CHAPTER 4 PREPARATION OF TENDER DOCUMENT AND RELATED STUDIES

THE DETAILED DESIGN STUDY FOR

MODERNIZATION OF TASHKENT THERMAL POWER PLANT

IN THE REPUBLIC OF UZBEKISTAN

FINAL REPORT (SUMMARY)

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CHAPTER 4 PREPARATION OF TENDER DOCUMENTS AND RELATED STUDIES

4.1 Summary of Preparation of Tender Documents

4.1.1 Constitution of Tender Documents

Tender documents for Tashkent Combined Cycle Power Plant Project are comprised the following four (4) books.

- Volume I : Commercial Specification
- Volume II : Technical Specifications
- Volume III : Schedule of Performance and Technical Particular
- Volume IV : Drawings and Appendices

4.1.2 Contents of Tender Documents

- Volume I : Contractual matters which are related to all of the Project are specified.
- Volume II : General technical matters and technical specifications are described.
- Volume III : Formats to be filled in by Bidders are mentioned.
- Volume IV : Drawings and appendices related to the Project are described.

4.2 Site Investigations

4.2.1 Objectives of Site Investigations

The objectives of Site Investigations are to obtain the information necessary to layout the Tashkent C/C power plant. The site investigations cover two kinds of investigations as mentioned bellow. The main items to be confirmed are site boundary lines, base points, general elevation and the soil condition of the proposed project site as well as the existing objects in the area.

- Soil Investigation
- Topographic Survey

In order to observe the technique, method and site management capability, the Investigation works were to be carried out by local subcontractors.

4.2.2 Local Subcontracting

Three bidders participated in the site orientation on Oct 7th. Evaluating the items listed below and negotiating the price, the subcontract of the investigation works was entrusted to TEPLOELEKTROPROEKT (hereinafter TEP) on Oct 17th with the approval of JICA.

- Priced bill of quantities and items of the proposed estimates
- Management condition of and quondam similar works by the company
- Convenience of the acquaintance with the concerned persons of DC "TASHTPP"
- A bank account possible of dollar payment

4.2.3 Schedule

(1) Soil Investigation

- Field Work: Oct.21,2003～Dec.15,2003
- Submittal of draft report: Jan.15,2003
- Submittal of final report: Feb.15,2003

(2) Topographic Survey

- Field Work: Oct.21,2003～Nov.30,2003
- Submittal of draft report: Jan.15,2003
- Submittal of final report: Feb.15,2003

4.2.4 Outline of the Results of the Investigations

(1) Soil Investigation

The local methods of the soil investigation was substituted for Standard Penetration Test (hereinafter SPT) since STP has not been executed in the nations of ex-Soviet Union for decades and the notice of refraining from STP had been announced from ex-Soviet authorities. The local methods of Soil Investigation mainly rely on laboratory tests and analysis of soil samples from the site. The chemical test to analyze the chemical elements of the soil is regarded as important as the physical test from the point of the quality of concrete underground. An adjustment was made to meet the consent about the same amount of the boring work between STP and the local methods.

The result of the soil investigation is shown in the Appendix A in Volume IV of the Tender Documents. The typical outline of the geological situation deduced from the data of the above-mentioned investigation is following,

- 0~1m depth from the existing ground level at the time of November 2002:

Disturbed top soil/Piled-up loamy soil, lumpy with pebble, gravel and debris

- From the bottom of the top soil down to approximately 494m above Mean Baltic Sea Level (hereinafter M.S.L):

  Mainly Loamy Sand Layer/ Loamy soil, lumpy, macro porous, from semi-solid to soft plastic, clay sand

  Amongst the above layer, single Sandy clay Layer of approximately 1~4m thickness at the diverse depth
- From the bottom of the above layer to approximately 495m M.S.L:

  Sand with various grains, clayey with small gravel inclusions
- Down from the bottom of the above layer: Loam, hard, dense, fractured clay

Determination sequences of the mechanical characters of the soil are explained in the report of the above-mentioned documents. According to the reported data, a referential analysis of soil bearing capacity (=R) is presented by TEP as below.

a. Water saturated loam with consideration of water-weighing as the foundation base of 3m width embedding from the ground level (501.15m M.S.L)
   - -2.0m: R=20.0t/m^2
   - -2.5m: R=22.1t/m^2
   - -3.0m: R=24.1t/m^2

b. Water saturated sandy loam with consideration of water-weighing as the foundation base embedding –3.0m from the ground level (501.15m M.S.L)
   - Foundation base of 3.0m width: R=18.5t/m^2
   - Foundation base of 4.5m width: R=19.5t/m^2

Chemical analysis shows specific consideration of sulfur components in the soil is necessary for underground concrete.

The level of the underground water to be considered for the planning of site and new underground structures changes seasonally along with the level of the existing canal adjacent to the site. De-watering work is necessary during the construction work.

(2) Topographic Survey

The result of the topographic survey is shown in the Appendix A in Volume IV of the Tender Documents Draft. According to the survey maps of the site, the accurate information of the location and area is acquired. The information had been reflected in the Drawing of Site Layout Plan /TMP-G-002 etc.

The base point in the whole premises of DC "TASHTPP" is 501m M.S.L on the side of the existing pump house for 7^{th} & 8^{th} power unit. Site elevation ranges from 501m M.S.L to 507m M.S.L. The highest point is in the northeast and the lowest is in the

southwest of the proposed project site. There remain several single storied warehouses, fences and other structures as shown on the survey map. The elevation of the existing gas pipeline between the area for the extension of the new power line and the division for the new Power Plant ranges from 506m M.S.L to 515m M.S.L.

According to the result of the survey TEP has suggested the level of preliminary grading shall be 504.3m M.S.L after removal of the above-mentioned structures with the least stripping of topsoil away from the site.

4.2.5 Considerations

The result of the investigations is sufficient and useful as a part of the draft of Tender Documents. Apart from the sufficiency of the result, there are several points to be considered as for the process of the investigations.

Although workers in the site and engineers in the laboratory of soil tests are sincere, well motivated and proud of their skills, instruments for the site work and equipment of the laboratory are old-fashioned. Fortunately there was not any accident or trouble in the site work of the investigation. The consideration for safety control of site work to be checked by the local subcontractor and the records of the process of the investigations to be reported from them were insufficient.

Since CAD technique is not prevalent in Tashkent, survey maps executed by local subcontractor are drawn by hand. The quality and size of papers on the market for drawings and copies are limited. There will be difficulties in communicating with drawing-data in international construction projects.

4.3 Overview of Works of Environmental Impact Assessment (EIA)

4.3.1 Overview of Preparation of EIA Report

As for Environmental Impact Assessment (EIA) of Tashkent Thermal Power Plant Modernization Project (hereinafter called "the Project"), a draft EIA report has been prepared in 1999 by Teploelectroproekt that is an associated company of SJSC "Uzbekenergo". The report has been approved by Goscompliloda (State Committee of Nature Preservation of the Republic of Uzbekistan), and at that time, Goscompliloda requested to prepare detailed EIA report of the Project as condition for approval.

When S/W (Scope of Work) mission of Japan International Cooperation Agency (JICA) visited Uzbekistan, JICA and Uzbekenergo agreed that Uzbekistan side would prepare detailed EIA report of the Project and Japanese side would conduct assistance for the preparation work and make English translated version of the report. In this study, JICA Detailed Design Study Team (hereinafter called "the Study Team") therefore has assisted the preparation of detailed EIA report of Russian version by Uzbekistan side and made English translated version of the report.

The procedure of EIA regarding construction of thermal power station over 300MWe in Uzbekistan usually consists of three stages. At first stage, a draft of Environmental Impact Statement (Draft EIS) is prepared prior to funding for the projects. At second stage, Environmental Impact Statement (EIS) is prepared in case that Goscompliloda requires preparation because of necessity of additional survey, analysis, countermeasures, etc. for the projects. At the final stage of EIA procedure, Statement of Environmental Consequences (SEC) is prepared prior to commissioning. SEC is a position of updated version of EIS. As for the Project the draft EIA report which is thought to be corresponding Draft EIS has already been prepared. Consequently, SJSC "Uzbekenergo" and Goscompliloda agreed that remaining EIS that means detailed EIA report and SEC should be prepared. The Study Team conducted assistance work and translation of this EIS.

The detailed EIA report has been conducted by Teploelectroproekt as well as the draft EIA report.

The detailed EIA report of Russian version was submitted to the Study Team in December 2002. The Study Team submitted results of the check and review summarized in comment sheets to Teploelectroproekt in February 2003 (in the period of the third on-site study).

Finally, the detailed EIA report was approved by Goscompliloda about one month review after.

Based on the final version of the report, main points of EIA for the Project are shown on **Table 4.3-1**.

Table 4.3-1 Main Points of EIA for the Project

Items	Impact of CCPP	Mitigation measures	Results expected
General	Environmental burdens	Employment of clean and high-efficiency CCPP technology	Reduction of fuel consumption and pollutant emission per MWh
Air quality	Emission of NOx, SOx and dust	Utilization of gas as a fuel and employment of gas turbine with low emission	Reduction of emission of NOx, SOx,and dust
Water quality	Wastewater discharged from CCPP	Installation of wastewater treatment system and implementation of storm water treatment	Reduction of impacts on water quality of Canal Boz-su
Thermal effluent	Thermal effluent discharged to Canal Boz-su	Less amount of water usage and strict limit of temperature increase	Reduction of impacts on water environment of Canal Boz-su
Soil and underground water	Oil leakage to soil and underground water	Establishment and implementation of preventive measures	Prevention of soil and underground water pollution
Wastes	Waste generation	Establishment of appropriate disposal of wastes	Reduction of possible harmfuland chemical impacts on human body
Noise and Vibration	Noise in operation	Installation of CCPP at the site in existing power station and implementation of soundproof measures	Compliance with noise standards in residential area and working positions
Ecology	Impacts on flora and fauna	Installation of CCPP at the site in existing power station	Increase of impacts on living environment of flora and fauna are not anticipated basically.
Socio-economy	Replacement of existing plants	Positive effects	Improvement of safety and stability of power generation Less operators Ensuring employment and improvement of workers' skill
Construction works	Noise, vibration and traffic jams	Limitation of conducting construction works with huge noise and vibration during daytime Planning of transportation schedule with traffic situation taken into consideration	Conservation of living environment and avoidance of traffic jams around the site
Emergency	Possibility of accidents	Employment of automatic control system, implementation of environmental risk assessment, safety procedures and employee training	Reduction of probability of accidents Establishment of countermeasures against emergency cases Employee having skills of emergency response

4.3.2 Overview of Public Hearing Regarding EIA Report

Accompanied with progress of preparation of the detailed EIA report, conducting public hearing regarding the detailed EIA report (hereinafter called "EIA public hearing") was proposed by JICA and JBIC. The method and schedule prepared by Teploelectroproekt was submitted to the Study Team through SJSC "Uzbekenergo".

According to the schedule submitted, the process of conducting EIA public hearing consists of five stages. At first stage, conducting EIA public hearing is familiarized to related parties. At second stage, summaries of the detailed EIA report are prepared and distributed to related parties and the detailed EIA report (complete version) is made available for public inspection. At third stage, EIA public hearing meeting is held. At fourth stage, opinions of residents are collected and analyzed by questionnaire survey. At final stage, results of EIA public hearing activities are reported to Japanese side (**Table 4.3-2**).

Table 4.3-2 Implementation Plan of EIA Public Hearing

(Received from SJSC "Uzbekenergo" in the end of May 2003)

Stages	Activities	Time	Parties Responsible
Stage 1	To familiarize related parties (local authorities, mahalla committee, residence, etc.) with conducting EIA public hearing	~ June 10, 2003	Teploelectroproekt Tashkent Thermal Power Plant (hereinafter called DC "TASHTPP") SJSC "Uzbekenergo"
Stage 2	To prepare summaries of the detailed EIA report and distribute summaries to related parties To make the detailed EIA report available for public inspection at Tashkent Thermal Power Plant and mahalla committee	~ June 20, 2003	Teploelectroproekt DC "TASHTPP"
Stage 3	To hold EIA public hearing meeting	~ June 30, 2003	Teploelectroproekt DC "TASHTPP"
Stage 4	To conduct questionnaire survey of residents and analyze it	~ August 10, 20032003. 8.10	Teploelectroproekt DC "TASHTPP"
Stage 5	To report the results of EIA public hearing to JICA and JBIC	~ August 30, 2003	Teploelectroproekt DC "TASHTPP" SJSC "Uzbekenergo"

Each activity was carried out as almost scheduled. The summaries of detailed EIA report were prepared in Uzbek (official language) and Russian and were distributed to related parties. The detailed EIA report of complete version in Russian was made available for public inspection at DC "TASHTPP" and mahalla committee that was an organization like residents' association.

EIA public hearing meeting, a direct dialogue with residence, was held at DC "TASHTPP" on 8 July 2003. Many staffs of DC "TASHTPP" and residents not worked at DC "TASHTPP" were attended because many staffs lived around DC "TASHTPP". Explanations of outline of the Project, benefit of newly constructed combined cycle power plant (CCPP) and environmental impact of the Project were given by staffs of DC "TASHTPP" and person of Teploelectroproekt in charge. Question-and-answer session was also conducted. Main opinions of residents consisted of following three points. First point is concern about noise from gas turbine. It came from confusing gas turbine and jet engine of aircraft. It was explained that new plant would be taken necessary countermeasures against noise and there was nothing to worry about. Second one is fear of job loss caused by stop of some existing units accompanied with operation of CCPP. Third one is request to plant trees around DC "TASHTPP" and to make playground for children. But looking overall, objection in regard to promote the Project was not presented, and it was recognized that understanding of residents was gotten.

At fourth stage, questionnaire was distributed to residents and collection of residents' opinions and its analysis were conducted. 100 copies of questionnaire were distributed and 88 copies were collected.

According to the results of questionnaire analysis, it can be said that residents' interest in the Project is comparatively high because many staffs of DC "TASHTPP" live around DC "TASHTPP" and summaries of the detailed EIA report were distributed in advance. Ratio of residents considering current environmental status to be bad is comparatively low. As for contribution to improvement of environmental status, "Yes (Expected)" is most frequent answer but answer of "I don't know" occupies a fair percentage. It shows quite a few residents doubt if the Project will lead to remarkable improvement of environment, despite a series of activities regarding EIA public hearing shows that environmental burden will decrease. But looking overall, residents living around DC "TASHTPP" are comparatively familiarized with the Project and many residents expect the Project to improve environmental status, health conditions and living conditions of residents.

In August 2003 (in the period of 4-3 on-site study), debrief session of EIA public

hearing was held at Uzbekenergo headquarters with attendance of representative of DC "TASHTPP" and Teploelectroproekt. At the session, SJSC "Uzbekenergo" reported the activities of EIA public hearing to the Study Team. It was reported that all process had been conducted as almost scheduled and mahalla committee agreed to promote the Project. It was also determined that the results of a series of activities regarding EIA public hearing would be released to the local press based on comments from Japanese side. EIA works of the Study Team have been completed by receiving report of EIA public hearing.

4.4 Summary of Transport Route Survey

4.4.1 Purpose of this survey

The purpose of this survey is to investigate the most suitable transport route and transport cost ex place of shipment including Japan up to Tashkent thermal power plant for the materials and equipment to be utilized for construction of new combined cycle power plant.

The followings are main purposes of this survey.

- To find the most suitable transport route for heaviest 372 MT gas turbine and 200 MT generator.
- To find separately the most suitable routing for general cargo.

4.4.2 Possible route:

(1) Existing Route

Presently, following routes exist.

a. Rail transportation ex Russian Eastern Coast, Siberian route
b. Rail transportation ex China East Northern region, China route
c. Inland transportation ex Iran
d. At first ocean transportation ex Black Sea for Caspian Sea, thereafter inland transportation ex Turkmenbashi to Tashkent
e. At first rail transportation for Baku, Azerbaijan via Black Sea, thereafter transportation by ferry ex Baku for Turkmenbashi, finally inland transportation ex Turkmenbashi for Tashkent

(2) Air Route

Besides, route by Air is as follows.

a. Ex Japan for Tashkent via Korea:
Usual passenger flight to be used. Thus, flight possibility to be depending on cargo size, weight, and space availability at the time of shipment.
b. Ex Luxembourge for Tashkent by cargo flight
One (1) flight /One (1) week by use of usual cargo flight. In this case, it is possible to ship cargo over 3 m length and 1.65 m height / piece that cannot be shipped by usual passenger flight.

(3) The best transport route:

Regarding transformers and generators and so on, as Maximum 125 MT / unit, most of

the cargoes ex Japan are suggested to be shipped for Turkmenbashi port by use of river vessel via transshipment basis at Mariupol at Black Sea. And then, in Turkmenbashi, cargoes are to be loaded on trailers by use of shore-crane.

Except above mentioned cargoes, others are to be delivered to Tashkent from Russian Eastern Coast after stuffing operation into containers.

(4) Transport Cost:

Saying from above mentioned route, and judging from conditions, total transport coat is indicated as US$7,500,000.00. In such, ocean freight for Turkmenbashi, inland transport cost up to Tashkent, and part rail transport cost via Russian Eastern Coast, shore-crane cost at Turkmenbashi, and reinforcement cost for bridges and roads (those are already explained.) would be;

Ocean freight ex Japan for Turkmenbashi:	US$2,300,000.00
Inland freight ex Turkmenbashi for Tashikent:	US$2,300,000.00
Shore-crane cost in Turkmenbashi:	US$ 700,000.00
(3 months are expected.)	
Reinforcement for bridges and roads and recovering	US$ 2,100,000.00
Rail transportation from Russian Eastern Coast	US$ 100,000.00
(Approx 20' x 30 containers as 500 M3)	

In the above, it includes charges for whole rental period of truck/trailer that we can foresee at this moment. However cost for obtaining road permission are excluded.

4.5 Power System Analysis

4.5.1 Purpose

A 370 MW combined cycle generating facility, which is scheduled to begin operation in 2008, is to be added to the Tashkent Thermal Power Plant. The purpose of the power system analysis is carrying out the calculation in order to examine the influence due to the introduction of this facility under normal condition and emergency condition. The power system analysis will be examined issues such as power flow, short-circuit current, stability, and frequency fluctuation.

4.5.2 Simulated System

Ideally, the power system of year 2008 would be simulated for the calculations, but accurate data is not available with regard to demand forecast, generation development plan, and power transmission system development plan for future years. Therefore, the analysis will be carried out based on the actual year 2002 data for the power system to which the new 370MW generator of the Tashkent Thermal Power Plant will be connected. For the purposes of these calculations, almost all of the 500 kV and 220 kV transmission lines and substations of the system were simulated except some radial power system. Major 8 power plants were simulated accurately unit by unit.

4.5.3 Calculation Results

(1) Power Flow

For all the 500 kV transmission lines and 220kV transmission lines, the calculated flow was within the allowable current capacity.

(2) Voltage

The 500kV bus voltage of each substations was within the range of 535 kV (107.1 %) and 500 kV (100.0 %). And the 220 kV bus voltage of each substations was within the range of 229 kV (104.0 %) and 201 KV (91.4 %). In all cases, the voltage was found to fall within the target range of ±10 %.

(3) Short-circuit Current

The maximum short-circuit current was 13.1 kA for a 500 kV bus and 27.5 kA for a 220 kV bus. In all cases, the current was within the rated current capacity for the equipment of 40 kA.

(4) Stability

The results of static stability calculations and dynamic stability calculations of the case that fault occurs at the nearest point of the Tashkent Thermal Power Plant indicated that the system was stable.

(5) Frequency Fluctuation

The frequency fluctuation was calculated for the case when the Tarimaljan 800 MW generator, which is the largest capacity in the Central Asia Power System, dropped out of the system and the case of 10 % load reductions of the whole system. The results of the case generator dropping out and load reduction are 0.1Hz drop and 0.1Hz rise, respectively. This frequency fluctuation values are within the range of permitted frequency, 48.5Hz - 51.5Hz.

4.5.4 Conclusion and Observations

The analysis revealed that there will be no problems of power flow, voltage, short-circuit current, stability and frequency fluctuation caused by connecting the new 370 MW generator of the Tashkent Thermal Power Plant to the existing power system.

However, the power flow is heavy from the east side to the west side of the power system, making the system a very weak one in terms of system stability. In particular, the dynamic stability is severe when the transmission line from Syrdarinskaya to Guzar is an accident. Therefore it will be necessary to install the new 500kV transmission line to keep the system stable

This analysis study was carried out using the data in 2002 not 2008 when the new CCPP will be putting into operation. For the exact power system development plan, it is necessary to carry out the analysis study at the stage of 2008 and of future year. Therefore it is necessary to clarify the problem of power system regarding power flow, voltage, short-circuit current, stability and frequency fluctuation based on more precise analysis study taking into account demand forecast, power generation development plan and power transmission development plan by SJSC "Uzbekenergo".

CHAPTER 5 IMPROVEMENT PLAN FOR TASHKENT THERMAL POWER PLANT (DC "TASHTPP")

THE DETAILED DESIGN STUDY FOR

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CHAPTER 5 REMEDIAL MAINTENANCE AND MANAGEMENT PLAN FOR THE TASHKENT THERMAL POWER PLANT (DC "TASHTPP")

5.1 Current Equipment Maintenance and Problem Areas at the Tashkent Thermal Power Plant (DC "TASHTPP")

5.1.1 Overview

There are twelve thermal power units at the Tashkent Thermal Power Plant (hereafter, DC "TASHTPP"). the output of units No.1 through No.5 and unit No.9 are 150 MW, the output of units No.6, No.11 and No.12 are 155MW and the output No.7, No.8 and No.10 are 165 MW. The all equipments are Russian-made (the former USSR). The units were commissioned at intervals between 1963, when unit No.1 began operation, and 1971, when unit No.12 began operation. Unit No.1 has already been in operation for forty years, and even the newest unit, unit No.12, has been operating for over 30 years, so all the equipment is aging. Picture 5.1-1 shows a overhead view of the existing plants of DC "TASHTPP".

Picture 5.1-1 Existing Tashkent Thermal Power Plant

In the beginning, the plants were operated and maintained by Soviet engineers. However, with the break-up of the Soviet Union in 1990, the responsibility for operating and maintaining the power plants was left to the staff of the power plant itself.

Most of the maintenance work carried out at the plant is repair work to fix a problem that has