업무자료 평가
2013-26-035

ISBN 978-89-6469-156-4 93320

KOICA 한국국제협력단

461-833 경기도 성남시 수정구 대왕판교로 825
Tel. 031-7400-114 Fax. 031-7400-655
http://www.koica.go.kr

업무자료 평가 2013-26-035

Ex-Post Evaluation Report for the Three Electric Transmission and Distribution Projects

한국국제협력단

발간등록번호
11-B260003-000042-01

Ex-Post Evaluation Report for the Three Electric Transmission and Distribution Projects

2012.12

KOICA 한국국제협력단

WORLD FRIENDS KOREA

Ex-Post Evaluation Report for the Three Electric Transmission and Distribution Projects

2012.12

KOICA
한국국제협력단
WORLD FRIENDS KOREA

The Korea International Cooperation Agency (KOICA) performs various types of evaluation in order to secure accountability and achieve better development results by learning.

KOICA conducts evaluations within different phases of phases of projects and programs, such as ex-ante evaluations, interim evaluations, end-of-project evaluations and ex-post evaluations. Moreover, sector evaluations, country program evaluations, thematic evaluations, and modality evaluations are also performed.

In order to ensure the independence of evaluation contents and results, a large amount of evaluation work is carried out by external evaluators. Also, the Evaluation Office directly reports evaluation results to the President of KOICA

KOICA has a feedback system under which planning and project operation departments take evaluation findings into account in programming and implementation. Evaluation reports are widely disseminated to staff and management within KOICA, as well as to stakeholders both in Korea and partner countries. All evaluation reports published by KOICA are posted on the KOICA website.
(www.koica.go.kr)

List of Abbreviations

Abbreviation	Formal Term
AMR	Automatic Meter Reading
ANDE	Administration Nacional de Electricidad
CAIDI	Customer Average Interruption Duration Index [CAIDI = SAIDI / SAIFI]
DAC	Development Assistance Committee
DAS	Distribution Automation System IDAS: Intelligent Distribution Automation System TDAS: Total Distribution Automation System
EEHC	Egyptian Electricity Holding Company
IT	Information and Techonlogies
KEPCO	Korea Electric Power Corporation
KOICA	Korea International Cooperation Agency
ODA	Official Development Assistance
OECD	Organization for Economic Cooperation and Development
PLN	Perusahaan Listrik Negara (Indonesian state-owned electricity company)
SAIDI	System Average Interruption Duration Index [Min/Customer] Equivalent Duration Interruption by Capacity [hours/kVA-year]
SAIFI	System Average Interruption Frequency Index [Freq/Customer] Equivalent Frequency Interruption by Capacity [N° /kVA-year]
SCADA	Supervisory Control and Data Acquisition

Contents

Evaluation Summary

Evaluation Summary

This evaluation is the ex-post evaluation of KOICA power transmission and distribution projects.

The subjects of the evaluation are "The Feasibility Study on Power Distribution System Improvement of 3 Cities in Indonesia and Automation Pilot Project (2006~2007)" and "Establishment of Master Plan for Power Distribution Field in Paraguay and Automatic Meter Reading Pilot Project (2007~2009)" and "Power Distribution Automatic System Construction Project in Northern Cairo in Egypt (2008~2010)", and the purpose of the evaluation is to assess effectiveness of the above 3 projects synthetically.

This evaluation is aimed at analyzing domestic and foreign data related to relevance, efficiency, effectiveness, impact and sustainability which are 5 evaluation criteria recommended by KOICA evaluation regulations and OECD/DAC, and deducing quantitative and qualitative results through questionnaire and a field survey and interviews with stakeholders etc. and providing policy recommendations.

Most questionnaire survey and interview results for the stakeholders of recipient countries showed better responses than satisfactory level, and they showed high satisfaction on effectiveness and sustainability, and hoped for the expansion of similar projects.

Evaluation Summary by Evaluation Criteria

◈ Evaluation on Relevance

○ Indonesia, the recipient country needed power distribution improvement and distribution automation system(DAS) project for expansion of power facilities, improvement of supply reliability and reduction of power distribution loss that were accompanied by a plan of economic restoration, and fostering of human resources to perform it.

○ Paraguay also needed the development of power facilities for economic development. They needed a master plan for power distribution field and an automatic meter reading (AMR) project for construction of power transmission and distribution facilities for a long distance and to prevent power loss and fostering of human resources to perform them since power demand is focused on the western regions.

○ Egypt also needed DAS project and fostering of human resources to perform it a matter claiming prior settlement for expansion of power facilities and improvement of supply reliability to prepare for increase of power demand.

○ Meanwhile, South Korea, the donor country has had a comparative advantage in terms of technologies improving efficiency of power transmission and distribution over the world, and designated DAS which had a big influence on improvement of supply reliability of distribution system and an automatic meter reading (AMR) system which had a great effect on reduction of loss as a strategic export product with high priority so the power transmission and distribution project that KOICA performed was evaluated to be a very timely one.

◈ Evaluation on Efficiency

○ Indonesia project was performed in accordance with the process of 15 months that was planned in the early stage of the project. Also, considering the demand of recipient countries, the pilot projects was expanded, and improvement of power distribution system and DAS pilot projects and invitation training (36 persons in working level for 4 weeks, 10 supervisors for 2 weeks) and local training (36 persons in working level for 3 days, 12 DAS operators for 5 days) etc. were efficiently performed by investing total project cost 950 thousand dollars, professional human power 58MM and 22 counterparts from recipient countries etc.

○ Paraguay project was performed in accordance with the process of 18 months that was planned in the early stage of the project. The establishment of a master plan of a power distribution field and AMR pilot projects and invitation training (3 supervisors for 14 days, 17 persons in working level for 21 days) and local loss training (16 persons for 21 days) etc. were efficiently performed by investing total project cost 1.5 million dollars, professional human power 67MM from the donor country and 17 counterparts from recipient countries etc.

○ Egypt project was performed in accordance with the process of 2 years that was planned in the early stage of the project. The Feasibility Study on improvement of supply reliability and DAS construction and invitation training (6 supervisors for 10 days, 14 engineers for 14 days) etc. were efficiently performed by investing total project cost 1.8 million dollars, professional human power 84MM (local dispatch 28, domestic support 56) from the donor country etc.

○ Therefore, the project duration and total cost of the projects of the 3

countries were reasonably planned and properly adjusted. Besides, the project implementation schedule and the infusion of human power and budget were thoroughly managed by applying a modern process management technique. It is evaluated to improve efficiency by completing the projects in accordance with the original plan or the adjusted plan by allocating and utilizing professionals from the recipient country by fields.

◈ Evaluation on Effectiveness

○ Indonesia has reduced PLN total power transmission and distribution loss ratio by 0.39% a year on average from 2007 to 2011 thanks to the project so the reduced cost of power transmission and distribution loss is estimated to be around 40 billion and 410 million Rp (around 4 billion and 639 million won, around 3 million and 688 thousand dollars) every year, and this effect has been continuously increased every year. As a result of analyzing development of variation of outage time and frequency from 2008 to 2011, the outage time was improved by 1,523.8 minutes (31.4%) and the outage frequency 2.8 times (21.1%) a year on average in overall PLN.

○ Paraguay has improved power distribution loss ratio 25.4% of 2006 by 1.6% a year on average so that 25% could be reduced in 2010, and it showed the effect that the outage time was improved from 11.4 hours in 2009 to 10.7 hours in 2010 and the outage frequency from 16.9 times to 16.3 times.

○ The pilot project of power distribution automation system construction in Egypt had an effect of reducing the number of times being inspected by an inspector, and it can be evaluated that it showed a certain level of effect by the fact that customers' dissatisfaction such as civil complaints was reduced. On the other hand, in case of the Feasibility Study on improvement of power distribution and supply reliability, there is a difficult

part in evaluating its effectiveness since time didn't go by so much after completion of the project, and also there was an aspect that data to determine whether the report was put into practice were insufficient.

○ Therefore, it can be evaluated that it was effective in all aspects of power distribution system improvement and pilot projects of DAS and AMR and invitation trainings for the above 3 projects.

- Supervisors and persons in working level were acquainted with the report of the Feasibility Study through invitation trainings and local trainings so that it could be utilized to be proper for the environment of the recipient country.
- New knowledge was passed down and commercialization and expanded distribution of pilot projects were promoted and the effectiveness was improved so that it could be utilized for the practice.

◈ Evaluation on Impact

○ It contributed to motivation and improvement of satisfaction for introduction of new technologies by providing training of a streamlined technology course to supervisors and site workers from 3 recipient countries. It is not yet sufficient but somewhat contributes to prepare for the ground of technology export from the donor country.

◈ Evaluation on Sustainability

○ All 3 countries utilize the provided programs and the pilot project system, and the part to be improved is smoothly maintained and replaced with its self-technology and cooperation of the donor country, and new similar projects are being tried.

- The pilot project had a limitation in utilization scope due to its small-scaled

system but it has a high possibility to increase the effect of a project constantly such as development of follow-up projects etc. by proving its effectiveness.

◈ Evaluation on Cross-Cutting Issues

○ As a result of questionnaire survey and interviews regarding human rights, gender-sensitive issues and environment that are the issues of overall fields suggested by international society, the above 3 projects are evaluated to give positive influence on environment protection through promotion of inter-region and inter-class communication, increase of jobs that women participate in and reduction of power loss[1].

Recommendations

A proposal in order to develop more appropriate projects for recipient countries in the future and to increase efficiency and sustainability by achieving greater effects and to promote interdependent mutual development by complying with policies of donor countries is deduced as below.

◈ Expanded Projects Considering Necessity of Development of Recipient Countries as Priority

○ As a result of evaluation, the development of power industry that is the driving force of economic development of recipient countries is constantly required, and among them, the increase of supply reliability and expansion

1) Policy Proposal of Korea NGO Council for Overseas Development Cooperation to Korean Government that attends HLF(High Level Forum)-4, KCOC (2011.1)

of power distribution loss reduction projects by improvement of power transmission and distribution facilities are proposed.

- As a result of analyzing country/region/field/environment of recipient countries, the necessity of construction or expansion of DAS is high in the order of Paraguay, Indonesia and Egypt that don't have good reliability index such as outage time (SAIDI), outage frequency (SAIFI) and outage continuation time (CAIDI) etc. as shown in the following table in terms of priorities that supply reliability will be improved.

Classification[2]	Paraguay (Prior to Project/Recent)	Indonesia (Prior to Project/Recent)	Egypt (Prior to Project/Recent)	
SAIDI [Min./Customer]	960.0/642.0	1,620/282.6	Total	81.01/87.918
			Work	38.35/40.152
			Failure	42.66/47.766
SAIFI [Freq/Customer]	18.2/16.3	13.9/4.90	Total	1.395/1.439
			Work	0.372/0.313
			Failure	1.023/1.126
CAIDI [Min./Freq]	52.747/39.386	116.547/57.673	Total	144.79/170.701
			Work	103.09/128.281
			Failure	41.70/42.420
Source	Preliminary Survey Report, KOICA (2006.12), Statistical Summary, ANDE(2006-2011)	Preliminary Survey Report, KOICA (2006.4), Overseas Power Industry Information Data KPX(2012. 6) PLN Statistics(2005-2011)	Final Report, KOICA(2010.12)	

- The priority to reduce distribution loss is in the order of Paraguay, Egypt and Indonesia that have the greatest loss as shown in the following table,

2) It is developed and defined in order to quantify and improve stability of power system in 1980s by IEEE Distribution Reliability Working Group and a benchmark index that is in common use. SAIDI(System Average Interruption Duration Index), SAIFI(System Average Interruption Duration Index) and CAIDI(Customer Average Interruption Duration Index; CAIDI=SAIDI/SAIFI)

and it is proper to apply AMR project that has a great effect in loss reduction and prevention of power stealing and among them, Paraguay has excessive distribution loss so it has high necessity of applying and expanding AMR project.

Paraguay(Prior to Project/Recent)	Egypt(Prior to Project/Recent)	Indonesia(Prior to Project/Recent)
Transmission and Distribution: 33.5/31.1%	Distribution: 13%	Transmission and Distribution: 11.54/9.54%
Distribution: 25.4/23.5%	Technological: 7%	Distribution: 9.28/7.34%
Transmission: 8.1/7.6%	Non-Technological: 6%	Transmission: 2.27/2.25%
Source: Preliminary Survey Report, KOICA(2006. 12), Statistical Summary, ANDE(2006-2011)	Source: Preliminary Survey Report, KOICA(2007. 8),	Source: Preliminary Survey Report, KOICA(2006. 4), PLN Statistics(2005-2011)

○ The expansion of the corresponding project is recommended and it is also desirable to progress expansion of our companies actively equipped with international competitiveness in computerization of distribution field and in the field of DAS and AMR technology.

◈ Promoting Interdependent Mutual Development by Strengthening Post Services System

○ Although KOICA provides post services up to 5 years after completion of the project, it is desirable to strengthen post services more until supply technology and the system are substituted or replaced so that it can support self-reliance of recipient countries and it can promote the necessity of distribution and expansion of similar technologies.

- It is recommended that smooth maintenance is promoted the opportunity to access to similar projects is given to companies from donor countries

by strengthening information cooperation system between the persons concerned of donor countries and recipient countries during service period.

- The sustainability shall be increased more by reflecting cooperative expenses considering maintenance costs during total period using the corresponding technology when budget is set or economic feasibility is reviewed at a planning phase of a project.

Evaluation Overview

Chapter

I Evaluation Overview

1. Background

○ The transmission and distribution project is one of KOICA industry infrastructure projects. It is essential to secure electric energy that can be referred to the driving force of the industry for industrial development of many cooperative countries and for this, it is also important to make the most of generated energy as well as to increase generation facilities. For this, many kinds of plans have been suggested for enhancement of the use of the limited electric energy by minimizing loss of electric energy and promoting reasonable use. And as one plan among them, the Feasibility Study and pilot projects have been performed to prepare for improvement plans such as minimization of power loss that occurs when transporting in terms of overall transmission and distribution facilities that are methods of electricity transportation. However, the performance evaluation for this is insufficient up to now.

○ The effect analysis is required for distribution loss reduction, improvement of supply reliability, efficiency of electricity production and related industries in accordance with facility provision and expansion of technology provision through these projects.

○ It is required to deduce improvement plans of policy support projects for the corresponding field, to propose policies and to provide data that can be utilized in the similar fields by conducting evaluation on ripple effects as

well as on the results of the corresponding project from the view of the recipient country and the donor country of this project.

○ The necessity of proposal deduction is addressed to be utilized for KOICA projects in the future by complimenting and implementing qualitative evaluation while using a quantitative evaluation method as a base for tangible and intangible evaluation methods regarding project results.

2. Purpose and Scope

A. Purpose

○ Suggestion of evaluation results for the performance of 'Transmission·Distribution System Construction Projects

○ Analysis on features of each project and evaluation on output·effectiveness

○ Improvement of power transmission·distribution efficiency and evaluation on contribution

○ Presentation of process evaluation results regarding social·economic contribution derived from the identical facilities

○ Process evaluation to grasp lessons·recommendations that are available for similar projects

○ Deduction of lessons·recommendations for increase of effectiveness of similar projects considering features of transmission·distribution projects

B. Scope

1) Evaluation Criteria

○ Evaluation criteria presented by OECD/DAC includes relevance, efficiency, effectiveness, impact and, sustainability.

○ After considering features of each project, the evaluation team sets up detailed criteria able to grasp project performance and deduce recommendations.

○ Quantitative measurement criteria that can measure influence of transmission·distribution system are reflected.

○ Considering gender mainstreaming and environmental factors

2) Critical Point by Evaluation Features

a) Relevance of Project Formation Process

○ Relevance analysis on details of the corresponding transmission·distribution system from microscopic-macroscopic viewpoint.

○ Analysis of beneficiary demand conformity and relevance of expected effects by achievement of project goals

b) Efficiency of Contents Composing Project

○ Analysis on technological efficiency of project components

○ Analysis on social·economic efficiency compared to the expenses of project process

c) Effectiveness Measurement According to Physical Output of Project

○ Measurement and analysis on whether physical output is achieved in

accordance with goal setting.

○ Analysis on medium and long-term socio-economic effectiveness of project output

d) Prediction of Impact and Sustainability According to Project Outcome

○ Measurement and analysis on outcome such as whether expected effects are achieved in terms of the established goals

○ Analysis on medium and long-term sustainability of project outcome and grasp of follow-up actions

3) Considerations upon Setting Evaluation Scope

○ Considering time/budget/data/political restrictions

○ In the analysis of the stakeholders and users of project results, residents in the region as a subject of the project receive direct and indirect benefits extensively but related indicators or data are not included in the subject since it is difficult to manage them necessary for evaluation quantitatively.

3. Evaluation Subject

A. Project Overview

1) The Feasibility Study on Distribution System Improvement in 3 Cities of Indonesia

<Table 1-1> Indonesia Project Overview

Classification		Description
Purpose		Presentation of improvement plans for distribution system of cities as a subject of the project, Increase of distribution efficiency and improvement of reliability of regions to be a subject of the project by implementing a pilot project of distribution automation system for some regions
Breakdown	Donor Country	Feasibility Study: Reliability increase field 80MM=>58MM
		Inviting trainees: 20 persons 4 weeks => 10 supervisors 14 days, 16 site workers 4 weeks
		Pilot Project: DAS construction (Semarang)
		Others: Preliminary survey, consulting implementation, evaluation
	Recipient Country	Installation, counterpart support (25 persons), tax-exempted customs, covering inland shipping charge etc.
Target Area		Surabaya, Semarang, Denpasar
Scale/Period		950 thousand dollars / 15 months (Oct. 2006 ~ Dec. 2007)
Beneficiary		Indonesia state-owned power company, residents in the regions to be a subject of the project
Expected Effect	Donor Country	Possible to link with development survey for basic and execution design of distribution system, construction of distribution automation, operation of power system and improvement project of protection system etc. as follow-up projects
	Recipient Country	- Contributing to improvement of cash flow and regional development through efficient and stable distribution system - Securing social stability with increase of distribution efficiency and stability and good-quality power supply
Implementing Agency	Donor Country	KOICA / KEPCO, KEPCO KDN
	Recipient Country	MEMR / PT. PLN(Persero)

2) Establishment of Master Plan for Distribution Field in Paraguay and AMR Pilot Project

<Table 1-2> Paraguay Project Overview

Classification		Description	
Purpose		To increase efficiency in distribution field of the country of sojourn by establishing a master plan for improvement of distribution field	
Breakdown	Donor Country	Pilot Project	AMR: Automatic Meter Reading
		Expert Dispatch	Establishing medium and long-term plans for distribution system of 2 major cities in Paraguay, analysis of distribution loss factors etc.
		Inviting Trainees	Supervisor, engineer (20 persons/ 4 weeks)
		Others	Preliminary Survey, consulting implementation, evaluation
	Recipient Country	Counterpart support etc. (140 thousand dollars)	
Target Area		2 Major cities in Paraguay (Capiata, Ciudad del Este)	
Scale/Period		1 million and 500 thousand dollars / 18 months (July 2007 ~ Jan. 2009)	
Beneficiary		Paraguay Power Agency, electricity users in target cities	
Expected Effect	Donor Country	Companies' expansion into central and south America	
	Recipient Country	Reduction of distribution loss and improvement of power supply stability	
Implementing Agency	Donor Country	KOICA / KEPCO, Nuri Telecom	
	Recipient Country	ANDE: Ministerio de Obras Publicas y Comunicacaiones	

3) Distribution Automation System Construction Project in Northern Cairo of Egypt

<Table 1-3> Egypt Project Overview

Classification	Description
Purpose	To present improvement plans of power supply reliability for 2 regions in the northern Cairo and to promote improvement of efficiency and reliability of distribution field by constructing distribution automation system in another area and to present direction of advancement of Egypt power field in the future
Target Area	Heliopolis, Nasr City, Shoubra regions
Description	- The Feasibility Study on improvement of supply reliability (Heliopolis, Nasr City) - DAS construction (Shoubra) - Domestic training for supervisors and site workers in power field in Egypt
Scale/Period	1 million and 800 thousand dollars / 24 months (Dec. 2008 ~ Nov. 2010)
Implementing Agency	- Donor Country: KOICA - Recipient Country: North Cairo Electricity Distribution Company

B. Performance Model

○ The model for performance evaluation that is utilized for the evaluation includes the following items.

1) The Feasibility Study on Improvement of Distribution System and Automation Pilot Project in 3 Cities in Indonesia

<Table 1-4> Indonesia Project Performance Model

Classification		Description
Investment	Donor Country	□ Total 950 thousand dollars investment ○ Expert dispatch: local 22MM, domestic 36MM, Total 58MM, 500 thousand dollars ○ IDAS construction substituting DAS pilot system: 1 million and 50 thousand dollars (KEPRI 85%: PLN 15%) ○ Inviting Training: 20 persons 4 weeks => 10 supervisors 14 days, 16 site workers 4 weeks; 250 thousand dollars ○ Consulting preliminary survey and its implementation (32 thousand dollars)

<Table 1-4> continued

Classification		Description
	Recipient Country	☐ local engineer 30 thousand dollars, switch replacement 70 thousand dollars, providing tax exemption for equipment provided by the donor country, cooperation for customs, land transport ☐ Securing safety of experts dispatched from the donor country and counterpart support ☐ Providing other administrative staff and amenities etc.
Activities		☐ Establishment of execution plans for DAS pilot introduction and defining functional requirements ☐ Situation survey for improvement of distribution reliability ☐ DAS installation ☐ Expert training
Production		☐ Feasibility Study report ☐ Improvement plan for power supply reliability ☐ DAS construction and operation
Result		☐ Reduction of outage zone and time ☐ Efficient operation plans of equipment ☐ Strengthening management competency
Upper Goal		☐ Improvement of distribution supply reliability at Semarang in the central part of Java

2) Establishment of Master Plan for Distribution Field in Paraguay and AMR Pilot Project

<Table 1-5> Paraguay Project Performance Model

Classification		Description
Investment	Donor Country	☐ Total 1 million and 500 thousand dollars investment ○ Expert dispatch: 67MM (dispatch 26.2MM, domestic 40.8MM), 850 thousand dollars ○ AMR pilot system construction: 300 thousand dollars, 250 million won ○ Inviting Training: 3 supervisors, 17 site workers, 16 persons for local training; 200 thousand dollars ○ Others: consulting preliminary survey and its implementation, 150 thousand dollars
	Recipient Country	☐ Local engineer: Guaranteeing tax exemption for equipment provided by donor countries, cooperation for customs, land transport ☐ Securing safety of experts dispatched from the donor country and counterpart support, providing administrative staff and amenities etc.

<Table 1-5> continued

Classification	Description
Activities	☐ Establishment of execution plans for AMR pilot introduction and defining functional requirements ☐ Improvement plans for loss reduction ☐ AMR installation ☐ Expert training
Production	☐ Feasibility Study report ☐ Improvement plan for power supply reliability ☐ AMR construction and operation
Result	☐ Establishment of distribution plans through distribution plan programs, strengthening manger competency
Upper Goal	☐ Improvement of distribution supply reliability of Paraguay and loss reduction

3) Distribution Automation System Construction Project in North Cairo of Egypt

<Table 1-6> Egypt Project Performance Model

Classification		Description
Investment	Donor Country	☐ Total 1 million and 800 thousand dollars investment ○ Expert dispatch (782 thousand dollars) ○ Pilot system expanded construction (852 thousand dollars) ○ Inviting Training (134 thousand dollars) ○ Consulting preliminary survey and its implementation (32 thousand dollars)
	Recipient Country	☐ Guaranteeing tax exemption for equipment provided by donor countries, cooperation for customs, land transport ☐ Securing safety of experts dispatched from the donor country and counterpart support ☐ Providing administrative staff and amenities etc.
Activities		☐ Establishment of execution plans for pilot introduction of distribution automation system and defining functional requirements ☐ Situation survey to present improvement plans to improve distribution reliability ☐ Distribution automation system installation ☐ Expert training
Production		☐ Feasibility Study report ☐ Improvement plan for power supply reliability ☐ DAS construction and operation
Result		☐ Reduction of outage zone and time ☐ Presenting efficient operation plans of equipment ☐ Strengthening competency of the supervisor
Upper Goal		☐ Improvement of distribution supply reliability at North Cairo of Egypt

Evaluation Method and Procedure

Chapter

Ⅱ Evaluation Method and Procedure

1. Evaluation Items and Method

A. Evaluation Criteria and Evaluation Items

○ Deducing evaluation items and basic model for evaluation matrix with 5 evaluation criteria of OECD/DAC

○ Presenting evaluation items adjusted to DAC 5 criteria by projects

○ Presenting evaluation matrix showing subjects of measurement and sources of data and analysis method by evaluation items

B. Basic Model of Evaluation Matrix

1) Concept of Evaluation Criteria

<Table 2-1> Evaluation Matrix Basic Model

Evaluation Criteria	Evaluation Items	Measurement Target (Index)	Source of Data	Analysis Method
Relevance (The degree that goals of development projects satisfy the needs of beneficiaries and their priorities and comply with policies and donor countries and recipient countries)	1. Does the project match with national development plans of the recipient country?	Conformity degree between the project purpose and national development plans of the recipient country	Project Request Sheet Report of Preliminary Survey Result Project Report Survey Interview	Qualitative Analysis Statistical Analysis
	2. Does the project match with regional development plans of the recipient country?	Conformity degree between regional development plans of the recipient country and the project	Project Request Sheet Report of Preliminary Survey Result Survey	Qualitative Analysis Statistical Analysis

<Table 2-1> continued

Evaluation Criteria	Evaluation Items	Measurement Target (Index)	Source of Data	Analysis Method
	3. Does the project match with assistance strategy/priorities of the donor country?	Conformity degree between KOICA assistance strategy and the purpose of the project	Project Report Survey Interview	Qualitative Analysis Statistical Analysis
	4. When establishing a project plan, are the demands of the recipient country properly reflected?	Whether the plan is modified or not by the demand of the recipient country in terms of establish a project plan	Feasibility Study Report of the Project Project Report Survey Interview	Qualitative Analysis Statistical Analysis
	5. Is the investment made to be proper for the purpose of the project?	Relevance of breakdown of investment to achieve the purpose of the project	Project Report Survey Interview	Qualitative Analysis Statistical Analysis
	6. Are social, cultural and environmental conditions of the recipient country considered?	Whether social and environmental local conditions are reflected or not	Project Report Survey	Qualitative Analysis Statistical Analysis
Efficiency (The degree that inputs are economically used and converted into products and outcome)	1. Is the project duration efficient to achieve the purpose of the project?	Comparison between period of planning and period of execution	Project Performance Plan Project Report Survey Interview	Qualitative Analysis Statistical Analysis
	2. Is the total project cost to achieve the purpose of the product planned and executed efficiently?	Comparison between infused costs and outputs	Project Request Sheet Report of Preliminary Survey Result Project Performance Report Project Report Interview	Qualitative Analysis
	3. Is the process of project execution managed efficiently?	Whether the process of project execution (time, cost, human power management) is implemented or not	Project Performance Report Project Report Survey Interview	Qualitative Analysis Statistical Analysis
	4. Is the utilization of experts efficiently operated?	Comparison between a utilization plan of experts of the recipient country and its performance	Project Performance Plan Project Report Statistical Data Survey Interview	Qualitative Analysis Statistical Analysis

<Table 2-1> continued

Evaluation Criteria	Evaluation Items	Measurement Target (Index)	Source of Data	Analysis Method
Effectiveness (The degree of achievement of the purpose of the project or goals)	1. Is the Feasibility Study report actually utilized?	Whether the written Feasibility Study report is utilized or not	Project Performance Plan Project Report Survey Interview	Qualitative Analysis Statistical Analysis
	2. Are AMR/DAS that are installed as a part of the project utilized?	Whether DAS is utilized or not	Project Performance Plan Project Report Survey Interview	Qualitative Analysis Statistical Analysis
	3. Are the invitation training and dispatch of experts (technical training) that are a part of the project helpful for achieving the purpose of the project?	The effect of invitation trainings and experts dispatch	Project Performance Plan Project Report Survey Interview	Qualitative Analysis Statistical Analysis
Impact (The entire results of positive or negative, intentional or unintentional effects of the development project)	1. What changes did the project cause on the target areas?	Index of changes (degree of improvement of electric quality etc.)	Survey Interview	Qualitative Analysis Statistical Analysis
	2. What changes did the project cause to related organizations?	Index of changes (degree of improvement of distribution operation technology etc.)	Survey Interview	Qualitative Analysis Statistical Analysis
	3. Is there any possibility of expanding the target areas of the project?	Index of changes (The will to develop the project)	Survey	Statistical Analysis
	4. Is there any change in the relationship between the donor country and the recipient country?	Index of changes (Degree of improvement of images between nations)	Survey Interview	Qualitative Analysis Statistical Analysis
Sustainability (Degree that positive effects can be sustained for a long term after completion of the project)	1. Are the effects of the project sustained?	Awareness degree of sustainability	Project Performance Plan Survey Interview	Qualitative Analysis Statistical Analysis
	2. Is there any training program to operate DAS/AMR?	Whether there is a training course or not	Survey	Qualitative Analysis Statistical Analysis
	3. Is the stable operation of DAS/AMR sustained?	State of management, maintenance cost	Project Performance Plan Survey Interview	Qualitative Analysis Statistical Analysis

C. Evaluation Method and Performance Procedure

1) Evaluation Performance Procedure

- ○ Commencement briefing session
- ○ Literature study
- ○ Field study
- ○ Interim briefing session
- ○ Final reports and final briefing session

2. Limitation of Evaluation and Restrictions

A. Limitation of Evaluation

○ There are difficult parts in evaluating the 3 target projects quantitatively since the unit of evaluation indicators by recipient countries, target areas to be evaluated, evaluation items and years and the statistical unit is different but it is possible to grasp tendency of decrease or increase.

○ The 3 project countries have different language and culture and the projects were performed at different times. Moreover, there were restrictions in data analysis and interviews since the data were written mostly with language and forms of the recipient countries. However, the limitation was minimized by preparing for English version and one with translated with the opposite language other than Korean questionnaires in advance and by hiring an interpreter who is familiar with local culture.

B. Restrictions

○ Since the statistical data that interruption duration and frequency were checked and recorded in the recipient country were not sufficient, it was a restriction.

- The evaluation on the effect of DAS pilot project would be more accurate evaluation if the target areas for the pilot project and other areas were comparatively analyzed regarding customers' interruption frequency and interruption duration that are indicators of power supply reliability, but it was difficult to obtain statistical data regarding the target areas and other areas. Besides, if the development by years is comparatively analyzed, the interruption statistics criteria by years must be consistent but those data were not gained either so they were supplemented with estimated data that can substitute them.

3. Domestic and Foreign Research and Survey Method

A. Literature Study List

○ Project Request Sheet
○ Preliminary Survey Result Reports, Experts' Reports
○ Implementation Consulting Result Reports
○ Project Performance Plan and Project Detailed Executive Planning
○ Final Reports (Korean and English)
○ Interim Evaluation Result Briefing and Final Reports (Plan) Evaluation Table
○ Completion Result Evaluation Reports
○ Annual Report and Statistical Data of Power Projects in Recipient Countries

B. Interviews with Interviewees

○ Interviews with related people with Donor Country KOICA, KEPCO, KEPCO KDN and Nuri Telecom

○ Interviews with the current management executives and persons in charge of the development phase of the project for the recipient country, the project performance, training

4. Evaluation Team Work Responsibility and Schedule

A. Work Responsibility

1) ACE Engineering Group

<Table 2-2> ACE Engineering Group Work Responsibility

Name	Job	Description (Indonesia, Paraguay)
Yun, Gap-Gu	Projector Integrator	Overall control on evaluation, development of performance indicators, management of domestic and foreign cooperators, overall control on a field study performance, analysis on domestic and foreign investigation results, making up a final report and its review
Lee, In-Gyu	Transmission and Distribution System Expert	Prior literature study, evaluation on transmission and distribution project performance and its process, domestic investigation, data collection and result analysis, making up a final report and its review
Gang, Il-Gu	Overseas Support Assistant Researcher	Making up a final report synthesizing results of surveys and interviews etc.
Han, Young-Seok	Domestic Support Assistant Researcher	Domestic work support

2) Korea General Electricity Co., Ltd.

<Table 2-3> Korea General Electricity Work Responsibility

Name	Job	Description (Egypt and English)
Kim, Gyung-Sik	Transmission and Distribution System Expert	Korea General Electricity Egypt Project Integrator
Goh, Su-Il	Assistant Researcher	Assistant Integrator, Dealing with external affairs (KOICA, ACE, KEPCO etc.)
Choi, Seong-Kwon	Assistant Researcher	Assistant Integrator, Dealing with external affairs (KOICA, ACE, KEPCO etc.)
Ryu, Min-Sik	Main Office Support	Evaluation design and survey analysis
Bae, Hwnag-Jin	Main Office Support	Evaluation design and survey analysis
Park, Chang-Guk	Main Office Support	Making up questionnaire and distribution system technology consultant
Lee, Hee-Seung	Main Office Support	Assisting evaluation design
Kim, Young-Geon	Main Office Support	Assisting survey analysis

B. Field Study Schedule

1) The Feasibility Study on Distribution System Improvement and Automation Pilot Project in 3 Cities of Indonesia

<Table 2-4> Indonesia Field Study Schedule

Date	Venue	Schedule
1st 5 Oct.(Fri.)	Jakarta	Visiting PT PLN main office - Meeting for adjusting a schedule of a field study and interviewing related persons Interviewing local KOICA related persons - Consulting supports during the period of a field study
2nd 6 Oct.(Sat.)	Jakarta	Collecting related data
3rd 7 Oct.(Sun.)	Moving	Moving to Semarang

<Table 2-4> continued

Date	Venue	Schedule
4th 8 Oct.(Mon.)	Semarang	Visiting PLN Java Central Branch - Distribution plan and interviewing distribution automation related persons - Interviewing distribution automation related persons and participants of KEPCO training
5th 9 Oct.(Tue.)	Semarang Jakarta	Visiting PLN Java Central Branch, Distribution Part - Checking distribution automation system operation status and interviewing related persons Moving to Jakarta
6th 10 Oct.(Wed.)	Jakarta	Visiting distribution planning dept., PLN main office Report of KOICA Indonesia Office Field Study Result Going home

2) Establishing a Master Plan for Distribution Field and AMR Pilot Project in Paraguay

<Table 2-5> Paraguay Field Study Schedule

Date	Venue	Schedule
1st 16 Sep.(Sun.)	Asuncion	Interviewing local KOICA office related persons
2nd 17 Sep.(Mon.)	Asuncion	Visiting local KOICA office - Meeting for adjusting a schedule of a field study Visiting ANDE main office - Interviewing Director of Energy Research, consulting the schedule of a field study - Visiting Distribution Planning Dept.
3rd 18 Sep.(Tue.)	Asuncion	Visiting ANDE main office - Adjusting the survey schedule of distribution planning dept. - Interview for non-technological sector loss consulting - Interviewing distribution master plan related persons - Interviewing participants of KEPCO trainings
4th 19 Sep.(Wed.)	Asuncion/ Capiata	Visiting ANDE main office - Visiting distribution meter reading dept. and interviewing head of the dept. - Visiting an office in charge of distribution operation and its maintenance - Visiting high voltage customers - Visiting Capiata Branch Visiting IT(Information Technology) Technological Support Team

<Table 2-5> continued

Date	Venue	Schedule
5th 20 Sep.(Thu.)	Asuncion	Interviewing the management of ANDE Interviewing training participants and collecting data Visiting local KOICA office
6th 21 Sep.(Fri.)	Asuncion	Visiting local KOICA office - Report of Field Study Result
7th 22 Sep.(Sat.)	Moving	Going Home

3) Distribution Automation System Construction Project in North Cairo of Egypt

<Table 2-6> Egypt Field Study Schedule

Date	Venue	Schedule
1st 7 Oct.(Sun.)	KOICA Office	Field survey schedule, discussing a plan, preparation (Interpretation, vehicles etc.)
2nd 8 Oct.(Mon.)	EEHC NCEDC	Visiting EEHC and NCEDC at the northern region of Cairo - Progressing a survey and interviews with interviewees
3rd 9 Oct.(Tue.)	Nasr City	Progressing a survey and interviews with staff in Heliopolis region Interviewing NCEDC president
4th 10 Oct.(Wed.)	Shoubra	Visiting Shoubra DAS System Control Center - Field checking and progressing a survey and interviews
5th 11 Oct.(Thu.)	KOICA Office	Interim report of field study results and discussion Going home

Evaluation Subject Analysis

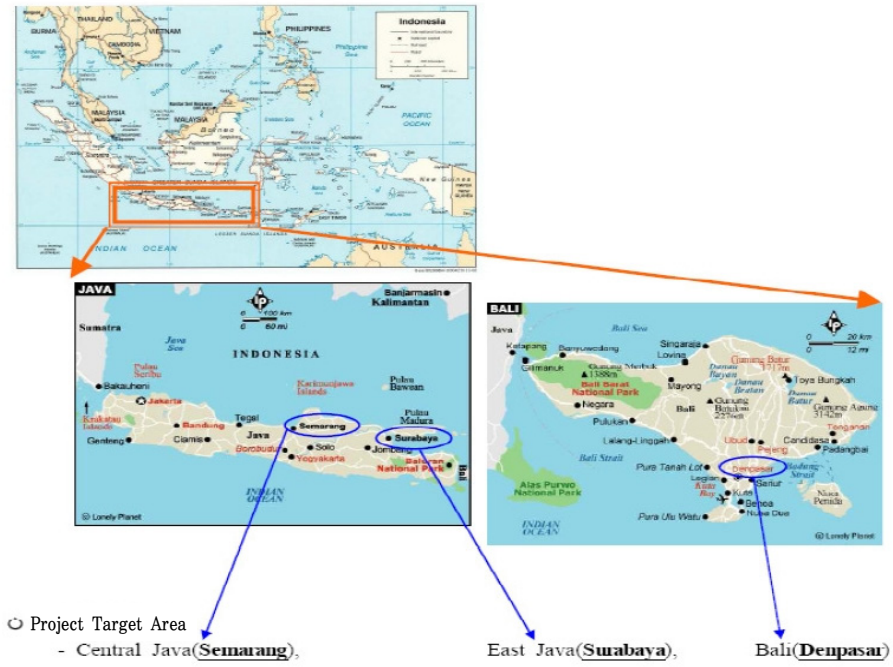
Chapter

Ⅲ Evaluation Subject Analysis

1. Country/Region/Field/Environment Analysis

A. Indonesia[3)]

<Fig. 3-1> Subject Regions of Indonesia Project



3) 2012 World Country Handbook, Export-Import Bank of Korea
Indonesia, Prospect of Electronic Products Market in 2010, Jakarta Trading Post (Dec. 17th, 2009)
Overseas Power Industry Information Collection – 7 countries of promising regions for overseas expansion, Power Exchange (June, 2012)
DigitalBeing Jul/26/2012 Country/Region Unemployment rate
Korea Internet and Security Agency, Indonesia Broadcasting Communication Item Report (Nov. 15th, 2010)
KOICA, KEPCO, Indonesia Preliminary Survey Report (Apr. 2006), Program (Sep. 2006), Final Report (Dec. 2007)
PLN DATA DAN STATISTIK TAHUN 2008-2011(2012)

1) Country Information

a) Generals and Politics & Economy

<Table 3-1> Indonesia Country Information

Classification	Description
Name of Country	Republic of Indonesia
Location	Southeast Asia, the Malay Archipelago
Climate	Tropical, high temperature and humidity monsoonal climate
Time Difference [Based on GMT]	+7 hours
Area [Thousand km^2]	1,904, 8.5 times of Korea Peninsula
Population[Million]	Prior to the project('05) 214, Recent('11) 241
Capital (Population[Ten Thousand])	Jakarta (Prior to the project 970, Recent 910)
Language	Bahasa Indonesia, 205 or so dialects
Race([%])	Java race (41), Sunda race (15) etc. 300 or so races
Religion([%])	Islam (86), Christian (6), Catholic (3), Hindu (2)
Government Type	Presidential System
Council([Seat])	National Council: Parliament(550), Regional Representative Council(128)
International Organization Accession	UN, IMF, IFC, ILO, UNCTAD, WHO, WTO etc.
Currency Unit	Guarani(G)
Industry Structure([%])	('11) Service (39.1), Manufacturing (46), Agriculture (14.9)
Major Exports	('11) Oil and gas, electronics, plywood, fabric
Major Imports	('11) Oil and gas, mechanical equipment, chemical products, groceries
Major Natural Resources	Tin, nickel, woods, coal and bauxite
Economic Strength	Plentiful natural resources and labors
Economic Weakness	Insufficient social overhead capital, deepening the gap between rich and poor, corruption

b) Major Social Development Indicators

<Table 3-2> Indonesia Major Social Development Indicators

Classification	Description	Classification	Description
Average Life[age]	69('10)	GNI per capita[dollar]	2,500('10)
Absolute Poverty Class Ratio[%]	12.5('10)	CO2 Emission[tCO2/person]	1.73('08)
Mobile Communication Subscribers [per million persons]	92('10)	Road Pavement Ratio[%]	79('10)
Internet User [per million persons]	10('10)	Energy Consumption(toe)	0.9('09)
Power consumption [kWh/person]	611('11)	Unemployment Ratio[%]	6.56('11)
Electrification Ratio[%]	64.5('10)	Home electronics penetration rate[%]	Refrigerator: 68 TV: 68
GDP[100 thousand dollars]	8,457('11)	Exchange Rate (E□ per dollar)	8,968('12)
GDP per capita[dollar]	3,509('11)	Current Account [million dollars]	2,070('11)
Export[billion dollars]	201('11)	Foreign exchange reserve [million dollars]	110,137('11)
Import[million dollars]	166('11)	Foreign loan balance [million dollars]	187('11)

c) Major Development Plan

◈ The necessity of power system development accompanied by economy restoration plan establishment comes to the fore.

○ Economy restoration plan established in 2005

○ Power demand is expected to increase by 6.5% or so every year until 2009, progressing power system development

◈ Request of ODA for the Feasibility Study on distribution system improvement and automation project

○ Reduction of distribution loss, system analysis, optimal plan, fostering human resources, advanced technology, introduction of management technique

○ The Feasibility Study on distribution system improvement of 3 cities, DAS pilot project, training

○ Establishing economy restoration plan, power demand is expected to increase by 6.5% or so every year until 2009.

○ The loss of distribution system is high, and recognizing insufficient standardized analysis methods and planning method and human resources

2) Regional Environment Analysis

a) Semarang(Target Area, DAS Pilot Project Site)

<Fig. 3-2> Jurisdiction Zone of Java Central Branch (Semarang Pilot Project Region)

◈ General Status

○ Preparation for Electric safety and power facilities is required for areas prone to floods during the rainy season.

○ Preparation is urgent since with there are lots of lightning accompanied

by raining with annul 137 days of lightning, IKL 37.5

- ○ Maximum wind speed is 26.46km/h in January and the maximum instantaneous wind speed is 55.8km/h in April.
- ○ The average temperature is 22.95~33.80℃, and the annual average relative humidity is 40.32~93.30%.

◈ Power Industry Status

- ○ The largest business office in jurisdiction of Java Central Branch
- ○ Distribution loss is high up to more than 10% until 2004
- ○ Low reliability index: SAIDI 2.16hour(129.6minutes), SAIFI 2.23 times
- ○ Insufficient developed countries consulting experiences
- ○ The distribution method is a 3-phase and 4-wire type like the donor country, and SCADA is in operation so it has an advantageous condition in introducing DAS
- ○ Unlike other branches, the separating tool is insufficient between customers premise failure and external failure

b) Surabaya and Denpasar (Target Area of Pilot)

(1) Surabaya

◈ General Status

- ○ Similar climate with Semarang, temperature and precipitation are rather low.
- ○ Maximum wind speed is 30.41km/h in January, and the maximum instantaneous wind speed is 72km/h in April.
- ○ Preparation for Electric safety and power facilities is required for areas prone to floods during the rainy season.
- ○ Preparation for lighting is required

◈ Power Industry Status

○ Lots of industrial demand as it is an industrial city

○ Insufficient developed countries consulting experiences, and high distribution loss, and low reliability

○ The second largest population of Korean immigrants next to Jakarta so it has an advantageous condition in progressing reciprocal cooperative projects

○ The existing closing and opening device is decrepit and the charging part is exposed so it is a risk of failure and safety accidents.

(2) Denpasar

◈ General Status

○ It is a small city located in an island with low temperature and rather higher relative humidity

○ The highest temperature is 34℃ in December, the lowest temperature is 18℃ in September.

○ The rainy season starts in October and November, and the maximum precipitation in January is 390.7mm

○ Preparation for Electric safety and power facilities is required for areas prone to floods during the rainy season.

○ Preparation for lighting is required

◈ Power Industry Status

○ Rather high interest in reducing power loss and increasing reliability

○ Owned performance of trading protective equipment in a distribution system with donor countries

○ Improving protective performance and establishing conditions for business expansion through this project

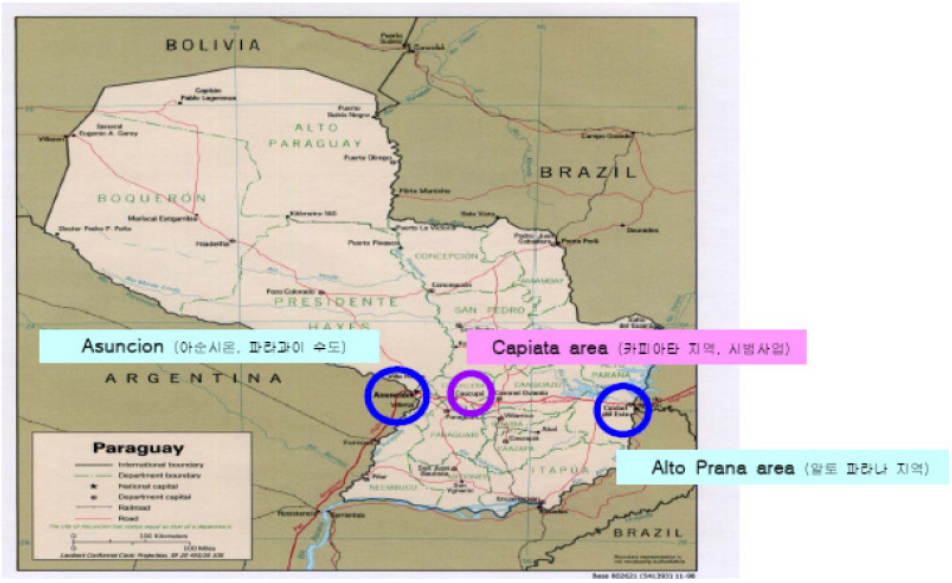
○ Major customers are relatively safe as underground distribution facilities are installed in customer premise.

B. Paraguay[4)]

1) Country Environment Analysis

a) Country Information

<Fig. 3-3> Paraguay Project Target Area Map



4) 2012 World Country Handbook, Export-Import Bank of Korea (Jul. 1st, 2012)
KOICA, KEPCO, Paraguay Preliminary Survey Report (Dec. 2006), Execution Plan (Apr. 2007), Final Report (Jan. 2009)
DigitalBeing Jul/26/2012 Country/Region Unemployment rate
ANDE Memoria y Balance 2010 (Dec. 21th, 2011)
ANDE Statistical Summary 2006-2010, 2007-2011

<Table 3-3> Paraguay Country Information

Classification	Description
Name of Country	Republic of Paraguay
Location	Central part of South America Continent
Climate	Subtropical
Time Difference [Based on GMT]	-4 hours
Area [Thousand km^2]	397, 2 times of Korea Peninsula
Population[Million]	Prior to the project('02) 5.9, Recent('11) 6.5
Capital(Population[Ten Thousand])	Asuncion (Prior to the project 51, Recent 200)
Language	Spanish, Guarani
Race([%])	Mestizo(95)
Religion([%])	Catholic (90), Christian (6)
Government Type	Presidential System
Council	The two houses(the Senate 45 seats, the House 80 seats)
International Organization Accession	UN, IMF, IFC, ILO, UNCTAD, WHO, WTO etc.
Currency Unit	Guarani(G)
Industry Structure([%])	('11) Service (57.7), Agriculture (19.2), Manufacturing (23.1),
Major Exports	('10) beans, raw cotton, woods, meat, leather
Major Imports	('10) consumer goods, products related to oil, electronics, transportation equipment, tobacco
Major Natural Resources	Woods, iron ore, manganese, marble, waterpower resources
Economic Strength	High potential of hydroelectric generation
Economic Weakness	High foreign dependence, deepening the gap between rich and poor, corruption among classes and regions

b) Major Social Development Indicators

<Table 3-4> Paraguay Major Social Development Indicators

Classification	Description	Classification	Description
Average Life[age]	76 old('11)	GNI per capita[dollar]	2,720('10)
Absolute Poverty Class Ratio[%]	35.0('10)	CO2 Emission[tCO2]	2.7('08)
Mobile Communication Subscribers [per million persons]	92('10)	Road Pavement Ratio[%]	89('09)
Internet User[per million persons]	20('10)	Energy Consumption(toe)	0.9('09)
Power consumption [kWh/person]	1,165('11)	Unemployment Ratio[%]	7.9('09)
Electrification Ratio[%]	96.7('10)	Home electronics penetration rate[%]	Cable TV: 7.6
GDP[100 thousand dollars]	212('11)	Exchange Rate (E□ per dollar, yearly)	4,376('12)
GDP per capita[dollar]	3,252('11)	Current Account [million dollars]	-545('11)
Export[billion dollars]	10,276('11)	Foreign exchange reserve[million dollars]	5,096('11)
Import[million dollars]	12,056('11)	Foreign loan balance [million dollars]	4,431('11)

c) Major Development Plan

◈ The necessity of power system development comes to the fore for economic development and improving the quality of life

○ Recognizing improvement of power quality essential to economic development and improving the quality of life

○ Power demand is expected to increase by 6.5% every year until 2010

◈ Request of ODA for the establishment of a master plan for distribution field and AMR pilot project

○ Aimed at improving distribution system facilities, reducing distribution loss factor

○ Comprised of a master plan for distribution field, AMR pilot project and trainings

2) Regional Environment Analysis

a) Capiata (Master Plan and AMR Pilot Project)

◈ General Status

○ Around 20km away from the capital Asuncion

○ An important traffic hub and high density area with 203 or so leading companies

◈ Power Industry Status

○ Electricity penetration rate within the region is around 97%, 126 lines which are around 50% of power distribution lines are managed.

○ One of the predetermined areas for establishing a distribution plan, and jurisdiction of Capiata City which is an AMR pilot area

○ Power supplied from 5 major substations for power distribution in the neighborhood

○ Low collection ratio of bills with 40% due to default of electrical bills by public organization such as schools and hospitals etc.

○ The number of customers is decreased by 1.5% per year on average, and the power for sales is increased by 3.0% per year on average.

<Table 3-5> Number of Customers in Capiata city and Power Sales Development

Year	2003	2004	2005
Number of Customer[Household]	35,530	34,240	34,491
Power for Sales[MWh]	120,980	124,847	128,189
Increase Rate of Power for Sales [%]	Standard	3.2	2.7

b) Alto Parana (Master Plan)

◈ General Status

- ○ Alto Parana area is near the Brazil border and around 320km away from the capital Asuncion
- ○ The central city is Ciudad del Este which is the second city in Paraguay.
- ○ Area: 14,895km2 which is an extensive area and electricity penetration rate is 95% or so.

◈ Power Industry Status

- ○ Alto Parana Branch is located at Ciudad del Este, and is operating two distribution operation center and 20 business offices.
- ○ Ciudad del Este is near to Brazil that is the largest trade state in South America so free trade is prevalent and recently commercial and industrial loads are rapidly increased and it shows high increase rate of around 7.2%.
- ○ That is the highest among regions in Paraguay, and the loads are expected to increase continuously
- ○ The substation facilities are being planned to prepare for the rapidly increasing loads but they go through many difficulties due to residents' objection and environmental issues etc.
- ○ With a rapid increase of loads, 20% among distribution lines within the region exceeds 4% which is the limit of voltage drop ratio

○ The major customers of this region are commercial facilities and manufacturers.

○ Number of customers: 51,825 households in 2005 and increased by 4.6% per year on average

○ Power for sales: 224,086MWh in 2005 and increased by 3.8% per year on average

<Table 3-6> Alto Parana Region Major Distribution Lines Voltage Drop Ratio

Name of Substation	Voltage Drop	Less than 4%		4%~10%		More than 10%	
	Total Wires	Number of Wires	%	Number of Wires	%	Number of Wires	%
Acaray(ACY)	8	6	75	2	25	0	0
Alto Parana (APR)	8	6	75	2	25	0	0
Presidente Franco(PFO)	4	4	100	0	0	0	0
Total	20	16	80	4	20	0	0

<Table 3-7> Number of Customers in Ciudad del Este and Power Sales Development

Year	2003	2004	2005
Number of Customer[Household]	51,777	51,623	51,825
Power for Sales[MWh]	208,380,863	222,804,502	224,085,516
Increase Rate of Power for Sales [%]	Standard	6.9	7.5

C. Egypt[5)]

1) Country Environment Analysis

a) Country Information

<Fig. 3-4> Egypt Project Target Area Map

5) 2012 World Country Handbook, Export-Import Bank of Korea (Jul. 1st, 2012)
Employment Trend, National Statistics Office (Nov. 2012)
The benefits of civilization getting down to Egypt families (Dec. 14th, 2011)
DigitalBeing Jul/26/2012 Country/Region Unemployment rate
KOICA, KEPCO, Egypt Preliminary Survey Report (Aug. 2007), Plan (Jul. 2008), Final Report (Dec. 2012)
2010 Edition, World Power Industry Information Collection, the 2nd Edition, Power Exchange (Dec. 2010)
Preliminary Survey Result Report for Distribution Automation Construction Project in Egypt(Nov. 2010)

<Table 3-8> Egypt Country Information

Classification	Description
Name of Country	Arab Republic of Egypt
Location	Northeastern part of Africa, the Mediterranean coast
Climate	Subtropical (Desert 95%)
Time Difference [Based on GMT]	+2 hours
Area [Thousand km^2]	1000.1 (5 times of Korea Peninsula)
Population[Million]	Prior to the project('08) 74, Recent('11) 84
Capital (Population[Ten Thousand])	Cairo (1,800)
Language	Arabic(official language), English and French (some)
Race([%])	Hamitic(99), other minoritites(1)
Religion([%])	Isam (90 Sunni), Christian
Government Type	Presidential System
Council	The two houses(the Senate 270, the House 508)
International Organization Accession	UN, IMF, IBRD, IFC, ILO, WHO, WTO etc.
Currency Unit	Egypt Pound (EGP, E￡)
Industry Structure([%])	('11) Service (51), Manufacturing (32), Agriculture (17),
Major Exports	Crude oil, oil products, cotton, fiber, metal, chemistry, processed food
Major Imports	Machines and equipment, food, chemistry, woods, fuel
Major Natural Resources	Oil, natural gas, iron ore
Economic Strength	Tourism resources and good-quality labors
Economic Weakness	Insufficient food, poor social overhead capital

b) Major Social Development Indicators

<Table 3-9> Egypt Major Social Development Indicators

Classification	Description	Classification	Description
Average Life[age]	73('10)	GNI[dollar/person]	2,420('10)
Absolute Poverty Class Ratio[%]	22.0('08)	CO2 Emission [tCO2/person]	2.7('08)
Mobile Communication Subscribers [per million persons]	87('10)	Road Pavement Ratio[%]	89('09)
Internet User [per million persons]	27('10)	Energy Consumption(toe)	0.9('09)
Power consumption [kWh/person]	1,435('08)	Unemployment Ratio[%]	9.4('09)
Electrification Ratio[%]	99('09)	Home electronics penetration rate[%]	Refrigerator: 2 units ↑ TV: 94.7('10)
GDP[100 thousand dollars]	2,357('11)	Exchange Rate (E□ per dollar)	5.9('11)
GDP per capita[dollar]	2,970('11)	Current Account [million dollars]	-5,422('11)
Export[billion dollars]	27,913('11)	Foreign exchange reserve[million dollars]	16,812('11)
Import[million dollars]	53,973('11)	Foreign loan balance [million dollars]	44,500('11)

c) Major Development Plan

◈ The demand of power is increased by constant economic growth and increase of population etc.

◈ It is difficult to supply the stable power due to insufficient power generation facilities and loss of transmission and distribution.

○ The power generation facilities need to be increased and the existing network of transmission and distribution need to be improved to

prepare for the increase of power demand.

○ Progressing stable power supply through reduction of transmission and distribution loss factor

○ EEHC (Egyptian Electricity Holding Company) is progressing the introduction of developed knowledge and experiences in the power industry

○ Expansion of cooperative projects in power field between nations in Arab·Africa·Europe etc.

○ In progress of establishing and progressing 5-year plan for increasing power plants and construction of power network for expansion of stable power supply to secluded areas.

○ Egypt requested for distribution automation system construction project including follows:

- The Feasibility Study related to improvement of distribution reliability and distribution automation pilot installation
- Fostering supervisor/engineer for North Cairo Electricity Distribution Company (NCEDC) and supporting the advancement of technology
- Domestic invitation training for supervisors and site workers in Egypt power field

2) Regional Environment Analysis

a) Nasr City, Heliopolis (Target Area for the Feasibility Study)

◈ General Status

○ Nasr City has the largest area (250km2) in North Cairo, and is a commercial center having large-scaled shopping malls and an international conference center

○ Heliopolis is an administration center that presidential palace and the office of President and military facilities etc. are located

◈ Power Industry Status

○ The middle voltage lines are all underground system, and only some regions of Heliopolis have low voltage aerial lines.

○ The voltage drop ratio is 6.35% on the side of high voltage, and 4.5% on the side of low voltage which are severe, and there were 117 cases on the side of high voltage of Heliopolis and 639 cases on the side of low voltage of Nasr City in terms of line failure so improvement of quality is required.

※ The voltage drop ratio is a ratio of power transmission voltage and power reception voltage and the higher the voltage drop ratio is, the greater the power loss is.

○ The voltage drop ratio in Egypt regions aggravated by 2% or so compared to Korea

<Table 3-10> Heliopolis, Nasr City Voltage Drop and Line Failure

Classification	Voltage Drop Ratio		Line Failure		Remark
	11kV	380/220V	11kV	380/220V	
Heliopolis	6.35%	4.5%	117 cases/year	-	
Nasr City	6.35%	-	-	639 cases/year	

b) Shoubra (Target Area for Pilot Project of Distribution Automation System Constrcution)

◈ General Status

○ Densely populated area (3 million people) and a large-scaled area in Cairo

○ An important point for railroad traffic and industrial area

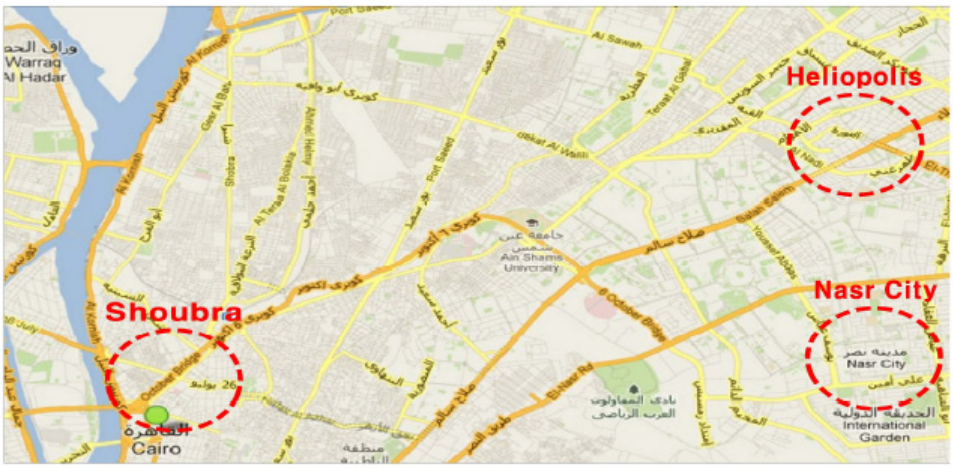
◈ Power Industry Status

○ The drastic increase of power consumption is expected in terms of

residence and industry.

○ Inadequate SCADA system, the actual situation is that the prompt distribution management is difficult due to decrepit internal equipment in a switching station

<Fig. 3-5> Cairo Shubra (Pilot Project Region) Map



2. Analysis on the Persons Concerned

A. The Stakeholders of Indonesia Project

○ The policy-makers from BAPPENAS (National Development Planning Agency) in charge of national development policies of the recipient country and MEMR (Ministry of Energy and Mineral Resources) in charge of energy resources policies and PT. PLN (Indonesian State-owned Electricity Company) that is its affiliated organization in charge of power industry were set to be site workers and supervisors and trainees to participate in project performance.

○ There are customer companies and residents of the target area that are indirect beneficiaries but it was judged that opinions and data that can give influence on the evaluation due to the nature of the project so they were excluded in the subject of evaluation and it was substituted by the analysis of objective related statistical data that they could feel.

○ It was set to be participants in projects of KOICA in charge of a counter of the donor country and total management of the projects and persons related to KEPCO and KEPCO KDN that were project implementers

<Table 3-11> The Persons Concerned of Indonesia Project

Classification	Recipient Country	Donor Country
Policy Decision	☐ BAPPENAS: Director of Mutual Cooperation ☐ MEMR: Director of Planning and Cooperation etc.	☐ KOICA: Survey participants etc. ◯ Industrial Environment Team Leader, ◯ Deputy director of Indonesia office ◯ External Experts
Implementer	☐ Validity: Experts in PLN ☐ Participants of Training ◯ Site workers: 16 persons for 4 weeks ◯ Supervisors: 10 persons for 14 days ◯ Local training: 36 persons for 3 days ☐ DAS operator: 12 persons for 5 days	☐ Feasibility Study: KEPCO PM etc. ☐ Pilot Project: KEPCO KDN ☐ Training Lecturer: ◯ Class for Site workers: 27 persons yearly 162 M/H,] ◯ Class for Supervisors: 17 persons yearly 91M/H, ◯ Local training: 28 persons - Site workers: 36 persons for 3 days - DAS operator: 12 persons for 3 days
Beneficiary	☐ Business Operator: PLN, PLN cooperators ☐ Customer: Companies, customers	☐ Implementer: KEPCO, KEPCO KDN, Cooperators of Project Implementers

B. The Stakeholders of Paraguay Project

○ The policy makers from Ministry of Foreign Affairs that is a counter of the recipient country and Public Communication Business Department in charge

of power industry policies and ANDE that is its affiliated organization and a state-owned power company assuming full charge of power industry were set to be site workers and supervisors and trainees to participate in performing a project.

○ There are customers' companies and residents of the target area that are indirect beneficiaries but it was judged that opinions and data that can give influence on the evaluation due to the nature of the project so they were excluded in the subject of evaluation and it was substituted by the analysis of objective related statistical data that they could feel.

○ It was set to be Paraguay Ambassador to Korea who participated in as a role of a counter of the donor country and KOICA project participants and KEPCO that is a project implementer and persons related to Nuri Telecom.

<Table 3-12> The Persons Concerned of Paraguay Project

Classification	Recipient Country	Donor Country
Policy Decision	☐ Vice-minister of Ministry of Foreign Affairs, Minister of Ministry of Public Communication ☐ Director of ANDE etc.	☐ Paraguay Ambassador to Korea, a councilor ☐ KOICA: Paraguay office director and survey participants etc. ◯ Industrial Energy Team Leader ◯ External Experts
Implementer	☐ Validity Implementation: ANDE PM etc. ☐ Participants of Training ◯ Site workers: 17 persons for 4 weeks ◯ Supervisors: 3 persons for 14 days ◯ Local training: many for 3 days ☐ DAS operator: 12 persons for 5 days	☐ Feasibility Study: KEPCO PM etc. ☐ Pilot Project: KEPCO, Nuri Telecom ☐ Training Lecturer: 72persons ◯ Class for Site workers: 27 persons yearly 162 M/H ◯ Class for Supervisors: 17 persons yearly 91M/H, ◯ Local training: 28 persons - Site workers: 36 persons for 3 days - DAS operator: 12 persons for 3 days
Beneficiary	☐ Power Business Operator: ANDE, cooperators of ANDE ☐ Power Customer: Customers installing AMR	☐ Project Implementer: KEPCO, KEPCO KDN, Cooperators of Project Implementers

C. The Stakeholders of Egypt Project

○ The stakeholders refer to institutions, organizations and individuals that have direct and indirect interest in development projects and their evaluation and the result of evaluation considerably varies in accordance with the setting scope of the persons concerned.

○ The persons concerned of the corresponding project in the evaluation were largely divided into the recipient country and the donor country and they were set focusing on the recipient country that would receive direct effects from the project.

○ It were set to be EEHC in charge of power policies in the recipient country and actual project participants who were site workers and supervisors from NCEDC that is a direct project implementer.

○ In case of customers and residents in the target area of the project who can be referred to indirect beneficiaries, it was judged that it would be difficult to achieve effects that customers and residents could feel due to the nature and the scope of the project so they were excluded in setting the persons concerned.

○ In the donor country, it was set to be the persons related to KEPCO KDN that was a domestic project implementer and a person in charge of KOICA projects as a role of a mediator.

1) The Persons Concerned of Distribution Automation System Construction Project in Egypt

<Table 3-13> The Persons Concerned of Egypt Project

Classification	Recipient Country	Donor Country
Policy Decision	EEHC	KOICA (Person in charge of projects)
Project Implementer	NCEDC Supervisor and Site workers	KEPCO KDN

Evaluation Results

Chapter

Ⅳ Evaluation Results

1. Indonesia Project

A. Evaluation on Relevance

1) Conformity Degree with National/Regional Development Plans of the Recipient Country

○ In 2006 when the project started, the demand of power in Indonesia, the recipient country, was expected to increase by 6.5% every year until 2009, and the efficiency of power supply was not good due to high transmission and distribution loss factor of 11.5% (transmission loss factor 2.3%, distribution loss factor 9.2%). SAIFI was high with 13.9 times and SAIDI was very long with 1,620 minutes so the situation was that the reliability of power supply was significantly bad. However there were difficulties due to non-existence of methods to improve the issues and experienced manpower.

○ On the other hand, the transmission and distribution loss factor of Korea, the donor country, was 4% at the time which was improved 2.9 times than the recipient country, and SAIFI was 0.47 times which was the level that was improved 29.6 times than the recipient country, and SAIDI was also 18.9 minutes that was developed as much as the level of developed countries and improved 85.7 times than the recipient country.

Therefore, Korea was equipped with proper capability to progress distribution system improvement and DAS pilot project and training for supervisors and site workers in the corresponding field as a cooperative project.

○ With such situation, Indonesian government established a national energy policy (KEN) in 2004 having a goal of economy restoration by 2020, and had established and commenced the National Energy Management Blueprint 2005-2025 in 2005.

○ Indonesian Ministry of Energy Mineral Resources (MEMR), and PLN and KOICA of the donor country agreed to take the lead in power industry and perform distribution system improvement and distribution automation pilot project and trainings of the present recipient country by utilizing the role of KEPCO that owns international level technologies and established appropriate plans in order that the project could be progressed actively and promptly.

○ At the time, National Development Planning Committee (BAPPENAS) of the recipient country pointed out that the project did not pass the preliminary review of BAPPENAS but the consequence was that they expressed their intention to welcome the fact that the project would be progressed as a cooperative project.

○ Indonesian government enacted the Energy Act during the execution of the project, and the new Power Act that regulated the new power supply system was prepared instead of the former Power Act enacted in 1985 and voted for by the National Assembly in September 2009. Meanwhile, the National Power General Plan (RUKN) / Regional Power General Plan (RUKD) were regulated to be issues to be approved by the National Assembly / local assembly to respond in detail.

2) Conformity Degree with Support Strategy / Priorities of the Donor Country[6)]

○ The indicators of Korea, the donor country, were significantly improved to be the level of the developed countries compared to indicators regarding transmission and distribution loss factor and SAIFI and SAIDI of Indonesia, the recipient country. Besides Korea has accumulated the technology for distribution system improvement for many years which was necessary to improve the issues of the recipient country, DAS is international level in the aspect of domestic development and utilization rate and distribution rate, and Korea is equipped with training facilities and capability to educate foreign supervisors and site workers in the corresponding field and has already made preparations to progress it as a priority project for overseas expansion.

○ Developed countries such as Japan has already entered the part of generation, transmission and distribution among power fields of the recipient country but it seems that Korean advance both accumulating technologies and having performances that have comparative advantages internationally into the project of loss reduction in a distribution field and improvement of reliability is advantageous and feasible in many ways.

○ During such times, transmission and distribution loss factor of Korea was 4% which was the top in the world, and SAIDI was within 20 minutes along with Japan, and SAIFI was improved to be less than one time along with Japan so that Korea could remain within the top two in the world and maintain the superiority.

---

6) Overseas Power Industry Information Collection Chap.8 Indonesia, Power Exchange (Jun. 2012)
KOICA Indonesia Preliminary Survey Result Report / Final Report (Apr. 2006 / Oct. 2007)
Electricity Newspaper No.2742 (Nov. 9th 2011) Page 7, EPJ Dec. 8th 2011 Reporter Yang, Hyun-Seok yhs@epj.co.kr

<Table 4-1> Power Transmission and Distribution Loss Factor by Major Countries and Supply Reliability Index[7)]

Classification	Korea	USA	U.K.	France	Japan
Loss Factor[%]*	4.4	6.3	8.6	6.9	5.3
SAIDI[Min.]**	18.6	137.8	68.38	57.6	11
SAIFI[Freq.]**	0.45	1.24	0.72	1.35	0.16

* Based on 2005 for loss factor, ** Based on 2004 for SAIDI and SAIFI

○ Distribution automation, its operation and loss management of transmission and distribution etc were designated to be priorities in the revitalization plan of foreign expansion of energy industries by Korean Ministry of Commerce, Industry and Energy in Sep. 2005.[8)]

◈ The opportunities of foreign expansion of the donor country is promoted by improving the issues of the recipient country visibly with installation of Korean DAS as a pilot project and making them feel the excellence of related technologies.[9)]

○ KEPCO and KEPCO KDN and Anygate etc. in Korea started DAS development since 1990 and operated 174 small-scaled DAS until 2002. Besides among these small-scaled DAS functions, a power distribution diagram, a single line diagram, important customers displayed on the screen of GIS (Geographic Information System), and it was developed into TDAS (Total DAS) equipped with the function of automatic separation for failure section by a computer and automatic reverse transmission of sound powered section.

---

7) Third Benchmarking Report on Quality of Electricity Supply (CEER, 2005)

8) dison Electric Institute 2003 Reliability Report (EEI, Oct. 2004 Revised)
Plan for Revitalization of Foreign Expansion of Energy Industries, Ministry of Commerce, Industry and Energy (Sep. 28th, 2005)

9) Distribution Automation, Changing into 'Distribution Intelligent System', Electric Power (Dec. 8th 2011)
Changed Distribution Automation System into 'Distribution Intelligent System', Electricity Newspaper (Nov. 9th 2011)

○ Slim-type TDAS was decided through system composition and comparison of prices regarding optimal distribution automation system specification and functions that would be applied to Indonesia.[10)]

○ The slim-type TDAS that was applied to a pilot project is a basic model excluding some applications from general standard TDAS and is simple so has advantages of less problems and easy maintenance.

○ The localization import substitution of DAS was reported to be 1 trillion and 35.05 billion won, and the performance leads to the export.

○ Semarang branch has 3-phase 4-wire system like KEPCO among 3-phase 3-wire system and 3-phase and 4-wire system and it has an advantageous condition for applying KEPCO technologies as SCADA that was already introduced is an advanced system and is proper to accumulate performances that could be useful for comparative analysis and securing competitiveness for the advance of similar business.

3) Establishment of Project Plans Reflecting Requests of the Recipient Country

◈ In the process of consulting with the government MEMR and electricity board PLN of the recipient country, the importance for each business was adjusted as below to boost business effects and sustainability.

○ The importance of business breakdown was adjusted focusing on the distribution automation pilot project and technology transfer.

- Feasibility Study : Pilot Project : Inviting Trainees = '6 : 3: 1' was adjusted into '4 : 4 : 2'

○ The Feasibility Study was determined to focus on a reliability enhancement field that was closely linked with an automation pilot project.

10) Korean name has been changed into 'Distribution Intelligent System' in order to leap up the current DAS of KEPCO into future system that the cutting-edge IT technologies are applied such as self-healing, automatic judgment on failure sector, failure foreknowledge etc. since Nov. 2011 (Electricity Newspaper Nov. 9th, 2011)

○ Considering the limited budget, a link with a pilot project and overlapping possibility with new ADB projects, a recipient organization hoped to concentrate on a pilot project and a training field.

○ Expansion of Importance of Automation Pilot Project and Trainees

- The effects of the project were made to be visible by expanding the cost of the automation pilot project from 25% to 40%.
- 5 invited engineers were added for trainees and a local training was added and a lecturer was dispatched for one week.

○ As above, the effects of the project could be enhanced by modifying the project plan in accordance with the requests of the recipient country and improving satisfaction of the recipient country.

◈ The English name of the project was changed to clarify the target areas for the breakdown of the project.[11)]

○ Original: Feasibility Study for the Improvement of Electric Distribution System and Establish of DAS Pilot Project in 3 Cities, Indonesia

○ Changed: Feasibility Study for the Improvement of Electric Distribution System and Establish of DAS Pilot Project in 3 cities and Establishment of Distribution Automation System (DAS) Pilot Project in Semarang, Indonesia

4) Relevance of Input with the Purpose

◈ The goal is achieved within the scheduled duration by infusing manpower necessary for the goal of the project and the project breakdown.

○ Total 17 KEPCO experts were invested as one for general management of the project, five for the Feasibility Study on improvement of supply reliability, seven for a pilot project and four for a training field, and total 58MM participation of them was made as local 22MM and

11) Indonesia Preliminary Survey Report pp.7-8

domestic 36MM.

- ○ Total of 32.95MM of participation was made as local 14.2MM and domestic 18.75MM by investing 11 experts to the DAS pilot project including KEPCO 5 persons. Due to reshuffling of a project implementer, one design expert and two installation experts who were initially invested were changed but it was evaluated to be proper as there was no case affecting the schedule.
- ○ It was judged that the above invested manpower was a proper one to achieve the goal of the project.

5) Relevance Considering Social, Cultural and Environment Conditions of Recipient Country

○ It was comprehended that the project was performed by considering social, cultural and environmental conditions of the recipient country properly by most manpower from the donor country that performed the project through a questionnaire and interviews with local related persons. The local practice was respected and opinions were collected by visiting related government ministries and related organization of an electricity board of the recipient country and forming intimate relationship from a preliminary survey to completion of project implementation. Local climate and cultural events were considered, and especially the working schedule was managed by being considerate of the time when local people participate in a religious event. The considerations were given with courteous, amicable and intimate conversation and not showing repulsion.

B. Evaluation on Efficiency

1) Efficiency of Project Period to Achieve Goal of the project

○ The plan and its performance were thoroughly managed by applying modern process management technique to 15-month process from October 1, 2006 to the end of 2007.

○ As a result of investigating a monthly project plan and its performance, the efficiency was evaluated to be very good because the performances compared to plans of total process and processes by fields were all matched.[12)]

2) Efficiency of Total Project Costs to Achieve Goal of the Project

○ Total project expenses of $950,000 was executed by establishing proper budget for project goals(fields) and yearly budget plans, and the importance of the pilot project was expanded by considering the effects of the project, enhancement of sustainability and the hope of the recipient country, and the proper budget was calculated on the basis of related regulations and expense payment criteria, and the efficiency of project costs was improved by adjusting overhead expenses within available budget from 110% to 25%.

○ The effects of the project were made to be visible by expanding the cost of Semarang DAS pilot project from 250 thousand dollars which was 25% of the original total project cost to 380 thousand dollars which was 40%.

- DAS engineering fee $130,000 was included in the cost of experts dispatch

12) Indonesia Project Implementation Progress Schedule, Final Report (Oct. 2007) p.6

for the Feasibility Study so it was efficiently executed within the scope of total project cost.

<Table 4-2> Proper Budget and Adjusted Budget Breakdown for Indonesia Project

Unit: Won

Item		Proper Budget	Adjusted Budget	Breakdown of Adjustment
Service Fee	Direct Labor Cost	234,175	234,175	- Proper Budget 100% Reflected
	Overhead Expense	257,592	58,544	- 110% of Direct Labor Cost Reflected → Downward adjustment to 25%
	Engineering Fee	-	-	- Proper Budget 100% Reflected
	Direct Cost	595,740	595,740	- Proper Budget 100% Reflected
Total		1,087,507	888,458	

<Table 4-3> Importance Adjustment by Fields of Indonesia Project

Unit: Thousand Dollars

Classification		Total	Importance[%]	
Total		950	100	100
Feasibility Study	Experts Dispatch	336	49	35
	DAS Engineering	130		40
Pilot Project	DAS Equipment	250	26	
Inviting Trainees		172	18	18
Others (Preliminary Survey, Evaluation)		62	7	7

3) Efficiency of Project Implementation Process

○ The efficiency of project implementation process was improved by implementing the project so that the goal of the project was achieved with thorough management of process plans and performances by making up a progress schedule regarding a project implementation schedule and costs and manpower and an execution plan and an organization of a project

implementation team and the procedure of project implementation by fields.

○ Distribution system improvement and DAS pilot project and invitation trainings (36 site workers for 4 weeks, 10 supervisors for 2 weeks) and local trainings (36 site workers for 3 days, 12 DAS operators for 5 days) etc. were efficiently implemented by investing the donor country experts 58MM (local dispatch 22MM, domestic support 36MM) and 22 recipient country counterparts and evaluation manpower 4MD etc.

4) Efficiency of Utilization of Recipient Country Experts

○ 22 experts from the recipient country were composed to be included from a project implementation plan and they cooperated a field project implementation and attended examination works, and it was evaluated to boost efficiency of utilization with a link of invitation trainings and local trainings.

<Table 4-4> Professionals by Fields on Indonesia Side

Office	Position	Name
Head Office	Project Supervisor	Harry Hartoyo
	Coordinator	Hernadi Buhron
Semarang	Supervisor	Moch, Sofyan
	Coordinator	Jimmy MJ Mandagi
	Reliability	Mananti Nainggolan, Tri Prantoro, Edy Djatmiko
	DAS	Siswo purnomo, Agus Sapto Widodo, Kadek Agung
Surabaya	Supervisor	Arief Nur Hidayat
	Coordinator	Lukman Hakim, Kendys Manurung
	Reliability	Isfaisal, Salmin Letto, Tjutjuk Hari Purwanto
Denpasar	Project Supervisor	Wirabumi Kaluti
	Coordinator	Sumartanto, Gusti Agung Ngurah Partha
	Reliability	Putu Budhyasa, Adi Fitri, I Made Wibrata

C. Evaluation on Effectiveness

1) Effectiveness of Feasibility Study Report

○ The distribution loss factor of Semarang branch that performed the Feasibility Study on the distribution system improvement and DAS pilot project was decreased by 0.21% per year on average from 7.19% in 2007 to 6.37% in 2011, and 0.37% for Java Central branch that Semarang branch is included and the entire Indonesia was decreased by 0.39%.[13]

<Table 4-5> Power Transmission and Distribution Loss Factor Variation Development of Indonesia Project

Classification		2007	2008	2009	2010	2011	Average Increase and Decrease
Semarang	Distribution	7.19	7.31	7.22	6.63	6.37	-0.21
Java Central	Distribution	7.43	6.93	6.63	6.74	5.96	-0.37
Indonesia	Distribution	8.84	8.29	7.93	7.64	7.34	-0.38
	Transmission and Distribution	11.08	10.67	10.13	9.89	9.54	-0.39

○ According to the Feasibility Study, the transmission and distribution loss factor was intended to be reduced by 0.12% per year on average by reducing from 2.23% in 2006 to 1.51% in 2012 by stages, but it could be said that more reduction more than 0.09% per year on average was achieved from the above performance.[14]

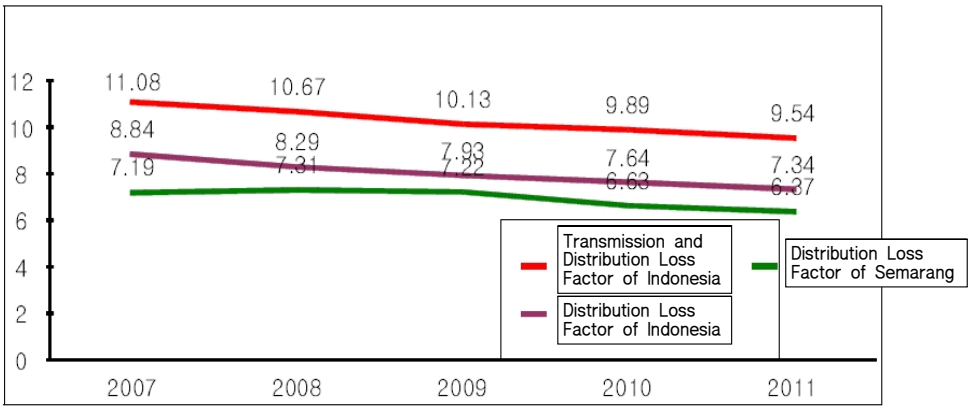
○ PLN key persons in charge who attended the field study for the post evaluation showed themselves explaining the effects of the project by

13) PT PLN (Persero), Statistik PLN 2011 (Jul. 22, 2012)

14) The Effect of Reduction of Extra-High Voltage Distribution Line, Final Report of Indonesia Project, pp.416~418 KOICA Report(Dec. 2007)

presenting the Feasibility Study on the project and official statistical data of PLN

<Fig. 4-1> Power Transmission and Distribution Loss Factor Variation Development of Indonesia Project



○ If the reduced cost of PLN total transmission and distribution loss is calculated on the basis of 2007 that was just before completion of the project, it is estimated to be 40.4 billion Rp (In case of applying the exchange rate at that time, it could be 4.6 billion Korean won, and 3 million and 680 thousand US dollars) in 2008 that was the first year after the project and this effect continuously increases every year in proportion to the increase of power sales.

- There may be factors other than the project for the above effect but it was difficult to find out measurement data or any method for measurement that could distinguish them.

<Table 4-6> Power Transmission and Distribution Loss Reduction Effect Implication of Indonesia Project

Classification		Unit	2007	2008	2009	2010	2011
Distribution Loss Factor		%	8.84	8.29	7.93	7.64	7.34
Transmission and Distribution Loss Factor		%	11.08	10.67	10.13	9.89	9.54
Reduction of Loss Factor		%	Standard	-0.41	-0.95	-1.19	-1.54
Lost Power		GWh	15,239.2	15,093.5	15,358.6	16,260.2	16,918.1
Reduction of Lost Power		GWh	Standard	61.884	145.907	193.496	260.539
Unit Price for Sales		Rp/kWh	629.2	653.0	670.0	699.1	714.2
Reduced Cost of Loss	Annual	million · Rp		40,410	97,758	135,273	185,353
		Won/Rp		0.1148	0.1238	0.1266	0.1271
		Million Won		4,639	12,102	17,126	23,558
	Total	Million Won		4,639	16,742	33,867	57,425
		US$/Thousand Won		0.795	0.856	0.878	0.867
		Thousand Dollars		3,688	14,331	29,735	49,787

2) Effectiveness of Pilot Project DAS Construction

◈ As a result of analyzing the development of changes in SAIFI and SAIDI from 2008 to 2011 as evaluation indicators of DAS construction effects, the entire PLN was improved by 1,523.8 minutes (31.4%) per year on average and 2.8 times (21.1%) for SAIFI respectively.

○ In case of Semarang branch, it was improved by 104 minutes (5.1%) and 2.16 times (4.7%) per year on average respectively.

○ In case of Java Central branch, it was improved by 92.2 minutes (17.3%) and 2.32 times (18.3%) per year on average respectively.

- There may be factors other than the project for the above effect but

it was difficult to find out measurement data or any method for measurement that could distinguish them. Besides, the supply reliability index before 2007 was omitted in a comparative analysis by judging that statistical conditions were ambiguous.

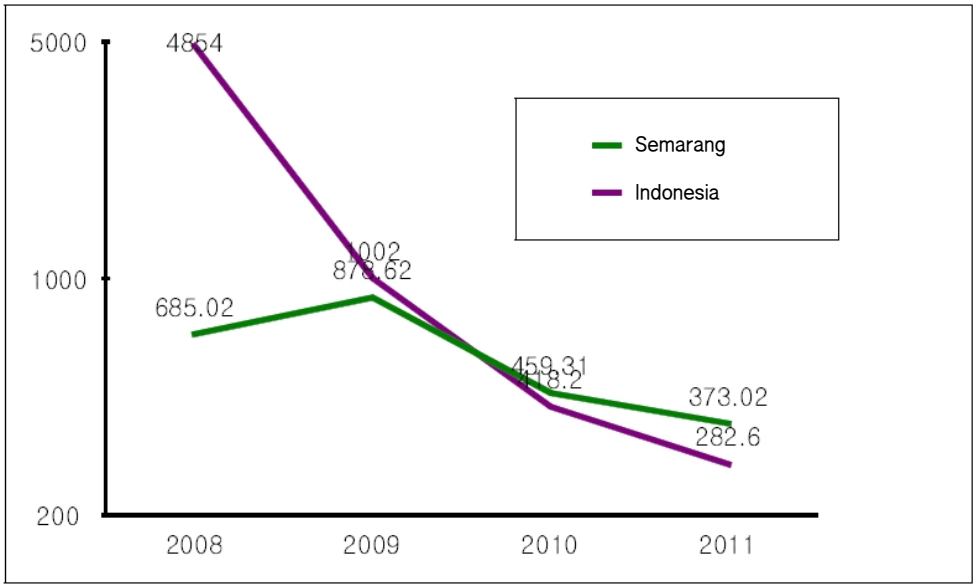
◈ The effect of motivation for acquiring new knowledge of similar projects and expanded distribution and the effect of exhibition were achieved.

○ The DAS system that was installed by KOICA showed improvement that SAIDI and SAIFI were reduced within the area after installation and considering it, it could be said that it achieved the goal of the pilot project sufficiently.

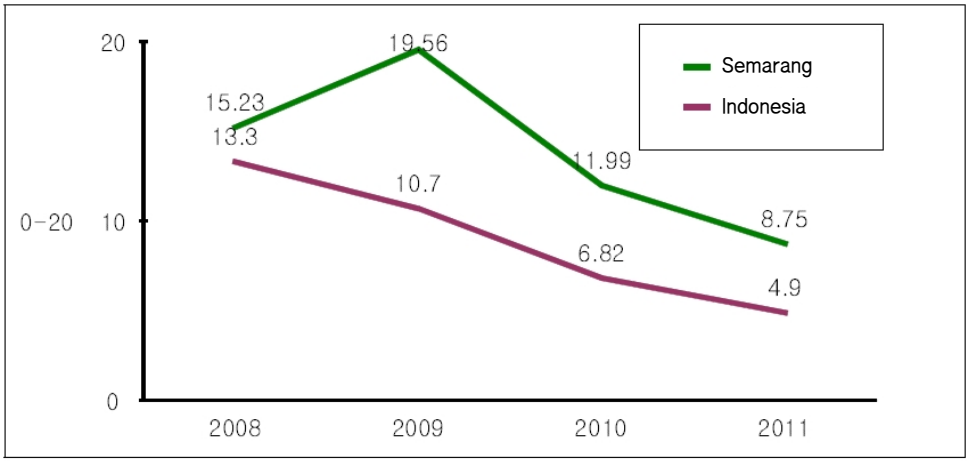
○ The current DAS system was substituted by IDAS with KEPCO cooperation of the donor country aiming at expansion of functions and commercialization.

- According to a director of Korea Electric Power Research Institute of KEPCO that is an additional implementer who was interviewed at a field study by an evaluation team, IDAS that integrated SCADA function and was referred to distribution intelligent system was performed as a part of 10 development projects for power IT of Korean government from January 2009 to September 2010 (21 months).
- The prior information cooperation was not sufficient between DAS pilot project team of KOICA and IDAS project team of KEPCO but mutual win-win effect and commercialization effect were promoted and it was judged that the satisfaction of the recipient country and the trust on the donor country were amicably developed to a considerable level.

<Fig. 4-2> System Average Interruption Duration Index (SAIDI)
Development of Indonesia Project



<Fig. 4-3> System Average Interruption Frequency Index (SAIFI)
Development of Indonesia Project



<Table 4-7> Supply Reliability Variation Development Related to Indonesia Pilot Project[15)]

Classification		2008	2009	2010	2011	Average Increase and Decrease
Semarang	SAIDI[Min.]	685.02	878.62	459.31	373.02	-104
	SAIFI[Freq.]	15.23	19.56	11.99	8.75	-2.16
Central Java	SAIDI[Min.]	530.07	438.98	329.94	253.60	-92.2
	SAIFI[Freq.]	12.67	10.54	8.49	5.70	-2.09
Indonesia	SAIDI[Min.]	4,854.0	1,002.01	418.2	282.6	-31.4
	SAIFI[Freq.]	13.3	10.7	6.82	4.90	-21.1

3) Effectiveness of Invitation Trainings and Experts Dispatch

○ Remarkable promotional transfer and promotions cases could be found through a field study and interviews in an organization regarding reliability increase works and automation works that invited trainees were educated and the persons directly involved showed considerable satisfaction on the training contents and its period and evaluated highly of the training effects.

○ One trainee had a separate training at Korea Electric Power Research Institute of KEPCO and after going back to their own country, the person is in charge of promotion training on the effects of the project and takes an important position in the field of introduction plan of similar new technologies.

15) Indonesia, 7 Promising Regions for Overseas Expansion, Overseas Power Industry Information Collection, Power Exchange (June 2012)

D. Evaluation on Impact

1) Changes Given by the Project to Target Areas

◈ The project played a role of identifying DAS functions that were the main purpose of a pilot project and finding the possibility of commercialization and of a step stone towards developed IDAS.

○ After analyzing the quality of electricity in the target areas, power loss reduction by years and improvement of supply reliability have been constantly improved starting from the project.

○ But slim-type TDAS at Semarang was installed as a very small-scaled one. It was connected only with 15 Gas Switches and 3 Reclosers. Therefore, it is difficult to conclude it as overall effects for extensive areas.

2) Changes Given to Related Organizations

◈ Energy Development Support Board (BAPPENAS) and Ministry of Energy Mineral Resources and a project implementer PLN that are government ministries of the recipient country and that are contacted in terms of business cooperation such as a preliminary survey on the project and approval etc. recognize the importance of promoting cooperation between the two nations.

○ Development cooperation of power industry is recognized to be very important for economic and cultural development of developing countries through the progress of the project and they are making an effort such as sharing of mutual information and enhancement of involvement in related international activities.

○ IDAS substitution that is a follow-up project of DAS pilot project also was made by the request and interest of a head of PLN distribution

project group who visited the verification project complex of Smart Grid at Jeju island in Korea.

3) Expansion Possibility of Project Target Areas

○ In case of the Feasibility Study project, it has a plan to expand throughout the entire regions annually, and securing budget and decision making by executives are prepared.

○ As for the pilot project DAS, it is replaced and operated by the developed IDAS, and the expansion plan will be reviewed.

E. Evaluation on Sustainability

1) Sustainability of Project Effect

○ The recipient organization is making an effort in order to sustain and spread the effects of the project such as preparing for distribution system improvement studies reflecting items recommended in the Feasibility Study on the project and holding "The 1st Conference on Distribution System for Modern City with High Density" across the country in July 2012.

○ It is said that separation and linkage of distribution system, insulation work of overhead lines, introduction of cable in air and introduction of equipment for diagnosis of deterioration that are recommended in the report of the Feasibility Study on the project are mostly reflected in the distribution system improvement studies.

○ They show their interest in Smart Grid seeking green growth with combination of power system technologies and IT technologies, and strong interest

and high participation in foreign and domestic business information sessions and exhibitions of Korean companies for this.

2) Education Program for DAS Operation

○ The existing DAS operation has been passed on to on-the-job training within the place of business focusing on trainees and the local training of the project implementation team such as KEPCO power researcher and Anygate etc. along with new IDAS substitution continues. Hands-on training was just implemented for one week from October 8, 2012 which was a period of post evaluation.

○ The local training concentrates on DAS operation method and inspection method and record management and maintenance and promotes DAS self-operation technology and improvement of supply reliability by utilizing it and increase of distribution efficiency.

3) Maintaining Stable Operation of DAS

○ With the new IDAS substitution, the existing DAS operation stopped. According to interviews, it is said that the existing DAS was not equipped with restraint of abnormal voltage by a theft of a ground wire upon lightning so some terminals had some problems in communication but it was comparatively stably operated.

F. Cross-Cutting Issue[16)]

1) Evaluation on Effects on Human Rights

○ The project was found to have a positive influence on improvement of human rights in the corresponding areas. There were many respondents saying that supervisors and site workers could have opportunities to attend the trainings of the project extensively and information exchange and communication between regions and between classes were improved because they could be more in touch with information and communication technologies and information on foreign developed countries.

2) Evaluation on Effects on Gender Response

○ Because they were dispatched to do difficult work such as operating equipment or climbing up an electric pole during the power cuts, male staff were mainly on standby and patrolling for 24 hours but the participation rate of women was increasing because it was possible for a remote monitoring control from a center as the lines were automated thanks to the project and the main jobs were data processing and software works using computers.

3) Evaluation on Effects on Environment

○ The reality is that most production facilities and social amenities, safety management facilities etc., depend on electricity and electric appliances so it is found that the reduction of the power cuts and improvement of distribution efficiency are directly connected to environmental improvement

16) Fourth High Level Forum on Aid Effectiveness, Pusan, Policy Suggestions for Overseas Assistance Consultation for Korea (Dec. 1, 2012)

and it affects the operation of social safety net.

○ Therefore, the project that improved indicators regarding improvement of distribution efficiency and supply reliability can be evaluated to be one having positive influence on environmental effects directly or indirectly.

G. Evaluation on Satisfaction through Questionnaire Response Analysis[17)]

◈ The satisfaction is evaluated by using five-point scale for each indicator regarding response of questionnaire and interviews.

○ Very Agreeable (Excellent: 80~100 points) 100points, Agreeable (Good: 60~79 points) 75points, Average (middle: 40~59 points) 50points, Not Agreeable (Poor: 20~39 points) 25points, Least Agreeable (Very poor: less than 20 points) 0 point, and a weighted average considering respondents for each evaluation item was calculated.

◈ The overall satisfaction of Indonesia project that was analyzed as above is 70.4 points, and the weight responded at higher grade than 'good' was 52%, which shows comparatively good satisfaction.

○ The satisfaction analyzed by 5 evaluation criteria shows mostly good satisfaction as below.

- The score of questionnaire analysis regarding relevance was 76.9 points, and the weight responded at higher grade than 'good' was 85%, which shows generally good satisfaction.
- The score of questionnaire analysis regarding efficiency was 57.5 points, and the weight responded at higher grade than 'good' was 30%, which shows generally normal satisfaction.
- The score of questionnaire analysis regarding effectiveness was 62.5

17) MEGAresearch, Report of 2010 Grant-Type Aid Recipient Country Satisfaction Survey Commencement (May 7, 2010)

points, and the weight responded at higher grade than ‘good’ was 35%, which shows generally normal satisfaction.

- The score of questionnaire analysis regarding influence was 71.4 points, and the weight responded at higher grade than ‘good’ was 74%, which shows generally good satisfaction.
- The score of questionnaire analysis regarding sustainability was 70 points, and the weight responded at higher grade than ‘good’ was 67%, which shows generally good satisfaction.

<Table 4-8> Questionnaire Analysis by Evaluation Criteria of Indonesia Project

Evaluation Criteria	Respondents[Person] Response Weight[%]	100 Point Conversion Score				
		50 Average	75 Good	100 Excellent	Total	Average
Relevance	40 100	6 100	25 85	9 23	3,075	76.9
Efficiency	10 100	7 100	3 30	0 0	575	57.5
Effectiveness	20 100	13 100	4 35	3 15	1,250	62.5
Impact	35 100	9 100	22 74	4 11	2500	71.4
Sustainability	35 100	10 100	16 67	4 13	2,100	70.0
Total	135 100	45 100	70 52	20 15	9,500	70.4

○ The result of analysis by project fields shows that DAS pilot project was 66.7 points, and the weight responded at higher grade than ‘good’ was 60% and the common field combining improvement of distribution system with the training field was 70.8 points, and the weight responded at higher grade than ‘good’ was 68%, which shows generally good satisfaction.

<Table 4-9> Questionnaire Analysis by Fields of Indonesia Project

Evaluation Item Field			100 Point Conversion Score by Evaluation Items					
Field	Item	Ratio	Response	50 Average	75 Good	100 Excellent	Total	Average
Automation Pilot Higher Grade Response Weight[%]	3	11.1	15 100	6 100	8 60	1 7	1,000	66.7
Common Higher Grade Response Weight[%]	24	88.9	120 100	39 100	62 68	19 16	8,500	70.8
Indonesia Total	27	100.0	135	45	70	20	9,500	70.4

2. Paraguay Project

A. Evaluation on Relevance

1) Conformity Degree with National/Regional Development Plans of the Recipient Country

○ Paraguayan government in 2006 expected that the power demand would increase by 6.5% every year until 2010, and had a goal of developing a power system for economic development.

○ Paraguayan government established a long-term investment plan (approved by the President) in power field for 2007~2016, but the development of distribution field was at a basic level and required the advanced technologies and support, and the project had been performed by receiving a loan from JBIC and IDB for improvement of power generation and transmission·distribution field for 17 years. Besides, they requested Korea having comparative

advantages in this field to establish a master plan of power distribution for 2 targeted major cities.

○ The power supply to the capital Asuncion region with immense power demand in Paraguay had problems that much loss of transmission and distribution occurs and metropolitan power cuts due to failure of power transmission lines frequently occur.

○ Transmission and distribution loss factor was fully 33.5% (power transmission loss factor 8.1%, power distribution loss factor 25.4%) which had never been higher. That was caused by many combined and accumulated problems such as technical problems that the distance of transmission and distribution was too far away and facilities of transmission and distribution were weak and industrial infrastructure was behind the times and non-technical problems like incompletion of measuring facilities to measure electricity consumption and theft of electricity and nonpayment of a charge etc. However, the actual situation was difficult because there was no master plan in distribution field to improve this, and database required to establish a plan was not equipped.

○ SAIFI which is an indicator of supply reliability was 18.2 times which was frequent, and SAIDI was 16 hours which was considerably long, which caused great complaints of customers and aggravated productivity of industrial facilities and quality of products. But they went through difficulties because there were no plans and no skilled manpower to solve this.

○ With this actual situation, making this project that started in December 2006 concentrate on technology transfer of a distribution plan program and AMR pilot project and training for loss reduction is evaluated to be appropriate.

2) Conformity Degree with Support Strategy / Priorities of the Donor Country

○ The transmission and distribution loss factor of Korea at that time was within 4% which was improved 8.4 times than the recipient country, and it was difficult for exact comparison with identical indicators as there was a difference in a statistical method of supply reliability index but SAIFI was 0.47 times which was the level that was improved 29.6 times than the recipient country, and SAIDI was also 18.9 minutes that was developed as much as the level of developed countries. Therefore, it can be said that Korea has a proper capability to progress the establishment of a master plan for a distribution field and AMR pilot project and trainings for supervisors and site workers in the corresponding field as cooperative projects in order to improve the issues of the recipient country.

○ By that time, Korea organized the 1st Power Industry Export Private and Public Council (Dec. 20, 2006) and announced a plan to progress export industrialization of power industry, and confirmed loss reduction of power distribution and operation (O&M), DAS and AMR as foreign expansion type and a leading industry by fields and decided to support them actively with the Council as a center. Therefore, this Paraguay project is evaluated to be proper for priorities of the support strategy of the donor country.

3) Establishment of Project Plans Reflecting Requests of the Recipient Country

◈ The project plans were modified in accordance with requests of the recipient country and approached closer to the necessity of the recipient country, and it was judged that it would be proper to enhance its effectiveness by increasing satisfaction of the recipient country.

○ The existing agreement procedure was omitted and early commencement of the project was promoted with the signature on the agreed minutes by representatives from the both countries (a minister of Ministry of Foreign Affairs from the recipient country, Ambassador of the donor country to Paraguay), and the project name, the number of inviting trainees, the scope of consulting etc. were reasonably adjusted to be proper for local conditions.

○ The term of the target areas was changed into jurisdiction zone of power distribution companies in each region.

- 'Capiata City' was changed into 'Capiata Region'
- 'Ciudad del Este City' was changed into 'Alto Parana Region'

○ The completion time was moved up by adjusting it from the second quarter of 2008 to the first quarter.

○ As for selection of trainees, it was difficult to recommend qualified 30 persons with the ability of English etc. therefore it was adjusted to 20 persons.

4) Relevance of Input with the Purpose

◈ The goal is achieved within the scheduled duration by infusing manpower necessary for the percentage of the goal of the project and the project breakdown.

○ In order to perform the project smoothly, 1 professional engineer from KEPCO, 1 professional engineer and 1 high-class engineer as experts of a distribution plan and 1 professional engineer as an expert of distribution loss were invested and 1 professional engineer as a team leader of AMR pilot project, 1 high-class engineer as an expert of communication, 1 professional engineer as an expert of software, 1 professional engineer as an expert of AMR installation and 1 high-class engineer as an expert of training etc. total 9 persons were invested.

○ One KEPCO expert as a project supervisor of AMR pilot project and one person from KEPCO as an expert of survey and design, 4 experts from Nuri Telecom and one KEPCO expert and 5 persons from Nuri Telecom for construction and commissioning were dispatched to the site.

5) Relevance Considering Social, Cultural and Environment Conditions of Recipient Country

○ It was grasped that the project was performed by considering social, cultural and environmental conditions of the recipient country properly by most manpower from the donor country that performed the project through a questionnaire and interviews with local related persons. The local practice was respected and opinions were collected by visiting related government ministries and related organization of an electricity board of the recipient country and forming intimate relationship from a preliminary survey to completion of project implementation. Local climate and cultural events were considered, and especially the working schedule was managed by being considerate of the time when local people participate in a religious event. The considerations were given with courteous, amicable and intimate conversation and not showing repulsion.

B. Evaluation on Efficiency

○ Paraguay project had total project cost of 1 million and 500 thousand dollars, 67MM experts from the donor country (local dispatch 26.2, domestic support 40.8), 17 counterparts from the recipient country, 4MD for evaluation manpower etc. investment and efficiently performed the establishment of a master plan for a distribution field and AMR pilot project and invitation training (3 supervisors for 14 days, 17 site workers for 21 days) and local loss training (16 persons for 21 days) etc.

1) Efficiency of Project Period to Achieve Goal of the project

○ Through the preliminary survey in December 2006 (3 persons for 10 days) and consultation for implementation (2 persons for 9 days) in February 2007 upon the request of ANDE in Paraguay in August 2006, the plan and its performance were thoroughly managed by applying modern process management technique to 18-month process from July 2006 to the end of 2008.

○ As a result of investigating a yearly and monthly project plan and its performance, the efficiency of project period was evaluated to be good because the performances compared to plans of total process and processes by fields were matched.[18)]

2) Efficiency of Total Project Costs to Achieve Goal of the project

○ As a result of investigating a yearly budget and its performance by project fields, the efficiency of total project costs was evaluated to be good because the performances compared to plans were all matched.

<Table 4-10> Budget by Years and Fields of Paraguay Project

Classification	Total	2007	2008	2009
Total [Thousand Dollars]	1,500	400	600	500
Expert Dispatch [Thousand Dollars]	861	150	334	377
Pilot Project [Thousand Dollars]	270	150	61	59
Trainees Invitation [Thousand Dollars]	275	80	195	0
Others [Thousand Dollars]	94	20	10	64

18) Paraguay Project Implementation Progress Schedule, Final Report (Jan. 2009) p.6

<Table 4-11> Performance Compared to Budget Plan by Years of Paraguay Project

Classification	Total	2007	2008	2009
Plan [Thousand Dollars]	1,500	965	325	210
Execution [Thousand Dollars]	1,500	964	304	210
Execution Ratio [%]	100	100	93.5	100

3) Efficiency of Project Implementation Process

○ The efficiency of project implementation process is evaluated to be improved by thorough management of process plans and performances by making up a progress schedule regarding a project implementation schedule and costs and manpower and an execution plan and an organization of a project implementation team and the procedure of project implementation by fields.

4) Efficiency of Utilization of Recipient Country Experts

○ 14 experts from the recipient country were composed to be included from a project implementation plan and it was evaluated to boost efficiency of utilization with a link of cooperation of a field project implementation and attendance at examination works and invitation trainings and local trainings by adding 3 more persons.

<Table 4-12> Experts by Fields in Paraguay

Part	Position	Name
Establishment of Planning	Project Supervisor	Inoue
	Supervisor	Victor Damian Paravicino Zayas
	Translator	Jose Alberto Rodriguez Fandos
	Planning	Ceasr Antonino Ferreira Benitez, Enrique Sanabria Franco, Jose Agustin Espinoza Diaz, Ricardo Francisco Alonso Cardozo, Luis Alberto Centurion Alfonso, Pedro Agustin Insfran Gimennez
	Loss	Mario Jorge Cardozo Martinez
	Alto Parana Division	Jose Orlando Romero

<Table 4-12> continued

Part	Position	Name
AMR System	Project Supervisor	Luis Carlos Cardozo Canellas
	Coordinator	Guido Rafael Chavez Nunez
	Communication	Delia Mercedes Villasanti vargas, Isidro Nicolas Pinto Riquelme, Giancarlo Valentin Gonzalez Britez
	Billing	Carlos Eduardo Moreira Guerra

C. Evaluation on Effectiveness

1) Effectiveness of Feasibility Study Report

◈ It was verified through questionnaire and interviews that it was utilized usefully such as reviewing long-term plans and short-term plans biennially and reflecting them to the future plan by using the Feasibility Study report and the program of a distribution plan.

○ AMR pilot project database and the status of drawings and operation were being updated.

○ The demand was predicted by utilizing the program of a distribution plan and the expansion plan of substations and lines was established.

○ The distribution diagram was drawn by using the provided program and they were utilized by making them as database.

2) Effectiveness of AMR Construction

◈ AMR pilot project achieved the effect of exhibition and the effect of acquirement of new knowledge of similar projects and motivation for expanded distribution. Therefore, meters at 300 places were replaced with an electronic type (Bolivia Prime) and being separated from 100 units that were supplied by KOICA project.

○ ANDE said that they hoped participation and guidance by Korea in the process of replacing the system by recognizing international compatibility and excellent performance of Korean electronic-typed meters through this project. But it is judged that Nuri Telecom that was an implementer of the project didn't participate in due to problems such as change of occupation by a person in charge and participation in other projects etc. at that time.

○ At present, ANDE replaced 18% of total meters and is achieving the effect of 14% loss reduction, and is progressing the replacement work of 450 thousand electronic-typed meters under the support of IDB as a prior phase of AMR.

3) Effectiveness of Invitation Trainings and Experts Dispatch

◈ It could be heard of active participation and positive response through interviews and questionnaire and they evaluated highly the effect of trainings.

○ The trainees satisfied not only with education facilities of KEPCO central education institute but also judged that contents of training were useful and helpful, and they hoped that these trainings continued for other engineers in ANDE.

- Upon completion of the courses, the trainees had a time of presentation regarding an execution plan based on what they learned about their duty field each individual belongs to. Through this, they expressed their opinions that they wanted to apply the cutting-edge distribution technologies and the advanced distribution facilities management technique such as DAS, NDIS and AMR etc. in Paraguay, and they repeated such a hope and a request in this evaluation as well.
- The trainees acquired what they learned through training courses and showed an active attitude in learning the training courses such as seeking a plan to apply them to Paraguay in the future during the training period.

D. Evaluation on Impact

1) Changes Given by the Project to Target Areas

◈ If transmission and distribution loss factor variation development and supply reliability variation development related to Paraguay project were analyzed, the loss factor and reliability index are being considerably improved.

○ Since the data for comparative analysis separating the target areas from other areas were not obtained, it was difficult to evaluate influence among regions, but the direct and indirect effects and influence of the project could be judged through national statistics.

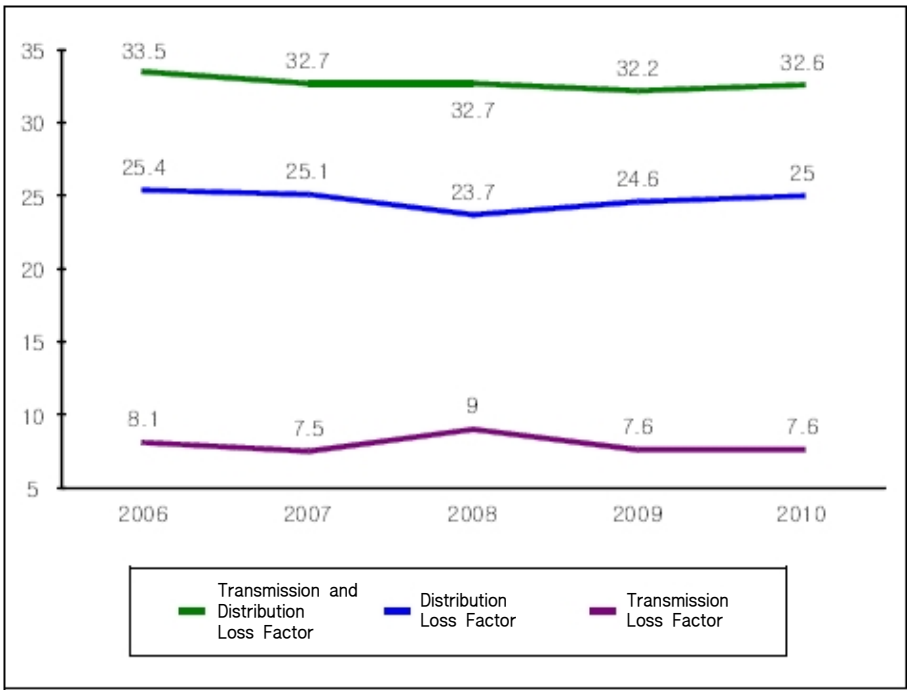
○ The transmission and distribution loss factor increased by 38.4% (distribution loss factor 38%) per year on average until 2006 which was the previous year of project commencement from 24.2% in 2001 (distribution loss factor 18.4%) but started to be improved by 2.7% (distribution loss factor 1.6%) per year on average with the peak of 33.5% (distribution loss factor 25.4%) and was decreased to 32.6% (distribution loss factor 25%) in 2010.

○ As a supply reliability index, ANDE manages SAIDI per kVA for SII and it was improved by 3.1% from 11.4 in 2009 to 0.35 per year on average until 2011. SAIFI per kVA was improved by 0.3 per year on average until 2011 from 16.9 in 2009.

<Table 4-13> Transmission and Distribution Loss Factor Variation Development in Paraguay

Classification	2006	2007	2008	2009	2010
Transmission and Distribution Loss Factor [%]	33.5	32.7	32.7	32.2	32.6
Annual Average Increase and Decrease	38.4	38.4	-2.7		-2.7
Distribution Loss Factor [%]	25.4	25.1	23.7	24.6	25.0
Annual Average Increase and Decrease	38.0	38.0	-1.6		-1.6
Transmission Loss Factor [%]	8.1	7.5	9.0	7.6	7.6
Annual Average Increase and Decrease	39.7	39.7	-6.1		-6.1

<Fig. 4-4> Power Transmission and Distribution Loss Factor Variation Development of Paraguay Project



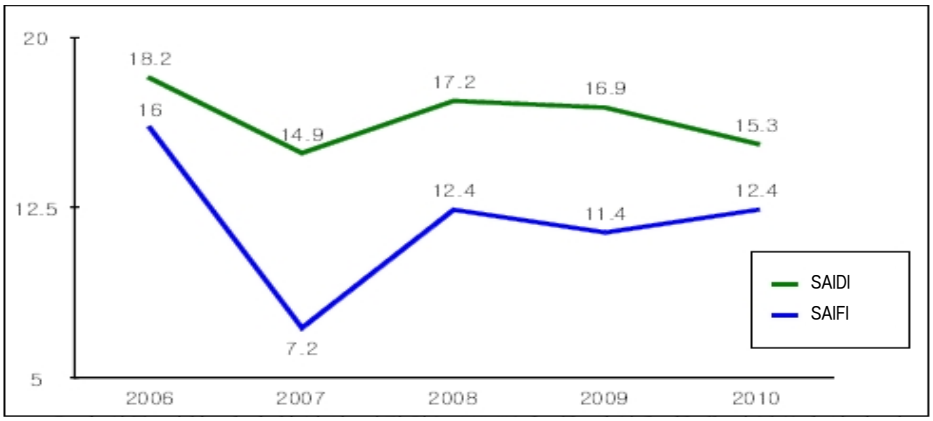
<Table 4-14> Paraguay Supply Reliability Variation Development[19)]

Unit: DEP[hours/kVA-year], FEP[N° /kVA-year], Increase and Decrease[%]

Classification	2006	2007	2008	2009	2010	2011	Annual Average Increase & Decrease
DEP Increase & Decrease	16.0 Standard	7.2 -55	12.4 72.2	11.4 -8.1	12.4 8.8	10.7 -13.7	-1.1 -6.6
FEP Increase & Decrease	18.0 Standard	14.9 -18.1	17.2 15.4	16.9 -1.7	15.3 -9.5	16.3 65.4	-0.4 -2.1

19) ANDE STATISTICAL SUMMARY 2007-2011
ANDE Memoria y Balance 2010

<Fig. 4-5> System Average Interruption Duration and Frequency Index Development of Paraguay Project



2) Changes Given to Related Organizations

○ The trust became stronger as much as government ministries related to the recipient country and ANDE requested to verify the effectiveness and efficiency of a self-master plan that was already approved with advanced Korean technologies through the identical project.

○ They requested a support for a survey job to improve high distribution loss factor that reached almost 30% which was the biggest problem of power field in Paraguay.

○ They hope that Korea participate in the expansion of AMR pilot project and in the project of replacing the current mechanical meters with electronic meters.

3) Expansion Possibility of Project Target Areas

○ The replacement by electronic meters which is an essential prior phase of AMR is actively in progress related to a pilot project AMR installation.

E. Evaluation on Sustainability

1) Sustainability of Project Effect

○ The program of a distribution plan that was provided and educated in the Feasibility Study on the master plan of power distribution field is being utilized when establishing a 2 major regions plan biennially, and they have a plan to expand it annually.

○ They showed interest in Smart Grid seeking green growth combining power system technologies with IT technologies.

2) Education Program for AMR Operation

○ The existing AMR operation has been passed on through a hands-on training within the place of business focusing on trainees and they expressed their interest in the recent AMI (Advanced Metering Infrastructure)[20]

3) Maintaining Stable Operation of AMR

○ An AMR server, a terminal meter, modems and communication equipment are being stably operated, and hardware failure due to lightning is repaired by reserve stocks.

○ Since the field meter reading and billing works continue by a meter-reading person after AMR installation, the situation is that the verification of AMR effects and expanded distribution are being held in abeyance. However, workers in AMR department are confident in AMR features and its

20) AMI is duplex communication between modems with a built-in electronic electricity meter (smart meter) and a built-in PLC (Power Line Communication) Chip and is the latest technology realizing DR (Demand Response) · real-time billing system as well as automatic meter reading. KEPCO KDN (Sep. 28, 2011)

maintenance, and they hope that they can get involved in and take initiative of automatic meter reading and billing works.

- Since decisions from high-ranking executives such as changing the department bearing communication fee related to AMR and job adjustment and a reshuffle of the existing meter-reading persons and the billing department and changing policies of employment need to be made in order for replacement by automatic meter reading and billing works, they make a recommendation of it.

F. Cross-Cutting Issue[21)]

○ It could be verified through interviews and questionnaires that the project had a positive influence in the aspects of human rights, gender equality, environment etc.

G. Evaluation on Satisfaction through Questionnaire Response Analysis

The overall satisfaction of Paraguay project through questionnaire response analysis was 76.8 points, and the weight responded at higher grade than 'good' is 86%, which shows very good satisfaction.

○ The satisfaction analyzed by 5 evaluation criteria shows mostly good satisfaction as below.

- The score of questionnaire analysis regarding relevance was 77 points, and the weight responded at higher grade than 'good' was 89%, which shows generally good satisfaction.
- The score of questionnaire analysis regarding efficiency was 77 points, and the weight responded at higher grade than 'good' was 78%, which shows

21) Fourth High Level Forum on Aid Effectiveness, Pusan, Policy Suggestions for Overseas Assistance Consultation for Korea (Dec. 1, 2011)

good satisfaction.

- The score of questionnaire analysis regarding effectiveness was 75 points, and the weight responded at higher grade than 'good' was 91%, which shows good satisfaction.
- The score of questionnaire analysis regarding impact was 77.1 points, and the weight responded at higher grade than 'good' was 92%, which shows good satisfaction.
- The score of questionnaire analysis regarding sustainability was 78.8 points, and the weight responded at higher grade than 'good' was 69%, which shows satisfaction.

<Table 4-15> Questionnaire Analysis by Evaluation Criteria of Paraguay Project

Evaluation Criteria	Respondents [Person] Response Weight[%]	100 Point Conversion Score				
		50 Average	75 Good	100 Excellent	Total	Average
Relevance	37 100	4 100	26 89	7 19	2,850	77.0
Efficiency	37 100	8 100	18 78	11 30	2,850	77.0
Effectiveness	23 100	2 100	19 91	2 9	1,725	75.0
Impact	12 100	1 100	9 92	2 17	925	77.1
Sustainability	13 100	4 100	3 69	6 46	1,025	78.8
Cross-Cutting	16 100	1 100	13 94	2 13	1,225	77.0
Paraguay Total Response Weight at Higher-Grade	138 100	20 100	88 86	30 22	10,600	76.8

○ The result of analysis by project fields shows that the Feasibility Study on power distribution was 77 points, and the weight responded at higher grade than ‘good’ was 84%, which were good and AMR pilot was 76.8 points, and the weight responded at higher grade than ‘good’ was 100%, which were very good, and the training was 77.1 points, and the weight responded at higher grade than ‘good’ was 79%, which showed good satisfaction.

<Table 4-16> Questionnaire Analysis by Fields of Paraguay Project

Evaluation Item Field			100 Point Conversion Score by Evaluation Items					
Field	Item	Ratio	Response	50 Average	75 Good	100 Excellent	Total	Average
Power Distribution Validity Higher Grade Response Weight[%]	6	35.5	49 100	8 100	29 84	12 25	1,000	77.0
Automation Pilot Higher Grade Response Weight[%]	5	10.1	14 100	100	13 100	19 16	1 7	76.8
Training Higher Grade Response Weight[%]	3	17.4	24 100	5 100	12 79		7 29	77.1
Common Higher Grade Response Weight[%]	9	37.0	51 100	7 100	34 86		10 20	76.5
Paraguay Total	23	100.0	138	20	88	20	30	76.8

3. Egypt Project

A. Evaluation on Relevance

1) Conformity Degree with National/Regional Development Plans of the Recipient Country The northern Cairo region in Egypt is the center of electricity demand, with anticipation of 7% of increase in load until 2016; but there are problems such as high rate of loss in electric supply (13%), frequent power cuts, insufficient technological personnel, and lack of experience on electricity distribution technology. The Egyptian Electricity Board anticipated future increase in electrical demand, establishing a long term plan (year 2002-2022) in the electricity field, and in particular included the "Electricity Distribution Automated System Establishment Project" in the state project "Northern Cairo Electricity distribution Company (NCEDC) Development Plan (10 years)", responding actively and speedily to the request of the donor country.

○ The northern Cairo experiences frequent power cuts and the overall electrical quality is low. This is a problem of obsolete equipment and operational technology. The NCEDC seeks to establish a strategy for reduction in electric supply loss and increase in electricity distribution reliability by introducing advanced electricity distribution operational technology.

○ The 3 target areas for the project are commercial center (Nasr City), administrative center (Heliopolis) and industrial center (Shoubra), which are regions where electricity distribution reliability is important. Therefore it is judged that Feasibility Study of Nasr City and Heliopolis, and selection of DAS installation project of Shoubra are appropriate.

2) Conformity Degree with Support Strategy / Priorities of the Donor Country

○ At the time of the 2008 project, priority of the Egyptian government was high and therefore the priority of support at KOICA was also high. Also, it was a time when electrical field consulting projects were promoted and vocational training projects were many, therefore it was appropriate to select and support Egypt as the project target country.

○ The 『Egyptian Electricity distribution Automated System Establishment Project』, suggesting strategy to improve reliability of electrical supply and seeking increased efficiency and reliability in the electricity distribution field by establishing an electricity distribution automated system fitting the characteristics of the Egyptian electrical system, was a project conforming to the active support policy of the Egyptian government and foreign aid project policy.

3) Establishment of Project Plan Reflecting Request of the Recipient Country

○ In order to satisfy the request of the recipient country being improvement of electricity distribution supply reliability, education expert technological personnel, and acquiring advanced electricity distribution technology, the donor country sought to improve the reliability by comprehending the reducing factors of electricity distribution supply reliability and suggesting improvement strategy in the "Electricity Distribution Supply Reliability Improvement Feasibility Study". Moreover, as a part of the improvement strategy, improvement of reliability was sought by reducing power cut intervals, and reducing breakage and power cut time through "Electricity Distribution Automated System Establishment Pilot Project". Electricity distribution technology was passed on naturally to the technicians of the

recipient country during the system operation process of the pilot project, and lastly technological personnel was trained through training with electrical technicians invited into the country. This was an appropriate plan and progress which satisfied the request of the recipient country.

4) Relevance of Input with the Purpose

○ For support fitting the macroscopic purpose off electricity distribution efficiency, the solution must be suggested after comprehending the local circumstances and problems. To this the donor country comprehended the Egyptian local circumstances and problems and suggested the solution by carrying out a Feasibility Study for comprehension of local circumstances and problems and suggesting the solution.

○ As one of the solutions, by establishing DAS in a particular region, showed an example to the recipient country of electricity distribution efficiency. Therefore the project of the donor country was appropriately planned, was carried out by investing an appropriate amount of funds, and electricity distribution expert personnel was dispatched to carry out the project.

5) Relevance Considering Social, Cultural and Environment Conditions of Recipient Country

○ Most Muslims put great priority on religious events such as the Ramadan. No less than 90% of the Egyptian residents are Muslims, with a culture of not eating or working during the daytime hours during the 1 month period of Ramadan.

○ Therefore, the work process was planned considering the fact that it is unreasonable to carry out work such as installation of electricity distribution

automated system, and such appears to be an appropriate establishment of plan considering the social and cultural conditions.

B. Evaluation on Efficiency

1) Efficiency of Project Period to Achieve Goal of the project

○ It was strictly managed to match the planned process and results of 24 months of project period from December 1008 to November 2010.

○ When the project period in the business plan and the final report, it can be seen that the project was efficiently carried out during the planned period.

2) Efficiency of Total Project Costs to Achieve the Goal of the Project

○ According to the usage details of the total project budget per year, the total rate of usage of budget is 89.6%, showing that the final usage amount was less than the planned amount. From such, it can be seen that it was efficiently used in accordance with the planned budget.[22)]

<Table 4-17> Egypt Project Usage of Budget per Year

Classification	Planned amount [$] (Ratio)	Actual usage [$] (Ratio)	Rate of usage (%)
Total	1,885,135 (100%)	1,688,929 (100%)	89.6%
Dispatch of expert	823,267 (43.7%)	682,700 (40.4%)	82.9%
DAS establishment	885,870 (47%)	885,870 (52.4%)	100%
Invitation training	142,235 (7.5%)	105,875 (6.3%)	74.4%
Other	33,763 (1.8%)	14,484 (0.9%)	42.9%

22) Egypt Electricity Distribution Automated System Establishment Project Completion Report, KOICA (internal document)

○ Even the usage details of each project, being expert dispatch 82.9%, DAS establishment 100%, invitation training 74.4%, and other 42.9%, showing an efficient usage compared to the plan.

○ In case of DAS establishment, usage rate is higher than other project categories, but this is because expense for equipment, tools and materials took up a large part of the budget, and it can still be said to be an efficient usage because the planned amount was not exceeded.

3) Efficiency of Project Implementation Process

○ By introducing donor country expert personnel 84MM (dispatch 28, domestic support 56), evaluation personnel 4MD, supply reliability improvement Feasibility Study, DAS establishment and invitation training (6 supervisors for 10 days, 14 technicians for 14 days) were efficiently carried out.

○ For efficient execution of the project, the participating personnel were divided into personnel in charge (PM, reliability expert, electricity distribution automation expert) and supporting personnel (electricity distribution operation, repair expert automation design related expert, training expert). Personnel in charge carried out work at the site, and supporting personnel carried out inter-supplemental work such as carrying out in Korea the work which cannot be done at the site. Moreover, persons with experience of overseas project were appointed to respond to unexpected problems which may occur overseas.

○ Electricity distribution automated system establishment pilot project was carried out together with corporation with automation related original technology and overseas export experience, to reduce trial and error. (in actuality, Korea Electricity KDN the corporation which carried out the

work is a corporation in charge of electricity distribution automated system installation for KEPCO, and which has the overall technology of DAS.)

○ Data provided by the recipient country alone is insufficient to suggest reliability improvement strategy, and site investigation and actual measuring of the necessary number of sites was required in order to comprehend reliability reducing factors. Subsequently, in order to secure the objectivity and accuracy of the provided data, the verification TOOL used in reliability data collection procedure suitability verification of utilities in the US in 2003 were used to verify the accuracy of the data. This is an appropriate procedure to suggest reliability improvement strategy.

○ As above, that skilled and experienced personnel were gathered and placed, verification tools were used for securing of objective data and project was carried out through actual measuring of the site can be seen to be appropriate methods to reduce trial and error and manage time and expenses efficiently.

4) Efficiency of Utilization of Recipient Country Experts

○ On execution of the project, the recipient country enabled progress of the project through cooperation of high level local expert with supervisor of the Korean side, and responded efficiently to passing on of technology by accompanying in all processes of DAS installation.

○ Considering from the fact that after completion of the project, site work such as H/W installation was able to be resolved by local expert alone, it is determined that utilization of recipient country experts was efficiently carried out. However, in conclusion, it can be seen as a half success due to the aspect of wrong response to H/W and S/W problems (breakage).

C. Evaluation on Effectiveness

1) Effectiveness of Feasibility Study Report

○ During the site investigation process, it was questioned whether the electrical supply reliability improvement strategy was put into action in accordance with the Feasibility Study report, and the recipient supervisor and workers only gave reply that it was done well, and did not provide actual data. Also, it was questioned whether the breakage record form recommended by KEPCO during questionnaire was used, and through the response, it was comprehended that the breakage record form was utilized well.

○ It is difficult to confirm whether the improvement strategy provided through the same project was put into action. First, no detailed data was provided by the recipient country, and even if it was put into action, 3 years is not a sufficient time to change all obsolete cables and check the effects. It still appears to be a stage for reviewing.

2) Effectiveness of Pilot Project DAS Construction

○ In conclusion from mention and response to questionnaire by local related persons, and confirmation during site investigation, DAS is operating well. However, a difference in the actual breakage time and recorded time is occurring due to S/W breakage, and due to such, repair time of the broken part becomes late. Moreover, it is not a good phenomenon in terms of long term accumulation of data. The possibility of other error occurring in consequence of such also cannot be ignored.

○ From the fact that during the past 3 years, frequency of breakage site inspection by inspector decreased through DAS establishment, and that

customer complaint such as civil complaint decreased, it can be considered that some kind of effect was obtained in terms of reduction in power cut frequency, reduction in power cut time, and improvement of electricity quality according to the purpose of DAS establishment. However, it is regrettable that a greater effect was not able to be achieved due to the small scope of DAS installation.

3) Effectiveness of Invitation Trainings and Experts Dispatch

○ Another goal of the same project was acquiring advanced electricity distribution technology and training expert personnel. For this, passing on of technology and invitation training was carried out during the electricity distribution automated system operation process. From the result of counseling training participants at the time and the present system operating personnel, local technicians were able to improve system operating skills and technological understanding with technology passed on at time of invitation training and system establishment, but had low responding skill to H/W and S/W breakage. This shows that there was an insufficient aspect of invitation training and technological education.

D. Evaluation on Impact

1) Changes Given by the Project to Target Areas

○ Effects of reduced power cut time and reconfirming of reliability between customer and company (NCEDC). This can be seen indirectly from the fact that complaints such as civil complaint from power cuts decreased, and that the work time of breakage maintenance agent decreased due to remote control of DAS system becoming possible.

○ 3 years is a too short a time for strategies suggested at the "Electricity Distribution Supply Reliability Improvement Feasibility Study (Consulting)" including obsolete underground cable substation construction, thermal burn diagnosis, and usage of cable protective plate to show effects. It is because the entire electricity distribution system of Heliioipolis and Nasr City are composed of underground cable routes, therefore finding the obsolete cables and carrying out substitution construction itself takes a considerable amount of time. Therefore, the level of satisfaction indicated through questionnaire and discussion can be said to be the effect of electricity distribution automated system rather than the Feasibility Study report.

2) Changes Given to Related Organizations

○ In interview with the CEO of EEHC, he showed interest in when the secondary project is being carried out. He mentioned that if there is no aid of the secondary project or reserve parts, that he will look for businesses of other donor countries. The fact that a local policy-maker mentioned such a thing can be said to be an evidence of having experienced the necessity of DAS. If he felt that DAS was unnecessary, he would not have mentioned that if there is no aid of the secondary project or reserve parts, that he will look for businesses of other donor countries.

○ However, if EEHC policy or system actually changed, then a self-commenced project plan would have already been established and executed. Looking for aid for secondary project or other donor countries can be said to be showing no intention of expansion their own project, and this is regrettable. It seems that we should be satisfied at bringing a change in the awareness held by a policy-maker of the recipient country. However, change in awareness

is the most difficult problem, and once it is changed, it can be said that possibility of expanding the project has already been opened.

3) Expansion Possibility of Project Target Areas

○ The prerequisite of expanding project target area is whether the active policy support of the recipient and the rationale of original project of the donor country match each other. If the two conditions match each other appropriately, it is determined that the target area can be expanded without problem. However, if the recipient country wants unconditional or if donor country businesses participate with commercial purposes with the free original project as opportunity, expansion of target area would be a difficult thing to do.

E. Evaluation on Sustainability

1) Sustainability of Project Effect

○ The recipient country has been operating the system for 3 years after completion of project, but system operation is being unclear due to problems of S/W breakage handling. The donor country has provided an operational manual when evacuating the project, but it appears that it was difficult for the local technicians to completely understand. The reason could have been because endeavors by local technicians to upgrade their skills were insufficient or because the standard of the manual was too high. It is difficult to any one party for fault.

○ 95.2% of the respondents responded yes to the question of whether electricity distribution automation technological education should be maintained. This shows that the local technicians are feeling the necessary of education.

However, because there is no educational program self-operated by the recipient institution, they were wanting that education would continue through exchange with the donor country. Because this is links directly to DAS operation, if provision is possible, sustainability would be enhanced further.

○ At the present condition, DAS cannot be 100% utilized. If is because if accurate collection of data is not carried out due to S/W breakage, possibility of error occurring in comprehending breakage site and remote control.

○ In order for effects of the project to continue in the long term, technological independence of the recipient country must be the issue with priority. For technological independence, help of donor country and the will of the recipient country for technological independence is needed.

○ In the discussion at the site country, the workers were experiencing realistic difficulties regarding handling of breakage, and it is determined that improving sustainability of the project and possibility of developing follow-up projects will be able to be enhanced through expanding communication window between project operators of donor and recipient countries.

○ Donor country needs to continually notify the recipient country in order that the communication window with the recipient country can be the KOICA office at the site country. Moreover, policy-makers of the recipient country must provide political support such as technological training for technological upgrading of the local technicians and introduction of advanced system.

Conclusion and Recommendations

Chapter

V Conclusion and Recommendations

1. Major Evaluation Results and Lessons Learned

A. Relevance

○ From the evaluation results, the electricity distribution appropriateness investigation and the electricity distribution automated system (DAS) or automatic maintenance and repair (AMR) pilot project and training/education were appropriately selected as highly valid projects in accordance with the development plan of the recipient country and the support strategy priority of the donor country.

○ It was assessed that in accordance with the setting of the recipient country, introduction fitting the project purpose was carried out by deciding the focused fields as improvement of supply reliability or AMR pilot project and electricity distribution loss reduction strategy, and the social, cultural and environmental conditions of the recipient country were suitably considered.

B. Efficiency

○ The project period and total project expenses of the 3 countries were practically planned and appropriately adjusted. Moreover, using modern process control method, project schedule, personnel and budget introduction were strictly controlled. It is assessed to have enhanced efficiency by completing while

matching the original plan or adjusted plan, by distributing and utilizing experts of the recipient country per field.

C. Effectiveness

○ From the result of analyzing the effects of DAS or AMR system installed for effect of validity report and as pilot project, constant effects were shown such as reduction in distribution loss factor, power cut time, and power cut frequency. Moreover, effectiveness was increased by passing on new knowledge and technology and enabling such to be utilized in actual work.

D. Impact

○ Contributed to providing motivation regarding introduction of new technology and enhancing satisfaction, by providing training of the latest technological process to supervisors and workers in the 3 recipient countries. While still unsatisfactory, also contributing to providing the foundation for technological exporting of the donor country.

E. Sustainability

○ Effects of the project are being continued the functions of the system installed as pilot project were effectively used, and part of the system is requiring self-upgrade or expansion. Moreover, operation education of the system is being continued.

2. Suggestions Related with Projects

A. Indonesia Project

1) Planning Stage

○ During the project planning stage, the plan must be established to form a smoother corporation system, by thoroughly reviewing the difference between characteristics of the donor country electricity system and operating organization and the status and characteristics of recipient country electricity system and that of their operating organization.

- The electricity system of KEPCO is an integrated single system with the operating organization also being a single corporation as a unified system, but on the other hand, the electricity system and operating organization of Indonesia are functionally and regionally independent and diverse. Therefore, there is a need to consider diversity per region for carrying out of electricity distribution system improvement project, pilot project and training project.

2) Execution Stage

a) Electrical distribution system improvement project Feasibility Study (reliability improving strategy)

○ Electrical distribution system improvement project Feasibility Study in Indonesia is a reliability improving strategy; a validity review, which determines the priority for loop or network method over radial method for zones or customers requiring high supply reliability and improving gradually year by year, is recommended.

b) DAS pilot project

○ It is recommended that DAS is supported to enable development into the already substituted smart distribution system, and power cut statistical analysis is to use the data secured through DAS, comprehending the reliability index per equipment, period, region, and cause, and establish an appropriate strategy.

c) Training/education

○ Recommended to support aftercare regarding training/education during the usage period of the provided technology and equipment, and establishing online or offline education network to enable data exchange and communication.

3) Aftercare Stage

○ Review desired regarding electricity distribution field master plan establishment project which provides distribution plan program similar to the Paraguay cooperative project for continued utilization of distribution system improvement Feasibility Study and expansion of project in Indonesia.

B. Paraguay Project

1) Planning Stage

○ During the project planning stage, the plan must be established to form a smoother corporation system, by thoroughly reviewing the difference between the characteristics of the recipient country electrical system infrastructure and operating organization.

- Compared to KEPCO, electrical system and operating organization of

Paraguay are functionally and regionally independent and diverse.

- Therefore opinions regarding AMR pilot project are all different; therefore consistency throughout regions and departments is difficult to anticipate, and such diversity must be considered.

2) Execution Stage

a) Distribution field master plan

○ Regarding distribution field master plan of Paraguay, it is recommended that a mid to long term distribution field master plan which can reduce distribution loss by linking with transmission line expansion plan securing power interchange ability of a level to be able to maintain the supply reliability balance between the regions in accordance with demand forecast per region be established and as short term correction work reflecting the reality be continued to be carried out.

b) AMR pilot project

○ There is a need to handle AMR concurrently with the currently performed manual check-up, go through an inter-comparison process and move finally onto an automated system.

c) Training/education

○ Recommended to establish a system to enabling data exchange and communication by establishing online or offline education network which supports aftercare during the usage period of AMR equipment and utilization of the provided distribution plan program.

3) Aftercare Stage

○ IDAS commercialization project can be considered in Paraguay in the future for distribution plan program utilization, AMR commercialization or expansion of similar project.

C. Egypt Project

1) Planning Stage

○ There is a need to establish the project plan considering the climatic, cultural, and religious environments in the overall. During the execution of this project, there was a problem of installation being delayed because the installation was planned during the summer and Ramadan period. This is a factor which significantly reduces work efficiency. Therefore, for process requiring local personnel, the circumstances of the recipient country must be comprehended in the overall, and such must be considered when establishing the plan. Moreover, the project plan must be thoroughly established in accordance with KOICA project execution procedure.

<Table 5-1> KOICA Project Execution Procedure

1. Project commencement agreement with government of recipient country
2. Submission of official project request to recipient overall supervision institution of recipient country
3. Validity review regarding the requested project (dispatch of investigation team)
4. Pre-selection of project
5. Confirming project details (signing Record of Discussion)
6. Agreement between governments
7. Selection of project operator and execute project
8. Evaluation of project

2) Execution Stage

a) Distribution supply reliability improvement Feasibility Study

○ It cannot be ignored that the improvement effect and reliability index may differ depending on the accuracy of the data itself, because various data and measurements used to suggest the distribution supply reliability improvement strategy were based on the data provided by the recipient country. Of course where possible the reliability of the data may be increased through actual measurements, but there is a limit to covering all required data. The focus of the Feasibility Study is securing data, and because securing of data in most developing countries is very difficult, therefore Feasibility Study must be carried out after planning and carrying out data securing strategy and reliability securing strategy for the provided data.

○ Feasibility Study (consulting) project is a good project which enables comprehension of reliability reducing factors and analyzing the factors to increase reliability and technology, but in the current situation in Egypt, Feasibility Study project does not have high appropriateness or effectiveness. Therefore, whether to carry out Feasibility Study (consulting) should be decided after comprehending well through Feasibility Study for other similar project planning whether the recipient country has firm will to carry out the improvement strategy and whether they want a visible result. If the recipient country merely stores the validity report and does not put it into action, tangible support such as DAS establishment would be a more effective project.

b) DAS establishment pilot project

○ DAS system is a part of distribution supply reliability improvement, and has small scope of installation. Therefore, effects of reduction in power cut time and area, and reduction in waste in personnel from dispatch to site were able to be seen, but significant effects could not be seen. Consequently, for similar project planning, if DAS establishment scope is expanded or the project is provided concurrently with support provided at a cost (materials and equipment at a cost, and education etc. for free), greater effects would be able to be obtained.

c) Invitation training

○ In the questionnaire and interviewing process, there were opinions that the depth and period of the training (10 days for supervisor, 14 days for technician) is short. Such a period of time is too short to fully understand the details of the education, and programs such as introduction of distribution technology, visiting the electrical power facility, visiting material and equipment production company, and Korean cultural experience etc. would not have direct influence on technological independence of the recipient country. Therefore the education should be operated in accordance with a systematic program, and the period should be extended as much as required for full understanding of the core details. For example, independent problem solving abilities would be greatly increased if supervisors and workers are education long term (no less than 1 year) and trained to be experts.

3) Aftercare Stage

○ There is a need to clearly determine the scope of the project in order to respond to various problems which may occur in the aftercare stage.

- Additional support regarding depletion of reserve hardware parts is outside the scope of the project. There is a need to confirm a clear scope of A/S regarding such through agreement between the two countries before the project.
- Insufficient ability to respond to breakage on part of the local technicians is a problem (matter to be improved) of passing on technology during system installation and invitation training. Even after completion of the project, recipient and donor countries should aim to increase the capacity of the local technicians through continued exchange.
- Therefore, if there is a similar project in the future, plan and A/S strategy which can increase technological independent of the local technicians should be established and project should be progressed on such basis.

○ Sustainability of distribution supply reliability increase improvement strategy and DAS establishment project depends on the will of the recipient country to sustain the project. There may be differences in opinion with the donor country in terms of aftercare, but such can be resolved through explanation of scope and rationale of project and agreement between the countries, therefore it is an issue that must be decided before commencement of project for similar projects.

- In case of invitation training for project in Egypt, difficulties are being experienced in handling of S/W breakage of the provided instruments, because the training focuses on distribution system theory and management. This is a problem which can very well occur in similar projects in the future. There is a need to be considerate of the recipient country technicians by developing the S/W in Open Source Code, or relieving

the technological monopoly of application supplier. In order to resolve this, when deciding the project operator, indicating such as a contractual condition can also be a good strategy.

3. Policy Recommendations

A. Increase Effectiveness by Proceeding with Similar Cooperative Project in the Future

◈ Expansion project considering the development needs of the recipient first

○ Development of electrical power industry which is the driving force of the economic development of the recipient country is continued to be required, and out of such in particular, increase of supply reliability due to improvement of transmission and distribution facility and expansion of distribution loss reduction project is required.

- Priority in improving supply reliability is in the order of Paraguay with the lowest reliability, Indonesia, and Egypt, and there is high necessity of DAS project.

<Table 5-2> Major Countries Supply Reliability Index

Country	Region	Power cut frequency SAIFI [no. of times/Customer]	Power cut time SAIDI [minutes/no. of times]	Power cut time per time CAIDI [minutes/no. of times]	Notes
Indonesia	PLN	6.82	418.2	61.319	Source: PLM STATISTICS 2010, p.17, PT PLN (June 2011)
	Cent. Java	5.70	253.60	44.491	Source: DATA DAN STATISTIK TAHUN 2011, pp.30-31, PT.PLN (Maret 2012)
	Semarang	8.75	373.02	42.630	

<Table 5-2> continued

Country	Region	Power cut frequency SAIFI [no. of times/Customer]		Power cut time SAIDI [minutes/no. of times]	Power cut time per time CAIDI [minutes/no. of times]	Notes
Paraguay	ANDE	*216.3		*2642.0	39.386	*1[hours/kVA-year] *2[N° /kVA-year] Source: STATISTICAL SUMMARY 2007-2011, ANDE (2012)
Egypt	NCEDC	Total	1.439	87.918	170.701	Source: Final Report on Project for Developing and Automating the Electricity Distribution System in North Cairo, Egypt pp.31-140, KOICA & KEPCO (Dec 2010) *3Breakage and power cuts (unplanned interruptions): Europe; Austria, Denmark, Germany: within 50[minutes]; France, Ireland, Italy 50~100[minutes]; Portugal, Spain; 100~120[minutes]
		Work	0.313	40.152	128.281	
		Breakage*3	1.126	47.766	42.420	
	Nasr City	Total	0.80	40.81	176.784	
		Work	0.15	22.23	148.200	
		Breakage*3	0.65	18.58	28.584	
	Heliopolis	Total	0.21	14.70	95.554	
		Work	0.18	14.2	78.888	
		Breakage*3	0.03	0.50	16.666	
Korea	KEPCO	Total	0.48	17.19	105.677	
		Work	0.11	9.27	84.272	
		Breakage*3	0.37	7.92	21.405	

- Priority for reducing distribution loss is appropriate to apply AMR project in the order of Paraguay with the highest loss, Egypt, and Indonesia, and out of such Paraguay has excessive distribution loss, therefore there is high necessity to expand AMR project with priority.

<Table 5-3> Major Countries Transmission and Distribution Loss Factor

Country	Region	Distribution Loss Factor [%]		Notes
		Transmission	Distribution	
Indonesia	PLN	2.25	7.64	Source: PLM STATISTICS 2010, p.3, PT PLN (June 2011)
	Cent, Java		5.96	Source: DATA DAN STATISTIK TAHUN 2011, pp.58, PT.PLN (Maret 2012)
	Semarang		6.37	
Paraguay	ANDE	7.6	23.5	Source: STATISTICAL SUMMARY 2007-2011, ANDE (2012)
Egypt	NCEDC		13: technological loss 7+ Non-technological loss 6 (non-collection of fee 4+ electricity stolen 2)	Source: Egypt DAS establishment project – detailed execution plan, p.. KOICA (Jun 2008)
Korea	KEPCO	2.16	1.53	Source: Korea Electricity Statistics 2011, KEPCO (Jun 2012)
Major countries	Japan 5.10, USA 6.10, France 7.20, UK 7.70 Source: JAPAN ELECTRIC POWER INFORMATION CENTER, INC. (JEPIC 2011, EPSIS, 2012)			Japan 4~5, USA 6, France 6~7, UK 7~8 Source: http://data.worldbank.org/indicator/EG.ELC.LOSS.ZS?page=1

○ Consequently, expansion of the applicable project is recommended, and also actively proceeding with advance of our company with international competitiveness in distribution field computerization, and DAS and AMR fields is desirable.

○ At the time, regarding distribution field computerization, and DAS and AMR technology, foreign items were localized and exported by Korea a donor country, and the appropriateness was high due to the development plan of recipient country and support strategy priority of donor country matching each other.

○ The distribution field computerization, and DAS and AMR technology of Korea at the moment is internationally considerably high, and in case of

the recipient country also, because technological accumulation was done through pilot project, it is recommended to increase the effectiveness by proceeding with similar cooperative projects in the future.

B. Strengthen A/S System

○ Regarding the provided technology endeavors to improve on efficiency, effectiveness and influence is required from both donor and recipient countries.

○ It is desirable to strengthen A/S system in order to enhance the independence of recipient country within the life cycle during which the applicable technology is used without exchanging (approximately 5 years for information communication projects) and increase the desire to distribute and expand similar technology.

○ There is a need to prepare a cooperation system by activating A/S system to enable securing of information when in the future the recipient country receives support for a cost or carrying out similar projects by ordering from itself.

○ Increase sustainability in the initial project planning process, by considering also the maintenance and repair expenses during the entire usage period during budget setting or economic value review.

○ It will be helpful in the future if with the cooperation of the recipient country, the evaluation index between target clients connected to the pilot project and non-target clients is analyzed and utilized in similar cooperative project plan and execution in the future.

Appendix

Appendix

Questionnaire

1. Indonesia, Egypt

This Questionnaire is prepared for assessment of "Feasibility Study for the Improvement of the Electric Distribution System in 3 cities and Establishment of a Distribution Automation System(DAS) Pilot Project in Semarang, Indonesia" /“Egypt Power distribution Automization System Establishment Project”. The information acquired through your participation in this survey will be used as valuable source for the development of KOICA/ODA projects. We deeply thank you for your cooperation.

Personal information

Please tick in the parenthesis or fill in the answer to the questions below.

1. Sex male( ) female( )
2. Age ( )
3. Occupation ( )
4. Participating area in the project ( )
5. Current work in charge ( )

Questionnaire items

[Relevance]

1. I think this project considered appropriate technical requirements for the purpose of stable power supply.
   Never( ) No( ) Neutral( ) Yes( ) Very much so( )

2. I think that this project adequately responded to demands for power quality enhancement.
   Never( ) No( ) Neutral( ) Yes( ) Very much so( )

3. I think that this project is adequately planned and facilitated in consideration of power distribution network system of the beneficiary country.
   Never( ) No( ) Neutral( ) Yes( ) Very much so( )

4. I think there was adequate cooperation between the beneficiary country and donor country in the course of this project performance.
   Never( ) No( ) Neutral( ) Yes( ) Very much so( )

5. I think appropriate work is proceeded in this project for speedy technological settlement.
   Never( ) No( ) Neutral( ) Yes( ) Very much so( )

6. I think the project is processed by optimal plan to reduce power outage during project implementation.
   Never( ) No( ) Neutral( ) Yes( ) Very much so( )

7. I think the project is planned and processed by optimal plan to minimize social effect (traffic hazard induced etc.) during project implementation.
   Never( ) No( ) Neutral( ) Yes( ) Very much so( )

8. I think this project presented effective method to enhance confidence of power distribution.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

[Efficiency]

1. I think the project implementation period was appropriate.(Comparison between project task and implementation period)

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

2. I think the implementation process was efficiently managed.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

[Effectiveness]

1. I think the target of the project was well achieved.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

2. I think KOICA's investment support was effectively provided.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

3. I think the potential risk of this project was well managed.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

4. I think utilization of professionals was effectively managed.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

[Impact]

1. I think the confidence of power distribution in the project area was enhanced

after project completion.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

2. I think the power outage accidents in the project area have decreased after project completion, and acknowledge that phenomenon is attributable to the effect of this project.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

3. I recognized the importance of data computerization after completion of this project, and am applying to power distribution facilities operation.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

4. I think the success of this project will stimulate the birth of similar projects.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

5. Korea's image was changed as positively after this project completion.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

6. After project completion, I changed my mind positively to introduction of Korean technology.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

7. I think this project is contributing to social and economic developments.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

[Sustainability]

1. I think the support from central department and department in charge was continued.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

2. I think the functions of equipments and facilities were maintained.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

3. I think breakdown improvement operation technologies were enhanced after power distribution automization facilities establishment.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

4. I think power distribution operational skill training has been upgraded.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

5. I think power distribution operational skill training shall be maintained.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

6. I think the project has been helpful not only to facilities but also improvement of operational skill by facilities operator, and operational improvement is in progress.

Never( ) No( ) Neutral( ) Yes( ) Very much so( )

Thank for your kind response. Your answers will be used only for assessment of KOICA's development projects.

2. Paraguay

Name					
Tel. Email					
Company Position					
Please mark(√) on project status, section, and region.	Pre-survey ( ) Consultation of Implementation ( )	Project Implementation ( )	Training in Korea( ) Training in Paraguay( )	Post management ( )	Mid-term evaluation( ) Final evaluation( )
	Masterplan( ) Capiata( ) Alto Parana( )	AMR( ) Capiata( ) Asuncion( )	Training in Korea( ) Manager( ) Staff( ) Specialist( )	Training in Paraguay ( ) Loss( ) AMR( )	Maintenance ( ) Distribution( ) AMR( )

1. This questionnaire intends to evaluate the performance of KOICA/ODA programs. Thank you for your considerate cooperation.
2. Please mark "√" among rank 1~10 in the evaluation work sheet on page 2~5, and describe reasons or opinions about your judgment.
3. Personal information of interviewers

Evaluationteam	Person in charge	Coordinator	Note
Name	YOON Kap koo	Kang, Il-Koo	
Mobile	+82-10-8882-5683	+82-10-8644-1142	
Email	yoon@ace.re.kr	Andrew45@chol.net	
Counterpart	Coordinator	Interviewer(translator)	
Name	Victor Paravicini	Jose Rodriguez	
Mobile			
Email	Vitor_paravicini@ande.gov.py	Jose_rodriguez	

Rank	1( )	2( )	3( )	4( )	5( )	6( )	7( )	8( )	9( )	10( )
Linguistic Evaluation	Critical	Very difficult	Difficult	Very unfavorable	Unfavorable	insufficient	Normal middle	Fair	Good	Excellent

Creative Ideas Evaluation worksheets, Caltrans Value Analysis Report Guide, Fist Edition June 1999, p.8.5

Evaluation Work Sheet

Evaluation Criterion	Category	Question (Q)/Evaluation grade(R)/Opinion(C)									
A. Relevance: Evaluation of relevance between Recipient/Donor's policy, development priority and the project	Middle and long-term load forecast	Q1: Is the middle and long-tem load forecast properly implemented analyzing increase rate of power sales and economic indexes per industry such as population growth rate, economic growth rate?									
		R1	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W1										
	Substation construction	Q2: Is the substation construction plan including construction schedule, scale, place, and supply area according to load forecast established?									
		R2	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W2										
	Analysis of field condition	Q3: Is detailed analysis of field conditions for AMR project carried out?									
		R3	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W3										
	New construction plan	Q4: Is construction plan of new distribution lines and line routes properly suggested?									
		R4	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W4										
	Training Schedule	Q5: Is the Training Schedule properly planned for the purpose of this project?									
		R5	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W5										
B. Efficiency: Analysis of input and output level considering alternatives	Data collection and analysis	Q6: Is data collection and analysis for the improvement of distribution reliability implemented?									
		R6	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W6										

Evaluation Criterion	Category	Question (Q)/Evaluation grade(R)/Opinion(C)									
	Judgment of project implementation difficulty	Q7: Does pre-survey include detailed information and provide judgmental assistance for project implementation?									
		R7	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W7										
	Software supply and solution	Q8: Are solutions for AMR design and supply issues of software suggested?									
		R8	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W8										
	Economic effect	Q9: Is there a study result of economic effects calculating electricity tariff according to power loss rate, supply reliability?									
		R9	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W9										
	AMR satisfaction level	Q10: Is satisfaction level of people in the recipient country analyzed and reviewed for the introduction of AMR?									
		R10	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W10										
	Training Course	Q11: Is training course prepared properly considered the training purpose and the level of trainee?									
		R11	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W11										
C. Effectiveness: Evaluation of achievement level of project objective	System management and expected effect of AMR	Q12: Is management plan and expected effect of AMR system satisfactorily suggested and thoroughly reviewed?									
		R12	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W12										

Evaluation Criterion	Category	Question (Q)/Evaluation grade(R)/Opinion(C)									
	Power supply reliability	Q13: Do we expect effect of power supply reliability?									
		R13	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W13										
	Power loss rate	Q14: Are direct effects of power loss rate measured?									
		R14	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W14										
	Effect against investment	Q15: Is effect against investment analyzed through the economic feasibility study?									
		R15	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W15										
D. Impact: Effect evaluation of the project on society, economics, environment, etc.	Education effect	Q16: How are effects of the recipient country due to the training program?									
		R16	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W16										
	System pilot operation	Q17: How is reaction of the recipient country about the pilot system operation?									
		R17	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W17										
	Economic Impact	Q18: What is the level of economic impact to the recipient country given by this project?									
		R18	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W18										
E. Sustainability: Evaluation of aftereffects of the project and sustainability	Long-term Distribution Implementation Schedule	Q19: Is the yearly implementation plan suggested for long-term distribution master plan?									
		R19	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W19										

Evaluation Criterion	Category	Question (Q)/Evaluation grade(R)/Opinion(C)									
	Post management	Q20: Is the plan for continuous administrative and technical assistance to extend effects of the project outcome established?									
		R20	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W20										
F. Policy initiative of international society (cross-cutting issues)*	Human rights	Q21: How much does distribution master plan, AMR system and training course affect human rights and equality?									
		R21	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W21										
	Gender awareness	Q22: How much does distribution master plan, AMR system and training course affect the improvement of social participation such as women welfare and gender equality?									
		R22	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W22										
	Environmental impacts	Q23: How much does distribution master plan, AMR system and training course affect improvement of neighboring environment?									
		R23	1 ( )	2 ( )	3 ( )	4 ( )	5 ( )	6 ( )	7 ( )	8 ( )	9 ( )	10 ( )
		W23										

Q: Question, A: Answer, W: Why, Reason & Comments

* Policy Suggestions for the South Korean Government in the Run-up to the Upcoming Fourth High Level Forum on Aid Effectiveness in Busan, 1 December 2011

Interview Sheet

1. Indonesia, Egypt, Paraguay

This Interview Sheet is prepared for assessment of "Egypt Power distribution Automization System Establishment Project ". The information acquired through your participation in this survey will be used as valuable source for the development of KOICA/ODA projects. We deeply thank you for your cooperation.

Questionnaire items

[Relevance]

1. What do you think is the matter to be improved in the course of implementing this project?

2. What do you think is the characteristics of this project? Please explain in relation to the business purpose of KOICA.

3. Were there any difficulties for quality enhancement as the main purpose of this project, during project implementation? (beneficiary country's viewpoint, donor country's viewpoint)

4. Were the contents and period of training program adequate to Egyptian party's needs and acquisition of technologies, and was you at the adequate position to participate in the training program?

[Efficiency]

1. What kind of difficulties arose in the course of discussion or implementation period? (Please explain based on actual schedule vis-a-vas planned schedule)

2. Do you think project cost was enough to achieve the project purpose?

3. Please tell us what level is the input (time, cost, manpower) versus result for the achievement of project purpose?

4. Was the training program sufficient enough to cover training course (contents) within the period, and was the program well managed efficiently?

[Effectiveness]

1. On what level do you think the planned project purpose has been achieved?

2. What is the visible effect appearing as the effect of KOICA's investment support (enhanced confidence, power distribution automation or AMR)? And what do you think was the effect in comparison with the status before the project implementation?

3. What level of purpose do you think has been achieved in potential risk management at this project at minimum cost?

4. What was the level of participation by specialists from beneficiary country, and level of management by them? And what was the capacity of technology intelligibility and site applicability by specialists from beneficiary country?

5. Did DAS or AMR System achieve enhanced operational capacity and technology

intelligibility through the training program?

6. Do you think electricians were developed who can be deployed to project sites?

[Impact]

1. Please tell us your opinion on the power supply satisfaction level. Please explain as the changes after project implementation as you feel.

2. Please tell us your opinion on whether the breakdown record forms presented for the analysis of detailed causes of breakdown are actually utilized, and whether breakdown cause management is helpful.

3. Are the site materials that are real time measured by established distribution automation system or AMR utilized usefully in facilities management?

4. Please tell us if you felt any changes in Korea's image, while you were witnessing the project process, and while you are actually utilizing the solution methods proposed for the efficiency of power distribution facilities operation.

5. Did the training program provide sufficient support to DAS or AMR System operation? If not, what do you think was the reason?

6. Do you think you enhanced your personal ability?

[Sustainability]

1. Please explain whether there is any change in the budget executed for enhancement of supply confidence, comparing with the period ahead of this project implementation.

2. Please tell us what are the breakdown or difficulties that arise during utilization of power distribution automation system or AMR, what are the improvement points, and then what are the responding measures at breakdown.

3. Please tell us your other proposal or opinion. Your ideas will be very much helpful for the assessment of this project.

4. Is there any possibility that the training program contents would be continuously reflected on DAS or AMR System operation?

5. Do you want the training program to be maintained for the purpose of new technology introduction and mutual cooperative interchange between two countries?

Thank for your kind response. Your answers will be used only for assessment of KOICA's development projects.

Ex-Post Evaluation Report for the Three Electric Transmission and Distribution Projects

Published by the Korea International Cooperation Agency(KOICA)
825 Daewangpangyo-ro, Sujeong-gu, Seongnam-si,
Gyeonggi-do, Korea 461-833
C.P.O Box 2545
Tel: 82-31-740-0114, Fax: 82-31-740-0655
Website: http://www.koica.go.kr

ISBN: 978-89-6469-156-4 93320