JOINT EVALUATION REPORT
ON
THAILAND - JAPANESE TECHNICAL COOPERATION PROJECT FOR TRAINING IN THE DISTRIBUTION AUTOMATION SYSTEM

Prepared by
Japanese Evaluation Team
and
Thai Evaluation Team

March 12, 1997

Bangkok
The Kingdom of Thailand

MUTUALLY ATTESTED AND SUBMITTED

TO ALL CONCERNED

March 12, 1997

Bangkok, The Kingdom of Thailand

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I. INTRODUCTION

1. The Evaluation Team

The Japanese Evaluation Team (hereinafter referred to as "the Japanese Team") organized by Japan International Cooperation Agency (hereinafter referred to as "JICA") headed by Mr. Masayoshi Juro, visited the Kingdom of Thailand from February 24 to March 12, 1997 for the purpose of evaluating jointly with the Thai Evaluation Team (hereinafter referred to as "the Thai Team") the achievements of the Project on the Training in the Distribution Automation System in the Kingdom of Thailand (hereinafter referred to as "the Project") within the framework of the Japanese technical cooperation based on the Record of Discussions signed on June 30, 1992 (hereinafter referred to as "the R/D").

Both teams discussed and evaluated together the objective of the Project, purpose, output, input, impact and prospects of sustainability.

Through careful studies and discussions, both sides summarized their findings and observations as described in this document.

2. Schedule of the Joint Evaluation

Date	Schedule
February 24, 1997	<Arrival of a consultant of the Japanese Team at Bangkok>
February 25 (Tue)	- Meetings with JICA office and the Japanese experts of the Project - Preliminary discussion of the Project with PEA
February 26 (Wed)	- Preliminary interview to PEA counterparts
February 27 (Thu)	- Preliminary interview to PEA counterparts
February 28 (Fri)	- Preliminary interview to PEA counterparts
March 1 (Sat)	- Preparatory work for reporting
March 2 (Sun)	- Preparatory work for reporting
March 3 (Mon)	- Interview to the Project Manager of PEA <Arrival of the Japanese Team>
March 4 (Tue)	- Meetings with the JICA office - Meetings with the Embassy of Japan - Discussions of the Project with DTEC, PEA and Japanese experts of the Project
March 5 (Wed)	- Discussions of the Project evaluation method with the Thai team
March 6 (Thu)	- Interview and discussions with PEA personnel
March 7 (Fri)	- Interview and discussions with PEA personnel and the Japanese experts - Meeting on the Evaluation Check List
March 8 (Sat)	- Internal meeting
March 9 (Sun)	- Internal meeting
March 10 (Mon)	- Discussions on the Joint Evaluation Report and Minutes of Meeting
March 11 (Tue)	- Meeting on the Joint Evaluation and preparation of the Minutes of Meeting
March 12 (Wed)	- Signing of the Joint Evaluation Report and the Minutes of Meeting - Reporting to JICA office and the Embassy of Japan <Departure for Japan>
March 13 (Thu)	<Arrival to Japan>

3. Attendance

3-1. Japanese Evaluation Team

Mr. Masayoshi Juro	: Leader, Director, Financial Cooperation Division, Mining and Industrial Development Cooperation Department, JICA
Mr. Koichi Kumano	: Electric Power Technology Division, Public Utilities Department, Agency of Natural Resources and Energy, Ministry of International Trade and Industry
Mr. Hiroshi Oshima	: Manager, Distribution Planning Division, Distribution Department, Kyushu Electric Power Co., Inc.
Mr. Miyoshi Nishimaru	: Senior Engineer, Department No.1, Techno Consultants, Inc.
Mr. Yasuhiko Wada	: Staff, Technical Cooperation Division, Mining and Industrial Development Cooperation Department, JICA

3-2. Thai Evaluation Team

Mr. Pravit Chiradeja	: Leader, Assistant Governor, Planning and System Development, PEA
Mr. Somchai Srirath	: Director, Power System Control and Operation Department, PEA
Mr. Manop Thanomkitti	: Assistant Director, Electric Administration Area 1 (Central), PEA
Mr. Thatri Deelokpatanamonkon	: Manager, Distribution System Control Division, PEA

II. METHODOLOGY OF EVALUATION

1. Evaluators

(1) Thai Side : Thai Evaluation Team

(2) Japanese Side : Japanese Evaluation Team

2. Items for Evaluation

As to the items for evaluation, both Teams agreed as follows:

1) Objective of the Project
2) Purpose of the Project
3) Output of the Project
4) Input of the Project
5) Impact of the Project
6) Sustainability of the Project

3. Methodology of Evaluation

The evaluation of the Project was carried out through the following steps with referring the following materials:

1) Steps for Evaluation

① Preparation of the questionnaire and fact sheets of the Project
② Analysis and evaluation of the answer to the questionnaire and fact sheets
③ Interview and discussions with the persons concerned
④ Preparation of the draft of the joint evaluation report
⑤ Authorization of the joint evaluation report at the meeting of the Joint Committee for the Project
⑥ Signing to the Joint Evaluation Report by both teams

2) Materials used for the Evaluation

① Record of Discussions
② Tentative Schedule of Implementation
③ Annual Work Plan
④ Minutes of Discussions
⑤ Project Design Matrix as shown in Annex-I
⑥ Other documents, materials and data agreed on or accepted in the course of implementation of the Project

III. BACKGROUND AND SUMMARY OF THE PROJECT

1. Brief Background of the Project

The Government of Thailand has been promoting industrialization, including fostering high-tech industries, for the development of the country's economy. Coupled with this industrialization, reinforcement of power supply reliability, particularly improvement of measures and mobility against black-out accidents, became one of major tasks to be tackled. Based on the 7th National Social and Economic Development Plan between 1992 and 1996, Provincial Electricity Authority (PEA) had prepared programmes for the automation of power distribution work and other planning for the improvement of power supply reliability. With the recognition that the personnel training is imperative for bringing the distribution automation system into PEA and with understanding for the technology transfer that Japan has the most advanced distribution automation technology, the Government of Thailand submitted the request for project type technical cooperation to the Government of Japan in January 1991.

In response to the above request, JICA dispatched a Preliminary Survey Team in July 1991, in which survey period details of the request was confirmed and the basic policy of the technical cooperation Programme was explained to PEA. In March 1992, Long-Term Experts Survey was conducted to collect detailed technical information. Between June and July 1992, the Implementation Survey Team was dispatched, and the R/D (Record of Discussions) was signed. The Project started from June 1992.

Since then during this four years and eight months period, the technology for planning the Distribution Automation System (DAS) was transferred; the DAS simulator was installed; and related equipment and materials were provided in accordance with the R/D, TSI (Tentative Schedule of Implementation), TCP (Technical Cooperation Programme) and Minutes of Meetings.

Before the forthcoming June 29, 1997, the termination day of the cooperation of the Project, this Joint Evaluation was conducted.

2. Chronological Review of the Project

The chronological review of DAS Project is described in Annex 2.

3. Objective of the Project

The objective of the Project is "to transfer necessary knowledge and technology in the field of DAS to Thai C/P personnel so as to enable PEA staff to develop a most suitable system to meet the specific requirement of PEA" as described in the Master Plan of R/D.

4. Purpose of the Project

The purpose of the Project is that "PEA personnel will be trained in the field of the planning and managing of DAS" as shown in the Project Design Matrix (Annex 1).

The overall goal of the Project is that "Modern DAS suitable for the infrastructure in Thailand will be introduced, and its maintenance along with its operation system will be established, so that the DAS will be well operated."

5. Tentative Schedule of Implementation

The Tentative Schedule of Implementation and Accomplishment is shown in Annex 3.

6. Technical Cooperation Programme

The Technical Cooperation Programme and Accomplishment is shown in Annex 4.

IV. RESULTS OF EVALUATION

All the activities carried out in this Project were reviewed and related information, such as present situation and future plan of the distribution automation, present activities and results of the training, were obtained through the interview and discussions with PEA administrative and managerial people, PEA counterparts and Japanese long-term experts of this Project. Results of the evaluation by both teams are described in this chapter.

1. Overall Goal of the Project

Overall goal of the Project is defined as "Modern distribution automation system suitable for the infrastructure in Thailand will be introduced, and its maintenance along with its operation system will be established, so that the DAS will be well operated". The evaluation teams of both side contemplate that this overall goal will be achieved for the following reasons:

(1) There are now ongoing projects for introducing the DAS and other similar automation systems to PEA power networks which are called as the DDC (Distribution Dispatching Centre) project for the automation of transmission lines, substations and distribution networks and the CSCS (Computer based Substation Control System) project. First stage of the DDC project will be implemented for five areas in Thailand administrative regions and remaining seven areas will be implemented as second stage. A consulting company was selected in October 1995 for the preparation of tender documents and now this project is at the tender stage. The system operation is scheduled from February 1999. The CSCS project is now being implemented for the automation, monitoring and controls of 30 substations on a turnkey base project.

(2) In the Project, DAS equipment was introduced for both training and practical operation purposes as a pilot model in Nava Nakhon Industrial Estate. The effects on the improvement of power supply reliability, restoration time of black-out in particular, can be observed in the industrial estate, though the long term quantitative data to prove overall effects have not been accumulated.

(3) System Automation Division was established in September 1995 in Power System Operation & Control Department and project work as explained the above has been started to bring actual automation systems to PEA. Other divisions, such as Communication Engineering & Safety Division, Distribution System & Transmission Design Division, Research Division, Operation Division, Switchgear & Relay Division, Training Centre and others where PEA counterparts of the Project belong to, will collaborate with the System Automation Division to introduce, operate and maintain the actual automation systems.

2. Purpose of the Project

The purpose of the Project is that "PEA personnel will be trained in the field of the planning and managing of DAS".

Though the DAS technology was relatively new to the most of counterparts, such technology was effectively transferred to the counterparts. Capability to integrate the principle system was developed and the technical level was improved very much. PEA is now proceeding the automation system projects to develop the suitable system to meet the existing power systems of PEA with his own fund and financial supports from international organizations.

3. Output from the Project

All the activities of the Project were carried out as per the Record of Discussions, Tentative Schedule of Implementation, Technical Cooperation Programme, and Minutes of Meetings.

3-1. Technology Transfer concerning DAS to the Thai Counterparts

Necessary knowledge and technology have been transferred by the Japanese long-term and short-term experts through lectures, seminars, on the job training and field practices in Thailand and in Japan since October 1992 in the following fields:

- Basics of DAS (Basic theory and practical technics of DAS)
- Design, installation and adjustment of a DAS simulator (Preparation of specification, design, installation work, and adjustment)
- Operation and maintenance of the DAS simulator (Practice of commanding in system operation, maintenance and operation, and inspection)
- Advanced application of DAS (Emergency repair service, design, and long term planning of automation systems)

Quantity of the training, total person-day attended as of 31 December, 1996, is as follows:

• Lectures	:	892 person-days
• OJT	:	2,439
• Practices	:	251
• Training in Japan	:	624
• Others (internal training, seminar, site observation, etc.)	:	669
• Total	:	4,875 person-days

Training items were basically as per the original plan set forth in the R/D.

Period of the training course was extended from one year and six months to two years and eight months because of the delay of the DAS simulator delivery at site. To effectively utilize the vacant period, the Project conducted on-the-job-training about the system planning and design, observation of other systems and other research work which measures taken were judged to be rational. For measuring instrument and data processing analyzers, some were delivered on behind the schedule and re-scheduling of short term experts dispatch was necessary. There will be still some maintenance tools and measuring instruments to be arrived later from Japan before the end of coming June. All the training subjects could be conducted, except for the tools and instruments to be arrived. Other training activities were carried out as per the original plan.

3-2. Management of DAS Simulation System

(1) Installation of the simulator

The DAS simulator was installed at the Rangsit electric office in early 1995 for the training purpose. From this simulator, actual operations can be studied for the remote control and monitoring of the distribution line in Nava Nakhon Industrial Estate.

(2) Utilization of the simulator

During and after installation of the DAS simulator, OJT and field practices were made to the counterparts and PEA internal training was carried out by PEA himself by utilizing the simulator. Also, through the system of the DAS simulator, operation of actual system has been practiced from the Rangsit electric office for the distribution network in Nava Nakhon Industrial Estate.

(3) Maintenance of the simulator

The Rangsit electric office is making practical operation and maintenance of the simulator and other related system. Technical supports from the PEA head office is available when required.

3-3. Internal Training Courses for PEA Staff

Internal training for PEA staff was conducted by PEA. There were two type of internal training courses; one is called as a Head Office and Regional Office Staff Training Course which was conducted by the counterparts and another called as a Provincial Office Technical Training Course which was carried out by the technical staff trained in the former course. The former course was separated further into the Basic Course and Advanced Course. Main subjects of the former course were basics of DAS, operation and maintenance of the DAS simulator and advanced application of DAS. Totally 232 persons attended to the Basic Course and 107 persons to the Advanced Course. Main subjects of the later course were basic of DAS and operation and maintenance of the DAS simulator. Totally 232 persons participated to the

course. Such actual number of persons who attended to the internal training was more than initially planned number of 200 persons.

3-4. Seminars on DAS

Two seminars were carried out on the theme of "Outline of Summary of Reliability in the Power Utility & Summary of DAS Project" in November 1993 and "Full Automatic DAS System" in August 1995.

4. Input to the Project

Japanese side conducted dispatch of long term and short term experts, training of PEA counterparts in Japan and provision of equipment as per the Tentative Schedule of Implementation. Thai side took necessary measures, such as assignment of counterparts and administrative personnel, budget allocation, supply and replacement of machinery and equipment and running expenses as per R/D.

It can be concluded that the Input to the Project is achieved as per R/D.

4-1. Input by Japanese Side

(1) Dispatch of Experts and Survey Teams

1) Dispatch of Experts

Japanese side has assigned and dispatched three long-term experts (team leader, coordinator and an expert of DAS) throughout the Project period since September 1992 as decided in R/D and also, as shown in Annex 9, dispatched 27 short-term experts in 16 special fields, such as wireless telecommunication system, protective relays, communication cable, long term automation facility planning, and new automation technology.

2) Survey Teams

JICA dispatched six survey teams related to the Project, including this evaluation team as shown in Annex 10.

(2) Training of Counterpart Personnel in Japan

Japanese side received total of 21 PEA counterparts in seven batches from 1992 to 1996 for their training in Japan as shown in Annex 11.

(3) Provision of Necessary Equipment

Japanese side provided, in accordance with the R/D, the DAS simulator, equipment of DAS, and other necessary equipment and materials as shown in Annex 12 of which amount is Yen 458 million approximately.

(4) Expenses

Japanese side spent Yen 850 million approximately in total outlay of the project expenses, including the above equipment costs, as shown in Annex 13.

4-2. Input by Thai Side

(1) Allocation of Thai Counterpart and Administrative Personnel

Thai side assigned, in accordance with the R/D, total 21 counterparts and more than 15 administrative and managerial personnel as shown in Annex 14.

(2) Provision of Equipment and Facilities

Thai side provided, in accordance with the R/D, offices, machinery, equipment, vehicles, instruments, tools and other materials necessary for implementation of the Project as shown in Annex 15.

(3) Expenses

Thai side spent Bahts 86.0 million approximately in total outlay of the project expenses as shown in Annex 16.

5. Impact of the Project

5-1. Contents of Impact

(1) Technical Impact

The most notable impact is that PEA counterparts and other technical staff acquired the principle and applications of the DAS technology which helped own initiative of PEA to make plans and to introduce the actual automation systems for transmission, substation and distribution facilities, now under implementation. It is quite meaningful that PEA is making initiative to introduce actual automation systems as well as DAS for the improvement of power supply reliability.

(2) Institutional Impact

Technology transfer of DAS contributed to the establishment of System Automation Division in PEA which is responsible for the planning of the automation systems, designing, preparation of technical specifications and the assistance on operation and maintenance of the DAS equipment provided. Four counterparts personnel and six engineers trained internally have been assigned to this division and have been engaged to introduce actual automation systems to PEA in collaboration with other divisions where other counterparts belong to.

(3) Socio-Economic Impact

The DAS simulator and actual DAS equipment was installed in Nava Nakhon Industrial Estate in the Project. Direct socio-economic impact is that through the improved reliability of the power distribution system of the Nava Nakhon Industrial Estate, high-tech and other important industries will have benefits to increase their productivity in long run.

5-2. Dissemination of Impact and the Range of Beneficiaries

Dissemination of impact and the range of beneficiaries brought by the improved reliability and increased productivity will be extensive in terms of economic activity of PEA customers in the Industrial Estate. Also, there is educational effects through the DAS simulator that enabled university students to learn the latest industrial applications on the technologies, such as data tele-communication, computers and power systems.

6. Prospects of Sustainability

6-1. Organizational Sustainability

Both Teams confirmed that PEA internal training will be opened successively to transfer the DAS technology to remaining PEA technical personnel and the Training Center and System Automation Division will make a concrete plan and manage the training. Counterpart personnel and other engineers will conduct the training on each subject.

6-2. Financial Sustainability

Both Teams confirmed that the budget for maintaining the DAS simulator and other equipment provided will be allocated every year. PEA has already signed the maintenance contract with a manufacturer for the computers provided through the Project.

6-3. Technical Sustainability

(1) Work assignment of counterpart personnel

Both Teams confirmed that the counterpart personnel are involved to the DAS related work, much or less depending on his work place, and planning, purchasing and operation and maintenance for DAS will be conducted successively through communication of the counterparts on actual work.

(2) Technical capability for introducing DAS in future

Both Teams contemplate that the technical capability of PEA for introducing the DAS could become self sustainable.

(3) Future effective utilization of the provided DAS simulator and other equipment through this Project

Both Teams confirmed that the DAS simulator will be utilized as a training equipment for other PEA

personnel who were not trained during the Project. Also the simulator will be used to practice the work on the distribution network in Nava Nakhon Industrial Estate.

(4) Maintenance of DAS simulator

Both Teams confirmed that the maintenance of DAS simulator shall be conducted by PEA in collaboration with a local agent of the equipment.

V. CONCLUSIONS

Both Japanese and Thai Teams have reached to the following conclusions:

(1) The initial purpose of the Project has been achieved though there were delays on the delivery of some equipment. Necessary knowledge and technology in the field of the DAS were transferred to PEA counterpart personnel.

(2) The overall goal of the Project will be also achieved since PEA is making the plans and developing most suitable automation systems based on the technology transferred through this Project. The linkage between the technology transfer and its application to actual automation systems can be observed sufficiently.

(3) Sustainability of the Project, in terms of effective utilization of the DAS simulator and other equipment, further internal training, technical capability for introducing actual DAS, will be maintained in PEA.

(4) From the above evaluations and conclusion, the Project would be completed very successfully.

THAILAND-JAPAN TECHNICAL COOPERATION PROJECT FOR TRAINING IN THE DISTRIBUTION AUTOMATION SYSTEM

PROJECT SUMMARY	INDICATOR	MEANS OF VERIFICATION	ASSUMPTION
<OVERALL GOAL> Modern DAS suitable for the infrastructure in Thailand will be introduced, and its maintenance along with its operation system will be established, so that the DAS will be well operated.	1. State of progress of DAS introduction in PEA 2. Operating situation of DAS 3. Effect of introduction of DAS 4. Organization for the distribution automation	1. Record of installation of DAS 2. Organization chart and record of DAS operation 3. Record of recovery time for black-out	a. Funds necessary for installation of DAS will be financed. b. Cost for DAS won't be largely increased. c. Thai government will promote the policy on improvement for stable supply of electric power.
<PROJECT PURPOSE> PEA personnel will be trained in the fields of the planning and managing of DAS.	1. Improvement of technical level to plan DAS 2. Improvement of technical level to operate and maintain DAS	· Project's documents, monthly reports, annual reports, training manuals and texts · Hearing from experts and C/P	a. Thai side will be able to finance for the installation of DAS in some areas. b. PEA will have its constant organization to promote DAS.
<OUTPUTS> 1. C/P of PEA will acquire the basics of DAS, and the knowledge and technology necessary for its construction, operation, maintenance, and application. 2. DAS simulator for training will be installed at the project site, then maintained and managed. 3. Internal training courses for PEA's engineers and technicians other than C/P will be opened and managed. 4. Seminars concerning full automatic DAS will be opened at PEA.	1. Technical level of C/P 2. Situation of operation, maintenance and management of DAS simulator as well as plan of operation in the future 3. Result of internal training courses by C/P and its evaluation 4. Result of seminars on DAS and its evaluation	· Project's documents, monthly reports, annual reports, training manuals and texts · Hearing from experts and C/P	a. PEA will systematically cooperate with the activities such as trainings or seminars for PEA engineers and technicians. b. C/P will continue to work at PEA.
<ACTIVITIES> 1-1. To plan technical transfer schedule to C/P concerning DAS 1-2. To implement technical transfer to C/P concerning DAS 2-1. To plan detailed schedule of equipment necessary for technical transfer concerning DAS 2-2. To transfer technique necessary for the installation and the maintenance of equipment concerning DAS 2-3. To implement construction work at the project site related to the installation of DAS simulator 2-4. To install DAS simulator at the project site 3-1. To plan technical transfer schedule concerning DAS to PEA technicians by C/P 3-2. To make curriculum and text books for internal training courses on technical transfer mentioned in 3-1. 4-1. To plan seminars on full automatic DAS 4-2. To make documents for seminars mentioned in 4-1.	<INPUTS> JAPANESE SIDE · Dispatch of survey teams · Dispatch of experts · Acceptance of C/P training in Japan · Provision of necessary equipment · Provision of necessary expenses THAI SIDE · Allocation of C/P · Finance of local cost · Provision of teaching materials, equipment, and facilities including rooms for experts		a. Local cost necessary for the installation and the maintenance of training equipment will be financed. b. C/P will continue to work at PEA. <PREPOSITION>

Annex 2. Chronological Review of DAS Project (1/2)

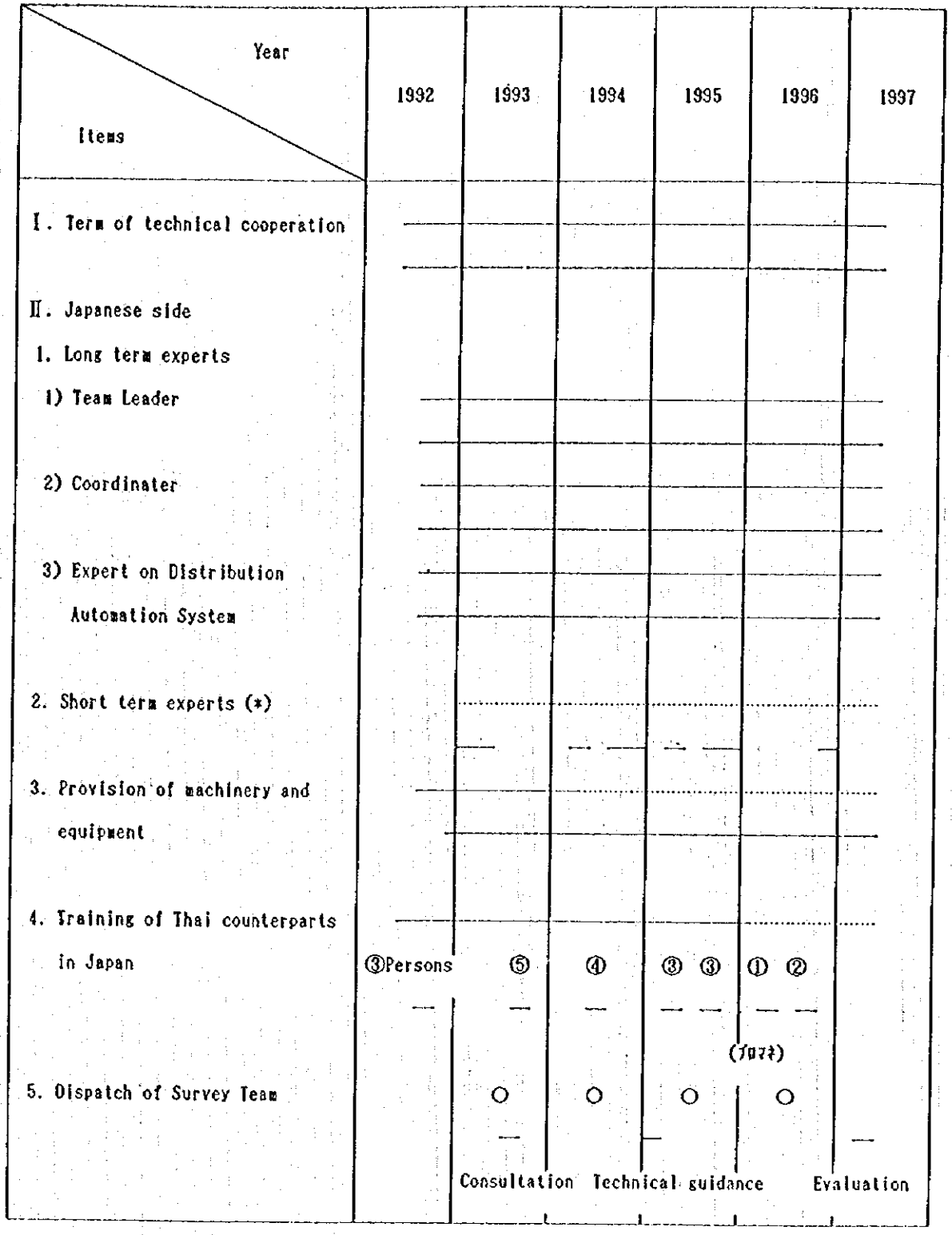
CHRONOLOGICAL REVIEW OF DAS PROJECT
1/2

From 1991 to 1994

Year	Month	Item
1991	January	Government of Thailand requested the project typed technical cooperation to Japan
1991	July	Dispatch of Preliminary Survey Mission by JICA (realization of required contents of Thailand and notification of JICA's cooperation scheme)
1992	March	Dispatch of Long-term Survey Team by JICA (for confirmation of implementation organization, facility, allocation status of C/P, etc.)
	June	Dispatch of Implementation Team by JICA (overall plan, confirmation on the division of responsibility, signing to R/D, etc.)
	June	Commencement of the project on June 30
	September	1) Dispatch of 3 Long-term Experts by JICA (Mr. Ikumasa OGATA/Team Leader, Mr. Masaaki DOI/Coordinator, Mr. Seiichiro BABA/Expert) 2) Start of the C/P personnel training by the Expert
	October	1) Training of 3 C/P personnel in Japan (Mr. Tho, Mr. Niwat and Ms. Jurailuk for Distribution automation system) 2) Start of the research activity by the Expert and C/P 3) Start of specification definition for the main machinery
1993	January	Dispatch of 2 Short-term Expert (Mr.Yoshinao YAHIRO for Radio control system and Mr.Hajime HASHIGUCHI for Protection relay system)
	February	Dispatch of a Short-term Expert (Mr.Toshihiro OHTAKARA for Telecommunication system)
	April	Dispatch of a Short-term Expert (Mr. Shuji SAKAGUCHI for System design)
	July	Dispatch of Consultation Team by JICA (for confirmation of implementation status and of the plan for the next fiscal year)
	October	Training of 5 C/P personnel in Japan (Mr. Suwat/I, Mr. Suwat/C, Mr.Tawee, Mr. Kitipong and Mr. Sanid for Distribution automation system)
1994	March	Dispatch of a Short-term Expert (Mr. Yoichi TSUBOI for Radio system)
	May	Start of PEA construction work for DAS Simulator System
	June	Training of 4 C/P personnel in Japan (Mr. Taweechoke, Mr. Pongsak, Mr. Boonyarat and Mr. Jaturong for Distribution automation system)
	September	1) Dispatch of 4 Short-term Experts (Mr. Kiichiro IRIE, Mr. Koichi OKUSU, Mr.Motomu UTO and Mr.Junji KUNISAKI for Distribution automation system) 2) Change of Team Leader to Mr. Tadanori MORI
	October	1) Arrival of the main machinery to the site 2) Dispatch of a Short-term Expert (Mr. Yoshinao YAHIRO for Automation equipment) 3) Installation start of DAS Simulator by both JICA and PEA sides

Annex 3. Tentative Schedule of Implementation and Accomplishment (1/2)

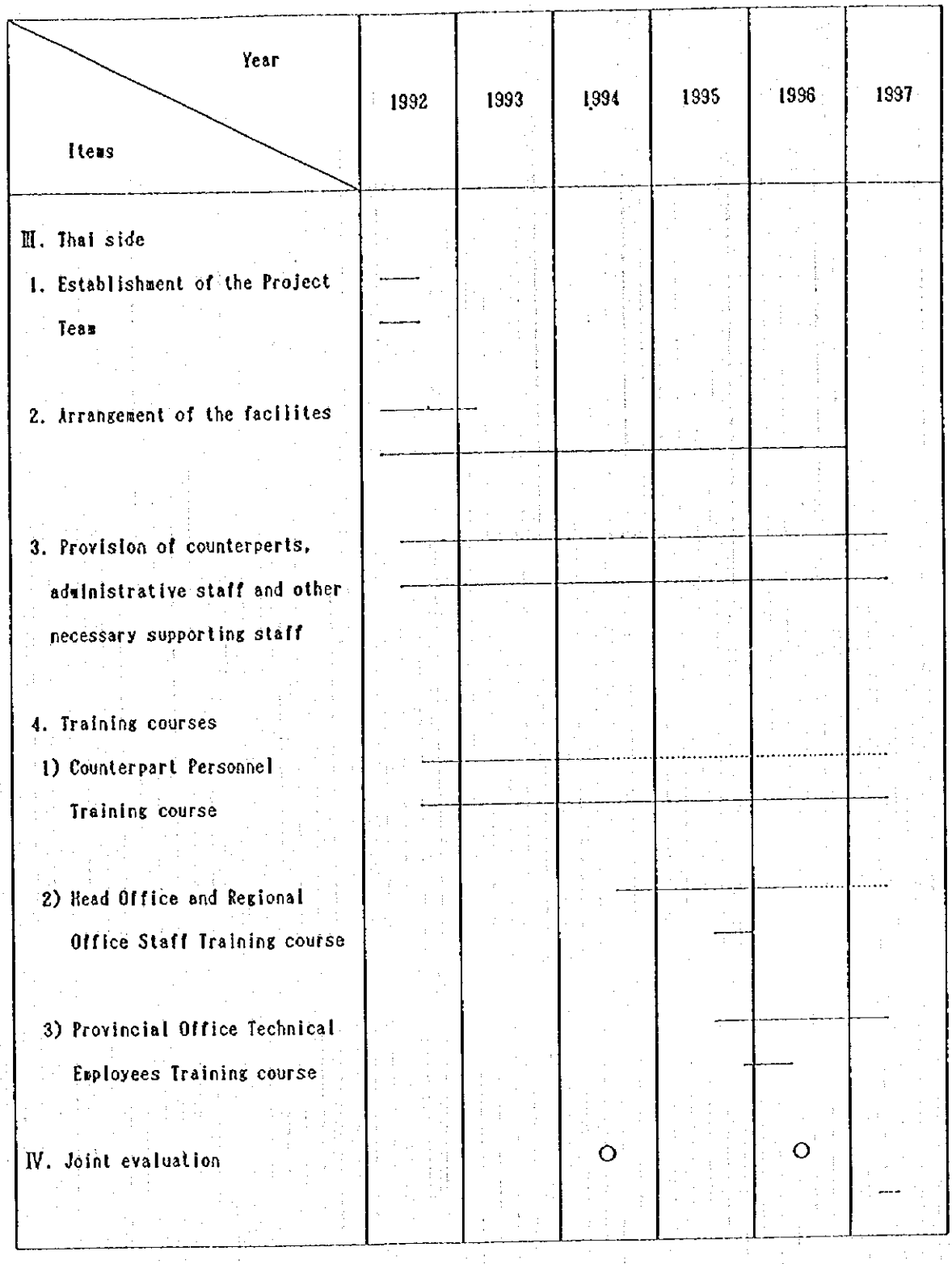
TENTATIVE SCHEDULE OF IMPLEMENTATION AND ACCOMPLISHMENT



Notes: ① (*) Short term experts will be dispatched when necessity arises.

② —— or ····· : plan —— : accomplishment

Annex 3. Tentative Schedule of Implementation and Accomplishment (2/2)



Notes: ① (*) Short term experts will be dispatched when necessity arises.

② —— or ····· : plan —→ : accomplishment

TECHNICAL COOPERATION PROGRAMME AND ACCOMPLISHMENT

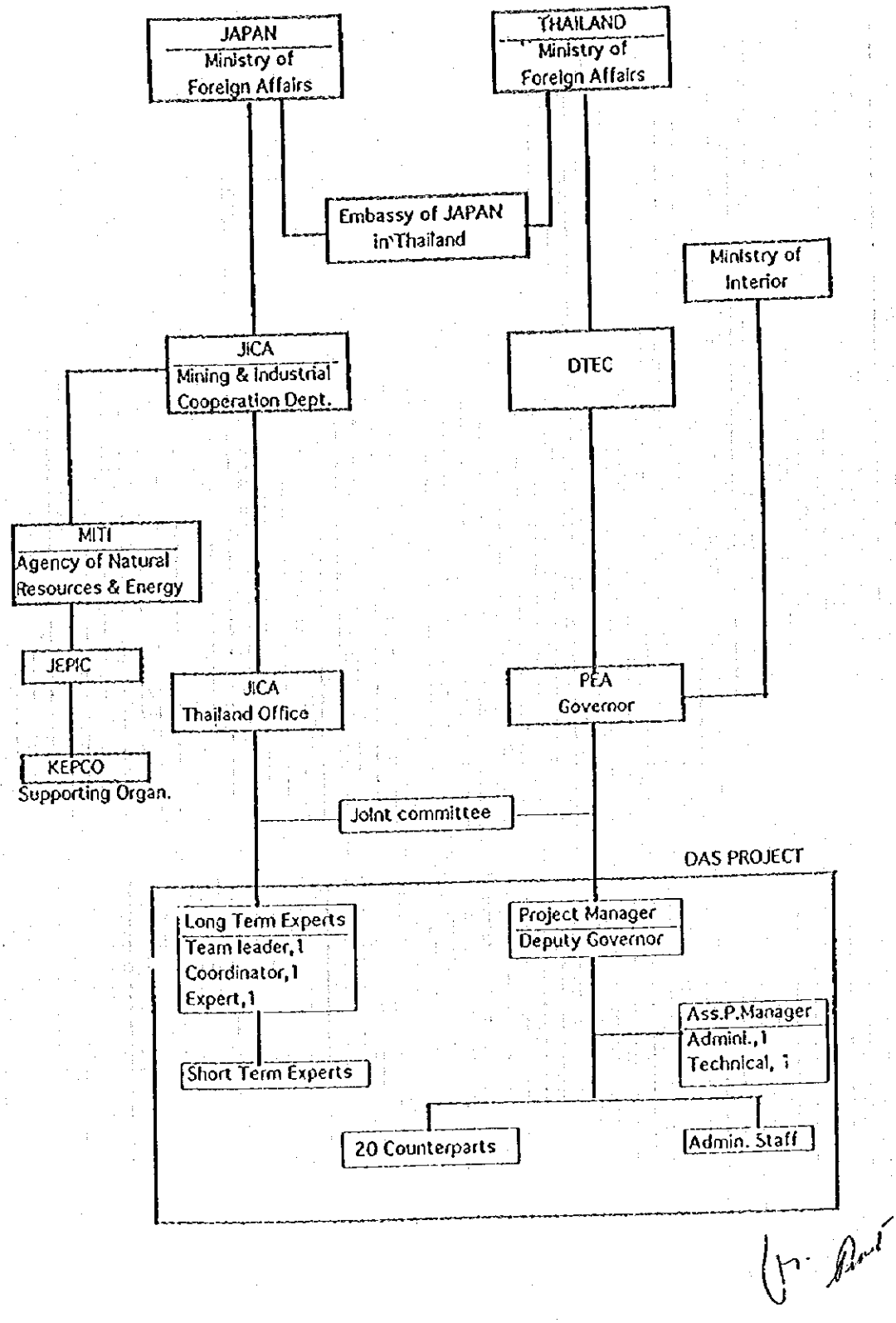
[Schedule / Method]

Schedule: 92 (9, 10, 11, 12) · 93 (1–12) · 94 (1–12) · 95 (1, 2, 3, 4, 5, 6, 7 8 9 12) · 96 (1 3 4 6, 7 8 9 12) · 97 (1 3 4 6)

Fields of Technology Transfer	Subject	Schedule / Method
1) Basis of Distribution Automation System	1. Basic theory of Distribution Automation System · Fundamentals of automation · Overview of automation systems and components · Concept of network inter-connection	(Basic) Lecture
	2. Practical techniques of Distribution Automation system · Comparison with remote control systems · Specifications of remote control systems · Operation of system components · Practice of commanding in system operation · Rule for maintenance and inspection	(Spec Make) O.J.T. (Spec) Lec. (Design of Cable and RTU Location) O.J.T.
2) Design, Installation and Adjustment of Simulator of Distribution Automation System	1. Preparation of specifications of system components	(Spec Make) O.J.T.
	2. Design of automation systems	(Design of Cable and RTU Location) O.J.T.
	3. Installation work techniques - Installation of G-CRT system and master station · Installation of satellite stations - Installation of telecommunication cables	(Installation) (DAS Simulator) O.J.T. Practice (DAS Simulator) Prac. O.J.T. ([illegible] Monitor) OJT OJT (Cable, RTU) OJT
	4. Adjustment of Simulator	(Adjustment) Prac. Prac.
3) Operation and Maintenance of Simulator of Distribution Automation System	1. Practice of commanding in system operation (Normal and Emergency mode)	(Dispatching) Lec. (Dispatching) Prac.
	2. Maintenance and Operation (Including data maintenance)	(Maintenance, Operation) Prac. (Regular Maintenance : On Occasion) OJT (Annual Maintenance) OJT (Annual Maintenance) OJT
	3. Inspection of equipment	(Inspection) Prac.
4) Advanced applications of Distribution Automation System	1. Emergency repair service for automation systems	(Repaire : On Occasion) OJT
	2. Design of Distribution Automation System covering hardware and software	(System Design) Lec. by Prac. on desk ([illegible] Evaluation) OJT (New Tech.) Semi
	3. Long-term planning of automation systems	(Planning) Lec.

Annex 5. Organization of DAS Project

ORGANIZATION OF DAS PROJECT



Annex 6. Training Results in Technical Transfer Field

TRAINING RESULTS IN TECHNICAL TRANSFER FIELD

Attendance Record for Counterpart Training Courses As of Dec.1996

SUBJECT			DAYS	DAY・PERSON
Lecture (Basic of DAS, Operation & Maintenance, Appplication of DAS)		All C/P	98	796
		In charged	19	96
		Total	117	892
OJT	Specification of DAS		—	580
	PEA Construction		—	769
	DAS Construction		—	240
	DAS Maintenance		—	446
	NGR Evaluation		—	160
	Reserch		—	244
	Total		—	2,439
Practice	DAS Construction		77	224
	Operation & Maintenance			27
	Total		92	251
Observation			16	145
Semminar			25	287
Training in JAPAN		In PEA	20	93
		In JAPAN	156	531
		Total	176	624
PEA Internal Training			—	237
Total			—	4,875

Attendance Record for PEA Personel Training Courses on DAS

NAME OF COURSE		GROUP	PERIOD	TRAINEE
Head office and regional office staff training course (for engineers)	Basic course (2 weeks)	Group 1	1995. 7.17～ 7.28	41
		Group 2	1995. 7.31～ 8.11	44
		Group 3	1995. 9. 4～ 9.15	48
		Group 4	1995.10. 2～10.13	45
		Group 5	1995.11. 6～11.17	54
		Total	———	232
	Advance course (1 week)	Semminar	1995. 8.21～ 7.25	105
		Group 1	1995. 9.18～ 9.22	27
		Group 2	1995. 9.25～ 9.29	27
		Group 3	1995.10.16～10.20	25
		Group 4	1995.10.30～11. 3	28
		Total	———	107
Provincial office technical training cource (for technicians) (2 weeks)		Group 1	1995.11.20～12. 1	55
		Group 2	1996. 1. 8～ 1.19	59
		Group 3	1996. 1.22～ 2. 2	58
		Group 4	1996. 2. 5～ 2.16	60
		Total	———	232

(Note) Attendants in the Advanced Course of the Head office and regional office staff training course were selected attendants in the Basic Course.

Annex 7. List of Seminars

List of Seminars

NO	THEMA	DATE	CONTENTS	LECTURER	ATTENDANTS	PLACE
1	PEA.C.I Area Seminar	11 Nov. 1993	1.Outline of Japanese cooperation (1)International cooperation by Japan (2)ODA to PEA ・Technical Cooperation by JICA ・Economic Cooperation by OECF 2.Summary of reliabirity in the power utility (1)Comparision between PEA & KEPCO (2)KEPCO's measure on improvement of reliabirity (3)Recommendation on reliability 3.Summary of DAS Project (1)Schedule of DAS Project in PEA (2)Outline of DAS (3)Field of technology transfer (4)Grounding System	Long term experts Mr.H.Tsuji Mr.I.Ogata Mr.M.Doi Mr.S.Baba	150 persons Oversears and chiefs in Central Area I)	Krung Sri Hotel in Ayuttaya
2	Full Automatic DAS System	28~29 Aug. 1995	1.Necessity of Distribution Automation 2.History of Distribution Automation 3.Promotion of Distribution Automation 4.Remote control System for Line Switches 5.Automatic Distribution Dispatching System 6.Integrated Distribution Automation System	Short term expert Mr.K.Hiromatsu (KEPCO)	50 persons Oversears in H/O and R/O, P/O)	Rose Gardens Hotel in Bangkok

Annex 8. List of Text Books (1/13)

LIST OF TEXT BOOKS

1. Text books provided by Japan side 1/2

Kind	Outline	Remark
Main text book	1. General, Present condition and future of Distribution Automation in Japan 2. Basic Theory and outline of communication engineering, control, computer,etc. 3. Practical works Detail, construction method, maintenance, operation and dispatching method of Automation Facilities 4. Application Maintenance, design policy and test of Automation Facilities	Detail as per attached sheets herewith (Contents of Main Text Book Provided by Japan Side)
Sub text books	1. Text for lecture Basic, system, specification, NGR system, construction, dispatching, application 2. Text for practice Construction, maintenance,operation, dispatching 3. Text for OJT Trouble shooting, installation, annual maintenance, SV-TM hardware and software, maintenance, communication cable construction, evaluation of NGR system	
Text books used by Short-term Experts	1. Telemetry radio circuit design 2. Design procedure and construction of communication cable 3. System based on radio circuit, network 4. Installation procedure and orientation of DAS Simulator 5. RTU testing 6. DNDS monitor installation 7. Full automation DAS system	
Text books for seminar	1. Recommendation on reliability (93/11) 2. Status and future trend of Distribution Automation in KEPCO (95/8)	

Annex 8. List of Text Books (2/13)

2/2

Kind	Outline	Remark
Manual of DAS Simulator in terms of specification, operation, maintenance, inspection, hardware and software (issued by the supplier)	1. DNDS (94/6) 2. TC, M/S (94/6) 3. RTU (94/6) 4. SV-TM (94/6) 5. T.S (94/6) 6. Protection relay system (94/6) 7. Radio (94/6) 8. DNDS monitor (95/6)	
Text books translated into Thai	1. IEEE Standard definition, Specification and analysis of systems used for Supervisory Control, Data acquisition and Automation Control 2. IEEE Recommended practice for Master/Remote Supervisory Control and Data Acquisition (SCADA) Communication	

CONTENTS OF MAIN TEXT BOOK PROVIDED BY JAPAN SIDE

VOLUME	CHAPTER	SUB-CHAPTER	DESCRIPTION
I. GENERAL		Present Condition and Future of Distribution Automation	This sub-chapter explains comprehensively from necessity of the distribution line automation to the development evolution, promotion conditions and outline of the major facilities of the system.
II. BASIC	1. Communication Engineering	1.1 Line Transmission Theory	Formulae for distribution constant, matching and reflection as well as crosstalk are necessary for calculations of transmission losses and characteristics for data transmission through cables. These formulae are presented here and cable's transmission characteristics will be understood.
		1.2 Communication System	Concerning the communication system for signal transmission, the construction in general, communication methods, transmission methods, expression of the quality and purposes of the use by different transmission line are explained.
	2. Control	2.1 Sequence Control	Basic of the control, widely applied not only for automation equipment for distribution lines but also for automatic assembly line in factories, control of trains, washing machine for domestic use, etc., is a sequence control using relay timers, etc. Though nowadays, this relay sequence is complicatedly programmed and so is very hard to understand, basic of the sequence control is studied in this sub-chapter.
		2.2 Drawings	When the sequence control is designed and manufactured as a device, particular drawings are necessary. These drawings are also essential for programming of software. In this sub-chapter, kind of drawings and how to draw as well as actuation design of devices and a system compilation of these devices are studied.
		2.3 Mechanism of Control Device	This sub-chapter explains types and construction of devices versatilely used for the sequence control, and the trainees are required to comprehend configuration of the automation equipment.
		2.4 Semi-conductors	This sub-chapter explains kinds, construction and function of semi-conductors such as an IC used as parts of automation equipment.
	3. Computer	3.1 Outline of Computer	General construction of a computer, the working mechanism and the application methods are explained.
		3.2 Computers for Control and Versatile Computers	Functions of a control computer (micro-computer) used for the distribution automation are explained as compared with versatile computers used for office automation.

VOLUME	CHAPTER	SUB-CHAPTER	DESCRIPTION
II. BASIC	3. Computer	3.3 Hardware	Typical construction and function of each device of a computer are introduced.
		3.4 Software	Kind and construction of programs which operates the computer are explained.
		3.5 Planning and Introduction of Computer	The procedures for establishment of a system by introduction of computers, including relationship with manufacturers and basic items for design method, are explained.
		3.6 Automation Control Technology of Distribution Line by Computer	System configuration, connections with remote control devices and functions and levels of automatic control computers are explained.
	4. History of Automation	4.1 Necessity of Distribution System Automation	In consideration of features and operations of distribution lines, necessity of distribution automation are explained.
		4.2 History of Technology Development of Distribution Automation	History of technology development for distribution automation is introduced and the system features and effects by the distribution automation are also introduced.
		4.3 History of Distribution Automation Equipment	Specifications and evolution of the equipment are introduced with reference to the appearance sketches.
	5. Outline of Automation Facilities (Equipment)	5.1 GCRT	Construction and functions of GCRT are outlined.
		5.2 SV-TM	Kind and features of SV-TM, and outline of the functions are explained.
		5.3 Remote Control of Pole Switch	Construction of remote control system using exclusive lines and outline of the functions are explained.
		5.4 Training Simulator	Functions of the simulator used for training with automation facilities are explained.
	6. Distribution System	6.1 System Planning of Distribution Line	General items for planning of distribution line system are processed and short-circuit, voltage drop and feeder operating capacity those which shall be paid attention in introduction of automation equipment are explained.

VOLUME	CHAPTER	SUB-CHAPTER	DESCRIPTION
II. BASIC	6. Distribution System	6.2 Tie Line	The installation plan of tie lines, which are aimed at maximizing the effect of remote control devices in reduction of outage hours, is explained and methods to express power supply reliability are introduced.
		6.3 Detection of Fault Section	Concerning methods to detect fault sections of distribution lines, a DM method used in Japan is explained. In addition, the method to use in combination with the remote control devices, as well as the effects and features are explained.
		6.4 Protection	The protection methods of short-circuit and ground fault in the distribution line networks are explained and attentions to and problems in operations of the remote control system are introduced.
		6.5 Grounding Method	As there are a several of grounding systems in the distribution line networks, fault current and the affection depending on the grounding methods become essential factors for selection of an automation method and for design of the equipment employed. In this sub-chapter, types and features of the grounding methods are processed and matters paid attentions to are discussed.
		6.6 Insulation Design Standard	RTUs, installed in many scattered locations of distribution networks, play an important role to ensure power supply reliability. In particular, these RTUs (including switches and the power sources) must be more endurable to abnormal voltage like one generated by lightning than the other ordinary distribution equipment. The design policy of the insulation is processed and explained.
III. PRACTICAL WORKS	1. Detail of Automation Facilities (Equipment)	1.1 Distribution Automation Technology	Technology concerning distribution automation is roughly divided into 3 fields; (1) data transmission, (2) equipment and (3) distribution equipment. In addition to those relationship, the data transmission, which is an essential factor, is explained particularly on its features and automation contents suitable for the data transmission.
		1.2 GCRT	GCRT device displays a distribution network map on a CRT. Connected with SV -TM, remote control devices, it enables to control the network operations freely by its display capability and keyboard operations. The hardware configuration, specifications and detailed functions are explained using the figures displayed on the actual CRT.

VOLUME	CHAPTER	SUB-CHAPTER	DESCRIPTION
III. PRACTICAL WORKS	1. Detail of Automation Facilities (Equipment)	1.3 SV -TM	Specifications, functions and working mechanism of SV -TM, which collects information concerning load current, sending voltage, outbreak of short-circuit or ground faults, etc. at a substation and display the information at a service office, are explained.
		1.4 Development Process of Pulse Code Method	The present remote control system, different from the general communication, is capable for I : N communication by a transmission line. Technical background of this I : N communication, signal methods, transmission format are explained in line with those development processes. A process of specification standardization to allow involvement of multiple manufacturers and difference of RTUs by a hardware method and a software method are explained to train the basic engineering of the remote control system.
		1.5 Remote Control Console	The remote control console is to control, supervise and display status of RTUs. The specifications and operating panel functions are explained and it is studied what display and operating method is suitable from the stand point of man-machine interface.
		1.6 Remote Control Master Station	The remote control master station stands in between a remote control operating console and RTUs and has important functions to operate a whole remote control system. Starting with explaining on functions of a remote control master station, this sub-chapter provides a backup methods in case of the malfunction and a method to separate the functions.
		1.7 Remote Terminal Unit (RTU)	Because one RTU is installed with each outdoor switch, and use many RTUs, the RTU must have a functions of high environmental endurance and must be highly reliable. It plays an important role to influence performance of the remote control system. In addition to explanation of the specifications, reliability, environmental characteristics and test method of the parts, programming configuration and handling in case of the errors are practically presented.
		1.8 Repeater Station for Remote Control	The remote control system can cover the area in radius of 30 to 40 km, but to extend further area for remote control of switches, the repeater station is used for signal amplification. The specifications of the device are explained. The remote control using telephone, wireless or IP sets may be possible depending on the hardware configuration of a repeater station. The equipment configuration in such a case is explained.

VOLUME	CHAPTER	SUB-CHAPTER	DESCRIPTION
III. PRACTICAL WORKS	1. Detail of Automation Facilities (Equipment)	1.9 Communication Cable for Remote Control	The communication cable used for the remote control system is different from those cables used for a telephone system. The differences are explained with reference to those specifications and the detailed explanations are provided on a connection box for connection between a cable and a cable, and an RTU and a cable, and a protection panel to protect the master station from lightning surge through the communication cables.
		1.10 Training Simulator	A simulator has been developed aiming at training and education of operators in charge of the remote control system. The functions and operating methods of the simulator are explained.
	2. Construction Method of Automation Facilities	2.1 SV-TM Installation	Prior to introduction of SV-TM, items of preliminary survey, items to be processed and practical construction method and actuation tests after construction are explained.
		2.2 Installation of Pulse Code Remote Control System	Prior to introduction of GCRT, remote control operating console, remote control master station to be installed in a service office, items of preliminary survey, items to be processed and practical construction method and actuation tests after construction are explained.
		2.3 RTU Installation	Design for installation, installation and installation management of RTUs and commissioning test after installation are explained. In addition, examples that the contractor is apt to commit errors and setting inside the RTU applied for distribution networks are explained.
		2.4 Communication Cable Works	Planning of the communication cable route for remote control, construction planning and supervision are explained.
		2.5 Standard of Communication Cable Works	Stringing method of the communication cables on poles, connection methods between cables and grounding methods are explained.
		2.6 Communication Cable Stringing Methods	Concerning stringing of communication cables, the procedures of and attentions to overhead stringing and underground laying are explained.
		2.7 Inspection	Concerning "the inspection" to assure if the equipment have been supplied according to the purchase or work orders, the method and handling and principle in case that any defective should be found are explained.

VOLUME	CHAPTER	SUB-CHAPTER	DESCRIPTION
III. PRACTICAL WORKS	2. Construction Method of Automation Facilities	2.8 Inspection of Pulse Code Remote Control System Works	Practical inspection items and contents of pulse code remote control system works are explained.
		2.9 Inspection of SV-TM Installation	Practical inspection items and contents of SV-TM installation are explained.
		2.10 Inspection of RTU Installation	Practical inspection items and contents of RTU installation are explained.
		2.11 Inspection of Communication Cable Works	Practical inspection items and contents of communication cable works are explained.
	3. Maintenance of Automation Facilities	3.1 Operation and Maintenance of SV-TM	Daily inspections and periodical inspection items of SV-TM are explained and measures and disposition in the event of trouble and preparation procedures of a trouble report are described in this sub-chapter.
		3.2 Operating and Maintenance of Pulse Code Remote Control System	Daily and periodical inspection items and contents of a remote control master station, operating console and GCRT are explained, and measures in case of trouble, data base maintenance method and procedures at alteration or modification of distribution networks and addition or removal of RTUs are described.
		3.3 Operation and Maintenance of Remote Control Cable	This sub-chapter explains on maintenance methods of remote control cable extended in urban and suburb areas and patrol method, function check methods and measures in case of troubles are studied.
		3.4 Management of Drawings and Documents	The automation equipment can be used as long as 10 to 20 years. Unless specifications of the facilities, connection diagrams, detailed route of cables and locations of RTUs should always be grasped, you can not cope with the troubles or additions of the facilities accurately and promptly. Thus, correction and proper storage of documents and drawings become significant. This sub-chapter explains management method of drawings and documents.
	4. Operation and Dispatching Methods	4.1 Operation of SV-TM	This sub-chapter explains operation of SV-TM.

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VOLUME	CHAPTER	SUB-CHAPTER	DESCRIPTION
III. PRACTICAL WORKS	4. Operation and Dispatching Methods	4.2 Operation of Pulse Code Remote Control System	Daily operating frequency of pulse code remote control system is very high and in particular the operation is indispensable at the time of a feeder fault. In this sub-chapter, basic operation with the operating console is mainly explained.
		4.3 Dispatching Service	Dispatching services for operation of, and at maintenance work for and at accident of the distribution networks are identified to be an essential point and introduction of the automation system made judgement and operation of the dispatchers much more important. This sub-chapter explains dispatchers' procedures to comprehend,the situation, to draw judgement and to dispatch orders so that the trainee's dispatching ability can be enhanced.
		4.4 Job Processing at Troubles	When a feeder fault should happened, immediate measures become necessary to restore the power distribution as early as it elapses 1 minute. On the contrary, however, there are many items of processing to be done such as notification to, and arrangement with many offices concerned, and judgement. This sub-chapter explains jobs to be done sequentially as soon as the trouble happened and summarizes the items which the manager or dispatchers should process.
IV. APPLICATION	1. Maintenance of Automation Facilities	1.1 Maintenance Activities	If the title of this sub-chapter is interpreted in a broad sense, the maintenance of the automation facilities involves from development and improvement of the facilities to information collection of the troubles and further more education of engineers, investment to the facilities and maintenance costs. Here in this sub-chapter, the method to master operation and maintenance of the facilities is introduced based on the maintenance activities of B-Company, one of the largest facility-intensive companies in Japan.
		1.2 Spare Parts	As a proverb says that a thing can not keep its form forever, a troulbe occurs on any facility. When replacement of the parts can not be done in time, the parts are to be replaced with good ones. The storage arrangement of the parts as well as quantility management are introduced here.
	2. Design Policy	2.1 General	Unless the design policy concerning service life, system expansion possibility, operation and maintenance method, indication method, etc. should be established before design of the equipment, the equipment will soon become unsuitable or obsolete. This sub-chapter explains the basic design policy, and attentions when the equipment is ordered, and then it is explained how the equipment is produced and how long it takes to produce the equipment.

VOLUME	CHAPTER	SUB-CHAPTER	DESCRIPTION
IV. APPLICATION	2. Design Policy	2.2 System	The distribution automation facility is a huge system composed of a variety of equipment. When one of the equipment will be designed, the equipment must be considered to be only a component of the hole facilities or the system. To do so, there are items to be designed basically when the system is formulated. In this sub-chapter, these items are explained.
		2.3 Equipment	Mainly on the equipment to be installed outdoor, those items necessary for design and the design policy are explained.
		2.4 Line Equipment	Concerning the design specifications of cables for remote control by exclusive lines, the relevant laws and regulations, insulation, connection and performance of the cables are explained.
		2.5 Indoor Equipment	Concerning the equipment installed indoor, the basic specifications and anti-fire and anti-earthquake requirements are explained.
		2.6 Design of Software	In many cases, detailed programs of the software is designed by a manufacturer based on GFC presented by a user. This sub-chapter explains the items which the designers in charge of preparation of the GFC should understand.
		2.7 Specifications	The commitment between the user and manufacture on what the manufacture will produce in response to the order of the user is the specifications. Because the manufacture will produce the product in accordance with the specifications, should the user present specifications perfunctorily prepared, the product manufacture produced may sometime differ from what the user did not intend or require. This sub-chapter explains items and contents to be described in "Purchase Specifications" presenting the supplier the term and conditions of supply and "Manufacturing Specifications" presenting the manufacture what the purchaser requests the manufacturer to produce.
	3. Test of Equipment	3.1 General	It can be said that two matters essential to produce equipment useful for a long time without troubles are good design and thorough tests. This sub-chapter explains what kinds of tests are necessary.

VOLUME	CHAPTER	SUB-CHAPTER	DESCRIPTION
IV. APPLICATION	3. Test of Equipment	3.2 Service Conditions	Life of the electric devices is greatly affected by the ambient conditions like temperature, moisture, etc. Prior to the tests of these devices, setting of the service conditions is first required. This sub-chapter introduces the service conditions of a variety of devices and explains policies and methods to set the conditions and requirements.
		3.3 List of Test Items and Standards	This sub-chapter introduces test items and required performance (standards) of a variety of automation equipment.
		3.4 Test Conditions and Methods	Prior to the tests, the testing conditions of what environment the test shall be conducted and what kind of testing equipment and procedures shall be applied must be decided. Otherwise, the test results may be unpractical or useless and the equipment by multiple manufacturers can not be compared. This sub-chapter explains the actual test conditions and methods of several automation equipment.
	4. Long-term Plan of Automation Equipment	4.1 Planning of Automation Facilities	Introduction of automation facilities needs not only the capital but also many kinds of equipment and human resources those who can handle and manage those equipment. For complete introduction of the facilities, the deliberate plan of these facilities must be formulated. The study items and processing in formulating of the plan are explained in this sub-chapter.
		4.2 Example of A Long-term Plan of Automation	The description here is an example to formulate a long-term plan for introduction of the facilities and explanation on detailed study items for this purpose.

Annex 8. List of Text Books (12/13)

2. Text books provided by Thai side

Course	Subject	Contents Subject	Remark
for Engineer Course	1. Introduction of DAS	1. Necessity of Distribution Automation 2. History of distribution Automation 3. Detial of distrbution Automation	Enlish version
	2. Basic Theory of DAS	1. Function of Distribution Automation System 2. Operation of distribution Automation System 3. Advantage of distribution Automation	
	3. RTU (Remote Terminal Unit)	1. Outline of distributon line TC System 2. Specification for slave station 3. Basic Actions 4. DM Function	
	4.TC (TeleControl)	1. Principle of protocal 2. Address Checking	
	5.SVTM (Super visory Telemetering)	1. SV-TM interface panel 2. SV-TM transmitter/Reciver 3. SV display panel	
	6. Communications	1. Communcation System 2. Necessity and History of Distribution Automation 3. Remote Control of Pole Switch	

Annex 8. List of Text Books (13/13)

Course	Subject	Contents Subject	Remark
for Engineer Course	7. DNDS (Distribution Network Display System)	1. The Outline of DNDS 2. Function of operator console Buttons 3. CRT Display Rule 4. Basic of Display Color 5. Operation	English version
	8. TS (Training Simulator)	1. Hardware of the System 2. Simulations 3. Function of Simulator 4. Setting of distribution Line Fault	
	9. Design of DAS	1. Planning of Distribution Systems 2. Design of SW Position	
	10.NGR (Neutral Grounding Resistance)	1. Necessity of Neutral Grounding Resistance for DAS 2. History of NGR 3. Effect of NGR to Customers	
for Technician Course	dito	dito	Thai version

page 2 of 2

Annex 9. Experts List Dispatched by JICA

Experts List Dispathced by JICA

LONG TERM EXPERTS			
	Name	Period	Remark
1	Mr. Ikumasa OGATA	1992. 9.15 - 1994.9.14	Team leader
2	Mr. Tadanori MORI	1994. 9. 1 -(1997.6.29)	Team leader
3	Mr. Masaaki DOI	1992. 9.20 -(1997.6.29)	Coordinator
4	Mr. Seiichiro BABA	1992. 9.15 -(1997.6.29)	Expert

SHORT TERM EXPERTS			
No.	Name	Period	Title(in A1/Offer)
1	Mr. Yoshinao YAHIRO	1993. 1.11 - 1993. 2. 8	Radio control system
2	Mr. Hajime HASHIGUCHI	1993. 1.22 - 1993. 3. 4	Protection relay system
3	Mr. Toshihiro OHTAKARA	1993. 2.15 - 1993. 3. 31	Telecommunication system
4	Mr. Shuji SAKAGUCHI	1993. 4.18 - 1993. 5. 1	System design
5	Mr. Yoichi TSUBOI	1994. 3.18 - 1994. 3.31	Radio system
6	Mr. Kiichiro IRIE	1994. 9.25 - 1994.12.28	Distribution automation system
7	Mr. Koichi OKUSU	- do -	
8	Mr. Motomu UTO	- do -	
9	Mr. Junji KUNISAKI	- do -	
10	Mr. Yoshinao YAHIRO	1994.10.23 - 1994.12.28	Automation equipment
11	Mr. Kiichiro IRIE	1995. 3. 1 - 1995. 3.29	DAS Training Simulator System
12	Mr. Haruya HARA	- do-	
13	Mr. Yasuhiro KIYONAGA	- do -	
14	Mr. Junji KUNISAKI	- do -	
15	Mr. Yoshinao YAHIRO	- do -	Automation equipment
16	Mr. Haruya HARA	1995. 8.14 - 1995. 9. 4	Installation of DAS Monitor
17	Mr. Koichi OKUSU	- do -	
18	Mr. Shuji KOTSUJI	- do -	
19	Mr. Kazuto IWASAKI	1995. 8.16 - 1995. 8.30	Telecommunication field/computer
20	Mr. Masatoshi SHIMADA	- do -	
21	Mr. Takeshi HIROWATARI	1995. 8.23 - 1995. 9.10	Full automation DAS System
22	Mr. Hirotoshi UCHINO	1995.11.29 - 1995.12.23	Maintenance and periodical inspection of DAS Simulator System
23	Mr. Masaki TAKAHASHI	- do -	
24	Mr. Isamu NAKAZAWA	1996. 9.18 - 1996.10.16	Acquisition, etc. of NGR data
25	Mr. Yukihiro NAGAMURA	1996.11.19 - 1996.12.19	Periodical precise inspection of DAS Simulator System
26	Mr. Junji KUNISAKI	- do -	
27	Mr. Koichi OKUSU	- do -	

Annex 10. Japanese Survey Teams Dispatched by JICA (1/2)

Name of Survey Teams	Description
Preliminary Survey Team	July 8, 1991 - July 19, 1991 (12 days) • Mr. Moriya Miyamoto (Leader), Technical Special Assistant to the President, JICA • Mr. Munekazu Urano (Team Member), Senior Inspector for Electric Technology, Public Utilities Department, MITI • Mr. Takeshi Hirowatari (Team Member), Engineer, Distribution Engineering Division, Kyushu Electric Power Co., Inc. • Mr. Tetsuhiro Ike (Team Member), Mining and Industrial Development Cooperation Department, JICA Background of the request from Thai side and appropriateness of the Project were clarified. Also, in the minutes of meeting, name of the project, objective, project sites, scope and items of the technical cooperation, undertaking by Thai side, and establishment of a joint committee were confirmed. With regards to the cooperation period, it was decided that the period was discussed in the course of visit of the Implementation Survey Team.
Long-Term Experts Survey	March 6, 1992 - March 19, 1992 (14 days) • Mr. Hiroshi Oshima, Manager, Distribution Division, Nagasaki Branch Office, Kyushu Electric Power Co., Inc. • Mr. Keishi Shiotsuki, Assistant Manager, Distribution Division, Kitakyushu Branch Office, Kyushu Electric Power Co., Inc. To prepare concrete planning for the cooperation, survey was conducted pertinent to the power distribution facilities of PEA and its operations.
Implementation Survey Team	June 22, 1992 - July 1, 1992 (10 days) Date of the Sign of R/D (Record of Discussions) : June 30, 1992 • Mr. Moriya Miyamoto (Leader), Technical Special Assistant to the President, JICA • Mr. Akira Kanazawa (Survey Member), Deputy Director, Electric Power Technology Division, Public Utilities Department, Agency of National Resources and Energy, MITI • Mr. Keishi Shiotsuki (Survey Member), Assistant Manager of Distribution Division, Kitakyushu Branch Office, Kyushu Electric Power Co., Inc. • Mr. Tetsuhiro Ike (Survey Member), Technical Cooperation Division, Mining and Industrial Development Cooperation Department, JICA The cooperation period of five years and undertakings by Thai side and Japanese side were confirmed in the R/D and TSI was signed. Also, a detailed planning of the training was decided in the minutes of meeting.

Annex 10. Japanese Survey Teams Dispatched by JICA (2/2)

Name of Survey Teams	Descreption
Consultation Team	July 5, 1993 - July 13, 1993 (9 days) • Mr. Kozo Esaki (Leader), Special Technical Advisor, JICA • Ms. Kyoko Nagashima (Member), Deputy Director, Electric Power Technology Div. , Public Utilities Department, Agency of Natural Resources and Energy, MITI • Mr. Hiroshi Oshima (Member), Manager, Distribution Div. Nagasaki Branch Office, Kyushu Electric Power Co., Ltd. • Mr. Takayasu Horimoto (Member), Technical Cooperation Division, Mining & Industrial Development Cooperation Department, JICA One year after the start of implementation, confirmation of the progress and preparation for succeeding year's plan were made.
Technical Guidance Team	January 19, 1995 - January 27, 1995 (9 days) • Mr. Shigehiro Okamura (Leader), Director, Electrical Appliance Safety Office, Public Utilities Dept., Agency of Natural Resources and Energy, Ministry of International Trade and Industry • Mr. Hiroshi Oshima, Manager, Distribution Planning Div., Distribution Dept , Kyushu Electric Power Co., Inc. • Mr. Takayasu Horimoto, Technical Cooperation Div., Mining and Industrial Development Cooperation Dept , JICA In the midst of the cooperation period, confirmation of the progress and preparation for succeeding year's plan were made.
Evaluation Team at the End of Period	February 24, 1997 - March 13, 1997 • Mr. Masayoshi Juro (Leader), Director, Financial Cooperation Division, Mining & Industrial Development Cooperation Department, JICA • Mr. Koichi Kumano, Electric Power Technology Division, Public Utilities Department, Agency of Natural Resources and Energy, Ministry of International Trade and Industry • Mr. Hiroshi Oshima, Manager, Distribution Planning Div., Distribution Dept , Kyushu Electric Power Co., Inc. • Mr. Miyoshi Nishimaru, Senior Engineer, Techno Consultants, Inc. • Mr. Yasuhiko Wada, Technical Cooperation Division, Mining & Industrial Development Cooperation Department, JICA At the end of the cooperation period, joint evaluation was conducted

Counterpart personnel training in Japan

Record of training result

Total Counterparts' number : 21 (One Project Manager and 20 Counterparts)

Depat. No.	Name	Fiscal year	Period	Training subject/Major training place
1	Mr. Tho KONGSAKUL	1992	1992.10.26 - 1992.12. 8	Distribution automation system /KEPCO
	Mr. Niwat CHAYAKUL	"	"	"
	Ms. Jurailuk CHOTIWANA	"	"	"
2	Mr. Suwat CHIOCHANCHAI	1993	1993.10.18 - 1993.12.10	"
	Mr. Tawee LAOTHCHOTE	"	"	"
	Mr. Suwat IUMCHITKUSOL	"	"	"
	Mr. Sanid RITKAJORN	"	"	"
	Mr. Kitipong KUPATA-TIRAWUT	"	"	"
3	Mr. Pongsak DARASILP	1994	1994. 6.28 -1994.8.18	"
	Mr. Taweechoke BEJRAKASHEM	"	"	"
	Mr. Boonyarat TANIPRAPHA	"	"	"
	Mr. Jaturong SUKSEN	"	"	"
4	Mr. Vanchai PIANPADUNGSITH	1994	1995. 3.26 - 1995. 5.17	"
	Mr. Pisute SIRISOPONWATTANA	"	"	"
	Mr. ChatchaiWISSSANURANGSUN	"	"	"
5	Mr. Theera SRIWATTANAPARAPHON	1995	1995. 6.25 - 1995. 8.10	"
	Mr. Pinphak ROMA	"	"	"
	Mr. Yongyut NGAMPATTRAPANT	"	"	"
6	Mr. Vibulya KUHIRUN	"	1996. 3. 2 - 1996. 3. 9	"
7	Mr. Vorachart PHONOUEYPORN	1996	1996. 6.30 - 1996. 8. 6	"
	Mr. Roongrat JONGON	"	"	"

Annex 12. Machinery & Equipment Provided by Japan Side (1/3)

MACHINERY & EQUIPMENT PROVIDED BY JAPAN SIDE

1/3 (Based on Japanese fiscal year)

J. Fiscal year	Arr. to site Y	M	Description		Amount, Yen ( )= Baht	Remarks Custody No.
1992	'92	11	NEC personal computer, PC9801 FA/u7	1	652,000.	AM-H4-001
"	"	"	NEC laser printer, PC PR2000/2	1	357,000.	AM-H4-003
"	"	"	Automatic voltage regulator	1	150,000.	AM-H4-008
"	93	1	Insulator tester	1	214,000.	GM01-H4-030
"	"	"	Video camera, JVC GR-327E	1	133,000.	AM-H4-016
"	"	"	Bubble jet word processor	1	206,000.	AM-H4-018
"	"	3	Waveform recorder, main unit	3	1,615,700.	GM01-H4-001/ 3
"	"	"	Plug in unit, analog	5	287,295.	GM01-H4-004/ 8
"	"	"	Plug in unit, logic	4	156,755.	GM01-H4-009/ 12
"	"	"	Spectrum analyzer, main unit	1	1,219,800.	GM01-H4-031
"	"	"	Dipole antenna	1	353,100.	GM01-H4-032
"	"	"	Handheld digtal multi meter	5	342,935.	GM01-H4-035/38
"	"	"	Color TV, JVC AV-21	1	145,000.	AM-H4-024
"	"	"	Communication cable	65km	15,280,000.	GM02-H4-001
"	"	"	Surge arrester	160	111,280.	GM02-H4-002
"	"	"	UPS	1	1,750,000.	GM02-H4-003
"	"	"	Video cassette recorder, JVC HR-D637	1	133,000.	AM-H4-017
"	"	4	Oscilloscope, battery type	1	593,850.	GM01-H4-033
"	"	"	Oscilloscope	1	1,348,200.	GM01-H4-034
"	"	"	All purpose tool set	1	214,000.	GM01-H4-040
"	"	8	Dielectric tester, IP-AL0505, No.6312	1	305,910.	GM01-H4-054
"	"	"	do -,IP-AD5050, No.6509	1	319,300.	GM01-H4-055

Annex 12. Machinery & Equipment Provided by Japan Side (2/3)

MACHINERY & EQUIPMENT PROVIDED BY JAPAN SIDE

2/3 (Based on Japanese fiscal year)

J. Fiscal year	Arrival to the site Y	M	Description	Qty.	Amount, Yen ( )= Baht	Remarks Custody No.
1993	'93	8	Data communication analyzer, AES105	1	1,675,810.	GM01-HS-056
"	"	"	Pot type junction box	160	6,361,280.	GM02-HS-004
"	"	9	Epson printer LQ-1170	1	(28,141.)	LC-HS-001
"	"	10	Data modem "OCTOCOM"	1	(33,170.)	LC-HS-002
"	94	1	Computer, JEXTOR 80386DX-40	1	(29,960.)	LC-HS-003
"	"	3	Digital data recorder TA-802	1	900,000.	GM01-HS-057
"	"	"	NEC Media board 101	1	(68,000.)	LC-HS-004
"	"	4	NEC page printer PC-PR2000/2	1	287,000.	AM-HS-027
"	"	5	NEC personal computer PC9821-As2/u7	1	328,000.	AM-HS-025
"	"	"	NEC color display PC-KM 152	1	107,000.	AM-HS-026
"	"	8	Cycle data monitor TD-44B	1	900,000.	GM01-HS-058
"		7	DAS SIMULATOR SYSTEM		285,044,260.	
"	"	"	1)Distribution network display system	2		
"	"	"	2)TC master station	1		
"	"	"	3)Supervision telemetering	1		
"	"	"	4)Supervision station	1		
"	"	"	5)Radio master station	1		
"	"	"	6)Training simulator	1		
"	"	"	7)Neutral grounding resister	4		
"	"		8)Protection relay system	2		
"	"	"	9)RTU output tester	1		
"	"	"	10) RTU connection band	1		
"	"	10	RTU	70	47,819,221.	

Annex 12. Machinery & Equipment Provided by Japan Side (3/3)

MACHINERY & EQUIPMENT PROVIDED BY JAPAN SIDE

3/3 (Based on Japanese fiscal year)

J. Fiscal year	Arrival to the site Y	M	Description	Qty.	Amount, Yen ( )= Baht	Remarks Custody No.
1994	'94	6	Personal computer Apple PB 180c	1	547,700.	AM-H6-028
"	"	10	Level meter LM-514	1	310,000.	AM-H6-029
"	"	"	DC voltage generator	1	332,000.	AM--H6-030
"	"	"	Frequency counter R5361K	1	396,000.	AM-H6-031
"	"	"	function generator FC-124	1	740,000.	AM-H6-032
"	95	6	LCD data projector VPL-3'51QM	1	(410,000.)	GM01-H6-060
"	"	"	Computer notebook Macintosh 520C	1	(85,000.)	GM01-H6-061
"	"	"	Graphic display & modem unit(DNDS Mo.)	1	24,195,763.	GM01-H6-062
1995	95	7	UHF/FM mobile radio & accessories	1	(36,808.)	LC-H7-005
"	"	"	Hand tool for P/N 175289,175218 Srs.	1	(48,150.)	LC-H7-006
"	"	8	Wireless telephone JHM 418S10T	6	1,725,993.	AM-H7-033
"	"		Measuring receiver ML 5228, etc.	1		
"		9	PC FMW-450 NL/S (Fujitsu)	1	300,000.	AM-H7-034
"	"	10	Cable locator AD-6202, printer DPU-40	1	748,810.	AM-H7-035
"	"	12	RPM OMEGA power monitor system	8	(4,751,561.)	GM01-H7-063
"	"	"	NEC media bpard 101	1	(79,000.)	LC-H7-007
"	"	"	Air purifier "imflex"	2	(62,000.)	LC-H7-008
"	96	2	VID- P100 Video presentation stand	1	(346,477.)	GM01-H7-064
	"		KV-2166 MW/7 21' color TV	4		
"	"	"	Wireless microphone TOA model WA-641	1	(52,644.)	LC-H7-009
"	"	3	COMPAQ Presario 7180 CDS	1	(82,925.)	LC-H7-010
"	"	4	NEC printer PC-PR 1000 E/4	1	(53,953.)	LC-H7-011
"	"	4	RTU cable type	1	730,930.	GM01-H7-
	"	4	RTU radio type	5	3,654,650.	GM01-H7-
"	"	4	Dummy switch	2	554,680.	GM10-H7-065
"	"	4	UHF radio telephone	6	3,328,080.	GM01-H7-066
"	"	6	Modem tester	1	434,830.	AM-H7-
1996	"	11	Oscillographic recorder,78201-5-F	1	(796,600.)	GM01-H8-
"	"	11	E123 developer black 2 sets and etc.	2	(43,600.)	GM01-H8-
"	"	11	HIOKI analog unit, attenuetor	2	(133,000.)	GM01-H8-

Annex 13. Expenses by Japanese Side

(Unit: Yen 1,000)

Items	Fiscal Year 1991	1992	1993	1994	1995	1996	Total
Dispatches of Survey Teams	2,973	7,133	11,636	1,536	0	6,022	29,300
Dispatches of Experts	5,374	48,573	62,824	92,037	77,457	62,349	348,614
Acceptance of C/P training in Japan	0	1,846	3,077	4,467	2,062	1,472	12,924
Provision of Necessary Equipment	293	42,034	139,176	233,252	32,199	11,016	457,970
Administration of the Project	0	0	0	0	666	313	979
Total	8,640	99,586	216,713	331,292	112,384	82,071	849,787

Amounts of fiscal year 1996 are estimated figures.

[COUNTERPART LIST OF DAS PROJECT]

As of Dec. 96

Project Manager : Mr. Vibulya KUHIRUN ; Deputy Governor, Planning & System Development (Fm; Dec.95)

Asst. Project Manager: Mr. Prayad KRUNAGRADIT; Manager, System Development Div. System Development Dept. (- do-)

Asst. Project Manager: Mr. Weerachai KOYAKUL ; Manager, System Automation Div. System Control & Operation Dept. (- do-)

Division belonged		First name	Family name	Position as of 96.12	Position in 1992 / (remarks)
Power System Control & Operation Dept.		Mr. Tho	KONGSAKUL	Asst. Director	Asst. Manager
	System Automation Div.	Mr. Suwat	CHIOCHANCHAI	Asst. Manager	Sec. Chief
		Mr. Theera	SRIWATTANAPARAPHON	5th grade Engineer	4th grade Engineer
		Mr. Pinphak	ROMA	4th grade Engineer	(Replaced Mr.Phchara 93.9)
		Mr. Taweechoke	BEJRAKASHEM	8th grade Engineer	Sec. chief
Training Center		Ms. Jurailuk	CHOTIWANA	Sec. chief	Sec. Chief
		Mr. Pisute	SIRISOPONWATTANA	Asst. Chief	5th grade Engineer
Electrical Administration Area 3 (South)		Mr. Roongrat	JONGON	4th grade Engineer	4th grade Engineer
Communication Engineering & Safety Div.		Mr. Tawee	LAOITICHOTE	8th grade Engineer	Sec. Chief
		Mr. Suwat	IUMCHITKUSOL	Asst. Manager	8th grade Engineer
Electrical & Mechanical Engineering Div.		Mr. Kitipong	KUPATA-TIRAWUT	Asst. Manager	8th grade Engineer
Research Div.		Mr. Narong	TANITICHAYOKORN	Asst. Chief	(Replaced Mr.Chatchai 95.10)
Switchgear & Relay Div.		Mr. Vorachart	PHONOUEYPORN	Deputy Manager	8th grade Engineer
System Development Div.		Mr. Niwat	CHAYAKUL	8th grade Engineer	Sec. Chief
Strategic Plans Div.		Mr. Boonyarat	TANTIPRAPHA	Asst. Manager	7th grade Engineer
Transmission Sys.& Substation Design Div.		Mr. Yongyut	NGAMPATTRAPANT	5th grade Engineer	4th grade Engineer
Trans. & Distribution System Design Div.		Mr. Vanchai	PIANPADUNGSITH	Deputy Manager	8th grade Engineer
Distribution System Control Div.		Mr. Pongsak	DARASILP	Asst. Manager	Sec. Chief
Operation & Industrial Service Div. Electrical Administration Area 1 (Central- Ayutthaya)		Mr. Sanid	RITKAJORN	Manager	Asst. Div. Chief
		Mr. Jaturong	SUKSEN	Asst. Chief	5th grade Engineer

Facilities and Equipment provided by PEA

In 1993

- Improvement of DAS project room at Head Office.

In 1994

- Improvement of Dispatching room at Rangsit Electric Office.
- Installation of Telecommunication System.
  - Main Route
  - Spare Route
- Distribution System Improvement
  - High Tension Line
  - Low Tension Line
  - Installation of SF6 Switches
  - Installation of CSP transformer
  - Installation of RTU
- Changing of Arresters
- Construction of NGR Foundation.

In 1995

- Adjusting and Testing Protection System before introducing DAS Simulator to PEA distribution System.

In 1996

- Installation of Disturbance Waveform Recorder and Data Acquisition for "Inspection and Analysis of NGR Grounding System".
- Repairing CPU Board and Cable Protection System of RTU.
- Performed contract for routine maintenance of VAX CPU System of DAS Simulator.
- Installation of the additional RTU.

In 1997

- Changing Arrester to MOV type.

Annex 16. Expenses by Thai Side

TENTATIVE SCHEDULE OF BUDGET ALLOCATION

(Unit : Million Baht)

Items \ Year	1992	1993	1994	1995	1996	1997	Total
	←	Actual	→				
1. Personnel Expense	2.5	5.0	5.0	4.58	5.0	4.0	26.08
2. Installation of Simulator							
(1) Improvement of Dispatching Room	-	-	1.12	-	-	-	1.12
(2) Installation of Telecommunication System	-	-	3.46	-	-	-	3.46
(3) Distribution System Improvement (HT, LT, CSP. Transformer, SF6 Switches)	-	-	40.90	-	0.6	-	41.5
(4) Changing of Arresters	-	-	4.25	-	-	4.73	8.98
(5) NGR Foundation	-	-	0.13	-	-	-	0.13
3. Routine Annual Expenditure							
(1) Electricity	-	-	0.02	0.12	0.04	0.03	0.21
(2) Equipment Maintenance	-	-	0.8	0.52	0.6	0.5	2.42
4. Others							
(1) Office Supplies & Text printing, etc.	0.2	0.2	0.2	0.26	0.2	0.2	1.26
(2) Others	-	-	-	0.72	1.0	-	0.82
Total Annual Budget	2.7	5.2	55.88	6.2	7.44	9.46	85.98

Remarks : (1) Thai Fiscal Year From October to September.
(2) Subject of offical approval.

Annex 17. Questionnaire on the Joint Evaluation (1/3)

<Technical Cooperation for the Project on the Training in the Distribution Automation System>

1. General (Interview to: mainly PEA managerial section, C/P and long-term experts)

1) Equipment and Materials provided from Japan

- In this project, how was the distribution system in Nava Nakhon Industrial Estate, including network configuration, circuit breakers, auto-reclosures, cut-out switches, insulators, grounding resistors, etc., changed to accommodate the DAS simulator system? It would be helpful if diagrams of the system is provided.
- What are the simulation items of the DAS simulator and what distribution and substation system are simulated, such as grounding system, monitoring items and control items?

2) Operational Information

Data and information on the following topics would need to be provided to the evaluation team:

- Changes of power consumption and peak load of PEA consumers
- Outline of distribution facilities of PEA (substation, transmission and distribution lines, communication facilities, etc.) and changes in the number of PEA personnel
- Records of accidents in high voltage distribution lines of PEA and its study data
- Records of distribution line accidents in Nava Nakhon Industrial Estate

3) Distribution Automation System in General

Infomation related to the following topics would need to be provided:

- Future plan of introducing and expanding DAS in PEA distribution network and relation of the DAS expansion with national planning, such as Energy Master Plan, Power Development Plan and National Socio-Economic Development Plan
- Outline of DAS planning, such as areas to be introduced, applicable distribution systems, and improvement of distribution equipment and materials
- Organization of the distribution automation system and assignment of the counterpart personnel to the section
- Other planning for increasing power supply reliability
- Linkage of automation planning conducted by EGAT and MEA, if any, for transmission and distribution lines and substation facilities (such as compatibility of the system and codes and standards)

4) Others

- Manual and textbook made by PEA counterparts
- Reports of PEA internal On the Job Training regarding DAS

Annex 17. Questionnaire on the Joint Evaluation (2/3)

- Annual Report of PEA

2. Achievement of the Project Purpose (Interview to: mainly C/P and long-term experts)

1) Is the technical capability of the counterparts about the DAS increased sufficiently?
   - Capability of evaluation for different type of power distribution systems and capability of an integration of the DAS which suits to existing power distribution systems
   - Capability of making conceptual or basic plan of the DAS
   - Integration of the DAS
   - Capability for issuing inquiry of the DAS to vendors, evaluation, purchase, and management of the system installation
2) Will the counterparts be capable of utilizing the technology studied in this project, when the DAS is planned in other network? Also, will there be a system for promoting and organizing internal staff training at that time?
3) In this project, were the training and seminar for the counterparts sufficient?
4) What were the factors of promoting or constraining intended project purposes?

3. Effectiveness of the Project (Interview to: mainly PEA managerial section)

1) How much degree is the power supply reliability, such as number of distribution system accidents and black-out time, considered to improve when the DAS is expanded?
2) How much degree will the improvement of power supply reliability in Nava Nakhon Industrial Estate (reduction of black-out time period by line accidents and reduction of areal extention of black out) be intended by operating the DAS installed in this project.
3) In near future, it is considered that the distribution automation equipment based on different system or models will be installed. Will PEA be able to cope with its planning, inquiry, purchasing, installation, operation and maintenance?
4) Is PEA ready for organizing an internal training system of future DAS?

4. Sustainability (Interviewed to: mainly PEA managerial section and partly C/P)

1) Establishment of the organization for distribution automation and its operation situation
2) Planning and records for introducing actual distribution automation systems in PEA
3) How many counterparts will keep up the work related to the distribution automation?
4) Are there financial and institutional supports for introducing distribution automation systems? Is the budget allocated for introducing DAS?
5) Is the counterparts capable to introducing and expanding future DAS by themselves?
6) Planning for effective utilization of the equipment provided
   - DAS simulator

- Equipment related to distribution facilities in Nava Nakhon Industrial Estate
- Measuring instrument

7) Maintenance of the equipment and materials provided
- Is it possible to make equipment repairing, calibration, or software changes of the DAS at local agents?

5. Adequacy of the Project (Interview to: mainly PEA managerial section and partly C/P)

1) Were the target levels of the project purpose and outputs appropriate?
2) What kind of planning dose PEA has about the automation of power transmission systems and substation facility? Is there any linkage with EGAT, MEA or other international cooperation agencies about such planning?
3) Were the original planning of methodology, schedule and periods for training and seminar suitable? Were the training through the equipment provided effective?
4) Was the implementation schedule suitable?
5) Is there a linkage of distribution automation with national planning, such as Energy Plan, Power Development Plan, and National Socio-Economic Development Plan?

6. Efficiency of the Implementation (Interview to: PEA managerial section and long-term experts)

1) Was the project size and input size appropriate?
- Number of long-term experts and short-term experts dispatched
- Period of their stay and timeliness of their dispatches
- Training in Japan
- Equipment and materials provided

2) Was the project organized smoothly?
3) Was the support to this project appropriate?

Annex 18. Evaluation Check List (1/3)

Evaluation Check List (1)

<Technical Cooperation for the Project on the Training in the Distribution Automation System>

Evaluation Grade : ◎Excellent, ○Good, □Fair, △Unsatisfactory
Evaluation Point of View : (T) Technology transfer by the Japanese Experts
(A) Technology acquirement by the Thai Counterparts

Evaluation Items	Acquired Results	Results of Evaluation						Remarks
		Japanese Side		Thai Side		Overall		
		T	A	T	A	T	A	
A. Overall Goal Modern DAS suitable for the infrastructure in Thailand will be introduced, and its maintenance along with its operation system will be established, so that the DAS will be well operated.	1. State of progress of DAS introduction in PEA • Plans for introducing DAS • Progress of DAS installation • Budget allocation of actual distribution automation systems	◎		◎		◎		
	2. Operating situation of DAS	–		–		–		
	3. Effects of introduction of DAS a) Nava Nakhon Industrial Estate • Improvement in high voltage distribution line accidents • Reduction of mean black-out time per accident • Mobility of restoration against the black-outs • Improvement in mis-operations of power system • Efficiency of power distribution operation	–		–		–		Note - 1
	b) Other areas with automated distribution facilities • Improvement in high voltage distribution line accidents • Reduction of mean black-out time per accident • Mobility of restoration against the black-outs • Improvement in mis-operations of power system • Efficiency of power distribution operation	–		–		–		
	4. Organization for the distribution automation a) Automation Planning Division b) Purchasing c) Operation d) Maintenance and trouble shooting e) Internal training system	◎		◎		◎		
B. Project Purpose PEA personnel will be trained in the fields of the planning and managing of DAS.	1. Improvement of technical level to plan DAS a) Evaluation capability of distribution systems b) Technical capability for integration of DAS which suits to existing distribution system • Conceptual and basic planning ability • System integration • Purchasing and construction management	◎		◎		◎		
	2. Improvement of technical level to operate and maintain DAS	◎		◎		◎		

Annex 18. Evaluation Check List (2/3)

Evaluation Check List (2)

Evaluation Items	Acquired Results	Results of Evaluation						Remarks
		Japanese Side		Thai Side		Overall		
		T	A	T	A	T	A	
C Output								
1. C/P of PEA will acquire the basics of DAS, and the knowledge and technology necessary for its construction, operation, maintenance, and application.	1.Technical level of C/P							
	a) Basics of DAS	◎	◎	◎	◎	◎	◎	
	b) Design, installation and adjustment of a simulator of DAS	◎	◎	◎	◎	◎	◎	
	c) Operation and maintenance of the simulator of DAS	◎	◎	◎	○	◎	◎	
	d) Advanced application of DAS	◎	◎	◎	◎	◎	◎	
	- Lectures : 892 persons-day							
	- OJT : 2,439 persons-day							
	- Field practices : 251 persons-day							
	- Others (seminars, site observation, etc.)							
2. DAS simulator for training will be installed at the project site, then maintained and managed.	2. Situation of operation, maintenance and management of DAS simulator as well as plan of operation in the future	◎		◎		◎		
	a) Installation of the simulator							
	b) Utilization of the simulator							
	c) Maintenance of the simulator							
3. Internal training courses for PEA's engineers and technicians other than C/P will be opened and managed.	3. Result of internal training by C/P and its evaluation	◎		◎		◎		
	a) Internal training for PEA head office staff and branch offices staff							
	• Number of participants : 232 persons							
	• Seminar period							
	- Basic course : Two weeks							
	- Advanced course One week							
	b) Internal training for PEA service offices staff							
	• Number of participants : 232 persons							
	• Seminar period : One week							
4. Seminars concerning full-automatic DAS will be opened at PEA	4. Result of seminars on DAS and its evaluation	◎		◎		◎		
	a) Outline of Summary of reliability in the power utility & Summary of DAS System							
	b) Full Automatic DAS System							
O. Inputs								
1. Input by Japanese side	<Record of input by Japanese side>							
• Dispatches of survey teams	1. Dispatches of survey teams	◎		◎		◎		
• Dispatches of experts	a) Number of teams : 6 teams							
• Acceptance of C/P training in Japan	b) Total team members : 22 persons							
• Provision of necessary equipment	2. Dispatches of experts	◎		◎		◎		
• Provision of necessary expenses	2.1 Long-term experts							
	a) Number of the field of expertise : 3 fields							
	b) Number of experts dispatched : 4 persons							
	c) Service period : 4 years and 10 months							
	2.2 Short-term experts							
	a) Number of the field of expertise : 16 fields							
	b) Number of experts dispatched :27 persons							
	c) Service period : 17.8 months in total							
	3.Acceptance of C/P training in Japan	◎		◎		◎		
	a) Training courses : 12 fields							
	b) Number of trainees : 21 persons							
	c) Training period : 38 to 54 days per batch							
	d) Total man-day : 630 man-days							

Annex 18. Evaluation Check List (3/3)

Evaluation Check List (3)

Evaluation Items	Acquired Results	Results of Evaluation						Remarks
		Japanese Side		Thai Side		Overall		
		T	A	T	A	T	A	
	4. Provision of necessary equipment a) DAS simulator b) DNDS monitor c) Measuring instruments d) Others	◎		◎		◎		Note-2
	5. Provision of necessary expenses a) Dispatches of survey teams : Yen 29.3 mil. b) Dispatches of experts : 248.6 c) C/P training in Japan : 12.9 d) Necessary equipment : 458.0 e) Administration : 1.0 Total amount : Yen 849.8 mil.	◎		◎		◎		
2. Input by Thai side • Allocation of C/P • Finance of local costs • Provision of teaching materials, equipment, and facilities including rooms for experts	<Record of Input by Thai Side> 1. Allocation of C/P a) Number of counterparts : 21 persons b) Managerial staff : more than 15 persons c) Assignment period : 4 years and 10 months	◎		◎		◎		
	2. Finance of local costs a) Personal expenses : Bahts 26.1 mil. b) Installation of simulator : 55.2 c) Routine annual : 2.6 d) Other expenses : 2.1 Total amount : Bahts 86.0 mil.	◎		◎		◎		
	3. Provision of teaching materials, equipment, and facilities including rooms for experts	◎		○		◎		
E. Sustainability	1. Organizational sustainability a) Organization of distribution automation training	◎		◎		◎		
	2. Financial sustainability a) Budget for maintaining the DAS simulator and other equipment provided	◎		◎		◎		
	3. Technical sustainability a) Work assignment of counterpart personnel b) Technical capability for introducing DAS in future c) Future effective utilization of the DAS simulator and other equipment provided through this project	◎		◎		◎		
F. Overall Evaluation of the Project								

Note-1	Improvement of the power supply reliability is observed in Nava Nakhon Industrial Estate though long term quantitative data to prove such effects have not been accumulated
Note-2	Several measuring instruments will arrive by the end of June in 1997

JICA