

終了時評価結果要約表（英文）

1. Outline of the Project	
Country : Republic of Turkey	
Project title : Project for Energy Efficiency Improvement of Power Plant in Turkey	
Sector : Electric Power	
Cooperation scheme : Project-Type: Technical Cooperation	
Division in charge : Industrial Development Department	
Total cost : 250 million Yen	
Period of Cooperation	(R/D): Jan. 2007-Nov. 2008
	Partner Country's Implementation Organization : Electric Generation Company (EUAS) Supporting Organization in Japan : Chugoku Electric Power Co., Inc.
<p>1.1. Background of the Project</p> <p>The growth rate in the demand for electricity in Turkey was 8.5% from 1990 to 2000, 6.4% from 2000 to 2005, and it is projected to increase 7.7% from 2005 to 2020. Against this background, the need to improve the energy efficiency of its existing power plants is growing. The Electric Generation Company (EUAS) which is supplying half of domestic power has played a central role in improving the energy efficiency of these power plants; and it plans to actively continue this task in future.</p> <p>To improve energy efficiency, an effective approach was taken to improve the maintenance and control capacity of the power plant employees in conjunction with measures to recover the performance of depreciated power facilities through rehabilitation (renewal). Presently, the priority issue for EUAS is to rehabilitate thermal power plants that have been in operation for 20 to 25 years in a total of ten locations. There is a high need to improve the energy efficiency of its coal-fired thermal power plants, while keeping in mind the effective use of coal, one of its few domestic resources, global environmental problems, and EU membership. However, due to inadequate cumulative knowledge and experience on the part of EUAS in rehabilitating power plant facilities, it did not have sufficient capacity to appropriately plan, implement, and manage rehabilitation, in addition to a lack of technical skills and knowledge to appropriately maintenance the rehabilitated facilities.</p> <p>In view of these circumstances, the Turkish government requested Japan to implement a technical cooperation project centered on a rehabilitation plan to improve the capacity of the electrical facilities of mainly its coal-fired thermal power plant and to improve the maintenance and control capacity of the power plant employees.</p> <p>Accepting this request, JICA began this two-year project in January 2007 in conjunction with the EUAS headquarters (department of thermal power and training department) and the counterpart (C/P), Orhaneli thermal power plant. In the first year of the project, on-site seminars were held in Turkey, and through the preparation of manuals and reports, technology transfer was carried out in the six areas of: (1) assistance to develop the skills of equipment diagnosis, (2) assistance to develop the skills of environmental measure, (3) assistance to improve the operations and maintenance capacity of power generating facilities, (4) assistance to improve and maintain boiler efficiency, and improve facility maintenance capacity, (5) assistance to</p>	

improve the operations and maintenance capacity of the excitation system, and (6) assistance to enhance the training system for energy efficiency improvement. In the second year, assistance to develop the capacity of planning and designing of rehabilitation was carried out as well as in the first year.

1.2. Project Overview

(1) Overall Goal

The energy efficiency of model power plant (Orhaneli) is improved.

(2) Project Purpose

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

(3) Output

- 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 facilities are improved (Outputs resulted from Activity 4 ~ 6)
- 5) The training system of EUAS for energy efficiency improvement is enhanced.

(4) Input (at the time of evaluation)

<Japanese side>

Experts: In total: 46.23M/M (13 experts: Fields of training are general overview/control equipment, electric/machinery/environmental operation facilities, technical transfer seminars, training program, seminar related teaching materials, equipment diagnosis, operational coordination)

Local Expenses: Equivalent to US\$175,000

Trainees received in Japan: 18

<Turkish Side>

Assignment of counterparts: Total 25

To provide an office for experts, training facilities provided at Orhaneli, equipment for use in workshops, accommodations for participants

2. Evaluation Team

Members of Evaluation Team	<p>(1) Japan Side</p> <p>Team Leader: Dr. Akira NIWA, JICA Senior Advisor</p> <p>Evaluation Planning: Mr. Yoshikazu WADA, Electric Power and Energy Division, Industrial Development Department, JICA</p> <p>Thermal Power Technology (energy efficiency): Mr. Hiroshi HANAOKA, President, Cooplus Ltd.</p> <p>Evaluation Analysis: Mr. Akira MATSUMOTO, President, A&M Consultant, Inc.</p>
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	(2) Turkish Side General Overview: Mr. Sefer Butun (EUAS Director-general)	
Period of Evaluation	Oct. 16, 2008 to Oct. 29, 2008	Type of Evaluation: Terminal
3. Results of Evaluation		
3.1. Project Performance		
<p>Input and activities for both the Japanese and Turkish sides progressed according to plan. Based on a request by the Turkish side, an additional training activity and technical transfer seminar were implemented and a flexible approach was taken with regard to changes that occurred in conjunction with the project's progress.</p> <p>With regard to output, as described in section 1.2.(3), a fixed level of results have remained due to the project activities or are anticipated to be achieved at the time the project is completed. A summary of the output is as follows.</p> <p>(1) Through the joint work of the team of Japanese experts and the C/P, a facility diagnosis report of the Orhaneli thermal power plant was prepared, the awareness about the importance of preventive maintenance was improved, and regular data measurements were started.</p> <p>(2) The environmental countermeasure report was prepared and its use is shared within the power plant. It is expected to be disseminated to other EUAS power plants in future.</p> <p>(3) With regard to improving the capacity for rehabilitation planning and design, the work carried out jointly with the C/P to formulate a plan targeting the boiler and exciter, as well as drafting a specification document were implemented.</p> <p>(4) Efforts to improve the operations and maintenance capacity of power facilities at the Orhaneli thermal power plant are being carried out.</p> <p>(5) Since a plan to strengthen training activities was formulated jointly with the training department, training opportunities throughout the EUAS organization are expected to be revitalized.</p> <p>With regard to the purpose of the project, which was to improve the capacity for energy efficiency improvement at model plant, it was ascertained that a change in awareness was observed through the work of formulating various types of reports and manuals in comparison to the level of awareness that existed at the start of the project. In particular, the purpose was achieved by producing specific activities to improve energy efficiency by fostering an understanding about the importance of preventive maintenance and enforcing the work of recordkeeping.</p> <p>Through this project, (1) there are plans to carry out systematic rehabilitation of the model plant and to foster an understanding by the C/P for the concept of preventive maintenance in the rehabilitation activities that have been implemented thus far, and (2) there are plans to officially use the reports and manuals that were prepared in the project throughout Turkey by the EUAS Director-general, the foremost C/P in the project; subsequently, the project contributed to achieving future priority objectives.</p>		
3.2. Summary of Evaluation Results		
(1) Relevance		

It was determined that the project was highly relevant from the standpoint of both Turkey and Japan's policies and the needs of the targeted group.

(Consistent with Turkish government policies)

Turkey enacted an energy efficiency law aimed at reducing the environmental burden of the state and demanded the efficient use of energy by power plants and other facilities. The aims of this project were suited to the country's orientation.

(Consistent with Japan's assistance policies)

Environmental improvement is one of Japan's priority areas of assistance; and this project, which aimed to reduce the burden on the environment through efficient use of energy by a power plant, was consistent with Japan's assistance policies. Moreover, Japan has high technical capacity in this area on par with other advanced nations, and its overseas assistance performance is high, in addition to its technical advantages.

(Needs of the Targeted Group)

EUAS is a public corporation that provides electricity in Turkey; and its goal to improve the efficiency of its power plants was consistent with the project's orientation. The Orhaneli thermal power plant required immediate rehabilitation of its boiler and other machinery and equipment as well as electrical facilities, and technical transfer activities were appropriate given the many operations and maintenance related problems that existed at the plant. In addition, there are coal-fired thermal power plants at ten other locations in Turkey where problems related to depreciation exist, as in the case of Orhaneli. Subsequently, it is anticipated that the experience of rehabilitating the Orhaneli thermal power plant will be applied at other power plants.

(2) Effectiveness

It has been determined that the desired purpose of the project regarding the Orhaneli thermal power plant and EUAS headquarters will be achieved. Firstly, in contrast to previous projects, the plan to replace the excitation system as part of the rehabilitation plan is more advantageous technically and in terms of cost. Secondly, there are plans to distribute the operations and maintenance manual of the boiler and excitation system that was translated into Turkish to all of EUAS power plants. Thirdly, it has also been ascertained that the rehabilitation design document and the rehabilitation plan/design manual will also be distributed to all power plants in Turkey.

It was determined that the activities to improve overall energy efficiency have begun to become established, while utilizing the outcome of the activities that were implemented in stages according to the project's reform efforts, which were based on the operating conditions of Orhaneli thermal power plant. By implementing preventive maintenance activities for the boiler and excitation system, which were especially important issues, and formulating a rehabilitation plan, it is believed that the various types of output produced by the project is linked to the systematic movement toward achieving the project purpose.

(3) Efficiency

Generally, the project inputs and activities were carried out efficiently.

With regard to the probability of achieving output, the output indicators established in the PDM have been achieved at this point in time, or is projected to be achieved at the time the project is completed.

Furthermore, it has been reported that the various types of reports, manuals, and plan documents will be translated into Turkish and disseminated to other EUAS power plants, and their usage will not be restricted to the Orhaneli thermal power plant.

(Efficiency of the Human Resources Input)

In accordance with their work plan, the Japanese experts unfailingly prepared reports and other activities while implementing technical transfer. The inputted areas of specialty were in boiler and turbine machine and facilities, environment related equipment, electrical equipment, and control system. But, due to the especially high on-site need to achieve boiler combustion efficiency and coordinated control with the turbine, an expert in boilers and control systems was inputted. In addition, the inputs were rated as strong or weak according to the area of specialty; experts in environment related equipment, electrical equipment, and training program planning were dispatched for short periods, and the activities were efficiently carried out. However, the experts pointed out that there was a large amount of technical transfer items and a large volume of reports and other documents that had to be prepared in the relatively short two-year project period.

The Turkish side provided a suitable office needed to implement the project and there were no requests for the provision of equipment. Equipment that was needed was provided within the budgetary means of EUAS. Despite a few transfers and retirement of C/P staff members, the C/P members were assigned according to the plan.

(Efficiency of the Training Program)

The training program in Japan was effective as a site where Japanese technology could be learned. In particular, the technical training carried out at the training facility where the cut-model of a power plant facility was exhibited, provided an attractive and practical training opportunity that was not available in Turkey. In addition, an action plan that incorporated specific improvements to issues at the project site was formulated and advice from the training instructors and experts, who had prior information about the project site, provided an effective review process.

(4) Impact

The project's overall goal, improving the energy efficiency of model power plant (Orhaneli), was not evaluated at this early stage due to the limited two-year project period. Thus, continued monitoring is important and establishing a monitoring structure and an evaluation system are vital. However, the short-term output was the preparation of needed technical documents to improve energy efficiency, accumulating engineering technology/knowledge of power plants by the C/P, and based on these activities, a positive impact can be seen in the attitude of those involved use the power plant efficiently.

Technical documents related to improving energy efficiency were prepared and a foundation for efficient use of the power plant was established based on the technical expertise and experience of the C/P and engineers; and the positive impact can be seen in many areas. With regard to the unplanned stop of the power plant, it was ascertained that the manuals, etc. which were prepared will continue to be used in preventive maintenance activities; thus, it is surmised that a strong change in the awareness and actions on the part of the C/P has occurred.

(5) Sustainability

As described below, it has been determined that the sustainability of the technology and policy is high. However, organizational sustainability remains unverified at the present point in time and continued monitoring is required.

(Organizational, policy, and institutional aspects)

1) Orientation of the C/P institutions and organizations

EUAS, the C/P institution, is a public corporation that supplies electricity; and with the application of the energy efficiency law in the near future, it is believed that its role and commitment to the efficient use of energy will continue to grow in future. As indicated in the statement made by the Director-general about continuing and further developing the output of the project, an independent organizational approach by EUAS is anticipated in future.

2) Policy environment and institutions surrounding Turkey's electricity sector

Privatization of the Turkey's power plants is an important policy issue; and policies on efficiency improvement measures according to the energy efficiency law are expected to be carried out in conjunction with specific privatization measures of power plants. EUAS power plants are expected to continue the task of achieving energy efficiency regardless of changes in ownership or market liberalization trends. Therefore, the power plant rehabilitation plan is expected to be implemented without fail, following assessment of the content and need for the plan by EUAS headquarters.

(Technical sustainability)

1) Utilization of Documents that are the output of the project

It was ascertained that the many types of technical reports and manuals prepared jointly by the Japanese experts and C/P are used in the daily work at the Orhaneli thermal power plant and will be useful for the C/P in future activities. It is also expected that they will be translated into Turkish, bound, and standardized for use at other power plants; and it is anticipated that the specific activities implemented at Orhaneli thermal power plant will serve as cumulative know-how for the entire EUAS organization.

2) Disseminate and permeate technology and knowledge

The technology and knowledge that is disseminated through technical transfer seminars and the training program in Japan was established or disseminated by individual C/Ps through their individual skills, through regular inspections, and by formulating rehabilitation plans and training programs and other activities, and further development is anticipated. In addition to the accumulation of individual knowledge and skills, the cumulative knowledge and technology of the organization is anticipated in future since it has been ascertained that a training program will be implemented at other power plants as well as at the Orhaneli thermal power plant.

(Financial sustainability)

EUAS is a large corporation in Turkey and it possesses the capacity to secure a budget to implement needed rehabilitation plans, foster human resources, and improve capacity. However, with the enactment of the energy efficiency law and the anticipated increased cost of environmental measures, there is a need to watch budgetary steps regarding activities to improve energy efficiency that will lead to improved operations.

3.3. Factors that Contributed to the Effect of the Project

<Factors that promote or impede the achievement of objectives>

(Promoting Factors)

(1) Coping with flexible project activities that meet the needs of Turkey

Among the project activities that were carried out, the implementation period of the technical transfer seminar was extended and the provision to undergo training in Japan were carried out at the strong request of the Turkish government and due to the actual needs of the Turkish side. Such changes in project activities were relevant and effective in fulfilling the needs of Turkish side as well as achieving the purpose of the project.

(2) Joint implementation of the project

In implementing activities to improve the efficiency of a coal-fired thermal power plant in operation, establishing a close and cooperative project implementation system with the C/P was important to implementing the project efficiently. In this project, the power plant was the target of the technical transfer activities. By focusing technical cooperation on specific activities at the on-site level, the output of each activity addressed actual problems.

3.4. Problems and Factors

There were none.

3.5. Conclusions

(1) The project continues to achieve the desired objectives and the C/P recognized the need to continue preventive maintenance and control activities at the power plant, in addition to acquiring an understanding of new technology and knowledge; subsequently, they were applied in the maintenance of the Orhaneli thermal power plant. In addition to individual C/Ps accumulating knowledge and technology, the cumulative organizational knowledge and technology of EUAS, the public corporation, was also achieved and its organizational capacity was strengthened.

(2) Technical reports, manuals, and other technical materials will be translated into Turkish for use at other power plants and their dissemination nationwide is anticipated. The technical skills and experience gained from the project are expected to serve an important role within the C/P organization.

(3) As shown in the PDM, the targeted issues were successfully tackled and it is projected that the purpose of the project will continue to be met until it is completed. The Project will be terminated in November 2008 as planned.

3.6. Recommendations

It is recommended that the following specific activities continue to be implemented in future.

(1) Finish preparing the written materials that remain.

Finish preparing the planned written materials that remain (rehabilitation schematic design document, rehabilitation plan and schematic design manual).

(2) Disseminate the written materials prepared in the project.

Disseminate and establish the written materials prepared in the project for the Orhaneli thermal power plant, in order to utilize them.

(3) Implement rehabilitation

Based on the rehabilitation plan that was formulated, rehabilitate the boiler tube and exciter.

3.7. Lessons Learned

(1) Establish the indicators to measure the effect of the project

At the start of the project, it was difficult to fix the numerical target at the time the indicator for the overall goal was established. Subsequently, it was decided to use the facility usage ratio as the indicator at the time the evaluation ended. But, if it was difficult to set indicators during the project planning stage, indicators that could be measured would be selected about six months after the start of the project. As the task of recording the numerical values that form the baseline begins and monitoring starts, effective measurements can be made.

(2) Significance and effectiveness of the training program in Japan

The curriculum for the training program in Japan that was implemented in the project was prepared based on the needs of the project site. The trainees were given the opportunity to observe performance and conditions in Japan at a training site that made practical training activities possible. As a result, an understanding especially about the importance of preventive maintenance was cultivated. In addition, through observations of power plants in Japan, the participants gained a quicker understanding of a systematic maintenance and control system that could not be adequately learned in the technical guidance activities at the on-site power plant.

(3) Project implementation approach

This project was implemented as a corporate contract; and a team of experts was dispatched to Turkey five times during the two-year period of the project (two-month period each time) and implemented technical transfer activities and prepared the written materials. The efficiency and effectiveness of a corporate contract and the limitations and issues within the scope of this project are given below.

1) Advantages

The first advantage was that a team of experts was organized at the start of the project and since the team came from the same company, contacting, coordinating, and instructions were efficiently carried out.

Secondly, the approach to the problems at the project site reflected the approach taken by their company. Therefore it was consistent with no variances, which made it possible to select the approach efficiently.

Thirdly, experts were dispatched consecutively that enabled technical capacity to improve in stages. In addition, the training provided in Japan was timely and also enabled technical levels to improve in stages.

Fourthly, the task of preparing the written materials (reports, manuals, etc.) was efficiently implemented since communication between experts took place in the same company.

2) Limitations and issues

One the limiting factors was the comparatively short two-year term of the project that did not allow sufficient time to measure the effectiveness of the technical transfer activities. As a result, it is important to monitor the project after it is completed.

Secondly, it could be one of the choices that the written materials were mainly drafted in Japan, then finalized in Turkey mainly as a means of technical transfer.

Thirdly, this project was affected by circumstances in Turkey and the limited time period. In past technical cooperation projects, Japanese experts dispatched to the project site during phase 1 in the first year of the project are given time to grasp the needs of the other side and to build a relationship of trust with the counterparts; and the expert is assigned a longer period of time in the country. But, due to Turkey's visa restrictions, the experts were limited to a maximum of a three-month stay, and the dispatch of experts tended to become a short-term shuttle between Japan and Turkey.

However, despite the limited two-year period of the project and the short-term stay of the experts per assignment, the intensive activities were efficiently carried out, while devising them to achieve results. As a result, they were implemented without lowering ownership in Turkey, a country with the highest technical standards among the developing countries, due in part to the lack of long-term stays in the country.

3.8. Follow-up Situation

None.