implementation for training course for "Distribution Design" will be carried out in the third year of the project.	-Due to the Ebola issue, Implementation of the Third countries Engineers Training Course on System Protection and Control is pending. - Restart of the training to be decided.
4. Monitoring and management capacity of ECG and third countries is improved	- Quality of revised texts - Quality of revised tools - Number of JCC meetings	- Quarterly Report of ECG and third countries - Project Progress Report - Manuals and tools		- Current monitoring and management capacity of ECG was confirmed. - Framework of the monitoring is developed and it is implemented in conjunction with the training courses. In addition to above, system of training monitoring is transferring to ECG counterpart. - Syllabus, curriculum and training materials for "Technique and Procedure for Maintenance of Power Equipment" were reflected by the result of the training monitoring.	



Activities	Inputs		Pre-Conditions
	The Japanese Side	The Ghanaian Side	
<p>1. Current situation of distribution system operation and maintenance is analyzed and training needs are identified.</p> <p>1- Review the electricity policy and plan of Ghana and regional cooperation</p> <p>1- Review the current situation challenges of distribution system O&amp;M in ECG and the third countries</p> <p>1- Review the current situation of human resources development of ECG engineers and technicians</p> <p>1- Identify the training needs of ECG engineers and technicians and the third countries is improved</p> <p>2- Review the existing training course of ECG for technicians</p> <p>2- Replace training equipments and facilities of ECG</p> <p>2- Update necessary training materials</p> <p>2- Deliver training programs for ECG technicians</p> <p>2- Deliver training programs for the third countries</p> <p>2- Observe the training performance and feed-back to training courses</p> <p>3. Training for engineers of ECG and third countries is implemented</p> <p>3- Develop syllabuses, culliculum and material for three training programs</p> <p>3- 3-2 Install new equipments and facilities for training</p> <p>3- 3-3 Strengthen skills and technology of ECG training</p> <p>3- 3-4 Deliver training programs for ECG engineers</p> <p>3- 3-5 Deliver training programs for the third countries</p> <p>3- 3-6 Observe the training performance and feed-back to training courses</p> <p>4. Monitoring and management capacity of ECG and third countries is improved.</p> <p>4- 4-1 Observe and analyze the current capacity of ECG for monitoring and management of training</p> <p>4- 4-2 Prepare plan for methodologies and procedures for improvement</p> <p>4- 4-3 Improve ECG capacity for training monitoring and management</p>	<p><b>A. Assignment of Experts</b></p> <ul style="list-style-type: none"> <li>-Chief Advisor/Training Planning</li> <li>-Power Distribution Planning/ Design</li> <li>-Power Distribution System Operation</li> <li>-Substation Maintenance</li> <li>-Training Monitoring/ Assistant for Power Distribution</li> <li>-Substation Equipment/ Procurement</li> <li>-Coordinator</li> </ul> <p><b>B. Training in Japan</b></p> <p>About ten (10) counterpart personnel are planning to be accepted to the training program in Japan in the three years of the Project.</p> <p><b>C. Provision of Equipment</b></p> <p>Equipment will be provided based on the R/D.</p> <p><b>D. Allocation of the necessary budget of trainings for third countries.</b></p> <ul style="list-style-type: none"> <li>- Allowance for third countries' trainees are provided by JICA.</li> <li>- Transportation fee of trainees is arranged by own organization.</li> </ul>	<p><b>A. Assignment of Counterpart personnel</b></p> <ul style="list-style-type: none"> <li>- Project Director</li> <li>- Project Manager</li> <li>- Project Coordinator</li> <li>- Technical Manager</li> <li>- Technical Counterpart</li> </ul> <p><b>B. Joint Coordinating Committee</b></p> <p><b>C. Office Space and others</b></p> <p>ECG will provide necessary office facilities including electricity, air-conditioning, water and internet during the duration of the Project.</p> <p><b>D. Allocation of the necessary budget for the activities described in PDM.</b></p> <p><b>E. Training for trainees of third countries</b></p> <p>ECG assigns necessary lecturers in order to implement trainings for third countries.</p>	<p>• Counterparts are assigned.</p> <p>• Necessary budget, office space and facilities for the Project are allocated.</p> <p style="text-align: center;">↓</p> <p style="text-align: center; background-color: yellow;">&lt;Issues and countermeasures&gt;</p>



Activities Sub-Activities	Plan Actual	2011				2012				2013				2014				2015				2016				2017				2018				2019				2020				Responsible Organization		Achievements	Issue & Countermeasures																												
		I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	Japan	Ghana																														
<b>Output 3: Training for engineers of ECG and third countries is implemented</b>																																																																									
3.1 Develop syllabuses, curriculum and material for three training programs	Plan																																												Development for the training courses on "System Protection and Control" and "Distribution Planning" was completed. Development for training course for "Distribution Design" will be carried out in the third year of the project.																												
3.2 Install new equipment and facilities for training	Plan																																													Specifications of machinery and equipment were completed. Technical assistance to construction is on-going.	Construction and installation is delayed. To complete smoothly, the contractor's work should be managed very carefully. Five types of instruments will be delivered by the end of March 2015.																										
3.3 Strengthen skills and technology of ECG training	Plan																																													Technical transfer is on-going on the theme of "System Protection and Control" and "Distribution Planning".																											
3.4 Deliver training programs for ECG engineers	Plan																																													ECG Engineers Training was organized in February 2015.																											
3.5 Deliver training programs for the third countries	Plan																																													Syllabus, curriculum and training materials for the Third countries were developed.	Due to the Ebola issue, Implementation of the Third countries Engineers Training Course on System Protection and Control is pending. Restart of training has yet to be decided.																										
3.6 Observe the training performance and feedback to training courses	Plan																																													Training monitoring was carried out in conjunction with the training course on System Protection and Control and its assessment is on-going.																											
<b>Output 4: Monitoring and management capacity of ECG and third countries is improved</b>																																																																									
4.1 Observe and analyze the current capacity of ECG for monitoring and management of training	Plan																																													Analysis of the training monitoring system in ECG Training Centre was completed.																											
4.2 Prepare plan for methodologies and procedures for improvement	Plan																																														Framework and plan of training monitoring is developing.																										
4.3 Improve ECG capacity for training monitoring and management	Plan																																													This activity has not been started yet.																											
<b>Duration / Phasing</b>																																																																									
<b>Monitoring Plan</b>		Plan	2011				2012				2013				2014				2015				2016				2017				2018				2019				2020				Remarks		Issue		Solution																										
		Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV																															
<b>Monitoring</b>		Plan																																																																							
Joint Coordination Committee	Actual																																																																								
Set-up the Detailed Plan of Operation	Plan																																																																								
Submission of Monitoring Sheet	Actual																																																																								
Monitoring Mission from Japan	Plan																																																																								
Joint Monitoring	Actual																																																																								
Post Monitoring	Plan																																																																								
<b>Reports/Documents</b>	Plan																																																																								
Inception Report	Actual																																																																								
Progress Report	Plan																																																																								
Training Materials	Actual																																																																								
Project Completion Report	Plan																																																																								
<b>Public Relations</b>	Plan																																																																								
Publicity activities	Actual																																																																								

## Project Monitoring Sheet I (Revision of Project Design Matrix)

Project Title: The Project for Electrical Engineers Training for African Countries (EETA)

Implementing Agency: Electricity Company of Ghana (ECG)

Target Group: Trainers of ECG

Period of Project: From Sep. 2013 to Sep.2016

Version 2.0

Dated July, 2015

Project Site: ECG Training Centre		Model Site:			
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	Achievement	Remarks
Overall Goal					
Distribution System operation and maintenance in ECG and third countries is improved.	- Distribution loss and SAIFI (The System Average Interruption Frequency Index ) will decrease in Ghana and third countries.	- Annual report of ECG and third countries	- There is no drastic change in Energy Policy in Ghana. - Necessary budget shall be allocated for the training.		
Project Purpose					
Training capacity on distribution system operation and maintenance for ECG and third countries is strengthened	- Number of training courses for technicians and engineers will increase. - Syllabus, curriculum and training materials will be revised or newly developed.	- Annual report of ECG and third countries - Quarterly Report of ECG and third countries	- Trained trainers continue to work for ECG. - Stakeholders fulfill their responsibilities in maintaining cooperation framework.		
Outputs					
1. Current situation of distribution system operation and maintenance is analyzed and training needs are identified	- Report compiled training needs	- Quarterly Report of ECG and third countries - Project Progress Report	- Trainees from third countries continue to participate in the training courses in ECG. - Equipment will be properly maintained for the training courses.	After surveying on training needs in ECG and the Third countries on September to November 2013, current situation of distribution system operation and maintenance was analyzed and training needs for technicians and engineers were identified.	
2. Training for technicians of ECG and the third countries is improved.	- Number of trainees for technicians courses will increase. - Number of certificated trainees (Ghana: a more than 30, third countries: more than 36)	- Quarterly Report of ECG and third countries - Project Progress Report - Syllabus, curriculums and Training materials for the training courses - Inventory list - Result of the Monitoring		- Syllabus, curriculum and training materials were developed and training courses for ECG and the Third countries were carried out on June to July 2014. - Monitoring of training courses was implemented in conjunction with organizing of training courses. According to the result of the monitoring, syllabus, curriculum and training materials were revised. - Training equipment and facilities of ECG have installed in March 2015.	Training Course for third countries is postponed because of the outbreak of Ebola Disease.
3. Training for engineers of ECG and third countries is implemented	- Number of training courses for engineers will increase programs. - Number of trainees (Ghana: a more than 50, third countries: more than 12)	- Quarterly Report of ECG and third countries - Project Progress Report - Syllabus, curriculums and Training materials for the training courses - Result of the Monitoring		- Syllabus, curriculum and training materials for "System Protection and Control" and "Distribution Planning" were developed. - Training courses on System Protection and Control and Distribution Planning for ECG Engineers were organized on Feb and July 2015 respectively. - Development and implementation for training course for "Distribution Design" will be carried out in the third year of the project.	-Due to the Ebola issue, Implementation of the Third countries Engineers Training Course on System Protection and Control is pending. - Restart of the training to be decided.
4. Monitoring and management capacity of ECG is improved	- Quality of revised texts - Quality of revised tools - Number of JCC meetings	- Quarterly Report of ECG and third countries - Project Progress Report - Manuals and tools		- Current monitoring and management capacity of ECG was confirmed. - Framework of the monitoring is developed and it is implemented in conjunction with the training courses. In addition to above, system of training monitoring is transferring to ECG counterpart. - Syllabus, curriculum and training materials for "Technique and Procedure for Maintenance of Power Equipment" "System Protection and Control" and "Distribution Planning" were reflected by the result of the training monitoring.	

Activities	Inputs		Pre-Conditions
	The Japanese Side	The Ghanaian Side	
<p>1. Current situation of distribution system operation and maintenance is analyzed and training needs are identified.</p> <p>1- Review the electricity policy and plan of Ghana and regional cooperation</p> <p>1- Review the current situation challenges of distribution system O&amp;M in ECG and the third countries</p> <p>2- Review the current situation of human resources development of ECG engineers and technicians</p> <p>3- Identify the training needs of ECG engineers and technicians and the third countries</p> <p>2. Training for technicians of ECG and the third countries is improved</p> <p>2- Review the existing training course of ECG for technicians</p> <p>2- Replace training equipments and facilities of ECG</p> <p>2- Update necessary training materials</p> <p>2- Deliver training programs for ECG technicians</p> <p>2- Deliver training programs for the third countries</p> <p>2- Observe the training performance and feed-back to training courses</p> <p>3. Training for engineers of ECG and third countries is implemented</p> <p>3- Develop syllabuses, culliculum and material for three training programs</p> <p>3- 3-2 Install new equipments and facilities for training</p> <p>3- 3-3 Strengthen skills and technology of ECG training</p> <p>3- 3-4 Deliver training programs for ECG engineers</p> <p>3- 3-5 Deliver training programs for the third countries</p> <p>3- 3-6 Observe the training performance and feed-back to training courses</p> <p>4. Monitoring and management capacity of ECG is improved.</p> <p>4- 4-1 Observe and analyze the current capacity of ECG for monitoring and management of training</p> <p>4- 4-2 Prepare plan for methodologies and procedures for improvement</p> <p>4- 4-3 Improve ECG capacity for training monitoring and management</p>	<p><b>A. Assignment of Experts</b>                      -Chief Advisor/Training Planning                      -Power Distribution Planning/ Design                      -Power Distribution System Operation                      -Substation Maintenance                      -Training Monitoring/ Assistant for Power Distribution                      -Substation Equipment/ Procurement                      -Coordinator</p> <p><b>B. Training in Japan</b>                      Seven (7) counterpart personnel are planning to be accepted to the training program in Japan in the first years of the Project.</p> <p><b>C. Provision of Equipment</b>                      Equipment will be provided based on the R/D.</p> <p><b>D. Allocation of the necessary budget of trainings for third countries.</b>                      - Allowance for third countries' trainees are provided by JICA.                      - Transportation fee of trainees is arranged by own organization.</p>	<p><b>A. Assignment of Counterpart personnel</b>                      - Project Director                      - Project Manager                      - Project Coordinator                      - Technical Manager                      - Technical Counterpart</p> <p><b>B. Joint Coordinating Committee</b></p> <p><b>C. Office Space and others</b>                      ECG will provide necessary office facilities including electricity, air-conditioning, water and internet during the duration of the Project.</p> <p><b>D. Allocation of the necessary budget for the activities described in PDM.</b></p> <p><b>E. Training for trainees of third countries</b>                      ECG assigns necessary lecturers in order to implement trainings for third countries.</p>	<p>•Counterparts are assigned.                      •Necessary budget, office space and facilities for the Project are allocated.</p> <p style="text-align: center;">↓</p> <p style="text-align: center; background-color: yellow;">&lt;Issues and countermeasures&gt;</p>

Project Monitoring Sheet II (Revision of Plan of Operation)

Version 2.0  
Dated: Mar 03, 2015

Project Title: The Project for Electrical Engineers for African Countries (EETA)

Inputs	Plan	2011				2012				2013				2014				2015				2016				2017				2018				2019				2020				Remarks	Monitoring		
		Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	Issue	Solution					
<b>Expert</b>	Plan																																												
Mr. Hiroshi Kurakata Chief Advisor/ Training Planning	Actual																																												
Mr. Takumu Genji Power Distribution Planning/ Design	Plan																																												
Mr. Tatsuhiro Tamura Power Distribution System Operation	Actual																																												
Mr. Tomohisa Fujita (Mr. Shinya Nishimatsu ,Mr. Tsuguhiro Yamada) Substation Maintenance	Plan																																												
Mr. Yukihiro Mikumo (Mr. Seiji Ito) Training Monitoring/ Assistant for Power Distribution	Actual																																												
Mr. Shinichi Tohjoh Substation Equipment/ Procurement	Plan																																												
Ms Ritsuko Kawabe Coordinator	Actual																																												
<b>Equipment</b>	Plan																																												
Equipment and Installation of 33kV Substation for training	Actual																													It is delayed and may be completed by the end of Sep. 2015.	It is delayed because of two reasons. 1. JICA internal process for tender took more time. 2. Contractor work performance is very low.	To manage the contractor's work very carefully.													
Maintenance Instruments(Portable Cable Fault Locator, Oil Tester, Primary Current Injection Test Set, Secondary Injection Test Set, Portable Power Quality Analyzer)	Plan																																												
	Actual																													Five types of instruments will be delivered by the end of March 2015.															
<b>Training in Japan</b>	Plan																																												
Human Resource Development in Power Distribution Training	Actual																													All CPs of ECG Training Centre attended the Training in 2014. So, second CP training in Japan will not be organized.															
<b>In-country/Third country Training</b>	Plan																																												
	Actual																																												
<b>Activities</b>	Plan	2011				2012				2013				2014				2015				2016				2017				2018				2019				2020				Responsible Organization		Achievements	Issue & Countermeasures
Sub-Activities	Actual	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	I	II	III	IV	Japan	Ghana						
<b>Output 1: Current situation of distribution system operation and maintenance is analyzed and training needs are identified</b>																																													
1.1 Review the electricity policy and plan of Ghana and regional cooperation framework	Plan																																												
	Actual																																												
1.2 Review the current situation challenges of distribution system O&M in ECG and the third countries	Plan																																												
	Actual																																												
1-3 Review the current situation of human resources development of ECG engineers and technicians	Plan																																												
	Actual																																												
1.4 Identify the training needs of ECG engineers and technicians and the third countries	Plan																																												
	Actual																																												
<b>Output 2: Training for technicians of ECG and the third countries is improved</b>																																													
2.1 Review the existing training course of ECG for technicians	Plan																																												
	Actual																																												
2.2 Replace training equipment and facilities of ECG	Plan																																												
	Actual																																												
2.3 Update necessary training materials	Plan																																												
	Actual																																												
2.4 Deliver training programs for ECG technicians	Plan																																												
	Actual																																												
2.5 Deliver training programs for the third countries	Plan																																												
	Actual																																												
2.6 Observe the training performance and feed-back to training courses	Plan																																												
	Actual																																												



## Project Monitoring Sheet I (Revision of Project Design Matrix)

Project Title: The Project for Electrical Engineers Training for African Countries (EETA)

Implementing Agency: Electricity Company of Ghana (ECG)

Target Group: Trainers of ECG


Period of Project: From Sep. 2013 to Sep.2016

Version 3.0

Dated March, 2016

Project Site: ECG Training Centre		Model Site:			
Narrative Summary	Objectively Verifiable Indicators	Means of Verification	Important Assumption	Achievement	Remarks
Overall Goal					
Distribution System operation and maintenance in ECG and third countries is improved.	- Distribution loss and SAIFI (The System Average Interruption Frequency Index ) will decrease in Ghana and third countries.	- Annual report of ECG and third countries	- There is no drastic change in Energy Policy in Ghana. - Necessary budget shall be allocated for the training.		
Project Purpose					
Training capacity on distribution system operation and maintenance for ECG and third countries is strengthened	- Number of training courses for technicians and engineers will increase. - Syllabus, curriculum and training materials will be revised or newly developed.	- Annual report of ECG and third countries - Quarterly Report of ECG and third countries	- Trained trainers continue to work for ECG. - Stakeholders fulfill their responsibilities in maintaining cooperation framework.		
Outputs					
1. Current situation of distribution system operation and maintenance is analyzed and training needs are identified	- Report compiled training needs	- Quarterly Report of ECG and third countries - Project Progress Report	- Trainees from third countries continue to participate in the training courses in ECG. - Equipment will be properly maintained for the training courses.	After surveying on training needs in ECG and the Third countries from September to November 2013, current situation of distribution system operation and maintenance was analyzed and training needs for technicians and engineers were identified.	
2. Training for technicians of ECG and the third countries is improved.	- Number of trainees for technicians courses will increase. - Number of certificated trainees (Ghana: a more than 30, third countries: more than 36)	- Quarterly Report of ECG and third countries - Project Progress Report - Syllabus, curriculums and Training materials for the training courses - Inventory list - Result of the Monitoring		- Syllabus, curriculum and training materials were developed and training courses for ECG and the Third countries were carried out on June to July 2014. - And for ECG Technicians (2nd) was implemented in June 2015. - Monitoring of training courses was implemented in conjunction with organizing of training courses. According to the result of the monitoring, syllabus, curriculum and training materials were revised. - Training equipment and facilities of ECG have installed in March 2015. - 19 ECG Technicians and 12 Third Countries' Technicians were trained in these training courses until March 2016.	Training Course for third countries is postponed because of the outbreak of Ebola Disease.
3. Training for engineers of ECG and third countries is implemented	- Number of training courses for engineers will increase programs. - Number of trainees (Ghana: a more than 50, third countries: more than 12)	- Quarterly Report of ECG and third countries - Project Progress Report - Syllabus, curriculums and Training materials for the training courses - Result of the Monitoring		- Syllabus, curriculum and training materials for "System Protection and Control", "Distribution Planning" and "Distribution Design" were developed. - Training courses on System Protection and Control and Distribution Planning for ECG Engineers were organized on Feb and July 2015 respectively. - And "System Protection and Control"(2nd) and "Distribution Design" were organized on Feb.2016. - Monitoring Activities were carried out and Syllabus and Curriculams were revised based on the results of these Monitoring Activities. - 47 ECG Engineers were trained in these training courses until March 2016.	-Due to the Ebola issue, Implementation of the Third countries Engineers Training Course on System Protection and Control is pending. - Restart of the training to be decided.
4. Monitoring and management capacity of ECG is improved	- Quality of revised texts - Quality of revised tools - Number of JCC meetings - Number of Monitoring Reports - PDCA cycle of Monitoring Activities will be established	- Quarterly Report of ECG and third countries - Project Progress Report - Manuals and tools - Monitoring Reports		- Current monitoring and management capacity of ECG was confirmed. - Framework of the monitoring is developed and it is implemented in conjunction with the training courses. In addition to above, system of training monitoring is transferring to ECG counterpart. - Syllabus, curriculum and training materials for "Technique and Procedure for Maintenance of Power Equipment" "System Protection and Control", "Distribution Planning" and "Distribution Design" were reflected by the result of the training monitoring.	




Activities	Inputs		Pre-Conditions
	The Japanese Side	The Ghanaian Side	
1. Current situation of distribution system operation and maintenance is analyzed and training needs are identified.			
1-1 Review the electricity policy and plan of Ghana and regional cooperation	<b>A. Assignment of Experts</b> -Chief Advisor/Training Planning -Power Distribution Planning/ Design -Power Distribution System Operation -Substation Maintenance -Training Monitoring/ Assistant for Power Distribution -Substation Equipment/ Procurement -Coordinator	<b>A. Assignment of Counterpart personnel</b> - Project Director - Project Manager - Project Coordinator - Technical Manager - Technical Counterpart	•Counterparts are assigned. •Necessary budget, office space and facilities for the Project are allocated.
1-2 Review the current situation challenges of distribution system O&M in ECG and the third countries			
1-3 Review the current situation of human resources development of ECG engineers and technicians			
1-4 Identify the training needs of ECG engineers and technicians and the third countries			
2. Training for technicians of ECG and the third countries is improved	<b>B. Training in Japan</b> Seven (7) counterpart personnel are planning to be accepted to the training program in Japan in the first years of the Project.	<b>B. Joint Coordinating Committee</b>	
2-1 Review the existing training course of ECG for technicians			
2-2 Replace training equipments and facilities of ECG			
2-3 Update necessary training materials			
2-4 Deliver training programs for ECG technicians			
2-5 Deliver training programs for the third countries			
2-6 Observe the training performance and feed-back to training courses	<b>C. Provision of Equipment</b> Equipment will be provided based on the R/D.	<b>C. Office Space and others</b> ECG will provide necessary office facilities including electricity, air-conditioning, water and internet during the duration of the Project.	<Issues and
3. Training for engineers of ECG and third countries is implemented			
3-1 Develop syllabuses, culliculum and material for three training programs			
3-2 Install new equipments and facilities for training			
3-3 Strengthen skills and technology of ECG training			
3-4 Deliver training programs for ECG engineers			
3-5 Deliver training programs for the third countries	<b>D. Allocation of the necessary budget of trainings for third countries.</b> - Allowance for third countries' trainees are provided by JICA. - Transportation fee of trainees is arranged by own organization.	<b>D. Allocation of the necessary budget for the activities described in PDM.</b>	
3-6 Observe the training performance and feed-back to training courses			
4. Monitoring and management capacity of ECG is improved.			
4-1 Observe and analyze the current capacity of ECG for monitoring and management of training			
4-2 Prepare plan for methodologies and procedures for improvement			
4-3 Improve ECG capacity for training monitoring and management			
		<b>E. Training for trainees of third countries</b> ECG assigns necessary lecturers in order to implement trainings for third countries.	





**Project Monitoring Sheet I (Revision of Project Design Matrix)****Project Title: The Project for Electrical Engineers Training for African Countries (EETA)****Implementing Agency: Electricity Company of Ghana (ECG)****Target Group: Trainers of ECG****Period of Project: From Sep. 2013 to Sep.2016****Version 4.0****Dated July, 2016**

<b>Project Site: ECG Training Centre</b>		<b>Model Site:</b>			
<b>Narrative Summary</b>	<b>Objectively Verifiable Indicators</b>	<b>Means of Verification</b>	<b>Important Assumption</b>	<b>Achievement</b>	<b>Remarks</b>
<b>Overall Goal</b>					
Distribution System operation and maintenance in ECG and third countries is improved.	- Distribution loss and SAIFI (The System Average Interruption Frequency Index ) will decrease in Ghana and third countries.	- Annual report of ECG and third countries	- There is no drastic change in Energy Policy in Ghana. - Necessary budget shall be allocated for the training.		
<b>Project Purpose</b>					
Training capacity on distribution system operation and maintenance for ECG and third countries is strengthened	- Number of training courses for technicians and engineers will increase. - Syllabus, curriculum and training materials will be revised or newly developed.	- Annual report of ECG and third countries - Quarterly Report of ECG and third countries	- Trained trainers continue to work for ECG. - Stakeholders fulfill their responsibilities in maintaining cooperation framework.		
<b>Outputs</b>					
1. Current situation of distribution system operation and maintenance is analyzed and training needs are identified	- Report compiled training needs	- Quarterly Report of ECG and third countries - Project Progress Report	- Trainees from third countries continue to participate in the training courses in ECG. - Equipment will be properly maintained for the training courses.	After surveying on training needs in ECG and the Third countries from September to November 2013, current situation of distribution system operation and maintenance was analyzed and training needs for technicians and engineers were identified.	
2. Training for technicians of ECG and the third countries is improved.	- Number of trainees for technicians courses will increase. - Number of certificated trainees (Ghana: a more than 30, third countries: more than 36)	- Quarterly Report of ECG and third countries - Project Progress Report - Syllabus, curriculums and Training materials for the training courses - Inventory list - Result of the Monitoring		- Syllabus, curriculum and training materials were developed and training courses for ECG and the Third countries were carried out on June to July 2014. - And for ECG Technicians (3rd) was implemented in July 2016. - Monitoring of training courses was implemented in conjunction with organizing of training courses. According to the result of the monitoring, syllabus, curriculum and training materials were revised. - Training equipment and facilities of ECG have installed in March 2015. - 29 ECG Technicians and 12 Third Countries' Technicians were trained in these training courses until July 2016.	Training Course for third countries is postponed because of the outbreak of Ebola Disease.
3. Training for engineers of ECG and third countries is implemented	- Number of training courses for engineers will increase programs. - Number of trainees (Ghana: a more than 50, third countries: more than 12)	- Quarterly Report of ECG and third countries - Project Progress Report - Syllabus, curriculums and Training materials for the training courses - Result of the Monitoring		- Syllabus, curriculum and training materials for "System Protection and Control" , "Distribution Planning" and "Distribution Design" were developed. - Training courses on System Protection and Control and Distribution Planning for ECG Engineers were organized on Feb and July 2015 respectively. - And "System Protection and Control"(2nd) and "Distribution Design"were organized in Feb.2016. Distribution Planning(2nd) was held in July 2016. - Monitoring Activities were carried out and Syllabus and Curriculams were revised based on the results of these Monitoring Activities. - 57 ECG Engineers were trained in these training courses until July 2016.	-Due to the Ebola issue, Implementation of the Third countries Engineers Training Course on System Protection and Control is pending. - Restart of the training to be decided.
4. Monitoring and management capacity of ECG is improved	- Quality of revised texts - Quality of revised tools - Number of JCC meetings - Number of Monitoring Reports - PDCA cycle of Monitoring Activities will be established	- Quarterly Report of ECG and third countries - Project Progress Report - Manuals and tools - Monitoring Reports		- Current monitoring and management capacity of ECG was confirmed. - Framework of the monitoring is developed and it is implemented in conjunction with the training courses. In addition to above, system of training monitoring is transferring to ECG counterpart. - Syllabus, curriculum and training materials for "Technique and Procedure for Maintenance of Power Equipment" "System Protection and Control" , "Distribution Planning" and "Distribution Design" were reflected by the result of the training monitoring.	

Activities	Inputs		Pre-Conditions
	The Japanese Side	The Ghanaian Side	
1. Current situation of distribution system operation and maintenance is analyzed and training needs are identified.			
1-1 Review the electricity policy and plan of Ghana and regional cooperation	<b>A. Assignment of Experts</b> -Chief Advisor/Training Planning -Power Distribution Planning/ Design -Power Distribution System Operation -Substation Maintenance -Training Monitoring/ Assistant for Power Distribution -Substation Equipment/ Procurement -Coordinator	<b>A. Assignment of Counterpart personnel</b> - Project Director - Project Manager - Project Coordinator - Technical Manager - Technical Counterpart	•Counterparts are assigned. •Necessary budget, office space and facilities for the Project are allocated.
1-2 Review the current situation challenges of distribution system O&M in ECG and the third countries			
1-3 Review the current situation of human resources development of ECG engineers and technicians			
1-4 Identify the training needs of ECG engineers and technicians and the third countries			
2. Training for technicians of ECG and the third countries is improved	<b>B. Training in Japan</b> Seven (7) counterpart personnel are planning to be accepted to the training program in Japan in the first years of the Project.	<b>B. Joint Coordinating Committee</b>	
2-1 Review the existing training course of ECG for technicians			
2-2 Replace training equipments and facilities of ECG			
2-3 Update necessary training materials			
2-4 Deliver training programs for ECG technicians			
2-5 Deliver training programs for the third countries			
2-6 Observe the training performance and feed-back to training courses	<b>C. Provision of Equipment</b> Equipment will be provided based on the R/D.	<b>C. Office Space and others</b> ECG will provide necessary office facilities including electricity, air-conditioning, water and internet during the duration of the Project.	<Issues and
3. Training for engineers of ECG and third countries is implemented			
3-1 Develop syllabuses, culliculum and material for three training programs	<b>D. Allocation of the necessary budget of trainings for third countries.</b> - Allowance for third countries' trainees are provided by JICA. - Transportation fee of trainees is arranged by own organization.	<b>D. Allocation of the necessary budget for the activities described in PDM.</b>	
3-2 Install new equipments and facilities for training			
3-3 Strengthen skills and technology of ECG training			
3-4 Deliver training programs for ECG engineers			
3-5 Deliver training programs for the third countries			
3-6 Observe the training performance and feed-back to training courses			
4. Monitoring and management capacity of ECG is improved.	<b>E. Training for trainees of third countries</b> ECG assigns necessary lecturers in order to implement trainings for third countries.		
4-1 Observe and analyze the current capacity of ECG for monitoring and management of training			
4-2 Prepare plan for methodologies and procedures for improvement			
4-3 Improve ECG capacity for training monitoring and management			



