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**MINUTES OF MEETING  
BETWEEN  
THE JICA TERMINAL EVALUATION TEAM  
AND  
THE AUTHORITIES CONCERNED OF THE GOVERNMENT OF  
THE REPUBLIC OF TURKEY  
ON  
THE TERMINAL EVALUATION  
ON  
THE PROJECT FOR ENERGY EFFICIENCY IMPROVEMENT OF POWER PLANT**

The Terminal evaluation Team (hereinafter referred to as "JICA Team"), headed by Dr. Akira Niwa, was organized by the Japan International Cooperation Agency (hereinafter referred to as "JICA"), and dispatched to Turkey from 16 October to 28 October 2008, for the purpose of conducting a terminal evaluation of the Project for Energy Efficiency Improvement of Power Plant in the Republic of Turkey (hereinafter referred to as "the Project").

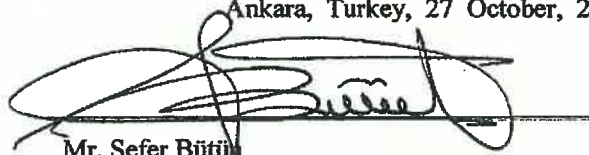
Joint Evaluation Team, which consists of members of Electricity Generation Company (Elektrik Üretim Anonim Şirketi, hereinafter referred to as "EUAS") and JICA Team, was established for the purpose of conducting the joint evaluation.

After intensive interview and analysis of the activities and achievements of the Project, the Joint Evaluation Team concluded on the Report on the Joint Terminal Evaluation (hereinafter referred to as "the Report") as attached hereto, and submitted to the Third Joint Coordination Committee for approval. As a conclusion of the detail review and discussion, the both sides of EUAS and JICA Team agreed upon the Report.

Ankara, Turkey, 27 October, 2008



Dr. Akira Niwa  
Leader  
JICA Terminal Evaluation Team  
Japan International Cooperation Agency (JICA)



Mr. Sefer Bütüm  
Chairman of the Board and Director General,  
Electricity Generation Co. Inc. (EUAS)



Mr. Raşit İş  
Deputy Director General  
Electricity Generation Co. Inc. (EUAS)

Attachment: Joint Terminal Evaluation Report

**JOINT TERMINAL EVALUATION REPORT  
ON  
THE JICA TECHNICAL COOPERATION  
FOR  
THE PROJECT FOR ENERGY EFFICIENCY IMPROVEMENT OF  
POWER PLANT  
IN THE REPUBLIC OF TURKEY**

**JAPAN INTERNATIONAL COOPERATION AGENCY (JICA)**

**ELECTRICITY GENERATION Co. Inc. (EUAS),  
MINISTRY OF ENERGY AND NATURAL RESOURCES,  
THE REPUBLIC OF TURKEY**

**27 October, 2008  
ANKARA, THE REPUBLIC OF TURKEY**

**MUTUALLY ATTESTED AND SUBMITTED  
TO ALL AUTHORITIES**

**27 OCTOBER, 2008**

**ANKARA, THE REPUBLIC OF TURKEY**




Dr. Akira NIWA

Leader

JICA Terminal Evaluation Team

Japan International Cooperation Agency (JICA)



Mr. Sefer BÜTÜN

Chairman of the Board and Director General,

Electricity Generation Co. Inc. (EUAS)

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## ABBREVIATIONS

AVR	Automatic Voltage Regulator
C/P	Counterparts of the project
DAC	Development Assistance Committee
DeSox	Desulphurization
EUAS	Electricity Generation Co. Inc. (ELEKTRİK ÜRETİM A.Ş.)
JCC	Joint Coordination Committee
JFY	Japanese Fiscal Year (from April 1 <sup>st</sup> to March 31 <sup>st</sup> )
JICA	Japan International Cooperation Agency
MENR	Ministry of Energy and Natural Resources
NECC	National Energy Conservation Center
OECD	Organization for Economic Cooperation and Development
PDM	Project Design Matrix
PET	Power Engineering and Training Services Inc.
PM	Preventive maintenance
PO	Plan of Operation
R/D	Record of Discussions



## I. INTRODUCTION

### 1. The Evaluation Team

The JICA Evaluation Team organized by Japan International Cooperation Agency (hereinafter referred to as "JICA Team") and headed by Dr. Akira Niwa, visited the Republic of Turkey from October 16 to October 28, 2008, for the purpose of joint evaluation with authorities concerned of Turkey on the achievement of the Japanese technical cooperation for the Project for Energy Efficiency Improvement of Power Plant in the Republic of Turkey (hereinafter referred to as "the Project") on the basis of the Record of Discussions (hereinafter referred to as "R/D") signed on October 10, 2006.

Both sides discussed and studied together the relevance, effectiveness, efficiency, impact, and sustainability of the Project in accordance with the JICA Guideline for Project Evaluation.

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

### 2. Schedule of Joint Evaluation

No.	Date	Schedule	Place
1	16 <sup>th</sup> Oct.	12:25 Depart Narita for Ankara >23:10 Arrive in Ankara	Ankara
2	17 <sup>th</sup> Oct.	9:00 Meeting with JICA Turkey Office 10:30 Courtesy call to Embassy of Japan 13:30 Courtesy call to Electricity Generation Co. Inc. (EUAS), Chairman of the Board and Director General of EUAS (Mr. Sefer Butun) 14:30 Meeting with project members of EUAS to confirm joint evaluation procedures	Ankara
3	18 <sup>th</sup> Oct.	8:00 Depart Ankara for Bursa 16:00 Discussion with Japanese experts	Bursa
4	19 <sup>th</sup> Oct.	Preparation for Evaluation workshop/ discussion with Japanese experts	Bursa
5	20 <sup>th</sup> Oct.	8:30 Courtesy call to Manager and Deputy Manager of Power Plant 9:00 Observation of Orhaneli power plant 10:00 Evaluation workshop at Orhaneli Power Plant (1) Mr. Mustafa Soyoral & Mr. Bulent Urer, Operation, (2) Mr. Orhan Kucuk, Electric Maintenance Chief, (3) Ferhat Kilic, Boiler Maintenance Engineer, with Chief for mechanic/ machine, (4) Mr.	Orhaneli

No.	Date	Schedule	Place
		Ramazan Ari, Turbine Maintenance Chief Engineer, (5) Ismail Akbiyik, Occupational Safety & Training Chief Engineer (out of office)	
6	21 <sup>st</sup> Oct.	9:00 Meeting with Manager and Deputy manager of Orhaneli Power Plant 11:00 Meeting with Japanese experts 12:30 Depart Orhaneli for Ankara	Orhaneli
7	22 <sup>nd</sup> Oct.	9:00 Evaluation workshop at EUAS (interview to C/Ps) (1) Department of Thermal Power Plants & Mining Areas, (2) Department of Education and Information Technology	Ankara
8	23 <sup>rd</sup> Oct.	9:00 Internal meeting on Joint Evaluation Report 14:00 Meeting with Director, Department of Education and Information Technology (Mr. Muzaffer Tani) 15:00 Meeting with Ministry of Energy and Natural Resources, Mr. Zafer Belin, Deputy Undersecretary 19:00 Meeting with Chairman of the Board and Director General of EUAS (Mr. Sefer Butun)	Ankara
9	24 <sup>th</sup> Oct.	9:00 Preparation for Joint Coordination Committee (JCC) 14:00 Meeting with EUAS (Feedback: submit evaluation report draft) 17:00 Meeting with JICA Turkey office (progress report)	Ankara
10	25 <sup>th</sup> Oct.	Report writing	Ankara
11	26 <sup>th</sup> Oct.	Report writing, preparation for JCC	Ankara
12	27 <sup>th</sup> Oct.	9:30 JCC meeting on the Terminal Evaluation 16:30 Observation of National Energy Conservation Center (NECC) (Mr. Erdal Calikoglu)	Ankara
13	28 <sup>th</sup> Oct.	9:30 Report to JICA office 15:00 Depart Ankara for Istanbul (TK131)	Ankara
14	29 <sup>th</sup> Oct.	12:25 Arrive in Narita	






### 3. Members of Joint Evaluation

#### 3-1. Japanese Side

Dr. Akira NIWA	Team leader Senior Advisor (Power Development), Department of Human Resources for International Cooperation, JICA
Mr. Yoshikazu WADA	Evaluation planning Electric Power and Energy Division, Natural Resources and Energy Group, Industrial Development Department, JICA
Mr. Hiroshi HANAOKA	Thermal Power Generation (Energy Efficiency) Cooplus Ltd.
Mr. Akira MATSUMOTO	Evaluation Analysis A&M Consultant Ltd.

#### 3-2 Turkish Side

Mr. Sefer BÜTÜN	Chairman of Board and Director General Electricity Generation Co. Inc. (EUAS)
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## II. METHODOLOGY OF EVALUATION

### 1. Purpose of Evaluation

The purpose of the evaluation of the Project was defined as follows:

- (1) Enhancing the "Learning Effects" of the personnel and the organizations concerned for more effective project implementation;
- (2) Using Evaluation feedback to consider next actions for the Project; and
- (3) Disclosing information widely to secure JICA's accountability.

### 2. Method of Evaluation

The Project evaluation was carried out in accordance with the JICA Guideline for Project Evaluation.

The following is the guiding principle of the evaluation:

- (1) The Project Design Matrix (PDM) was agreed by both sides and utilized as the foundation of the evaluation;
- (2) Achievement of the Project was confirmed by collecting data defined in the Objectively Verifiable Indicators of the PDM; and
- (3) The Project was evaluated employing the five evaluation elements defined by Development Assistance Committee (DAC) of Organization for Economic Cooperation and Development. A brief explanation is shown in the following section.

### 3. Elements of Evaluation

In the first step of the evaluation, the Joint Evaluation Team (hereinafter referred to as “the Team”) assessed the degree and prospects of achievement of the Project Purpose and outputs based on the PDME attached as ANNEX-1.

In the second step, the implementation process was assessed and evaluated from the aspect of project management.

In the third step, the team analyzed and evaluated the Project from the viewpoints of “Relevance”, “Effectiveness”, “Efficiency”, “Impacts” and “Sustainability” as below.

Finally, the Team made the conclusion and recommendation of the Project, and also identified the lessons learned from the Project.

The Project was evaluated on the following five Elements:

- |                    |   |
|--------------------|---|
| (1) Relevance      | The degree to which the project can still be justified in relation to the national and regional priority given to the theme;  |
| (2) Effectiveness  | The extent to which the purpose has been achieved or not, and whether the project purpose can be expected to happen on the basis of the outputs of the project;   |
| (3) Efficiency     | How the results stand in relation to the efforts and resources, how economically the resources were converted to the outputs, and whether the same results could have been achieved by other better methods |
| (4) Impact         | Foreseeable or unforeseeable, and favorable or adverse effect of the project upon the target groups and persons possibly affected by the project  |
| (5) Sustainability | The extent to which the positive effects as results of the project will still continue after external assistance has been concluded.  |

According to the above elements, the specific Evaluation Grid in this Project is attached as ANNEX-2.

### 4. Information for Evaluation

The Team carried out field survey in the Project sites to observe the Project situation, also made interviews with the Turkish counterparts engaged in the Project, Japanese experts, and other authorities concerned. The Team also collected information through questionnaire from concerned personnel. Following sources of information were used in this study:

- (1) Documents agreed by both sides prior to and/or in the course of the implementation of the Project,
- R/D,
  - Minutes of the Discussions,
  - The Project Design Matrix (ANNEX-1), and
  - Plan of Operation (ANNEX-4).

- (2) Record of inputs from both sides and activities of the Project,
- (3) Statistics and Materials,
- (4) Direct observation,
- (5) Interview to EUAS and & other Project Managerial Members (Headquarters level),
- (6) Interview to the counterparts (Orhaneli Power Plant level),
- (7) Interview to ex-trainees who attended in Japan, and
- (8) Interview to the person in charge for power sector in Ministry of Energy and National Resources  
(MENR)



### **III. BACKGROUND AND SUMMARY OF THE PROJECT**

#### **1. Background of the Project**

Electricity demand in Turkey is estimated to increase annually at the rate of 7.7 percent during the period of 2005 and 2020. In order to maintain the stable power supply, it is crucial in Turkey to rehabilitate ageing power plant facilities in order to increase the generation output. There are about 10 coal-fired thermal power plants which have been operated for 20 to 25 years and their efficiency had been gradually declining. Power plant of lower efficiency consumes more fuel for power generation, and consequently yield bigger load factor on the environment in terms of greenhouse gas emission. Therefore, the needs for improvement of efficiency in thermal power plants are considered to be extremely high in Turkey.

The Electric Generation Company Co. Inc. (EUAS), which generates more than 50% of power in Turkey, is in the major position to undertake rehabilitation of thermal power plants in Turkey. However, the current level of experience and knowledge for rehabilitation of thermal power plants is not sufficient to fulfill the requirements to improve energy efficiency of thermal power plants. Under such circumstances, the Turkish Government requested the Japanese Government to provide project-type technical cooperation for assisting energy efficiency improvement of thermal power plants in Turkey.

#### **2. Objective of the Project**

Objective of the Project in the R/D is: "The capacity for energy efficiency improvement at model power plant (Orhaneli) is improved."

#### **3. Chronological Review of the Project**

A chronological review of the Project is summarized in ANNEX-3.

#### **4. Administration of the Project**

Administration of the Project is shown in the Organization Chart of EUAS (ANNEX-5).



#### IV. PERFORMANCE OF THE PROJECT

##### 1. Achievement of the plan

The products for target area activities made by this Project are summarized in Annex 11.

Technical transfer seminar or technical lecture was conducted as planned in each stage during the Project successfully, and the subjects and specific contents were attached in ANNEX-12 & 13.

Achievement level of each output is described as below.

##### 1.1 Achievement level of outputs

(1) Output 1: *The skills of C/Ps for equipment diagnosis are developed*

Verifiable Indicators	Achievement (as of October 2008)
The report of equipment diagnosis at model power plant (Orhaneli) is developed.	<p>1) Technical report was prepared and now ready to be delivered to all power plants in Turkey.</p> <p>2) All facilities in Orhaneli were diagnosed and followings were pointed out.</p> <p>a) The number of yearly occurrence of unplanned shutdown had been increasing up to 2007.</p> <p>b) The primary cause for those unplanned shutdown was analyzed and identified of the rupture of boiler tube pipes.</p> <p>c) Breakdown maintenance was normally employed, and tube pipe repair was conducted only after the occurrence of rupture incidence.</p> <p>3) Proposal for adoption of Preventive Maintenance</p> <p>a) Experts strongly advised that Preventive Maintenance (PM) should be adopted, and the necessary action was taken by the C/Ps.</p> <p>b) Substantial proposal Substantial proposals were made as listed in the followings for equipment troubles, most of which are result of the non-existence of periodic inspection.</p> <p>i) Periodic inspection items for Boiler, Turbine, Electrical and Control equipment</p> <p>ii) Data collection of tube thickness for whole boiler parts because of so many tube leaks</p> <p>iii) Remaining life assessment of turbine rotor blades and casing</p> <p>iv) Replacement of Exciter and Automatic Voltage Regulator (AVR)</p> <p>v) Guidance on Transformer Insulation oil characteristic test</p> <p>4) Recognition by EUAS of importance for adoption of PM EUAS recognized importance of Preventive Maintenance and began many actions such as periodic measurement of boiler tube thickness.</p> <p><i>Note: PM defines that vital values of equipment conditions are to be periodically measured and the creation of database enable prediction of the adequate timing of repair for equipment.</i></p> <p>5) Importance of maintaining safety and hygiene conditions was pointed out. Followings have been improved,</p> <p>a) Cleaning around boiler</p> <p>b) Promotion of non-smoking in boiler area.</p>

(2) Output 2: *The skills of C/Ps for environmental measure are developed*

Verifiable Indicators	Achievement (as of October 2008)
The report of environmental measure at model power plant (Orhaneli) is developed.	<ol style="list-style-type: none"> <li>1) Technical report was prepared and now ready to be delivered to all power plants in Turkey.</li> <li>2) PM has been recommended to be applied to DeSOx facilities based on Japanese maintenance procedure.</li> <li>3) Utilization level of DeSOx was improved at the months of July and August 2008 owing to the remedying of Electric dust collector trouble and increasing of electric power supply capacity of DeSOx.</li> <li>4) Dust monitor is under repair to resume measurement of dust contents in emission.</li> </ol>

(3) Output 3-1: *The skills of C/Ps for planning of rehabilitation are developed*

Output 3-2: *The skills of C/Ps for designing of rehabilitation are developed*

Verifiable Indicators	Achievement (as of October 2008)
(3-1) The rehabilitation plan at model power plant (Orhaneli) is developed.	<ol style="list-style-type: none"> <li>1) Technical report was prepared and now ready to be delivered to all power plants in Turkey.</li> <li>2) Concept, basic process and work flow for rehabilitation work were transferred to counterparts.</li> <li>3) Necessity and priority of rehabilitation of major equipments was identified through application of diagnosis for the following items; Boiler ECO1 tubes and AVR and AC Exciter.</li> </ol> <p><i>Note: A part of boiler ECO tubes had been replaced by EUAS prior to the preparation of rehabilitation specifications by the Project.</i></p>
(3-2) The rehabilitation specification at model power plant (Orhaneli) is developed.	<ol style="list-style-type: none"> <li>1) The rehabilitation specification of following item is in a draft stage.                             <ol style="list-style-type: none"> <li>a) Excitation system (including AVR)</li> </ol> </li> <li>b) It will be delivered to all power plants in Turkey.</li> </ol>
(3-3) The manual for rehabilitation plan and design is developed.	<ol style="list-style-type: none"> <li>1) Manual for rehabilitation plan and design is now under preparation. It contains know-how for preparation of rehabilitation plan and design with examples that are informative and useful to all facilities.</li> <li>2) Manual for rehabilitation plan and design is now under preparation, and it will be delivered to all power plants in Turkey..</li> </ol>

(4) Output 4: *The skills of C/Ps for operation and maintenance of power facility are developed*

Verifiable Indicators	Achievement (as of October 2008)
(4-1) The manual for boiler efficiency maintenance and improvement, facility maintenance is developed.	<ol style="list-style-type: none"> <li>1) The manual which contains following items was prepared.                             <ol style="list-style-type: none"> <li>a) Boiler degradation factors &amp; diagnosis</li> <li>b) Criteria for tube wall thickness</li> <li>c) Periodic inspection control methods</li> </ol> </li> <li>2) Progress on preparation for manual of Turkish version The manual was already translated into Turkish, and it will be checked before distributing to other power plants.</li> <li>3) Evidence of application in Orhaneli PS Following items have been already adopted at Orhaneli PS.                             <ol style="list-style-type: none"> <li>a) Execution of periodic measurement of boiler tube thickness</li> <li>b) Monitoring of the trend and characteristics of data with introduction of necessary criteria</li> <li>c) Test methods of UJT (Ultra sonic Test), MT (Electromagnetic Test) and PT (Penetration Test) learned at Training in Japan is regarded very beneficial as practical use for non-destructive measurement.</li> </ol> </li> </ol>

(4-2) The O & M manual for generator excitation system is developed.	<p>1) The manual was prepared. It contains followings.</p> <ul style="list-style-type: none"> <li>a) Generator deterioration factors &amp; Daily maintenance</li> <li>b) Periodic inspection items</li> <li>c) Trouble information control methods</li> </ul> <p>2) Draft of Turkish version The manual was already translated into Turkish, and it will be checked before distributing to other power plants.</p> <p>3) Evidence of application in Orhaneli PS Excitation check list was already prepared and in use.</p>
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(5) Output 5: *The training system of EUAS for energy efficiency improvement is enhanced.*

Verifiable Indicators	Achievement (as of October 2008)
The training enhancement plan for energy efficiency improvement is formulated.	<p>1) The manual and materials given at technical seminars and training in Japan were translated to Turkish and will be delivered to all power plants of EUAS. These documents will become an important asset for EUAS trainers and training materials to deliver adequate training programs.</p> <p>2) Training implementation plan for EUAS is under preparation and will be issued at the end of this October.</p> <p>3) EUAS has a plan to promote a 4-year training program for newcomers, and that will be compiled into the system of enterprise resource planning.</p> <p>4) Provision of training text EUAS has responsibility for translation task to Turkish of all manuals and technical materials of 9,000 pages. Some of them were already translated into Turkish, and it will be checked, modified to make them appropriate for EUAS's use and then will be delivered to all power plants. This work will be executed by working group consisting of training department of head office and staffs from some power stations.</p> <p>5) Appointment of qualified trainers In order to accomplish training programs, qualified trainers have to be secured and officially appointed. Engineers who had received the trainings in Japan shall be the core members.</p>

**1.2 Achievement of the project purpose**

Project Purpose: *The capacity for energy efficiency improvement at model power plant (Orhaneli) is improved.*

Verifiable Indicators	Achievement (as of October 2008)
(1) At model power plant (Orhaneli), equivalent or better cost-performance rehabilitation plan is developed compared to outsourcing rehabilitation plans of same size power plants	<p>In cost comparison with the records of the past EUAS construction projects, it is expected that better rehabilitation plan and design (especially for replacement of excitation system) will be realized.</p> <p>1) PM decreases rehabilitation cost</p> <ul style="list-style-type: none"> <li>a) Boiler tubes Compiling of periodic tube thickness database may decrease unplanned shutdown and results in lower maintenance cost in comparison with the current maintenance way. One time of unplanned shutdown costs more than 500,000 YTL.</li> <li>b) Excitation system Engineers in Orhaneli power plant selected the optimal excitation system, namely of static exciter, for the rehabilitation work with the help of the experts. The cost for the choice would be 10 to 30 % lower than the other two excitation systems including the currently used excitation system.</li> </ul> <p>2) EUAS admits that all manuals, reports and texts produced in the</p>

(2) The reports, plans, specifications and manuals which are made by the project are adopted by EUAS.	Project as well as materials given by the training in Japan are worth using as texts in Turkey, and they are in process of translation into Turkish.
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### 1.3 Achievement of the overall goal

Overall Goal: *The energy efficiency of model power plant (Orhaneli) is improved.*

Verifiable Indicators	Achievement (as of October 2008)
(1) Level of capacity utilization in model power plant (Orhaneli) will be improved.	<p>The level of capacity utilization will be increased if the plant efficiency is increased and the number of plant shutdown by accidents is decreased owing to continuous practice of preventive maintenance.</p> <p>Operation records of Orhaneli power plant indicate that the capacity utilization factor was 63.05 % in 2007. The increase in the capacity utilization factor is expected to take place if the plant efficiency is increased and the number of plant shutdown by accidents is decreased by promotion of preventive maintenance.</p> <p>The occurrence of unplanned shutdown at Orhaneli power plant was 22 times in 2007. The shutdown times have been fluctuating in the last 5 years, but the tendency shows apparent decline in the medium and long term basis. (The number of unplanned shutdown is to be used as supplemental indicator.)</p> <p><i>Note:</i></p> <p>1) <i>Plant efficiency is difficult to calculate due to instability of coal calorie and uncertainty of coal volume.</i></p> <p>2) <i>Capacity utilization is adequate index in the following conditions,</i></p> <ul style="list-style-type: none"> <li>● <i>Plant is under the base load condition as far as possible.</i></li> <li>● <i>Coal calorie does not decrease so much as long term.</i></li> <li>● <i>The number of unplanned shutdown is regarded as a supplemental indicator.</i></li> </ul>
(2) Rehabilitation is conducted according to rehabilitation plan made by the project at model power plant (Orhaneli).	<p>Following rehabilitation will be executed by Orhaneli engineers.</p> <p>1) Best practical boiler tube rehabilitation (for Water wall, Super heater, Reheater and economizer)</p> <p>2) Replacement of Excitation system in 2009</p>

## 2. Input performance

According to the results of interview, study and observation, most of the inputs have been appropriate in terms of timing, quantity and quality made by both the Japanese and Turkish sides. The inputs of the Project were as follows (as of October 2008)

Lists of Inputs are attached in ANNEX (see ANNEX-6 to 10 and ANNEX 14)

### Inputs (as of October 2008)

<Japanese side>

Expert: In total: 46.23M/M (13 experts)

Trainees received in Japan: 18



**Local Expenses:** Equivalent to 174,807 US \$

<Turkish Side>

**Land, building, expert room and training facilities provided at Orhaneli**

**Counterparts:** In total 25

## **V. IMPLEMENTATION PROCESS OF THE PROJECT**

Due to the good collaboration between relevant authorities, the project activities were smoothly undertaken, and also undertaken as proper management. The Project has implemented as shown in the "Plan of Operation (Achievement)" (see ANNEX-4)

## **VI. RESULTS OF EVALUATION**

### **1. Conclusion**

The Joint Evaluation Team evaluated the Project in line with the five evaluation criteria based on the findings obtained from field observations and a series of discussions with those who are involved in the Project.

The Team concludes that the Project has been carried out successfully and produced some concrete outcomes. The most significant outcome is the capacity and skills of C/Ps at EUAS and Orhaneli power plant have been strengthened in terms of the technical capability, i.e., (1) necessary technical know-how and experiences with systematic manner, (2) integrated formulation of rehabilitation plan, and (3) tangible formulation of training program and the implementation defined by the Project.

The C/Ps have adopted the newly acquired skills, knowledge and attitude in the course of the technical cooperation and been able to utilize such capacity for operation & maintenance of the Orhaneli power plant. Empowered capacity of each C/P is the indispensable way of integration into the organizational capacity in EUAS enterprise. Documents, such as reports, manuals and technical papers which have been created during the Project by the Japanese Experts and C/Ps will be compiled and standardized, and then will be disseminated to all other power plants for utilization by EUAS.

In particular, practical rehabilitation plan as well as operation/maintenance manuals of the boilers and excitation system and the rehabilitation outline design shall be disseminated and utilized in relevant authority and department in Turkey. To attain these directions, the C/Ps will be able to



carry out their accumulated technologies and experiences gained in the Project.

According to the Project PDM, by the end of the Project, the Project purpose will be successfully achieved. Based on the findings mentioned above, it is concluded that the Project will be terminated in November 2008 as planned.

## **2. Summary of the Evaluation Using Five Elements**

### **Relevance**

The Team concluded that the Project has been relevant with regard to the following four items: First, this Project is in line with the current energy policy of Turkish government. Energy efficiency for power plants is one of the Turkish government's priorities in its policies. With a view to maximum utilization and necessary rehabilitation of power plant stations as well as engineer capacity building, the Project purpose and the implementation shall be made towards improving energy efficiency and ensuring energy saving.

Second, EUAS is a state economic enterprise, which operates state thermal power plants, and the goal of the company is the same direction of the Project.

Third, Orhaneli which was selected as the model plant for the Project is relevant because of the necessity to formulate rehabilitation plan immediately, so the selection of this power plant is appropriate to the purpose of this Project.

Finally, the Project is in line with JICA's priority sector of technical cooperation in Turkey defined as "Environmental Improvement".

### **Effectiveness**

The various numbers of technology transfer items and corresponding reports were produced through the Project (Seven contents/items and Nine deliverables/reports) as below.



	Contents	Deliverables
1	Facility diagnosis ability improvement support	Facility diagnosis report
2	Environmental measures ability improvement support	Environmental measures report
3	Power generating facility operation/maintenance/management ability improvement	Recommendations for power generating facility operation/maintenance/management ability improvement
4	Rehabilitation plan/design ability improvement	Rehabilitation plan Rehabilitation outline design Rehabilitation plan /outline design manual
5	Boiler efficiency maintenance/improvement, facility maintenance ability improvement	Boiler efficiency maintenance/improvement, facility maintenance manual
6	Excitation system operation/maintenance/management ability improvement	Excitation system operation management manual
7	Support of training system for improving capability of energy efficiency optimization	Training status report Training improvement plan

Project Purpose, "The capacity for energy efficiency improvement at model power plant (Orhaneli) is improved." has been achieved in accordance with the products and documentation prepared by the Project which are under preparation in Orhaneli and /or in EUAS headquarter.

(1) In comparison with the results of past construction projects, it is expected that better rehabilitation plan (especially excitation system replacement) will be designed.

(2) The operation/maintenance manuals of the boilers and excitation system will be planned to translate into Turkish, and will be distributed to all EUAS power stations. In addition, steps are being taken to distribute copies of the rehabilitation outline design report and rehabilitation plan/outline design manual to all the power plants in Turkey.

The Project was carried out on schedule and the Project has attained project purpose as already stated above. Therefore, the effectiveness of the Project is considered to be high. The questionnaire survey revealed that this Project was enabling formulation of various documentation regarding to the rehabilitation of power plants as well as training program. And also it was revealed that such documentation was being produced for the first time in Turkey. Most activities have been implemented as scheduled, and each Output has contributed to the achievement of the Project purpose.

As mentioned in the previous chapter of this report, "IV. Performance of the Project", the Team concluded that the Project is expected to be successfully achieved in general.

The followings have been identified as promoting and hampering factors.

#### (1) Factors that Promoted Realization of Effects

1) Flexible response for project activities according to the demand and needs of Turkish side  
Extension of duration for technical transfer seminar and provision of training opportunities in Japan were added in project activities because of strong requests and actual needs on Turkish side. Such modification of project activities was relevant and effective to fulfill the needs of Turkish side as

well as to attain the Project purpose.

2) Collaborating manner for project management

Close relationship was established between relevant Turkish organizations and Japanese experts. It is an evidence of a good collaboration between the two groups. In particular, the Project has emphasized on the technical transfer at Orhaneli power plant, and produced fruitful outcomes in the field level.

**(2) Factors that Impeded Realization of Effects**

1) Assignment of C/Ps

The Project activities were affected by due to retirement and also leave of few counterparts. However, such changes in assignment of C/Ps are normally seen in other organizations in Turkey and have not caused any material influence on the Project.

**Efficiency**

All of five outputs were achieved through utilizing the given inputs. In other words, since the project inputs were provided as planned, necessary activities were conducted based on the technical needs and were applicable in the targeted plant, so the Project was at a satisfactory level of utilizing the inputs.

The Team observed all the Project inputs were mostly appropriate such as assignment of Japanese experts and C/Ps, and the disbursement of the necessary budget both from Turkish and Japanese side. In particular, the C/P Training in Japan was carried out based on the strong requests by Turkish side, and implemented efficiently and effectively. Training institute in Japan who conducted the Project activity of training in Japan, PET (Power Engineering and Training Services Inc.), is one of the best institutes in Japan for Turkish C/Ps to learn various technical aspects since PET is used to be a thermal power plant and it has various cut models of equipments including boiler, turbine, exciter which used to be operated before.

**Impact**

The Overall goal of this Project, "The energy efficiency of model power plant (Orhaneli) is improved." was not evaluated at this stage due to the necessity of continuous monitoring and the collection and analysis of data. It is required to take time to derive visible certain impacts and trends through the Orhaneli power plant continuously.

However, it is remarkable accomplishment that this Project has contributed to the energy efficiency in the model power plants. The office/field interviews and questionnaire survey conducted during

the terminal evaluation, the Team observed that some of positive changes and influences have been driven through the Project as below;

- All the C/Ps utilize the newly acquired experiences, skills and knowledge in their day-to-day works in the respected workplaces, and also this gained knowledge will be transferred to other staffs.
- Project provided a strong motivation to have a more efficient plant operation with less unplanned stops.
- Project had more positive contribution on technical impacts since the Project created a chance to technology transfer and provided technical infrastructure sample and examining.
- Engineers from other power stations attended the technology transfer seminars and then it resulted that the technology transfer contents of this Project being diffused on a wider scale in the future.

### Sustainability

The Team pays attention to the sustainability of the Project as bellow:

#### <Organizational sustainability>

- It is expected that the role and responsibility of EUAS in energy efficiency will continue to be strengthened. The power plant privatization is currently an important agenda for Turkish government. However, provisions relating to efficiency improvement measures are expected to be included in the specifications for the privatization of power plant in accordance with by-law of energy efficiency law numbered 5627. Accordingly, EUAS power plants will be secured of the continued improvement of energy efficiency regardless of the possible change of the ownership.

#### <Technical sustainability>

The documents, such as reports, manuals and technical papers which have been created during the Project by the Japanese Experts and C/Ps will be compiled and standardized, and they will be disseminated to all other power plants for utilization by EUAS in Turkish language. The knowledge and skill developed in the Project has preserved and shared among the C/Ps in Orhaneli power plant. Within the framework of curriculum and training program which are under progress, EUAS will be able to strengthen the technical staff capacity which can utilize the knowledge and experience gained in the Project.

#### <Financial sustainability>


EUAS is a self-sustaining body and responsible to cover the cost of the operation and maintenance for power plants.



### 3. Detail of the Evaluation (Evaluation Grid)

#### 3-1. Relevance

Evaluation Questions	Result of the Surveys	Remarks <sup>1</sup>
(1) Relevance of the Project is in line with the National Development Plan of Turkey	<ul style="list-style-type: none"> <li>This Project is in line with the current energy policy in Turkish government. With a view to maximum utilization and necessary rehabilitation of power plants as well as engineer capacity building, the Project direction and the implementation shall be made towards improving energy efficiency and ensuring energy saving.</li> </ul>	++
(2) Is the selection of Target Group appropriate?	<ol style="list-style-type: none"> <li>Are the needs of the technical cooperation with EUAS high?               <ul style="list-style-type: none"> <li>EUAS is a state economic enterprise and operates state thermal power plants. The goal/purpose of the company named "EUAS" is to carry out rehabilitation program for increasing the efficiency of the existing power plants in order to secure the low cost generation of electricity, and contribute maximum utilization of the domestic energy resources for reducing energy imports. Therefore it is relevant and very appropriate to select EUAS as the target group of the Project.</li> <li>The model power plant in the Project was "Orhaneli", one of the state power plants and facing of rehabilitation for maintenance and operation. In addition, Orhaneli power plant is relevant because of the necessity to formulate rehabilitation plan immediately, so the selection of this power plant is appropriate to the purpose of this Project.</li> </ul> </li> <li>Is the coverage of the target groups appropriate?               <ul style="list-style-type: none"> <li>Energy Efficiency Law numbered 5627 was adopted by Turkish parliament and became effective on May 2, 2007. By-law on improving energy efficiency for the utilization of energy resources and energy is to be enacted at the end of October 2008. Under the framework of such government policy, the technical cooperation by the Project was designed to strengthen EUAS's capacity in promoting energy efficiency as well as capacity building in this sector in Turkey.</li> </ul> </li> </ol>	++
(3) Is the Project relevant to JICA's ODA program in Turkey?	<ul style="list-style-type: none"> <li>Project is in line with JICA's priority sector of technical cooperation in Turkey defined as "Environmental Improvement".</li> <li>JICA has implemented several technical cooperation projects around the world, and also received trainees for energy efficiency from various developing countries.</li> </ul>	++
(4) Are there technical advantages of Japan?	<ul style="list-style-type: none"> <li>Japan's experience in energy efficiency and advanced/ adopted technology in power plant sector is an asset for other nations seeking technology transfer. Japan has accumulated knowledge and know-how for delivering technical cooperation projects in energy efficiency through the past overseas cooperation, therefore Japan has technical advantage to provide the technology to developing countries.</li> </ul>	++

 <sup>1</sup> Note: "+ +" indicates Much Positive, "+": Positive, "N": Neutral, "-": Negative, "- -": Much Negative

*JICA*

### 3-2. Effectiveness

Evaluation Questions	Result of the Surveys	Remarks
(1) What was the achievement of the project purpose?	<p>1) What was the achievement in light of the project purpose? The team concluded that the project purpose was achieved as stated below.</p> <ul style="list-style-type: none"> <li>• In cost comparison with the records of the past EUAS construction projects, it is expected that better rehabilitation plan and design (especially excitation system replacement) will be realized.</li> <li>• The operation/ maintenance manuals of the boilers and excitation system are scheduled for translation into Turkish, and distributed to all EUAS power stations. In addition, steps are being taken to distribute copies of the rehabilitation plan, design, and manual to all the power plants in Turkey.</li> </ul>	<p>++</p> <p>+</p>
(2) What was the achievement of the Project outputs?	<p>1) Achievement in light of the Output 1: "The skills of C/Ps for equipment diagnosis are developed."</p> <ul style="list-style-type: none"> <li>• Technical report was prepared and now ready to be delivered to all power plants in Turkey.</li> <li>• All facilities in Orhaneli were diagnosed.</li> <li>• Proposal for adoption of Preventive Maintenance</li> <li>• Importance of maintaining safety and hygiene conditions prevailed.</li> </ul> <p>2) Achievement in light of the Output 2: "The skills of C/Ps for environmental measure are developed."</p> <ul style="list-style-type: none"> <li>• Technical report was prepared and now ready to be delivered to all power plants in Turkey.</li> <li>• Preventive Maintenance has been recommended to apply to DeSOx facilities.</li> <li>• Utilization factor of DeSOx was improved at the months of July and August, 2008.</li> <li>• Dust monitor is under repair to resume measurement of dust contents in emission.</li> </ul> <p>3) Achievement in light of the Output 3: "The skills of C/Ps for planning of rehabilitation are developed." and "The skills of C/Ps for designing of rehabilitation are developed."</p> <ul style="list-style-type: none"> <li>• Technical report was prepared and now ready to be delivered to all power plants in Turkey.</li> <li>• Concept, basic process and work flow for rehabilitation work were transferred to counterparts.</li> <li>• Necessity and priority of rehabilitation of major equipments was identified through application of diagnosis.</li> <li>• The rehabilitation specification is in the draft stage.</li> <li>• Manual for rehabilitation plan and design is now under preparation, and it will be delivered to all power plants in Turkey.</li> </ul>	<p>++</p> <p>+</p> <p>++</p>
	<p>4) Achievement in light of the Output 4: "The skills of C/Ps for operation and maintenance of power facility are developed. (Outputs resulted from Activity 4~6) "</p> <ul style="list-style-type: none"> <li>• Concept for Preventive Maintenance was introduced in technical seminars held at Orhaneli power plant.</li> <li>• Seminar materials are scheduled to be translated to Turkish and disseminated to all EUAS plants.</li> </ul>	<p>++</p>

Evaluation Questions	Result of the Surveys	Remarks
	<ul style="list-style-type: none"> <li>• Texts handed out during the training in Japan are in process of translation to Turkish at Orhaneli power plant.</li> <li>• The manual for boiler efficiency maintenance and improvement was prepared by the Project, and already translated to Turkish as a draft, and it will be reviewed.</li> <li>• The O &amp; M manual for generator excitation system was prepared, and already translated to Turkish as a draft, and it will be reviewed.</li> </ul> <p>5) Achievement in light of the Output 5: "The training system of EUAS for energy efficiency improvement is enhanced."</p> <ul style="list-style-type: none"> <li>• The manual and materials produced by the Project were translated to Turkish and will be delivered to all power plants.</li> <li>• Training implementation plan for EUAS is under preparation and will be issued at the end of this October.</li> <li>• EUAS plans to promote 4-year training program for newcomers, which are similar in principle to those employed in Japanese power industry, and that will be compiled into EUAS system of enterprise resource planning.</li> <li>• There will be prepared necessary preparation of training texts and also secured the qualified trainers.</li> </ul>	+
(3) Did the outputs of the Project contribute the Purpose of the Project?	<p>1) Did newly acquired capacity contribute to the Project Purpose?</p> <ul style="list-style-type: none"> <li>• The skill and knowledge of the C/Ps have been upgraded and improved through the Project according to the technical transfer.</li> <li>• Participants of the technical transfer seminar attempts to demonstrate the newly acquired skills and knowledge in the day-to-day operation in their respected work place.</li> <li>• By the creation of rehabilitation plan &amp; rehabilitation outline design, it is contributed to improve the rehabilitation planning and outline design ability at Orhaneli power plant station.</li> </ul> <p>2) Are there any other elements that contribute to achieving the Project Purpose?</p> <ul style="list-style-type: none"> <li>• None</li> </ul>	+ + ++ N
(4) What were the constraints for achieving the Project Purpose?	<p>1) Assignment of C/Ps It has affected to the Project activities due to the retirement and also leaves of few counterparts, even though the situation is almost the same as other organization in Turkey or other countries.</p> <p>2) Other constraints, if any?</p> <ul style="list-style-type: none"> <li>• None</li> </ul>	N

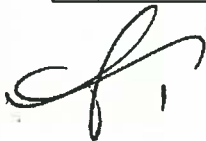


### 3-3. Efficiency

Evaluation Questions	Result of the Surveys	Remarks
(1) Were quality, quantity and timing of inputs appropriate?	<p>1) Were number, areas and timing of Japanese experts appropriate?</p> <ul style="list-style-type: none"> <li>• Assignment of Japanese experts was carried out according to the plan and the fulfillment the necessary activities as shown in the ANNEX-6. Number, areas and timing of the dispatch of the experts were appropriate. However, the two-month-period for each dispatching term was not long enough for the experts to undertake various duties simultaneously for preparation of documents and conducting OJT at Orhaneli power plant.</li> </ul> <p>2) Were number, specification and timing of machinery and equipment appropriate?</p> <ul style="list-style-type: none"> <li>• No any specific machinery and equipment provided through the Project</li> </ul> <p>3) Were number, qualification and timing of C/Ps appropriate?</p> <ul style="list-style-type: none"> <li>• Assignment &amp; timing of the C/Ps are appropriate as shown in the ANNEX-9, but the C/P qualification and experiences was varied and differently in the each field.</li> </ul> <p>4) Were number, areas and timing of training in Japan appropriate?</p> <ul style="list-style-type: none"> <li>• C/P Training in Japan was carried out based on the strong requests by Turkish side, and implemented efficiently and effectively as shown in the ANNEX-10</li> </ul> <p>5) Were size, quality and efficiency of the facility provided for the Project appropriate?</p> <ul style="list-style-type: none"> <li>• The office spaces for the Project and the meeting/ training room were prepared according to the R/D. However, additional desk space for the experts in each C/P's room could have been prepared in order to promote even further close consultations.</li> </ul> <p>6) Were amount and timing of disbursement of the project budget appropriate?</p> <ul style="list-style-type: none"> <li>• Local cost is covered properly such as expenses for holding technical transfer seminar, travel allowance for the C/Ps and other necessary expenses according to the R/D.</li> <li>• Necessary number of C/P and administrative personnel has been allocated as planned</li> <li>• Overall motivation and qualification of C/Ps is generally high to implement the Project, but most of the C/Ps is still young and necessary for the theoretical and practical experiences through the Project.</li> </ul>	<p style="text-align: center;">+</p> <p style="text-align: center;">N</p> <p style="text-align: center;">+</p> <p style="text-align: center;">++</p> <p style="text-align: center;">++</p> <p style="text-align: center;">++</p> <p style="text-align: center;">++</p> <p style="text-align: center;">+</p>
(2) The degree/level of utilizing the inputs	<p>1) Were there inputs allocated to the Project appropriately utilized for the Project?</p> <ul style="list-style-type: none"> <li>• Since the Project inputs were provided as planned, necessary activities was conducted based on the technical needs and were applicable in the targeted plant, so the project was satisfactory level of utilizing the inputs.</li> </ul>	<p style="text-align: center;">++</p>
(3) Project Management	<p>1) Is the Project efficiently managed?</p> <p>It was functioned to support and management system for the Project through the JCC meeting and dispatch of Consultation Team mission in timely manner.</p>	<p style="text-align: center;">+</p>
(4) Constraints	<p>1) Were there any constraints to efficiency of the Project?</p> <ul style="list-style-type: none"> <li>• None</li> </ul>	<p style="text-align: center;">N</p>

### 3-4. Impact

Evaluation Questions	Result of the Surveys	Remarks
(1) What would be the probability of achieving the Overall Goal	<p>1) How much is the increased overall energy efficiency of Orhaneli?</p> <p>The level of capacity utilization will be increased if the plant efficiency is increased and the number of plant shutdown by accidents is decreased due to the preventive maintenance.</p>	+
(2) Are there any other impacts?	<p>1) What were the expected &amp; unexpected positive impacts?</p> <ul style="list-style-type: none"> <li>• EUAS attempts to implement its training program by formulate detail engineer training program for a new course in power plants in Turkey.</li> <li>• All the C/Ps utilize the newly acquired experiences, skills and knowledge in their day-to-day works in the respected workplaces, and also the acquired knowledge will be transferred to other power plant staffs. For instance, one of the C/Ps had acquired knowledge on systematic method and procedure on monitoring boiler tube wall thickness during the training in Japan, and he initiated for necessary data collection and analysis in a systematic manner.</li> <li>• Resulted on the questionnaire and interview revealed that the Project provided a strong motivation to have a more efficient plant with less unplanned stops.</li> <li>• Project had more positive contribution on technical impacts since the Project created a chance to technology transfer and provided technical infrastructure sample and examining.</li> <li>• Engineers from other power stations attended the technology transfer seminars and then it resulted that the technology transfer contents of this Project being diffused on a wider scale in the future.</li> </ul> <p>2) What were the expected or unexpected negative effects?</p> <ul style="list-style-type: none"> <li>• No negative impact was identified at the time of the evaluation.</li> </ul>	<p>+</p> <p>++</p> <p>++</p> <p>+</p> <p>+</p> <p>N</p>
(3) Contribution of the Project for creating impact	<p>1) What was the share of the impact by this and other similar projects implemented in Turkey?</p> <ul style="list-style-type: none"> <li>• Successful implementation of the Project was the key of efficient rehabilitation and day-to-day works in Orhaneli power plants and also in other power plants.</li> <li>• Human resources of the Orhaneli and EUAS headquarter have been developed over the Project period, however, it is still needed more times for retain in organizational capacity.</li> </ul>	<p>++</p> <p>+</p>




### 3-5. Sustainability

Evaluation Questions	Result of the Surveys	Remarks
(1) Roles and responsibility of the EUAS	<p>1) What are the roles and responsibilities of the EUAS in energy efficiency?</p> <ul style="list-style-type: none"> <li>• It is expected that the role and responsibility of EUAS in improvement and promotion of energy efficiency will continue to be strengthened. The power plant privatization is currently an important agenda for Turkish government. However, provisions relating to efficiency improvement measures are to be included in the specifications for the privatization of power plant in accordance with by-law of energy efficiency law numbered 5627. Accordingly, EUAS power plants will be secured of the continued improvement of energy efficiency regardless of the possible change of the ownership.</li> <li>• All power plants in Turkey are required to comply with environmental emission standards of Ministry of Environment and Forestry no later than the year 2012. Reduction of power plant emission on environmental load is essentially proportional to the improvement of energy efficiency, and therefore EUAS is in a position to further accelerate the current improvement of energy efficiency of the power plants.</li> </ul>	+
(2) Capacity of EUAS to continue and improve energy efficiency	<p>1) How is the management and technical capacity of EUAS?</p> <ul style="list-style-type: none"> <li>• Within the framework of curriculum and training program which are under progress, EUAS will be able to strengthen the technical staff capacity which will utilize by increasing of knowledge and experience gained through the Project.</li> </ul> <p>2) How is the financial standing of EUAS?</p> <ul style="list-style-type: none"> <li>• EUAS is self-sustaining body and responsible to cover the cost of the operation and maintenance for power plants.</li> </ul>	+  +
(3) Results of technology transferred in EUAS	<p>1) Was the created documentation retained in the organizations?</p> <ul style="list-style-type: none"> <li>• Documents, such as reports, manuals and technical papers which has been created during the Project by the Japanese Experts and C/Ps will be compiled and standardized, and then will be disseminated to all other power plants for utilization by EUAS in Turkish language.</li> </ul> <p>2) Was the technology and knowledge retained in the organization?</p> <ul style="list-style-type: none"> <li>• Concept of preventive maintenance and benefits generated through its application were transferred by the Project to EUAS management level, and EUAS is now under consideration for introduction of preventive maintenance system to control all the power plants.</li> <li>• Knowledge and skill developed in the Project has retained and shared among the C/Ps in Orhaneli power plant. One example is a self-oriented job execution by C/P which the boiler tube wall thickness is to be implemented in a systematic manner in regards to boiler operation/maintenance and wish to disseminate to other plants.</li> <li>• Through the questionnaire, as a result of careful inspections and controls during the Project, Turkish C/Ps will have idea for future solution about remaining life for rehabilitation plan and design such as Boiler &amp; Exciter system.</li> </ul>	++  ++  +

## **VII. RECOMMENDATION**

### **1. Recommendation**

EUAS should play a leading role for energy efficiency improvement of electricity generation in Turkey. The Team recommends EUAS to take necessary actions to promote energy efficiency improvement of the thermal power plants through dissemination of a good practice and technology achieved by the Project at the model power plant, Orhaneli coal-fired thermal power plant. Specific issues are described in the following:

#### **(1) Finalization of reports and manuals**

The following reports and manuals, which are in draft stage, shall be duly finalized within the Project period.

- Rehabilitation specification at model power plant (Orhaneli)
- Manual for rehabilitation plan and design

#### **(2) Dissemination of reports and manuals**

The Team recommends EUAS to take necessary actions to disseminate the following reports and manuals to other EUAS power plants, upon termination of the Project.

- Report of equipment diagnosis at model power plant (Orhaneli)
- Report of environmental measures at model power plant (Orhaneli)
- Rehabilitation plan at model power plant (Orhaneli)
- Rehabilitation outline design at model power plant (Orhaneli)
- Manuals for rehabilitation plan and outline design
- Manual for boiler efficiency maintenance and improvement, equipment maintenance
- O&M manual for generator excitation system
- Training improvement plan for energy efficiency improvement

#### **(3) Rehabilitation of Orhaneli power plant**

The Team recommends EUAS to conduct boiler tube rehabilitation and replacement of excitation system in accordance with the best practice and technology acquired through the Project.

### **2. Lesson learned**

Energy efficiency improvement is a crucial matter to EUAS in electricity generation with respect to the needs for increasing generation capacity, cost performance, and reduction of environmental effects. The good practice and technology achieved in the Project had been timely delivered to fulfill the needs of EUAS in promoting energy efficiency improvement in thermal power plants in Turkey after termination of the Project.



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# ANNEX-1 PDMe (Project Design Matrix for Evaluation)

The Project for Energy efficiency improvement of power plant in Turkey  
 Target area : Orhaneli, Bursa province

Period : Dec.2006 - Nov.2008

Target Group: EUAS

PDM version: Final  
 Date : Oct, 2008

Project overview (Narrative Summary)	Indicator	Access to Indicator	Assumption
<p><b>(Overall goal)</b>                      The energy efficiency of model power plant (Orhaneli) is improved.</p> <p><b>(Project purposes)</b>                      The capacity for energy efficiency improvement at model power plant (Orhaneli) is improved.</p>	<p>(1) Level of capacity utilization in model power plant (Orhaneli) is improved.                      (2) Rehabilitation is conducted according to rehabilitation plan made by the project at model power plant (Orhaneli).</p> <p>(By end of the project)                      (1) A model power plant (Orhaneli), equivalent or better cost-performance rehabilitation plan is developed compared to outsourcing rehabilitation plans of same size power plants                      (2) The reports, plans, specifications and manuals which are made by the project are adopted by EUAS.</p>	<p>(1) Operation record                      (2) Hearings with officials at model power plant (Orhaneli)</p> <p>(1) Annual generation report issued by EUAS and hearings with officials                      (2) Hearings with officials</p>	<p>The rehabilitation is carried out by EUAS according to rehabilitation plan made by the project.</p>
<p><b>(Output)</b>                      (1) The skills of C/Ps for equipment diagnosis are developed                      (2) The skills of C/Ps for environmental measure are developed                      (3-1) The skills of C/Ps for planning of rehabilitation are developed                      (3-2) The skills of C/Ps for designing of rehabilitation are developed                      (4) The skills of C/Ps for operation and maintenance of power facility are developed                      (Outputs resulted from Activity 4-6)                      (5) The training system of EUAS for energy efficiency improvement is enhanced.</p>	<p>(1) The report of equipment diagnosis at model power plant (Orhaneli) is developed.                      (2) The report of environmental measure at model power plant (Orhaneli) is developed.                      (3-1) The rehabilitation plan at model power plant (Orhaneli) is developed.                      (3-2) The rehabilitation specification at model power plant (Orhaneli) is developed.                      (3-3) The manual for rehabilitation plan and design is developed.                      (4-1) The manual for boiler efficiency maintenance/improvement, facility maintenance is developed.                      (4-2) The O &amp; M manual for generator excitation system is developed.                      (5) The training enhancement plan for energy efficiency improvement is formulated.</p>	<p>(1) The report of equipment diagnosis at model power plant (Orhaneli)                      (2) The report of environmental measure at model power plant (Orhaneli)                      (3-1) The rehabilitation plan at model power plant (Orhaneli)                      (3-2) The rehabilitation specification at model power plant (Orhaneli)                      (3-3) The manual for rehabilitation plan and design                      (4-1) The manual for boiler efficiency maintenance/improvement, facility maintenance                      (4-2) The O &amp; M manual for generator excitation system                      (5) The training enhancement plan for energy efficiency improvement</p>	<p>The organization of model power plant (Orhaneli) for the project doesn't change.</p>
<p><b>(Activity)</b>                      (1) Transferring the skills for equipment diagnosis at model power plant (Orhaneli) by OJT and developing report of equipment diagnosis.                      (2) Transferring the skills for environmental measure at model power plant (Orhaneli) by OJT and developing report of environmental measure.                      (3) Transferring the skills for rehabilitation plan and design at model power plant (Orhaneli) by OJT and developing rehabilitation plan, specification and manual                      (4) Studying of the problems regarding maintenance system at each power plant in Turkey and examination of countermeasure.                      (5) Transferring the skills for boiler efficiency maintenance/improvement, facility maintenance by OJT and developing manual for boiler efficiency maintenance/improvement, facility maintenance.                      (6) Transferring the skills for O &amp; M of generator excitation system by OJT and developing O &amp; M manual for generator excitation system.                      (7) Reviewing and planning of the training enhancement plan for energy efficiency improvement.</p>	<p><b>Japan side</b>                      (1) Dispatching of Experts                      The area of expertise is as follows.                      - Boiler design and planning                      - Control system design and planning                      - Electrical system design and planning                      - Environmental equipment and planning                      - Training plan formulation                      (2) Provision of Equipment                      Equipments for training will be provided.                      (3) Training in Japan                      Three (3) or four (4) members of the C/Ps will join the training.</p>	<p><b>Turkey side</b>                      (1) Assignment of C/Ps                      - Project Director                      - Project Coordinators                      - Technical Counterparts                      - Administrative Assistance                      - Technical Supporting Staff                      - Other Supporting Staff necessary for the implementation of the project                      (2) Equipment and facility                      - Model power plant (Orhaneli) for training                      - Adequate office space and supplies for Japanese experts                      - The workshop facility and accommodations for participants                      - Other equipment agreed by both side                      (3) The local cost                      - Expenses for collection of data                      - Expenses for business trip of the C/Ps                      - Expenses for workshops and seminars                      - Expenses for consumable, electricity and etc                      - Expenses for maintenance of the equipments</p>	<p>Prior condition                      C/Ps at model power plant (Orhaneli) are prepared by EUAS.</p>

**ANNEX-2 Evaluation Grid**

(This Grid was prepared and finalized by Joint Evaluation Team.)

Oct. 2008

Criteria	Indicators	Source of Information	Method
Relevance	1. Relevance of the Project for Turkish government's policy	Energy Policy papers, Preliminary Evaluation Report, R/D, M/M, Interview with MENR/EUAS staff, Questionnaire	To confirm as to whether the Project is still meaningful along with the current energy policy (priority and direction of rehabilitation of power plants in Turkey)
	2. Relevance of the Project for the needs of target group (beneficiaries)	Preliminary Evaluation Report, R/D, M/M, Inception Report, Interview with C/P and J/E, Questionnaire	To confirm as to whether the Project is still meaningful for the current situation of target group (=EUAS) in the Project areas (=Orhaneli Power Plant)
	3. Relevance of the identification and selection of target group	Preliminary Evaluation Report, R/D, M/M, Inception Report, Interview with C/P and J/E, Questionnaire	To confirm as to whether the identification and selection of target group were appropriate
	4. Consistency with the Japanese aid policy	Preliminary Evaluation Report, Country Strategy Paper, Interview with J/E & JICA Turkey Office	To confirm as to whether the Project is relevant for the Japanese aid policies
Effectiveness	1. Achievement of Project Purpose	Preliminary Evaluation Report, R/D, M/M, Inception Report, Project Documents & Materials, Progress Reports, PDM, PO, Interview with C/P and J/E, Questionnaire	To confirm as to whether project purpose was achieved as expected. (Project Purpose="The capacity for energy efficiency improvement at model power plant (Orhaneli) is improved.") 1) At Orhaneli power plant, equivalent or better cost-performance rehabilitation plan is developed compared to outsourcing rehabilitation plans of same size power plants 2) The reports, plans, specifications and manuals which are made by the project are adopted by EUAS
	2. Contribution of Project outputs to the Project Purpose	Preliminary Evaluation Report, R/D, M/M, Inception Report, Project Documents & Materials, Progress Reports, PDM, PO, Interview with C/P and J/E, Questionnaire	To confirm as to whether the each output contributed to the achievement of the Project purpose "Outputs" are as below; 1) The skills of C/Ps for equipment diagnosis are developed 2) The skills of C/Ps for environmental measure are developed 3) The skills of C/Ps for planning of rehabilitation are developed 4) The skills of C/Ps for designing of rehabilitation are developed 5) The skills of C/Ps for operation and maintenance of power facility are developed 6) The training system of EUAS for energy efficiency improvement is enhanced
3. Analysis of the factors	3.1 Promoting factors	Preliminary Evaluation Report, Project Documents & Materials, Progress Reports, PDM, PO, Interview with C/P and J/E, Questionnaire	To confirm as to what are the positive factors that encouraged the achievement of the Project purpose
	3.2 Hampering factors	Preliminary Evaluation Report, Project Documents & Materials, Progress Reports, PDM, PO, Interview with C/P and J/E, Questionnaire	To confirm as to what are the negative factors that inhibited the achievement of the Project purpose

Efficiency	1. Efficiency of the Inputs	Project Documents (Personnel Input Records Sheet), Progress Reports, Interview with C/P and J/E, Questionnaire	To confirm as to whether the timing, amount and capability of the Japanese experts was appropriate
	1.1 Dispatch of Japanese experts (timing, amount, quality)	Project Documents (Personnel Input Records Sheet), Progress Reports, Interview with C/P and J/E, Questionnaire	To confirm as to whether the Input was carried out as planned in terms of amount, and the degree of satisfaction in terms of ability, timing and attachment.
	1.2 Allocation of Turkish C/Ps (numbers, technical quality and timing)	Project Documents (Personnel Input Records Sheet), Progress Reports, Interview with C/P and J/E, Questionnaire	To confirm as to whether the C/Ps' training was carried out as planned in terms of amount, and the degree of satisfaction in terms of contents
	1.3 C/P Training in Japan (amount, quality)	Project Documents (Personnel Input Records Sheet), Training Reports, Interview with C/P and J/E, Questionnaire	To ask about the degree of satisfaction of the timing and amount of budgetary/operational cost shared by Turkey and Japan
	1.4 Financial inputs (timing and amount)	Project Documents (Budget Records Sheet), Progress Reports, Interview with C/P and J/E	To confirm as to whether the equipment, personnel, and budget allocated to the Project were appropriately utilized for the Project
	2. The utilizing the inputs		
	2.1 The degree/level of utilizing the inputs	Project Documents (Personnel Input Records Sheet), Interview with C/P and J/E, Questionnaire	To confirm as to whether the support and management system functioned efficiently
	3. Project Management		
	3.1 Support and management system for the Project	Project Documents, JCC Records, Interview with C/P and J/E, Questionnaire	To confirm as to whether the monitoring activities were carried out efficiently
	3.2 Monitoring system	Project Documents, JCC Records, Interview with C/P and J/E, Questionnaire	To expect as to the degree to what the Project Purpose will be achieved and the prospect of achieving the Overall Goal in 2-6 years after the Project completion
Impacts	1. Degree of achievement of the Project Purpose and prospect of achieving the Overall Goal	Project Documents (Personnel Input Records Sheet), JCC Records, Interview with C/P and J/E, Questionnaire	
	2. Direct/Indirect Impacts with expected and/or unexpected factors		
	2.1 Impact on policy/institutional level	Project Documents & Materials, Progress Reports, Interview with MENR/EUAS staff, C/P and J/E, Questionnaire	To expect as to whether the Project had impact at this stage positively and/or negatively, such as; 1) Planning of the execution of power plant rehabilitation 2) Utilization and dissemination of technology and manual gained through the project 3) Possibility of disseminating the project outputs toward other power plants in Turkey 4) Impact on reduce environmental load 5) others
	2.2 Impact on technical level		
	2.3 Impact on environmental level		
	2.4 Impact economical/cultural/social level		
	3 Other impacts	Project Document & Materials, Progress Reports, Interview with MENR/EUAS staff, C/P and J/E, Questionnaire	To expect as to whether other impacts have been brought by the Project



Sustainability	1. Policy / Institution / System		
1.1 Continuity of the effects of the Project	Govt. Policy Papers, Progress & Completion Reports, Interview with MENR/EUAS and C/P, Questionnaire	To ask as to whether it is expected that the activities/effects of the Project results will continue after the Project completion	
1.2 Administrative System (focus on MENR & EUAS's role and function)	Interview with MENR/EUAS, C/P and J/E, Questionnaire	To ask as to whether administrative and management system of MENR and EUAS will be likely to be well organized	
2. Technology / Know-how			
2.1 Continuity for C/Ps and ex-trainees to execute current activities in its organization	Progress & Completion Report, Interview with trainees, C/P and J/E, Questionnaire	To check as to how C/Ps will be able to utilize the acquired skills and experiences for O&M and Training program through the Project. Also to check the C/Ps' continuity of the Project outcomes after the Project's end	
2.2 Dissemination of Project effects to other sites in Turkey	Progress & Completion Report, Interview with trainees, EUAS, C/P and J/E, Questionnaire	To check as to whether the Project activities or mechanism acquired through the Project is likely to be disseminated to other sites in Turkey after the Project's end	
3. Finance			
3.1 Financial condition of EUAS	Progress & Completion Report, Interview with trainees, EUAS, C/P and J/E, Questionnaire	To expect as to whether the MENR/EUAS financial budget will be stable or secured. Also to check the financial preparation for rehabilitation of power plants	
3.2 Possibility of securing Power plant rehabilitation in action	Progress & Completion Report, Interview with MENR/EUAS, C/P and J/E, Questionnaire, Relevant support organizations	To ask as to whether the financial resources for Power plant rehabilitation will be secured and in action	
4. Others			

Abbreviation; APO=Annual Plan of Operation, C/P=Counterpart Staff, EUAS=Electric Generation Company, JCC=Joint Coordinating Committee, MENR=Ministry of Energy and National Resources, M/M=Minutes of Meeting, O&M=Operation and Maintenance, J/E=Japanese Experts

### ANNEX-3 Chronological Review of the Project

Year	Month/Date	Item
2004	September	The Government of the Republic of Turkey submitted a request for a Project-type Technical Cooperation to the Government of Japan
2005	31 March - 11 April	Dispatch of first Preliminary Study Team
2006	18 June - 2 July	Dispatch of second Preliminary Study Team
2007	14 January - 14 March 15 January 17 January 24 January - 25 January 6 March - 7 March 12 March 8 July - 13 July 4 September - 4 November 22 October - 26 October 13 November - 16 December	Dispatch of Japanese Experts Team for the first Work in Turkey Explanation of Inception Report at EUAS HQ Explanation of Inception Report at Orhaneli Power Plant Held Technical Seminar Held first Technology Transfer Seminar Held first JCC Dispatch of the Consultation Team Dispatch of Japanese Experts Team for the second Work in Turkey Held second Technology Transfer Seminar Held first C/P Training in Japan
2008	15 January - 16 March 3 March - 7 March 14 March 20 May - 20 July 8 July - 11 July 28 July - 31 August 17 September- 21 November 16 October - 29 October 27 October 4 November - 7 November 17 November	Dispatch of Japanese Experts Team for the third Work in Turkey Held third Technology Transfer Seminar Held second JCC Dispatch of Japanese Experts Team for the fourth Work in Turkey Held fourth Technology Transfer Seminar Held second C/P Training in Japan Dispatch of Japanese Experts Team for the fifth Work in Turkey Dispatch of the Terminal Evaluation Team Held third JCC Held fifth Technology Transfer Seminar (tentative) Held fourth JCC (tentative)

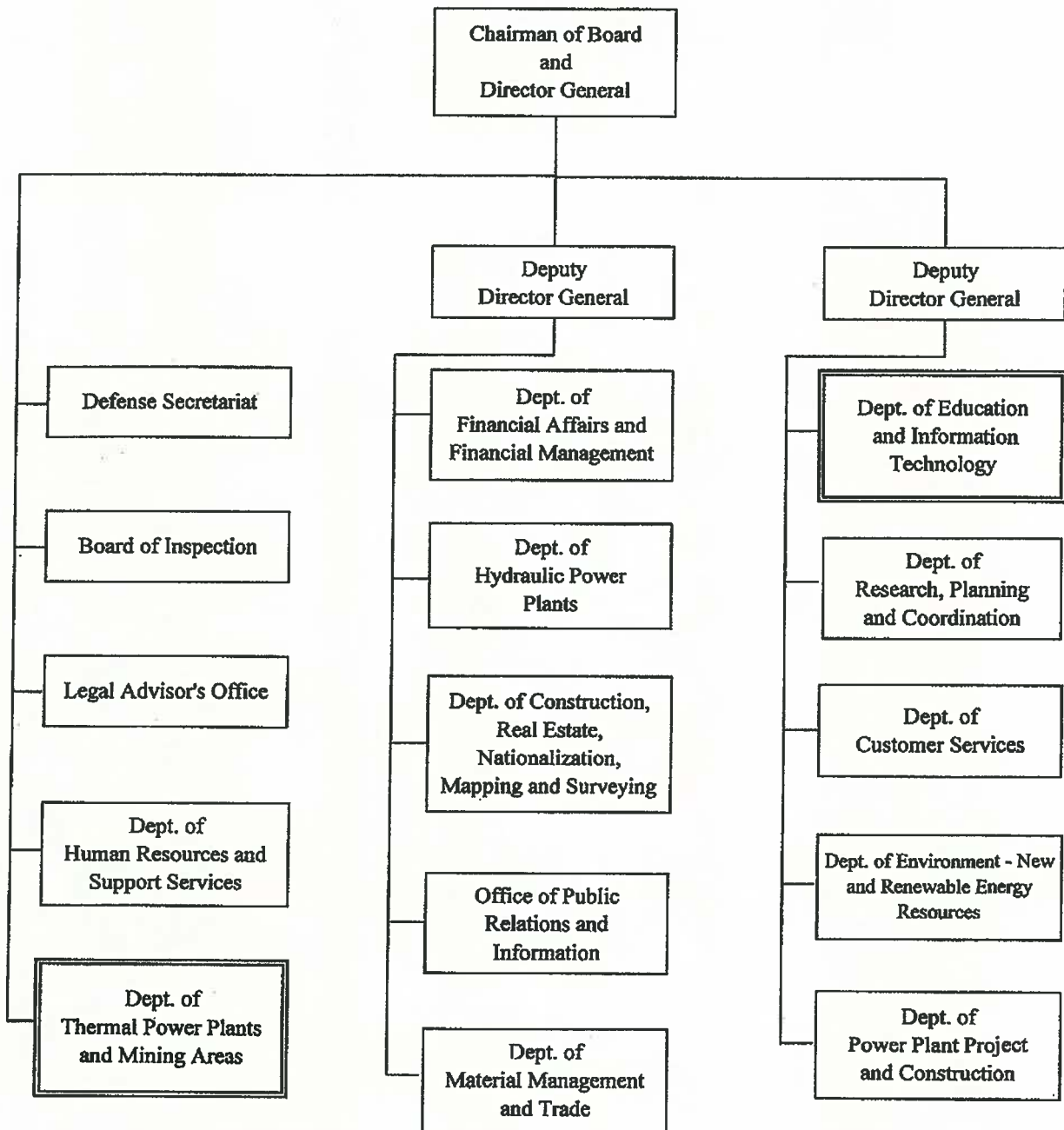
ANNEX-4 Plan of Operation (PO) (Achievement)

Japanese Fiscal Year Calendar Year Calendar Month Duration of Project	2006			2007			2008			2009			A person in charge	Inputs						
	2006			2007			2008			2009										
	11	12	1	2	3	4	5	6	7	8	9	10			11	12	1	2	3	Japanese side
I Work in Japan																				
1. Collection of Necessary Data/Information and Review																				
2. Preparation and Discussion on Detailed Work Plan																				
II Work in Turkey																				
I Capacity Development on Rehabilitation at Orhanli Power Plant																				
1.1 Improvement of Skills on Equipment Diagnosis																				
(1) Guidance on Theory and Practice of Equipment Diagnosis																				
(2) Monitoring and Assessment of Actual Plant Operation Data																				
(3) Preparing of Equipment Diagnosis Report																				
1.2 Improvement of Skills on Environmental Measure																				
(1) Monitoring and Assessment of Environmental facility																				
(2) Preparing of Environmental Measure Report																				
1.3 Improvement of Skills on Rehabilitation Planning and Design																				
(1) Comparison of Options for Repair, Replacement, and Upgrade																				
(2) Preparing of Rehabilitation Report																				
(3) Preparing of Rehabilitation Specification																				
1.4 Homewerk Study of Rehabilitation Plan and Design by C/P																				
1.5 Seminar for C/Ps from Other Power Plants																				
2 Capacity Development on O&M of Power Plant																				
2.1 Improvement of Skills on Maintenance of Power Plant																				
(1) Review and Assessment of Current Maintenance System																				
(2) Guidance on Theory and Practice of Maintenance System																				
2.2 Improvement of Skills on Boiler Efficiency Maintenance/Improvement, Facility Maintenance																				
(1) Review and Assessment of Current Boiler Efficiency Maintenance/Improvement, Facility Maintenance																				
(2) Guidance on Theory and Practice of Boiler Efficiency Maintenance/Improvement, Facility Maintenance																				
(3) Preparing of Manual for Boiler Efficiency Maintenance/Improvement, Facility Maintenance																				
2.3 Improvement of Skills on Generator Excitation System																				
(1) Review and Assessment of Current O & M system of Generator Excitation System																				
(2) Guidance on Theory and Practice of O & M system of Generator Excitation System																				
(3) Preparing of O & M manual for Generator Excitation System																				
2.4 Homewerk Study for O&M of Power Plant by C/P																				
2.5 Seminar for C/Ps from Other Power Plants																				
3 Enhancement of training system for energy efficiency improvement																				
(1) Review and Assessment of Current training system of EUAS																				
(2) Study and Preparing of Training enhancement Plan for Energy Efficiency improvement																				
4 Training in Japan																				
5 Japanese Experts in Turkey																				

Turkish side : PC: Project Coordinator, C/P: Technical Counterparts  
 Japanese side : LE: Lead Expert, Ex: Experts  
 .... (Dotted line): Homework study for Engineers

Formation of Project Counterparts  
 (1) Counterpart Team at Orhanli Power Plant  
 - Total eleven Engineers from Orhanli Power Plant  
 - Three Engineers from Headquarters, Department of Education and Information Technology  
 - Two Engineers from Headquarters, Department of Thermal Power Plant & Mining Areas  
 - One Environmental Specialist from Headquarters, Department of Environment-new and renewable energy resources  
 - One Engineer from Bursa Power Plant  
 - Administrative Assistants  
 (2) Counterpart from Other Power Plants  
 - One or Two Engineers from each power plant  
 (Participates in seminar which will be held at the end of each training at Orhanli Power Plant)

**ANNEX-5 Organization Chart of EUAS**



**ANNEX-6 List of Dispatched Japanese Experts**

No.	Name	Field	Term	Profession or Occupation
1	Masato NOSE	Team Leader/ Control System	14 Jan. 07 - 14 Mar. 07 4 Sept. 07 - 4 Nov. 07 15 Jan. 08 - 16 Mar. 08 20 May 08 - 20 Jul. 08 17 Sept. 08 - 21 Nov. 08	The Chugoku Electric Power Co., Inc.
2	Takashi FUJIMORI	Sub Team Leader/ Electrical System	4 Feb. 07 - 14 Mar. 07 4 Sept. 07 - 4 Nov. 07 15 Jan. 08 - 16 Mar. 08 20 May 08 - 20 Jul. 08 17 Sept. 08 - 21 Nov. 08	The Chugoku Electric Power Co., Inc.
3	Shigeru NAMBARA	Mechanical Equipment	14 Jan. 07 - 14 Mar. 07 4 Sept. 07 - 4 Nov. 07 15 Jan. 08 - 16 Mar. 08 20 May 08 - 20 Jul. 08 17 Sept. 08 - 21 Nov. 08	The Chugoku Electric Power Co., Inc.
4	Shuji FUJIKAWA	Environmental Measurement Equipment	4 Feb. 07 - 14 Mar. 07	The Chugoku Electric Power Co., Inc.
5	Koji TAKEMURA	Training Plan Formulation	14 Jan. 07 - 14 Mar. 07 30 Jan. 08 - 16 Mar. 08	The Chugoku Electric Power Co., Inc.
6	Hitoshi KANETSUKI	Technology Transfer and Diffusion	18 Feb. 07 - 14 Mar. 07	The Chugoku Electric Power Co., Inc.
7	Yutaka MATSUI	Equipment Diagnosis 1	4 Feb. 07 - 25 Feb. 07	Babcock-Hitachi K.K.
8	Setsuo FUJIMURA	Equipment Diagnosis 2	11 Feb. 07 - 25 Feb. 07	Babcock-Hitachi K.K.
9	Futoshi MASUDA	Technology transfer seminar	4 Sept. 07 - 28 Sept. 07 8 Oct. 07 - 4 Nov. 07 15 Jan. 08 - 16 Mar. 08	The Chugoku Electric Power Co., Inc.
		Rehabilitation planning	23 May 08 - 29 Jun. 08	Power Engineering and Training Services, Inc.
10	Tatsunori OKUDA	Seminar planning and implementation	27 Jun.08 - 13 Jul. 08	Power Engineering and Training Services, Inc.
11	Shinji MATSUZAKI	Seminar planning and implementation	24 Oct. 08 - 9 Nov. 08	Power Engineering and Training Services, Inc.
12	Toshimi ABE	Project Coordination	4 Sept. 07 - 4 Nov. 07	The Chugoku Electric Power Co., Inc.
13	Nobumasa TAKAHASHI	Project Coordination	8 Feb. 08 - 16 Mar. 08 20 May 08 - 20 Jul. 08 17 Sept. 08 - 21 Nov. 08	The Chugoku Electric Power Co., Inc.

## ANNEX-7 Japanese Study Teams Dispatched by JICA

Preliminary Study Team		Period: 31 March 2005 to 11 April 2005
No.	Area in charge	Occupation
1	Leader	Senior Advisor (Power Development), Institute for International Cooperation, JICA
		Name Akira NIWA
Second Preliminary Study Team		Period: 18 June 2006 to 9 July 2006
No.	Area in charge	Occupation
1	Leader	Senior Advisor (Power Development), Institute for International Cooperation, JICA
2	Project Planning	Electric Power and Energy Division, Natural Resources and Energy Group, Economic Development Department, JICA
		Name Kenji OKUMURA
3	Rehabilitation Planning for Machinery and Environmental Regulation	Consultant, JFE Techno Research
		Name Masanori EBIHARA
4	Rehabilitation Planning for Electric Facility and Control System	Consultant, Cooplus Ltd.
		Name Hiroshi HANAOKA
Consultation Team		Period: 8 July 2007 to 12 July 2007
No.	Area in charge	Occupation
1	Leader	Senior Advisor (Power Development), Institute for International Cooperation, JICA
2	Project Planning	Electric Power and Energy Division, Natural Resources and Energy Group, Economic Development Department, JICA
		Name Akira NIWA
3	Capacity enhancement for energy efficiency improvement	The Chugoku Electric Power Company
		Name Kenji OKUMURA
		Name Masato NOSE
Monitoring Team		Period: 11 March 2008 to 15 March 2008
No.	Area in charge	Occupation
1	Cooperation Planning	Electric Power and Energy Division, Natural Resources and Energy Group, Economic Development Department, JICA
		Name Kenji TAKADA
Monitoring Team		Period: 30 May 2008 to 5 June 2008
No.	Area in charge	Occupation
1	Leader	Senior Advisor (Power Development), Institute for International Cooperation, JICA
2	Cooperation Planning	Electric Power and Energy Division, Natural Resources and Energy Group, Industrial Development Department, JICA
		Name Akira Niwa
		Name Kenji TAKADA
Terminal Evaluation Team		Period: 16 October 2008 to 28 October 2008
No.	Area in charge	Occupation
1	Leader	Senior Advisor (Power Development), Institute for International Cooperation, JICA
2	Evaluation Planning	Electric Power and Energy Division, Natural Resources and Energy Group, Industrial Development Department, JICA
		Name Akira NIWA
3	Thermal Power Generation (Energy Efficiency)	Consultant, Cooplus Ltd.
		Name Yoshikazu WADA
4	Evaluation Analysis	Consultant, A&M Consultant Ltd.
		Name Hiroshi HANAOKA
		Name Akira MATSUMOTO

**ANNEX-8 Local Expenses by JICA**

Unit: US\$

Local Expenses	JFY2006	JFY2007	JFY2008	Total
Interpretation and Translation Cost	16,653.97	52,675.80	47,494.34	116,824.11
Repair and Maintenance Cost	0.00	0.00	0.00	0.00
Material/Equipment Purchase Expenses	0.00	0.00	0.00	0.00
Expendable Supplies	575.23	184.44	179.79	939.47
Travel Expenses	97.64	185.27	159.91	442.82
Communication Expenses	24.25	31.86	31.39	87.50
Printing Cost	395.24	2,301.42	1,115.39	3,812.05
Rental Cost	7,837.68	20,649.43	24,214.86	52,701.96
Conference Cost	0.00	0.00	0.00	0.00
Others	0.00	0.00	0.00	0.00
<b>Total</b>	<b>25,584.02</b>	<b>76,028.22</b>	<b>73,195.67</b>	<b>174,807.91</b>

## ANNEX-9 List of Turkish Counterpart Personnel

N o.	Role of the C/P	Name	Position title, Department/ power plant
1	Project director	Mr. Necip Karahan	Head of Department of Thermal Power Plants and Mining Areas
2	Project coordinator	Mr. Muzaffer Tanı	Director, Presidency for Department of Education and Information Technology
3	Project coordinator	Mr. Halil İbrahim Özen	Section Director, Presidency for Department of Thermal Power Plants and Mining Areas
4	Project coordinator	Mr. Ercan Atıllar	Manager of Orhaneli Power Plant, Orhaneli Power Plant
5	Technical C/P	Mr. Oğuz Tuncay	Technical Chief, Department of Thermal Power Plants and Mining Areas
6	Technical C/P	Mr. Oğuzhan Yıldız	Technical Chief, Department of Thermal Power Plants and Mining Areas
7	Technical C/P	Mr. Birhan Dilberoğlu	Technical Chief, Department of Education and Information Technology
8	Technical C/P	Ms. Nurdan Bulut	Technical Chief, Department of Education and Information Technology
9	Technical C/P	Mr. Hasan İrevil	Technical Chief, Department of Education and Information Technology
10	Technical C/P	Ms. Ayşegül Bahayetmez	Technical Chief, Department of Environment-New and Renewable Energy Resources
11	Technical C/P	Mr. Mahmut Öztürk	Deputy Manager, Technique Orhaneli Power Plant
12	Technical C/P	Mr. Ferhat Kılıç	Boiler Maintenance Engineer, Orhaneli Power Plant
13	Technical C/P	Mr. Mustafa Soyoral	Operation Chief Engineer, Orhaneli Power Plant
14	Technical C/P	Mr. Akif Yalın	Chemical Engineer, Orhaneli Power Plant
15	Technical C/P	Mr. Hakan Baba	Instrumentation and Control System Chief Engineer, Orhaneli Power Plant
16	Technical C/P	Mr. Sercan Kaymak	Instrumentation and Control System Engineer, Orhaneli Power Plant
17	Technical C/P	Mr. Fatma Alkan	Turbine Maintenance Engineer, Orhaneli Power Plant
18	Technical C/P	Mr. Bülent Urer	Operation Engineer, Orhaneli Power Plant
19	Technical C/P	Mr. Orhan Küçük	Electric Maintenance Chief Engineer, Orhaneli Power Plant
20	Technical C/P	Mr. Ramazan Arı	Turbine Maintenance Chief Engineer, Orhaneli Power Plant
21	Technical C/P	Mr. İsmail Akbıyık	Occupational Safety & Training Chief Engineer, Orhaneli Power Plant
22	Technical C/P	Mr. Ahmet Fatih Özkan	Head Electrical & Electronics Engineer, Electrical Department, Bursa Power Plant

## List of Ex-Turkish Counterpart Personnel

No.	Role of the C/P	NAME	Position title, Department/ power plant
1	Project coordinator	Mr. Ertuğrul Alper (Transferred)	Section Director, Presidency for Department of Thermal Power Plants and Mining Areas
2	Technical C/P	Mr. Birol Çiftkaya (Transferred)	Electric Maintenance Engineer, Orhaneli Power Plant
3	Technical C/P	Mr. Halil Albayrak (Transferred)	Operation Engineer, Orhaneli Power Plant



ANNEX-10 List of Turkish Counterpart Personnel Trained in Japan

No.	JFY	Name	Training Field	Organization	Term	Training Institute
1	2007	Ms. Fatma Alkan	Mechanical	Turbine Maintenance Engineer, Orhaneli Power Plant	13 Nov.07 - 16 Dec. 07	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
2	2007	Mr. Bülent Urer	Mechanical	Operation Engineer, Orhaneli Power Plant	13 Nov.07 - 16 Dec. 07	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
3	2007	Mr. Ramazan Ari	Mechanical	Turbine Maintenance Chief Engineer, Orhaneli Power Plant	13 Nov.07 - 16 Dec. 07	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
4	2007	Mr. Mustafa Soyoral	Mechanical	Operation Chief Engineer, Orhaneli Power Plant	13 Nov.07 - 16 Dec. 07	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
5	2007	Mr. Birhan Dilberoğlu	Mechanical	Technical Chief, Education and Information Technology Department	13 Nov.07 - 16 Dec. 07	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
6	2007	Mr. Oğuzhan Yıldız	Mechanical	Afsin Power Plant	13 Nov.07 - 16 Dec. 07	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
7	2007	Mr. Hasan İrevil	Electric and Control	Technical Chief, Education and Information Technology Department	13 Nov.07 - 16 Dec. 07	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
8	2007	Mr. Ahmet Fatih Özkan	Electric and Control	Head Electrical & Electronics Engineer, Electrical Department, Bursa Power Plant	13 Nov.07 - 16 Dec. 07	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
9	2007	Mr. Muzaffer Tani	(Director level)	Director, Presidency for Education and Information Technology Department	2 Dec.07 - 9 Dec.07	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
10	2007	Mr. Ercan Atıllar	(Director level)	Manager of Orhaneli Power Plant, Orhaneli Power Plant	2 Dec.07 - 9 Dec.07	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
11	2008	Mr. Birhan Dilberoğlu	Mechanical	Technical Chief, Education and Information Technology Department	28 Jul. 08 - 31 Aug. 08	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
12	2008	Mr. Ferhat Kılıç	Mechanical	Boiler Maintenance Engineer, Orhaneli Power Plant	28 Jul. 08 - 31 Aug. 08	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
13	2008	Mr. Oğuzhan Yıldız	Mechanical	Technical Chief, Department of Thermal Power Plants and Mining Areas	28 Jul. 08 - 31 Aug. 08	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
14	2008	Mr. Sercan Kaymak	Electrical and Control	Instrumentation and Control System Engineer, Orhaneli Power Plant	28 Jul. 08 - 31 Aug. 08	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
15	2008	Mr. Orhan Küçük	Electrical and Control	Electric Maintenance Chief Engineer, Orhaneli Power Plant	28 Jul. 08 - 31 Aug. 08	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
16	2008	Mr. Ahmet Fatih Özkan	Electrical and Control	Head Electrical & Electronics Engineer, Electrical Department, Bursa Power Plant	28 Jul. 08 - 31 Aug. 08	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
17	2008	Mr. Hasan İrevil	Electrical and Control	Technical Chief, Education and Information Technology Department	28 Jul. 08 - 31 Aug. 08	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan
18	2008	Mr. Hakan Baba	Electrical and Control	Instrumentation and Control System Chief Engineer, Orhaneli Power Plant	28 Jul. 08 - 31 Aug. 08	The Chugoku Electric Power Co., Inc., Japan Power Engineering and Training Services, Inc., Japan

ANNEX-11 List of Outputs

Deliverables	Item	Date of issue English version	Translation into Turkish In progress	Related Document	Remarks
1	Facility Diagnosis Report	Nov. 2007			
2	Environmental Measures Report	Mar. 2007		✓ (1)	(1) Additional Environmental data collection
3	Rehabilitation Plan	Mar. 2008			
4	Rehabilitation Outline Design	under preparation		✓ (2)	(2) Examination documents and Specification for Exciter replacement
5	Rehabilitation Plan/ Outline Design Manual	under preparation			
6	Boiler Maintenance Manual (Boiler Efficiency Maintenance and Improvement and Equipment Maintenance Manual)	Mar. 2008	✓	✓ (3)	(3) Record of Boiler tube thickness and trend display
7	Generator Excitation System Operation & Maintenance Manual	Mar. 2008	✓	✓ (4)	(4) Check list for Exciter
8	Training Status Report	Mar. 2007			
9	Training Improvement Plan	Mar. 2008			

## ANNEX-12 Record of Local Lectures and Seminars

Item	JFY 2006				2007				2008			
	4th	1st	2nd	3rd	4th	1st	2nd	3rd	1st	2nd	3rd	
Power generating facility operation/maintenance/management ability improvement	1			1	1							
Boiler efficiency maintenance / improvement, facility maintenance ability improvement	1			1	1							
Excitation system operation / maintenance / management ability improvement	1			1	1							
Rehabilitation plan/outline design ability improvement											1	1
Boiler outline, operation and maintenance								1	1		1	1
Steam Turbine outline, operation and maintenance								1	1		1	1
Electrical System outline, operation and maintenance								1	1		1	1
Control System outline, operation and maintenance											1	1

ANNEX-13 Record of Seminar and Technical Lecture and Training (Summary)

Technical Lecture and Seminar (summary)

Items	Tech lecture	1st Seminar	2nd Seminar	3rd Seminar	4th Seminar	5th Seminar
Period	24 Jan. 07 to 25 Jan. 07	6 Mar. 07 to 7 Mar. 07	22 Oct. 07 to 26 Oct. 07	3 March 08 to 7 March 08	8 July 08 to 11 July 08	4 Nov. 08 to 7 Nov. 08
Days	2	2	5	5	4	4
Trainee						
Orhaneli Power Plant	13	13	13	13	6	
Other Power Plants		14	11	13	17	
Trainer, EUAS HDQ	5	2	0	2	0	
Main subjects	Introductory lectures	Introductory lectures	Basics and Mechanical, Electrical	Operation and Maintenance, etc	Advanced operation and Maintenance, etc	Advanced operation and Maintenance, etc

Training in Japan (summary)

Items	1st Training	2nd Training
Period	13 Nov. 07 to 16 Dec. 07	28 July 08 to 31 Aug. 08
Days	34	35
Trainee		
Orhaneli Power Plant	4	4
Other Power Plant	1	1
Trainer, EUAS HDQ	2	2
Engineer, EUAS HDQ	1	1
Director, EUAS HDQ	2	0
Main training contents	Mainly Basics and Practical Training	Basics and Practically Advanced Training
Action Plan Report created by trainee	2	3

**ANNEX-13(2) Record of Seminar and Technical lecture**

Item	Content	Remarks
<b>Technical lecture</b>		
Period	24Jan. 2007 to 25 Jan. 2007	2 days
Trainee	C/P of Orhaneli	13 persons
	C/P of Education and Information Tech. Dept., EUAS	5 persons
Place	Orhaneli P.S.	
Subject	Structure and System of Chugoku EPC	Introductory lectures
	Plant Performance Management System	Introductory lectures
	Exciting system Operation/ maintenance/ Management	Introductory lectures
	Facility diagnosis and Remaining Life Assessment	Introductory lectures
	Efforts for Environmental Issues of Chugoku EPC	Introductory lectures
<b>1st Seminar</b>		
Period	6 March 2007 to 7 March 2007	2 days
Trainee	C/P of Orhaneli	13 persons
	Engineers from other 7 power plants	14 persons
	C/P of Education and Information Tech. Dept., EUAS	2 persons
Place	Orhaneli P.S.	
	Power generation facility operation/ maintenance/ management ability improvement	Introductory lectures (C/P: 2 persons)
	Ditto- Boiler Facilities	Introductory lectures (C/P: 1 person)
	Excitation system operation/maintenance /management ability improvement	Introductory lectures (C/P: 1 person)
<b>2nd Seminar</b>		
Period	22 Oct. 2007 to 26 Oct. 2007	5 days
Trainee	C/P of Orhaneli	13 persons
	Engineers from other 5 power plants	11 persons
	C/P of Education and Information Tech. Dept., EUAS	-
Place	Orhaneli P.S.	
	Power generation facility operation /maintenance/ management ability improvement	Basic concept, Guidelines for Thermal Power Plant Quality Control
	Boiler Maintenance Manual (Draft)	Draft (C/P: 1 person)
	Operation and Maintenance manual for Excitation system (Draft)	Draft (C/P: 1 person)
	Boiler outline, operation and maintenance	Basics, Configuration & Mechanicals
	Steam turbine outline, operation and maintenance	Basics, Configuration & Mechanicals
	Generator outline, operation and maintenance	Basics, Configuration & Electrical
Reference materials	Boiler facilities	
	Turbine Facilities	
	Electrical Facilities	
<b>3rd Seminar</b>		
Period	3 March 2008 - 7 March 2008	5 days
Trainee	C/P of Orhaneli	13 persons
	Engineers from other 9 power plants	13 persons

	C/P of Education and Information Tech. Dept., EUAS	2 persons
Place	Orhaneli P.S.	
Subject	Report on C/P training in Japan (by Trainee)	2 persons
	Boiler Maintenance Manual (Final)	
	Operation and Maintenance manual for Excitation system (Final)	
	Power generation facility operation/maintenance /management ability improvement	Preventive Maintenance & remaining life assessment Trouble shooting, Inspection, Upgrading of Maintenance planning
	Boiler outline, operation and maintenance	Combustion, Operation & Control
	Steam turbine outline, operation and maintenance	Operation, Maintenance & Control
	Electrical system outline, operation and maintenance	Insulator diagnosis & Inspection
<b>4th Seminar</b>		
Period	8 July 2008 - 11 July 2008	4 days
Trainee	C/P of Orhaneli	6 persons
	Engineers from other 9 power plants	17 persons
	C/P of Education and Information Tech. Dept., EUAS	-
Place	Orhaneli P.S.	
Subject	Rehabilitation plan/outline design manual (Draft)	Draft
	Rehabilitation outline design (Draft)	Draft
	Boiler outline, operation and maintenance	Damage factor and countermeasures, Trouble case examples
	Steam turbine outline, operation and maintenance	Turbine performance, Operation & Maintenance, Trouble case examples
	Electrical system outline, operation and maintenance	Maintenance management, Preventive maintenance
	Control system outline, operation and maintenance	Characteristic of control methods, Basic circuit of boiler control
<b>5th Seminar (Plan)</b>		
Period	4 Nov. 2008 - 7 Nov. 2008	4 days
Trainee	C/P of Orhaneli	persons
	Engineers from other power plants	persons
	C/P of Education and Information Tech. Dept., EUAS	persons
Place	Orhaneli P.S.	
Subject	Electrical system outline, operation and maintenance	Trouble case examples
	Control system outline, operation and maintenance	Instrumentation
	Report by C/P Trainee	
	Rehabilitation plan/outline design manual (Final)	
	Rehabilitation outline design (Final)	
	Boiler outline, operation and maintenance	Measures for ash erosion Trouble case examples O & M for Boiler auxiliaries
	Steam turbine outline, operation and maintenance	PM for turbine facilities Trouble case examples

**ANNEX-14 Record of training in Japan**

Item	Content	Remarks
<b>1st C/P Training in Japan</b>		
Period	13 Nov. 2007 to 16 Dec. 2007	34 days
Trainee	C/P of Orhaneli	4 persons
	Engineers from the other power plant	2 persons
	C/P of Education and Information Tech. Dept., EUAS	2 persons
	C/P of Thermal Power Plants and Mining Area Dept., EUAS	0 person
	Directors EUAS and etc.	2 persons
Place	PET (Power Engineering and Training Services, Inc.)	
Subject	Site visit (Shin-onoda P.S.)	
	Lecture /General & basics of power plant facilities	
	Management of operation and maintenance	
	Plant Operation simulator	
	Training management	
	Instruction manuals	
	Mechanical technical trainings (Pump and Motor)	
	Plant Operation simulator	
Manufacturer's factory visit (Mitsubishi Heavy Industry)		
Action Plan by trainee	Trainers	
	Engineers	
<b>2nd C/P Training in Japan</b>		
<b>Electrical and control course</b>		
Period	28 July 2008 to 31 Aug. 2008	35 days
Trainee	C/P of Orhaneli	3 persons
	C/P of Education and Information Tech. Dept., EUAS	1 person
	Engineers from the other power plant	1 person
Place	PET	
Subject	Site visit (Shimonoseki P.S.)	
	Generator & Exciter	
	PID control system	
	Digital Protection relay	
	Central Load Dispatching Center visit	
Manufacturer's factory visit (Mitsubishi Electric Co., Ltd.)		
<b>Mechanical course</b>		
Period	28 July 2008 to 31 Aug. 2008	35 days
Trainee	C/P of Orhaneli	1 person
	C/P of Education and Information Tech. Dept., EUAS	1 person
	C/P of Thermal Power Plants and Mining Area Dept., EUAS	1 person
Place	PET	
Subject	Site visit (Shimonoseki P.S.)	
	Maintenance	
	Vibration analysis and balancing	
	Nondestructive inspection	
	Diagnosis for equipment degradation and life expenditure	
	Central Load Dispatching Center visit	
Manufacturer's factory visit (Babcock-Hitachi K.K.)		
Action Plan by trainee	Orhaneli (Mechanical)	
	Orhaneli (Electrical and control)	
	Trainers	

## ANNEX-15 List of Attendants on Discussion

The Third Joint Coordination Committee on 27th October, 2008

Name	Organization	Position/ Title
Mr. Sefer BÜTÜN	Headquarters, EUAS	Director General
Mr. Raşit Is	Headquarters, EUAS	Deputy General Manager
Mr. Necip Karahan,	Headquarters, EUAS	Department Head of Thermal Power Plants and Mining Areas Department (Project Director)
Mr. Muzaffer Tani	Headquarters, EUAS	Department Head, Department of Education and Information Technology (Project Coordinator)
Mr. Halil İbrahim Özen	Headquarters, EUAS	Section Director, Department of Thermal Power Plant and Mining Areas (Project Coordinator)
Mr. Ercan Atlılar	Orhaneli Power Plant, EUAS	Manager of Power Plant (Project Coordinator)
Mr. Oğuz Tuncay	Headquarters, EUAS	Technical Chief, Department of Thermal Power Plant and Mining Areas
Mr. Birhan Dilberoğlu	Headquarters, EUAS	Technical Chief, Department of Education and Information Technology
Ms. Nurdan Bulut	Headquarters, EUAS	Deputy Manager, Department of Education and Information Technology
Mr. Hasan İrevil	Headquarters, EUAS	Electrical Teacher, Department of Education and Information Technology
Mr. Satoshi Umenaga	JICA Turkey Office	Senior Representative
Mr. Ali Bekin	JICA Turkey Office	Program Manager
Mr. Masato Nose	JICA Project Team	Team Leader, Expert on Control System
Dr. Akira Niwa	JICA Terminal Evaluation Team	Leader
Mr. Yoshikazu Wada	JICA Terminal Evaluation Team	Evaluation Planning
Mr. Hiroshi Hanaoka	JICA Terminal Evaluation Team	Thermal Power Generation (Energy Efficiency)
Mr. Akira Matsumoto	JICA Terminal Evaluation Team	Evaluation Analysis