State Joint Stock Company "Uzbekenergo"
The Republic of Uzbekistan

Selection of Optimum Cycle of Bottoming System
for
Tashkent Thermal Power Plant
Modernization Project

Document No. TMP-0032E

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Tokyo Electric Power Services Co., Ltd.

The combined cycle is a combination of "Topping System" (namely gas turbine with Brayton Cycle) and "Bottoming System" (namely boiler-steam turbine with Rankine Cycle). In general, the cycle of the topping system is unchangeable because a gas turbine is a standardized machine. However, the bottoming system is selectable in principal regardless of the gas turbine model, and the selection of bottoming system affects the performance and the cost of the Project.

In general, for the combined cycle with low exhaust gas temperature from the gas turbine, the bottoming system of two pressure/non reheat is selected, on the contrary, for the case that exhaust gas temperature of gas turbine is so high as the case of modern large capacity gas turbine, more complex system, i.e. three pressure/reheat system is usually applied.

In this report, four kinds of bottoming system, i.e. two pressure/non-reheat (2P-NR), two pressure /reheat (2P-R), triple-pressure/non-reheat (3P-NR) and triple-pressure/reheat (3P-R), will be compared in both technical and economic points of view.

1. Base Conditions of Comparison

1.1 Performance Conditions

The following standard site conditions are used:

Ambient temperature	15 ℃
Site elevation above sea	500 m
Atmospheric pressure	95.5 kPa
Cooling water temperature	12 ℃
Used fuel gas	Non-sulphur (Bukhara) gas
Heat supply	Non

1.2 Conditions for Economic Evaluation

Book lifetime	25 years
Interest rate of loan	5.0 % (1.8 % from JBIC)
Price of fuel gas	Variable
Escalation of gas price	2 % p.a.
Escalation of O&M cost	2 % p.a.
Discount rate	5 % p.a.
Exchange rate	1,000 Sum/$

The present gas price is 12,900 Sum/1,000 Nm^3 as of October 1, 2002. This price is extraordinarily low compared with the international marketing prices. Therefore, in this study, the gas price is treated as a variable.

2. Comparison Results

2.1 Comparison of Performance and Construction Cost

Table 1 shows a comparison of performances and construction costs of four bottoming systems. Each system has the same fuel gas consumption but the different power output each other. In comparison of the net plant outputs, the outputs of 2P-R and 3P-NR systems are almost same and by approximately 0.7 % higher than that of 2P-NR system. The output of 3P-R system is the highest and by approximately 1.7 % higher than 2P-NR system.

Table 1 Comparison of Performance and Construction Cost

Item	Unit	2P-Non Reheat	2P-Reheat	3P-Non Reheat	3P-Reheat
Performance Conditions:					
Ambient air temperature	°C		15		
Site elevation	m		500		
Fuel			Bukhara gas		
Heat supply			No		
HP steam pressure at HRSG	kPa abs	10,440	10,440	10,440	12,340
HP steam temperature at HRSG	°C	541	541	541	543
HP steam flow at HRSG	kg/s	88.56	74.49	88.7	69.27
Hot reheat steam pressure at HRSG	kPa abs		2,630		3,130
Hot reheat steam temperature at HRSG	°C		541		543
Hot reheat steam flow at HRSG	kg/s		74.49		84.95
IP steam pressure at HRSG	kPa abs			3,197	3,200
IP steam temperature at HRSG	°C			276	276
IP steam flow at HRSG	kg/s			10.44	15.68
LP steam pressure at HRSG	kPa abs	546	546	546	546
LP steam temperature at HRSG	°C	189	189	189	189
LP steam flow at HRSG	kg/s	17.87	22.63	7.06	9.80
GT gross output	kW	250,055	250,055	249,830	249,830
ST gross output	kW	121,679	123,924	124,680	127,959
Total gross output	kW	371,734	373,979	374,510	377,789
Auxiliary power	kW	10,641	10,362	10,711	10,575
Net power output	kW	361,093	363,617	363,799	367,214
Net plant heat rate (LHV)	kJ/kWh	6,606	6,560	6,556	6,496
Net plant efficiency	%	54.50	54.88	54.91	55.42
Capacity factor	%	90	90	90	90
Annual net power output	MWh	2,846,857	2,866,756	2,868,191	2,895,115
Lower calorific value of gas	MJ/Nm^3		36.97		
Fuel gas consumption	$1000Nm^3/year$	508,700	508,700	508,600	508,700
Total plant cost	10^6 US $	208.3	213.0	214.0	219.3
Unit cost per net output	US $/kW	576.9	585.8	588.2	597.2

Meanwhile, the rate of required cost for upgrading the system against the original cost is rather higher than the rate of power output increase. The 2P-R and 3P-NR systems require the additional costs of 2.3 % and 2.7 % respectively for attaining 0.7 % increase of power output. The 3P-R system requires the additional cost of 5.3 % for 1.7 % increase of power output. In principle, the decision of application of upgraded system depends on judgment whether these discrepancies between the rate of power output gains and the rate of required additional costs could be compensated by improving of thermal efficiency (or increasing of power output) of the systems.

2.2 Economic Evaluation of Systems

Each system is evaluated by the levelized generation costs calculated for the lifetime of 25 years with varying the fuel price.

Table 2 shows the levelized generation cost vs. fuel price for each bottoming system. Table 3 shows the calculation results of levelized generation costs for the case of natural gas price of 13,700 Sum/1,000 Nm^3.

Table 2

Levelized Generation Costs vs. Fuel Prices

(Levelized generation cost: $/MWh)

Fuel Price (Sum/1000 Nm^3)	13,700 (0.354 $/MMBTU)	60,000 (1.54 $/MMBTU)	120,000 (3.10 $/MMBTU)
2 Pressure-Non Reheat	10.37	21.46	34.53
2 Pressure-Reheat	11.42	21.44	34.42
3 Pressure-Non Reheat	11.45	21.46	34.43
3 Pressure-Reheat	11.48	21.40	34.26

Fuel price: as of 2005 year with escalation of 2 %

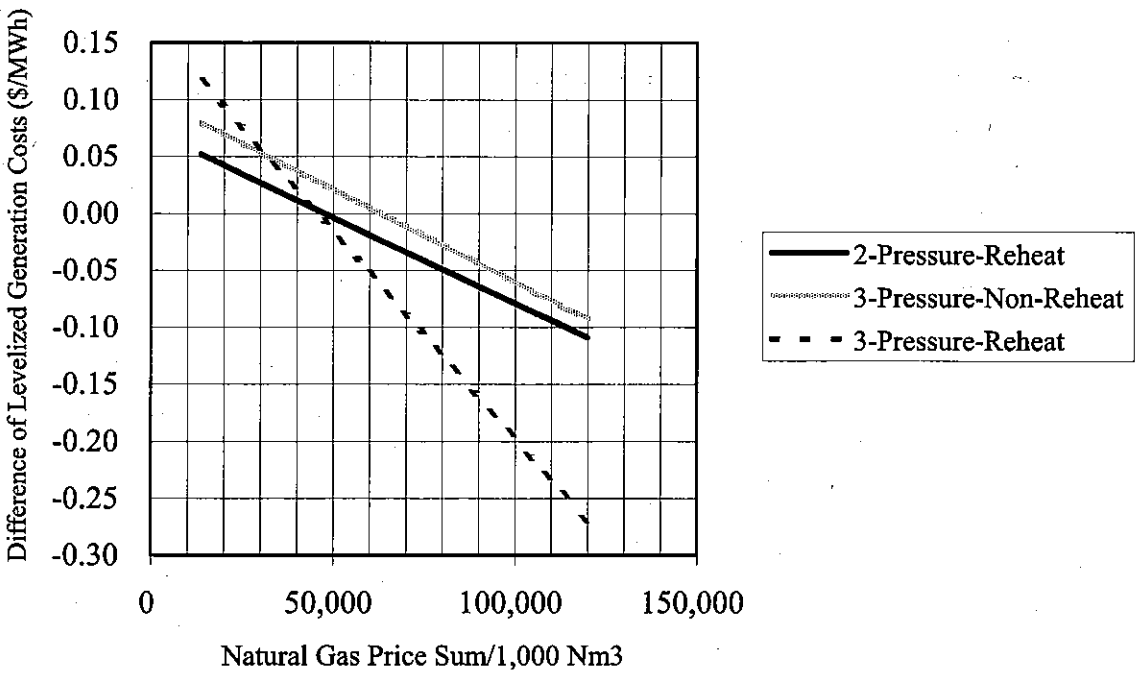
The fuel price of 13,700 Sum/1,000 Nm^3 is a calculated price from 2002 year's price (12,900 Sum/Nm^3) with escalation rate of 2 % p.a. The price of 60,000 Sum/1,000 Nm^3 is almost same as the price used in 400 MW Severnaya GTCC Project, Azerbaijan, in which the price of gas is 60 $/1,000 Nm^3 and 3-Prssure-Reheat system has been selected. The price of 120,000 Sum/1,000 Nm^3 is comparable to the international market prices of natural gases which are

approximately ranged between 2.5 ~ 3.5 $/MMBTU at user end. In this connection, the natural gas for the economical evaluation at the Feasibility Study was 1.16 $/MMBTU (45,000 Sum/$Nm^3$).

Fig. 1 shows the relation of the differences of the levelized generation costs vs. natural gas prices between 2P-NR and other three systems.

Fig. 1

Difference of Levelized Generation Costs vs. Natural Gas Price



At the present price of natural gas 2P-NR system shows the lowest generation cost, and 2nd lowest is 2P-R, 3rd lowest is 3P-NR and the highest is 3P-R system. However, in the range of the price higher than 60,000 Sum/Nm^3, all three systems, i.e. 2P-R, 2P-NR and 3P-R systems give lower generation costs than that of 2P-NR. Especially among of three systems 3P-R system shows the lowest generation cost in the price range over 50,000 Sum.

The difference of levelized generation cost between 3P-R and 2P-NR at the natural gas price of 120,000 Sum/1,000 Nm^3 is 0.27 $/MWh, and the difference between 3P-R and 2P-R/3P-NR is about 0.17 $/MWh. Those would results in annual cost saving of about 0.78 and 0.49 Million US $, respectively.

3. Conclusion and Recommendation

At the present price level of natural gas, most simple cycle, i.e. 2-Pressure-Non-Reheat system, has a benefit in both aspects of economy and operation/maintenance. However, the present price of natural gas is considered to be extraordinarily low in comparison of international market price level of natural gas. The republic of Uzbekistan is in transition from controled economy to open market and liberalization of economy. Therefore the price of natural gas would gradually go up and close to international market prices.

In above mentioned economic evaluation of candidate four systems, 3-Pressure-Reheat system shows the lowest levelized generation cost in the price range of natural gas higher than 50,000 Sum/Nm^3. The price of 50,000 Sum/Nm^3 is enough lower and approximately a half of the international market price of gas.

Therefore, the bottoming system of 3-Pressure-Reheat would be the most recommendable system in spite of somewhat more complexity in system and operation. 3-Pressure-Reheat system has already become the most popular system in the modern large-scale combined cycle power plant. So probable complexity of operation would be overcome by proper control system design. In addition, the highest thermal efficiency of 3-Pressure-Reheat would contribute to reduction of greenhouse gas emission.

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Table 3 ECONOMIC EVALUATION ON BOTTOMING SYSTEM (Unit 1000$)

Year	Total	Total (Value at Year 1)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
2 Pressure Non-Reheat																											
Total Investment Recovery	369,485	218,715	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779	14,779
Fixed O&M Cost	73,962	41,665	2,309	2,355	2,402	2,450	2,499	2,549	2,600	2,652	2,706	2,760	2,815	2,871	2,929	2,987	3,047	3,108	3,170	3,233	3,298	3,364	3,431	3,500	3,570	3,641	3,714
Valiable O&M Cost	164,690	92,774	5,142	5,245	5,349	5,456	5,566	5,677	5,790	5,906	6,024	6,145	6,268	6,393	6,521	6,651	6,784	6,920	7,058	7,200	7,344	7,490	7,640	7,793	7,949	8,108	8,270
Fuel Cost	223,225	125,748	6,969	7,109	7,251	7,396	7,544	7,695	7,848	8,005	8,166	8,329	8,495	8,665	8,839	9,015	9,196	9,380	9,567	9,759	9,954	10,153	10,356	10,563	10,774	10,990	11,210
Total Annual Operation Cost	831,363	478,901	29,199	29,488	29,782	30,082	30,388	30,700	31,019	31,343	31,675	32,013	32,357	32,709	33,067	33,433	33,806	34,187	34,575	34,971	35,375	35,787	36,207	36,635	37,072	37,518	37,973
Annual Power Generation (MWh)	71,171,430	42,129,620	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857	2,846,857
Annual Generation Cost ($/MWh)			10.26	10.36	10.46	10.57	10.67	10.78	10.90	11.01	11.13	11.24	11.37	11.49	11.62	11.74	11.87	12.01	12.14	12.28	12.43	12.57	12.72	12.87	13.02	13.18	13.34
Levelized Generation Cost ($/MWh)		11.37																									
2 Pressure Reheat																											
Total Investment Recovery	377,822	223,650	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113	15,113
Fixed O&M Cost	74,042	41,710	2,312	2,358	2,405	2,453	2,502	2,552	2,603	2,655	2,708	2,763	2,818	2,874	2,932	2,990	3,050	3,111	3,173	3,237	3,302	3,368	3,435	3,504	3,574	3,645	3,718
Valiable O&M Cost	165,685	93,334	5,173	5,276	5,382	5,489	5,599	5,711	5,825	5,942	6,061	6,182	6,306	6,432	6,560	6,692	6,825	6,962	7,101	7,243	7,388	7,536	7,686	7,840	7,997	8,157	8,320
Fuel Cost	223,225	125,748	6,969	7,109	7,251	7,396	7,544	7,695	7,848	8,005	8,166	8,329	8,495	8,665	8,839	9,015	9,196	9,380	9,567	9,759	9,954	10,153	10,356	10,563	10,774	10,990	11,210
Total Annual Operation Cost	840,775	484,441	29,566	29,856	30,150	30,451	30,758	31,071	31,390	31,716	32,048	32,386	32,732	33,084	33,444	33,810	34,184	34,566	34,955	35,351	35,756	36,169	36,590	37,020	37,458	37,905	38,361
Annual Power Generation (MWh)	71,668,911	42,424,101	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756	2,866,756
Annual Generation Cost ($/MWh)			10.31	10.41	10.52	10.62	10.73	10.84	10.95	11.06	11.18	11.30	11.42	11.54	11.67	11.79	11.92	12.06	12.19	12.33	12.47	12.62	12.76	12.91	13.07	13.22	13.38
Levelized Generation Cost ($/MWh)		11.42																									
3 Pressure Non-Reheat																											
Total Investment Recovery	379,596	224,700	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184	15,184
Fixed O&M Cost	74,047	41,712	2,312	2,358	2,405	2,453	2,502	2,552	2,603	2,655	2,709	2,763	2,818	2,874	2,932	2,991	3,050	3,111	3,174	3,237	3,302	3,368	3,435	3,504	3,574	3,645	3,718
Valiable O&M Cost	166,383	93,727	5,195	5,298	5,404	5,513	5,623	5,735	5,850	5,967	6,086	6,208	6,332	6,459	6,588	6,720	6,854	6,991	7,131	7,274	7,419	7,567	7,719	7,873	8,031	8,191	8,355
Fuel Cost	223,225	125,748	6,969	7,109	7,251	7,396	7,544	7,695	7,848	8,005	8,166	8,329	8,495	8,665	8,839	9,015	9,196	9,380	9,567	9,759	9,954	10,153	10,356	10,563	10,774	10,990	11,210
Total Annual Operation Cost	843,251	485,887	29,659	29,949	30,244	30,545	30,853	31,166	31,486	31,812	32,144	32,483	32,829	33,182	33,542	33,909	34,284	34,666	35,056	35,453	35,858	36,272	36,694	37,124	37,563	38,010	38,467
Annual Power Generation (MWh)	71,704,775	42,445,331	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191	2,868,191
Annual Generation Cost ($/MWh)			10.34	10.44	10.54	10.65	10.76	10.87	10.98	11.09	11.21	11.33	11.45	11.57	11.69	11.82	11.95	12.09	12.22	12.36	12.50	12.65	12.79	12.94	13.10	13.25	13.41
Levelized Generation Cost ($/MWh)		11.45																									
3 Pressure Reheat																											
Total Investment Recovery	388,997	230,265	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560	15,560
Fixed O&M Cost	74,056	41,717	2,312	2,358	2,405	2,454	2,503	2,553	2,604	2,656	2,709	2,763	2,818	2,875	2,932	2,991	3,051	3,112	3,174	3,237	3,302	3,368	3,436	3,504	3,574	3,646	3,719
Valiable O&M Cost	167,373	94,285	5,225	5,330	5,437	5,545	5,656	5,769	5,885	6,002	6,122	6,245	6,370	6,497	6,627	6,760	6,895	7,033	7,173	7,317	7,463	7,613	7,765	7,920	8,078	8,240	8,405
Fuel Cost	223,225	125,748	6,969	7,109	7,251	7,396	7,544	7,695	7,848	8,005	8,166	8,329	8,495	8,665	8,839	9,015	9,196	9,380	9,567	9,759	9,954	10,153	10,356	10,563	10,774	10,990	11,210
Total Annual Operation Cost	853,651	492,015	30,067	30,357	30,653	30,955	31,262	31,576	31,897	32,224	32,557	32,897	33,243	33,597	33,958	34,326	34,701	35,084	35,474	35,873	36,279	36,693	37,116	37,547	37,987	38,436	38,893
Annual Power Generation (MWh)	72,377,879	42,843,772	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115	2,895,115
Annual Generation Cost ($/MWh)			10.39	10.49	10.59	10.69	10.80	10.91	11.02	11.13	11.25	11.36	11.48	11.60	11.73	11.86	11.99	12.12	12.25	12.39	12.53	12.67	12.82	12.97	13.12	13.28	13.43
Levelized Generation Cost ($/MWh)		11.48																									

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November 26, 2002
TMP-0029E-2

Scope of Services and Works

1. Works and Services to be provided by the Contractor

The works and services to be provided by the Contractor shall include the design, manufacture, fabrication, factory testing, packing, transportation to site, unloading and storage at Site, erection, testing, trial operation, commissioning, reliability run, performance guarantee testing and handing over for commercial operation of the Plant on a full turn-key basis. The main works and services are as follows, but not limited to them.

(1) Gas turbine and its accessories

(2) Gas turbine generator and its accessories

(3) Heat recovery steam generator and its accessories

(4) Hot water supply system

(5) Steam turbine and its accessories

(6) Steam turbine generator and its accessories

(7) Electrical system for gas turbine generator

(8) Electrical system for steam turbine generator

(9) Electrical systems common to the Plant

(10) Mechanical systems common to the Plant

(11) 220kV switchyard system including interconnection lines from generator transformers

(12) Steam turbine condenser and its accessories

(13) Circulating cooling water system

(14) Makeup water treatment system

(15) Waste water treatment system

(16) Closed cooling water system for cooling of lubricating oil and other cooling media

(17) Civil works of equipment and building foundations and concrete structures

(18) Architectural works with necessary facilities

(19) Fire protection system for the Plant

(20) Natural gas pre-treatment and compressor station

(21) Main stack and bypass stack and diverter damper

(22) Station and instrument air supply system

(23) Plant control and monitoring system

(24) Continuous emission monitoring system

(25) Erection works of all equipment in scope of supply

(26) Training of client's staff for six (6) weeks at factory

(27) All necessary documentation related to the operating procedures and maintenance of the power plant

(28) All documents and as-built drawings of the power plant

(29) Computer based plant operation compact simulating device

(30) One (1) year supervision by contractor engineers during the defect liability period

(31) Mandatory spare parts for five (5) years operation

(32) Factory and site inspections and tests

(33) Trial operation and commissioning

(34) Reliability run and performance guarantee tests

2. Works and Services to be provided by Uzbekenergo

The following works and/or services associated with the Plant shall be provided by Uzbekenergo

(1) Makeup water, tap water, service water, service air and steam, auxiliary steam, low and medium voltage electric power for use during construction, commissioning and guarantee and reliability tests.

(2) Detailed Environmental Impact Assessment (EIA) report

(3) Assistance for acquisition of all permits necessary for construction and operation of the Plant.

(4) Topography mapping/surveying.

(5) Site Soil Investigation/Borings.

(6) Natural gas, electric power load, and hot water demand for commissioning and guarantee and reliability tests.

(7) Preparation and leveling of site area including temporary storage area during construction and preparation of access road for carrying-in of heavy components.

(8) Demolition works of any structures on the site surface and underground with compensation, if any.

(9) Relocation works of any structures of "TashGRESstroi" to the new plant site

(10) Relocation of maintenance facilities in existing workshop to the existing building

(11) Relocation of the existing natural gas and hot water pipelines.

(12) Relocation and modification of the existing 35 kV and 220 kV overhead lines.

(13) Space to warehouse the spare parts and special maintenance facilities.

(14) Fencing around the Plant site, access road to equipment and drainages inside the Plant site.

November 28,2002
TMP-0030E

Comparison and Evaluation Method between Bids

This document is to state how to compare and evaluate the proposed bids for review and discussion with Uzbekenergo. Any figures in this document are tentative values and have to be finalized through the discussion with Uzbekenergo.

Comparison and evaluation of Bids will be conducted in two (2) kinds of ways. One is a way to determine whether proposed documents will comply with the requirements by the Tender Documents. This will be performed with a pass or fail of the proposal against each item of the requirements.

The other is a way to compare the total cost through the service life of the project with the price, performance values and completion date declared by Bidders.

The Purchaser reserves the right to reject any or all Bidders and to waive minor formalities if it seems to be of interest for him to do so without giving any reasons.

Bidders are requested not to contact Uzbekenergo or the Engineer on any matters concerning their Bids.

1. Compliance with Bid Documents

1) Responsiveness of Bidder to the Tender Documents.
2) A substantially responsive Bidder is one that complies with the terms, conditions and specifications of the Tender Documents. The determination of responsiveness will be made based on examination of the Bidder itself without rely on external evidence. Bidders are not allowed to revise non-responsive Bid after Bid opening to make them responsive. However, the Bidder may be requested to clarify his Bid.

3) Completeness of proposed documents. It will be determined by whether all the requirements in the Tender Documents will be informed and given in the proposed documents.

4) Suitability of the proposed Unit from the viewpoint of impact on the environment.

5) Reconfirmation of full compliance with all the criteria conditions in the pre-qualification.

6) Full compliance with all the criteria conditions as EPC contractor.

2. Evaluation of Total Cost through Service Life

The evaluation of Bids will be made on a basis of the difference among the present values of the total cost through the unit service life of 25 years. However, it is practically impossible to foreseen the conditions at this stage and it does not always meet the purpose to do so. Therefore, the following costs will be considered for the purpose of evaluation because they can be practically estimated with data given by Bidders. The operating costs incurred during a simple cycle operation and a start/stop will be neglected because the costs are small compared with the total operating costs through the service life. All costs used for the evaluation are to be converted into US $ with the certain exchange rates.

1) The costs to be considered.

(1) The Corrected Bid Price (K_1) after making any corrections of errors in the Bid Specification. The scope to be covered with the price will be defined in the separate section. The mandatory and additionally recommended spare parts required for five (5) years operation will be considered for evaluation. If there is any discrepancy between the amount in figures and in words, the amount in words will govern. If there is any discrepancy between the sum of the unit price and the corresponding total price, the former will govern and the latter will be corrected. Any duties and taxes and provisional sum will be excluded from the scope in consideration

(2) The cost (K_2) to be loaded as the results of adjustment of any unacceptable variations and/or deviations from the Bid Documents. Variations and deviations, which do not comply with spirits of intents of requirements in the Tender Documents, will not be accepted and the costs for exception of them will be loaded in accordance with Purchaser's procedures and methods.

(3) The cost (K_3) to be loaded with the difference among Guaranteed Net Power Outputs declared by Bidders.

(4) The cost (K_4) to be loaded with the difference among Guaranteed Net Heat Rates declared by Bidders.

(5) The cost (K_5) to be loaded with the behind Unit Completion Dates of the gas turbine and combined cycle power plant against the specified Completion Dates of them.

2) Conditions for evaluation

(1)	Evaluation period	25 years
(2)	Annual total operating hours	7,970 hours
	for full power generating operation	5,250 hours
	for cogenerating operation with export of steam	2,720 hours
(3)	Price of fuel to be procured by Uzbekenergo	1.0 $/GJ (LHV)
(4)	Discount rate	10 %
(5)	Present electricity tariff at the outgoing terminal of the TashGRES	0.5 cents/kWh
(6)	Present hot water tariff price at the outgoing terminal of the TashGRES	0.694 $/GJ (= 0.25 cents/kWh)
(7)	Power generation cost by this project	1.0 cents/kWh
(8)	Hot water production cost by this project	1.39 $/GJ (= 0.5 cents/kWh)

3) Cost (K_3) to be loaded with Guaranteed Net Power Output difference

One of the reasons why this project is to be introduced is that the shortage of supply capability against the power demand is foreseen for the future in Uzbekistan. Considering such a situation of Uzbekistan for the balance between the power demand and the supply capability, the cost to be loaded will be estimated on the condition that the combined cycle power plant with the same capacity as the capacity difference against the maximum Guaranteed Net Power Output among the Guaranteed Net Power Outputs declared by Bidders will be additionally constructed for this project.

The attached curve (Figure-1) show the relationship between the unit capacity and the unit price ($/kW) ratio. The curve is made by approximating

data cited from Gas Turbine World 2001-2002 handbook with a method of least square. The unit price ratio is expressed with the ratio of the unit price of the combined cycle power plant to be additionally constructed to the unit price of the combined cycle power plant with a capacity of 370MW.

For example, it is assumed that one Bidder proposes a combined cycle power plant of a capacity of 360MW with a unit price of $600/kW on a basis of the corrected Bid price (K_1) plus the adjustment cost (K_2), while the declared maximum guaranteed net power output is 370MW among the Bidders. In this case, the capacity difference is 10MW. From the curve, the unit price ratios against power outputs of 360MW and 10MW can be founded to be "A" and "B" respectively. Consequently, the cost (K_3) to be loaded could be calculated as US$600×A/B×10×1,000 for this case.

Thus, the costs to be loaded against all other combined cycle power plants than the unit with the maximum Guaranteed Net Power Output could be estimated.

(4) Cost (K_4) to be loaded with difference of Guaranteed Net Heat Rate

The Guaranteed Net Heat Rate of the combined cycle power plant with the maximum Guaranteed Net Power Output among the proposed Bids will be used as it is for the base for evaluation. While, the Guaranteed Net Heat Rate of the combined cycle power plant with less Guaranteed Net Power Output will be revised as the weighted mean of the declared Guaranteed Net Heat Rate and the heat rate of the combined cycle power plant to be added.

The heat rate of the combined cycle power plant to be added can be presumably estimated from the curve (Figure-2) that is made by approximation of data cited from the said Handbook.

In the case as stated in the previous paragraph, if the Declared Net Heat Rate and the heat rate of the combined cycle power plant to be added are designated as "C" and "D" respectively, the revised net heat rate (E) of the combined cycle power plant with less Guaranteed Net Power Output could be calculated as $E = (360 \times C + 10 \times D)/(360+10)$

Thus, the revised net heat rates of all other combined cycle power plants than the unit with the maximum Guaranteed Net Power Output could be estimated.

Therefore, the annual fuel cost difference (J) can be calculated as $J = F \times (E - G) \times H \times I$.

Where,

E. Revised net heat rate of combined cycle power plant in consideration (kJ/kWh)
F. Maximum declared Net Power Output (MW)
G. Net heat rate of combined cycle power plant with maximum declared net power output (kJ/kWh)
H. Fuel cost ($/GJ)
I. Annual operating hours (hours)

The cost (K_4) to be loaded due to the heat rate difference can be obtained as shown below by multiplying the annual fuel cost difference (J) by the factor $((1+0.1)^{25} - 1)/0.1(1+0.1)^{25} = 9.08$ for the discount rate of 10% and the service life of 25 years.

$$K_4 = 9.08 \times J \text{ (US\$)}$$

4) Cost (K_5) to be loaded for late Completion Date

The cost proposal of which declared project completion date is behind against the specifically required completion date will be loaded provided that the loss will be equivalent to the power energy (kWh) and hot water energy (GJ) to be lost due to the late completion of the project. The lost power energy and the hot water energy will be converted into the cost with the sales prices of them. Therefore, the cost (K_5 US$) to be loaded could be calculated as $K_5 = (L \times N/100 + M \times O)$.

Where,

L. Power energy (kWh) to be lost during the considered period
M. Hot water energy (GJ) to be lost during the considered period
N. Equals to the present electricity tariff minus the generation cost by this project.
O. Equal to the present hot water tariff minus the production cost by this project.

3. Evaluation

The totally evaluated price per kW could be calculated by dividing the total amount (K_1+ K_2+ K_3+ K_4+ K_5) of the costs obtained in accordance with such estimation methods as stated above by the maximum declared net power output.

The Bid evaluation will be taken into account on the condition that all the requirements and conditions in the Tender Documents will be fully complied with proposed Bid.

If a Bidder does not declare the guaranteed net output and net heat rate, the Bid will not be considered for evaluation

The Contract will not be bound to be awarded to the Bidder who offers the lowest evaluated Bid or to any Bids. However, it will be expected that the lowest evaluated Bid will award the Contract on the condition that the Bid will pass all the requirements stated in the Tender Documents.

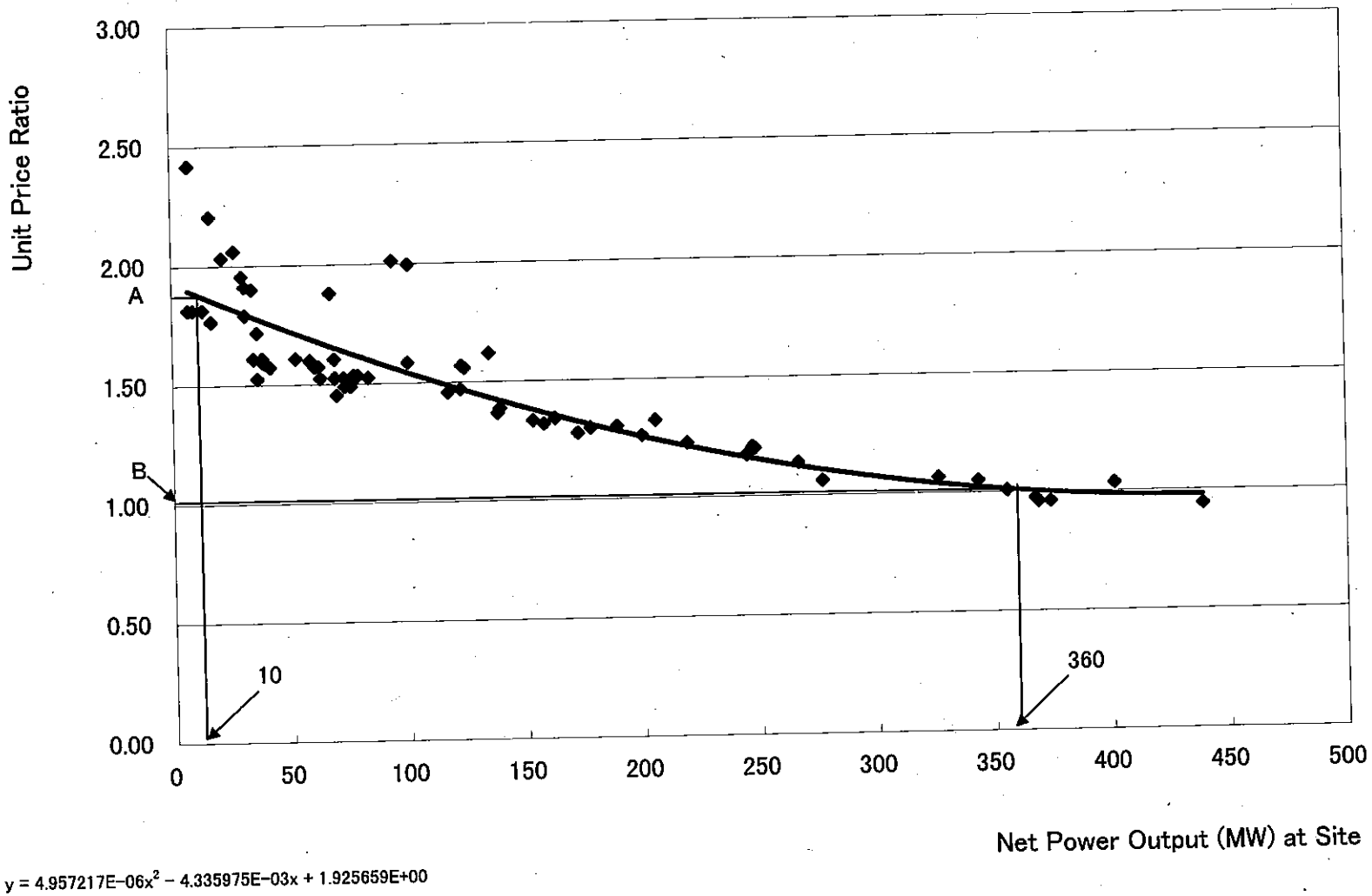

Figure-1 Unit Price Ratio of Combined Cycle Power Plant

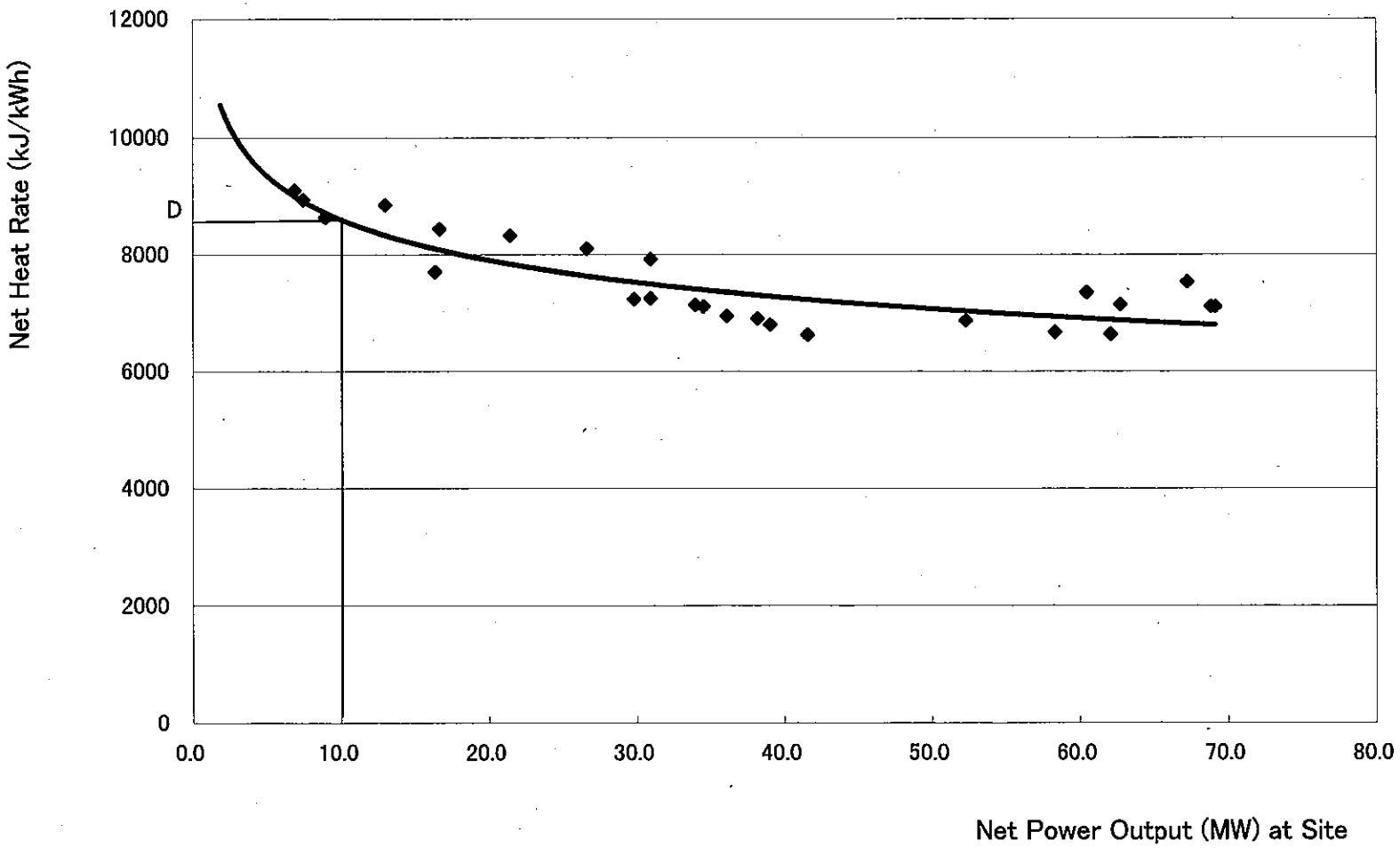

Figure-2 Net Heat Rate of Small Combined Cycle Power Plant

Estimation of Liquidated Damage Rate for Performance Guarantee Test Results and Late Completion

1. Shortfall of one (1) kW of the power output

1) First Scenario

The presently estimated construction price is ¥29.1Billion (US$ 242.5 MM) and the nominal power output is 370MW. Therefore, the power output of (1) kW corresponds to ¥78,600 (US$ 655). The liquidated damage rate shall be such value as makes the EPC Contractor discourage the declaration of the undue estimation of the power output. Increasing the value by 1.5 times considering that the shortfall is a certain kind of retribution, the liquidated damage rate of ¥120,000 (US$ 1,000) could be obtained against the shortfall of one (1) kW.

2) Second Scenario

When the power output of the new plant is less by one (1) kW, the existing plant with a lower thermal efficiency shall be operated at the more output by (1) kW to compensate the power output shortfall of the new plant. As the results, the fuel consumption shall increase by the difference between the fuel consumption of the existing plant and that of the new. The present worth value of the difference of annual fuel consumption through the service life of 25 years could be deemed as the liquidated damage against the power output shortfall.

The present worth value is calculated at ¥63,990/kW (US$ 533/kW) under the following preconditions:

Plant net thermal efficiency of the existing plant	36 % (LHV)
Plant net thermal efficiency of the new plant	56 % (LHV)
Discount rate for conversion to present worth value	12 %
Escalation rate of fuel unit price	1.5 %
Conversion factor to present worth value	8.842
Fuel unit price used for Feasibility Study	¥995/m^3 ($8.29/ m^3)
Annual total operating hours used for Feasibility Study	7,440 hours

Where, increasing the value of ¥63,990 (US$ 533/kW) by 1.5 times considering that the shortfall is a certain kind of retribution, the liquidated damage rate of ¥96,000(US$ 800)

against the shortfall of one (1) kW could be obtained against the shortfall of one (1) kW of plant net power output.

2. Shortfall of one (1) percent of plant net thermal efficiency for full power generation mode
When the plant net thermal efficiency is lower than the declared guarantee value, the fuel consumption increases by the quantity corresponding to the thermal efficiency shortfall. The present worth value of the increased annual fuel consumption during the service life of 25 years could be deemed as the liquidated damage against the shortfall of the plant net thermal efficiency.

The present worth value is calculated at ¥510.3 Million (US$ 4.25 MM) under the following preconditions:

Plant net power output	370 MW
Annual operating hours at full power generation	4,900 hours
Other necessary preconditions	Equal to said values

Where, increasing the value of ¥510.3 Million (US$ 4.25 MM) by 1.5 times considering that the shortfall is a certain kind of retribution, the liquidated damage rate of ¥765 Million (US$ 6.40MM) could be obtained against the shortfall of one (1) percent of plant net thermal efficiency for full power generation.

3. Shortfall of one (1) percent of plant net thermal efficiency for cogeneration
Similarly to the previous paragraph, the present worth value of the increased annual fuel consumption during the service life of 25 years could be deemed as the liquidated damage against the shortfall of the plant net thermal efficiency for cogeneration mode. And present worth value due to the thermal efficiency shortfall of one (1) percent could be calculated under the following preconditions:

Plant net power output	363 MW
Plant net hot water supply energy	30 Gcal/h
Annual operating hours at cogeneration	2,540 hours
Other necessary preconditions	Equal to said values

The calculated value is ¥245.7 Million (US$ 2.05 MM). Therefore, increasing the value of ¥245.7 Million (US$ 2.05 MM) by 1.5 times for the same reason as stated above, the value of ¥368.6 Million (US$ 3.10 MM) could be obtained as the liquidated damage rate

per the shortfall of one (1) percent of the plant net thermal efficiency for cogeneration.

4. Late Completion

When the completion date of the Plant is delayed, the revenue by the sales of the power and hot water shall diminish being equivalent to the amount of the power and hot water to be produced during the delayed period. Therefore, the loss of the revenue could be deemed as the liquidated damage against the late completion. The value of the loss per one (1) day delay could be calculated at ¥5.62 Million (US$ 46,800) with the following preconditions:

Plant net power output	363 MW
Plant net hot water supply energy	30 Gcal/h
Sales price of electricity	¥0.6 /kWh (500 Sum/kWh)
Sales price of hot water	¥540/Gcal (4,500 Sum/Gcal)

Therefore, increasing the value of ¥5.62 Million (US$ 46,800) by 5 times for the same reason as stated above, the value of ¥28.1 Million (US$ 234,000) could be obtained as the liquidated damage rate per one (1) day delay of the completion date of the Plant.

5. Conclusion

As the results of the study as stated above, the following liquidated damage rates should be employed:

1) Shortfall of the plant net power output for full power generation: US$ 1,000kW

2) Shortfall of the plant net thermal efficiency for full power generation: US$-6.50 Million/percent

3) Shortfall of the plant net thermal efficiency for cogeneration: US$ 3.50 Million/percent

4) Late completion of the Plant: US$ 0.25 Million/day

* All calculations are made on the exchange rate of ¥ 120/US$.

Questionnaire about
Design Conditions of New Hot Water Supply System
(Document No. TMPS-1E)

1. Design Condition of Hot Water Supply System

Maximum heat duty	Gcal/h	100
Flow of hot water	tons/h	***2500***
Temperature of water at heat exchanger in	℃	***70***
Temperature of water at heat exchanger out	℃	***110***
Required supply pressure	kPa(g)	***1240***
Pressure at pump inlet	kPa(g)	***100***

2. Operating Conditions of Hot Water Supply System

Maximum flow in ***December*** (Month)	tons/h	***2300***		
Minimum flow in ***August*** (Month)	tons/h	***150***		
Outlet water temp. control range	℃	***70***	to	***110***
Inlet water temperature fluctuation	℃	***50***	to	***70***

Annual average conditions used for performance guarantee of combined cycle

Water flow	tons/h	***875***
Temperature in	℃	***70***
Temperature out	℃	***110***
Supply pressure	kPa(g)	***1140***

3. Confirmation of Scope of Supply

Heat exchangers (50 % capacity per each)	3 sets
Hot water supply pumps (50 % capacity per each)	3 sets
Condensate return pumps (50 % capacity per each)	3 sets
Inlet steam piping	
Cold water piping from the existing header pipe to new pumps	
Hot water supply pipes from hot water heater's outlet to the existing header pipe	
Condensate return piping	
Small capacity hot water supply pump	***2 sets***
Small capacity condensate return pumps	***2 sets***

System Requirements of Hot Water Supply System

Item		Unit	Resident (300 A)	Greenhouse (800 A)
Purpose of use		-	Heating, Shower, Bath, Cooking, etc.	Heating only (no direct use)
Required temperature Supply/Return	Winter	℃	/	***110 / 70***
	Summer	℃	/	*- / -*
Minimum required pressure at consumer	Winter	kg/cm^2g		***12***
	Summer	kg/cm^2g		-
Water flow Max./Min.	Winter	m^3/h	/	***2500 / 150***
	Summer	m^3/h	/	*- / -*
Supply pressure vs. flow of existing plant		kg/cm^2 vs. m^3/h	vs. vs. vs.	***5.1 vs. 1600*** ***4.5 vs. 875*** ***3.5 vs. 150***
Pressure at inlet of hot water supply pump of existing plant		kg/cm^2g	***1.5***	
System spillage flow rate (Supply-Return)/Supply		%		*3 %*

Hot water for residents will be supplied by the existing hot water supply system.

Size of building for new hot water supply system: *12* m W *18* m L *9* mH

Allocation of control and supervisory functions :

Functions		New plant (BCR)	Existing plant
Water temperature at heater outlet		***C, SV***	
Water supply to 300 A	supply temp.	~~SV~~	C, R
	supply flow	SV	C, R
	return temp	SV	R
	return flow	SV	R
Water supply to 800 A	supply temp.	***C, SV***	C, R
	supply flow	***C, SV***	C, R
	return temp	***C, SV***	R
	return flow	***SV***	R
Return pressure		***C, SV***	?
Make-up water tank level		***C, SV***	
Heater internal pressure		***SV***	
Heater water level		***C, SV***	
Heating steam temp. and press.		***SV***	
Condensate tank level		***C, SV***	
Return condensate temp. and press.		***SV***	
Make-up flow		***SV***	
Make-up water deaerator internal temperature		***C, SV***	
ditto pressure		***C, SV***	

Note: C: Control including measuring element, signal transmitting and control valve
R: Recording
SV: Supervising in BCR (Block Control Room of Combined Plant)

All functional values and data regarding the hot water supply to the greenhouse (800 A supply pipe) shall be controlled and supervised in BCR.

EXISTING HOT WATER SUPPLY SYSTEM

MAKE UP WATER

DEAERATOR

MAKE-UP WATER DEAERATOR

SEAL STEAM

MAKE-UP WATER TANK

MAKE-UP WATER PUMPS

EXTRACTION STEAM

300A

600A

RESIDENTS

GREEN HOUSE

800A

300A

MAIN HOT WATER PUMPS

AUX. HOT WATER PUMPS

HOT WATER HEATERS

RETURN CONDENSATE

AUX. CONDENSATE RETURN PUMPS

CONDENSATE TANK

MAIN CONDENSATE RETURN PUMPS

NEW HOT WATER SUPPLY SYSTEM

BY UZBEKENERGO

BY THE CONTRACTOR

REV.	DATE	DESCRIPTION	BY
0		ISSUED FOR TENDER PURPOSE	

CLIENT :

State Joint Stock Company "Uzbekenergo"

PROJECT :

TASHKENT THERMAL POWER PLANT MODERNIZATION PROJECT

CONTRACT NO:

DRAWING NO: TMP-M-004 REV. 0

CONSULTANT :

TEPSCO TOKYO ELECTRIC POWER SERVICES CO., LTD.

DRAWN	T. SHIOMI	EXAMINED	H. OKANO	SCALE : NTS
DATE	06.02.03	APPROVED	K. MIKATA	DRG SIZE A2

TITLE :

FLOW DIAGRAM OF HOT WATER SUPPLY SYSTEM

FILE NAME : REV. : 0

2. 事前資格審査書

Tashkent Thermal Power Plant

Modernization Project

Pre-qualification Documents
for
International Competitive Bidding
of
Construction of 370MW Combined Cycle Power Plant

Document No. TMP - 0001E

September, 2003

Republic of Uzbekistan

State Joint Stock Company

Uzbekenergo

Pre-qualification Documents
for
International Competitive Bidding
of
Construction of 370MW Combined Cycle Power Plant

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Republic of Uzbekistan
State Joint Stock Company "Uzbekenergo"

1. Invitation for Pre-qualification

1.1 The Government of the Republic of Uzbekistan has applied (*the application date should be inserted by SJSC "Uzbekenergo"*) for a loan from The Japan Bank for International Cooperation, hereinafter referred to as the JBIC, in the amount of ¥ 24,955,000,000 towards the cost of "Construction of 370MW Combined Cycle Power Plant for Tashkent Thermal Power Plant Modernization Project" hereinafter referred to as the Project. Payments by the JBIC will be made only on the request of Government of Uzbekistan and shall be subject, in all respects, to the terms and conditions of the Loan Agreement including the 'Guidelines for Procurement under JBIC ODA Loans'.

1.2 The object of the Project is the modernization of the existing Tashkent Thermal Power Plant by introduction of the highly efficient current technology of power generation on the basis of the combined cycle system. In this connection, the State Joint Stock Company, UZUBEKENERGO, through its Consultant, intends to pre-qualify the Contractor for the following works under this Project:

1) The Project will consist of a nominal capacity 370MW unfired type combined cycle power plant with a multi-shaft arrangement. The fuel is natural gas, which is supplied at the pressure of approximately 0.7 MPa at the terminal point within the premise of the Tashkent Thermal Power Plant.

2) The Project shall consist of designing, manufacturing, procurement, transportation, constructing, installing, starting-up, commissioning and testing of a complete operable combined cycle power plant to be constructed by an EPC Contractor with a single responsibility on a full turnkey basis in the premise of the Tashkent Thermal Power Plant. The Plant is situated at the distance of approximately 20km in the direction of the northeast from the central area of Tashkent City and at the altitude of 502 m.

1.3 Description of the Project

1) Pursuant to the power generation development plan, SJSC "Uzbekenergo" intends to construct one 370 MW unfired multi-shaft combined cycle power plant. The thermal cycle of the bottoming system will be preferably of triple-pressure reheat type. The power plant uses indigenous natural gas transmitted through the existing pipelines from Bukhara and Shurtan gas fields of Uzbekistan. The power plant consists of one(1) gas turbine/generator, one(1) heat recovery steam generator, one(1) steam turbine/ generator complete with all the associated auxiliary equipment.

2) The plant is normally scheduled to be continuously operated as a combined cycle, while it may be operated as a simple cycle in an emergency when the bottoming system will be out of order due to any reason. During the dry season, the plant will be normally operated to supply the power energy, while it will supply the power and heat energy (the low pressure steam extracted from the steam turbine) during the wet season.

3) The power plant will be located on the area of approximately 150m by 200m at the distance of approximately 50m in the Southeast direction from the existing No.12 conventional type unit. The site layout of the power plant shall be designed considering the future extension of one (1) similar or higher performance power plant. The exhaust steam from the steam turbine will be condensed in a condenser cooled by the fresh water taken from the artificial pond diverged from the Boz-Su canal. The water will be conveyed to the condenser with the pumps, which will be newly built at the end of the extended canal. A new water treatment plant will process the canal water so that it will be suitable for make-up to the heat recovery steam generator. The generator output voltage will be stepped up to 220kV and will be connected to the new switchyard to be built extended adjacent to the existing switchyard.

4) The supply pressure of the natural gas is not sufficiently high to feed it into the gas turbine and the pressure boosting compressors shall be required. The necessary pre-treatment system of the natural gas will be included in the scope of works to provide the gas turbine with it on the proper conditions.

5) The gas turbine/generator, the steam turbine/generator and control and electrical equipment shall be installed in the gas turbine and steam turbine buildings newly built for this Project. The main supervisory operator panels will be located in the Block Control Room in the gas turbine building and the remote operating condition monitoring system will be installed in the existing Central Control Room located adjacent to the existing No.1 conventional type unit.

A detailed description of the Modernization Project is made in Appendix-A.

1.4 Site Description

1) The Project site is in the premise of Tashkent Thermal Power Plant approximately 20 km Northeast of Tashkent City, the metropolitan of Uzbekistan. The site is accessible by rail and road.

2) The area of approximately 150m by 200m is prepared for this Project and the further area could be available depending upon the requirement. The area is nearly plain. The site belongs to the area with No.9 of ISI Seismic Map Zone. All the equipment and structures for this Project are to be designed to withstand the seismic factor.

3) The annually averaged ambient temperature is 16 degrees C with a maximum temperature of +41.1 ℃ and minimum temperature of –15.5 ℃. Annually averaged relative humidity is approximately 52% with 30% in the summer season and 73% in the winter season. Annually averaged rainfall is 405mm with the maximum hourly rainfall of 4 mm.

4) The Project utilizes once-through cooling water system using fresh water taken from the artificial pond diverged from the Boz-Su canal. The discharge of the cooling water will be connected to the existing discharge underground culvert via the new underground steel pipe. The fresh water will be used for the make-up requirements of the Project.

1.5 General Experience

1) Total amount of engineering, procurement and construction contracts associated with more than (1) combined cycle power plant for the last five (5) years must be

more than US$500 millions; and

2) The averaged annual turnover as a prime contractor for works in progress or completed for the last five (5) years will not be less than US$ 250 millions.

1.6 It is expected that Invitation of Bids will be made in the beginning of December, 2003.

1.7 The EPC Contractor will be obligated to guarantee the completion time of the Project and performances of the Plant..

1.8 Pre-qualification is open to firms and voluntarily formed Joint ventures or Consortiums from eligible source countries that are all countries and areas.

1.9 Misprocurement

1) No party other than the Government of Uzbekistan shall derive any rights from the Loan Agreement or have any right to the loan proceeds. The above Loan Agreement will cover only a part of the project cost. As for the remaining portion, the Government of Uzbekistan will take appropriate measures for finance.

2) Goods and services under this Contract shall be procured in accordance with the procedures agreed in the Loan Agreement. The loan allocation for the goods and services that will have been misprocured will be cancelled.

3) In case it is determined that the Bidder recommended for the award of this Contract has engaged in corrupt or fraudulent in competing for the Contract, the proposal for the award will be rejected.

4) The Contractor will be recognized as ineligible when it is determined that he has engaged in corrupt or fraudulent practices in another contract funded with ODA loans of JBIC.

1.10 General information on the climate, geology, geography, Project layout, expected construction period, facilities and services to be provided by SJSC "Uzbekenergo", and scope of works under this Contract are provided in Appendix-A.

1.11 Eligible applicants may obtain the pre-qualification documents by written letter and facsimile to the following address with a remittance certificate reference number of document fee.

Mr.Alisher Ziyaevich SIRADJEV
Deputy Chairman of the Board SJSC "Uzbekenergo"
6, Khorezmskaia Str.,
Tashkent, 700000
Republic of Uzbekistan
Facsimile No. +998 (71) 136 27 00

1.12 The Applicants must clearly state "Request for Pre-qualification Documents" for the "Modernization Project of Tashkent Thermal Power Plant; Construction of 370MW Combined Cycle Power Plant". The documents are available at 12:00 September 15th , 2003.

The Applicants must transfer a non refundable fee of US$ 250 to SJSC "Uzbekenergo" foreign currency (US$) account No 20210840000117832001 at ABN AMRO Bank New York.
Internal number of account for deposit money in Uzbek sum: 5038758
Bank Code: 00831
SWIFT Code: ABNAUZ22
Correspondent Bank: ABN AMRO Bank New York
Correspondent Bank SWIFT: ABNAUS33

SJSC "Uzbekenergo" will promptly dispatch the documents by registered airmail, but will not take the responsibility for late delivery or loss of the documents under any circumstances.

1.13 Submissions of Applications for Pre-qualification must be received in sealed envelopes, which must be either delivered by hand or by registered mail, to the address mentioned below , not later than 12:00 October 24th , 2003 and be clearly marked "Application to Pre-qualify for the "Modernization Project of Tashkent Thermal Power Plant; Construction of 370MW Combined Cycle Power Plant".

All the information to be provided for pre-qualification must be in English language. Additional provision of them in Russian language may be encouraged.

Failure to provide information, which is essential to evaluate the qualifications of the Applicants, or to provide timely clarification or substantiation of the information to have been supplied may result in disqualification of the Applicant. The name and mail address of the Applicant must be clearly marked on the envelopes.

Mr. Alisher Ziyaevich SIRADJEV
Deputy Chairman of the Board SJSC "Uzbekenergo"
6, Khorezmskaia Str.,
Tashkent, 700000
Republic of Uzbekistan
Facsimile No. +998 (71) 136 27 00

1.14 Applicants will be advised, in due course, of the results of their applications. Only firms, Joint ventures or Consortiums pre-qualified under this procedure will be invited to the bid. The Bidder(s) will be defined as the pre-qualified firm(s), Joint Venture(s) or Consortium(s).

2. Instructions to Applicants

Name of the Project:		Modernization Project of Tashkent Thermal Power Plant
Name of the Employer	:	SJSC "Uzbekenergo"
Name of the Borrower	:	Government of Uzbekistan

2.1 General

1) Misprocurement

(1) No party other than the Government of Uzbekistan shall derive any rights from the Loan Agreement or have any right to the loan proceeds. The above Loan Agreement will cover only a part of the project cost. As for the remaining portion, the Government of Uzbekistan will take appropriate measures for finance.

(2) Goods and services under this Contract shall be procured in accordance with the procedures agreed in the Loan Agreement. The loan allocation for the goods and services that will have been misprocured will be cancelled.

(3) In case it is determined that the Bidder recommended for the award of this Contract has engaged in corrupt or fraudulent in competing for the Contract, the proposal for the award will be rejected.

(4) The Contractor will be recognized as ineligible when it is determined that he has engaged in corrupt or fraudulent practices in another contract funded with ODA loans of JBIC.

2) Only firms, Joint Ventures or Consortiums that have been pre-qualified under this procedure will be invited to bid. A qualified firm or a member of a qualified Joint Venture or Consortium may participate in only one bid for the Contract. If a firm submits more than one bid, singly or in joint venture, all bids including the firm shall be rejected. This rule shall not apply for the case where any subcontractors may be used by more than one (1) bidder.

3) Bidders will be required to provide a bid security in the form of a bond, bank guarantee, or other security acceptable to SJSC "Uzbekenergo" for an amount of US$ 4 million, and the successful bidder will be required to provide performance security. Examples of acceptable forms will be supplied with the bid documents. The bid security shall be from a reputable bank located in any eligible Countries, and the bank guarantee for the performance security must be endorsed by an eligible Bank in the "Republic of Uzbekistan".

4) The Uzbekenergo reserves the right to:

(1) amend the scope and value of any Contract to be bid. In such event, the pre-qualification process will be repeated depending upon the extent of the revised scope and value; and

(2) reject or accept any application; and

(3) cancel the pre-qualification process and reject all applications.

The SJSC "Uzbekenergo" shall neither be liable for any such actions nor be obliged to inform the Applicant of the grounds for them.

4) Applicants will be advised in writing by facsimile, within 90 days of the date for Submission of Applications (Sub-clause 1.11 above), of the result of their application, and the names of the pre-qualified applicants, without explanation of any reason for the SJSC "Uzbekenergo's" decision.

2.2 Qualification Criteria

1) Pre-qualification will be made based on the Pass/Fail evaluation form regarding the Applicant's general and particular experience, personnel and equipment capabilities, and financial situation, as demonstrated by the Applicant's responses given in the forms attached to the Letter of Application (specific requirements for Joint Ventures or Consortiums are given under Sub-clause 2.4-1) and 2) below). The SJSC "Uzbekenergo" reserves the right to waive minor deviations, if they do not substantially affect the capability of the Applicant to perform the Contract. Any information regarding Subcontractors shall not be considered in determining the Applicant's compliance with the qualification criteria; and

2) The Bidder shall include a gas turbine manufacturer and comply with the qualification criteria stipulated hereunder and have the experience to have internationally executed such activities as similar to this Project. The gas turbine manufacturer mean any firm, partnership or company which has developed, design and manufactured gas turbines with its own technology and regularly owns, operates and keeps a factory or establishment that produces the equipment and materials required for the Project; and

3) The Bidder must provide accurate information on any litigation or arbitration resulting from contracts completed or under its execution over last two (2) years in accordance with the Application Form (11) A consistent history of awards against the Bidder or any partner of a Joint Venture or Consortium may result in failure of the application; and

4) Total amount of engineering, procurement and construction contracts associated with combined cycle power plants for the last five (5) years must be more than US$ 500 million, and the averaged annual turnover for the last five (5) years will not be less than US$ 250 million; and

   The number of contracts for similar size of combined cycle power plants to the current project must be more than one (1) in the last five (5) years; and

5) The Applicant must demonstrate that it has access, liquid assets, unencumbered real assets, lines of credit, and other financial means sufficient to meet the construction cash flow for a period of 34 months up to the provisional acceptance of the Plant.

6) The audited financial statements for the last five years shall be submitted and must demonstrate the soundness of the Applicant's financial position, showing long-term probability.

7) Any Bidders may participate in the Tender, provided that they have sufficient experience and personnel capable of fulfilling the functions and roles required for the Project and shall associate with the qualified manufacturer of the gas turbine. The manufacturer of the gas turbine in association with them is required to be qualified in accordance with the procedures specified hereunder. They shall have the commitment letter from the manufacturer of the gas turbine for such the

association agreement; and

The gas turbine manufacturer, whichever is associated with a trading firm or the Joint Venture or the Consortium or is singly a Bidder, must have not only supplied gas turbines, but also completed more than one (1) multi-shaft combined cycle power plant (block) with a capacity more than 350MW consisting of natural gas fueled gas turbine/generator(s), unfired heat recovery steam generator(s), and one (1) steam turbine/generator on a full turnkey basis outside its domicile country. The accumulated commercial operating hours of each reference multi-shaft combined cycle power plant (block) shall have amounted to at least 7,500 hours at the Pre-qualification closing date and the plant shall have been operated at the averaged load factor above 75%. The Applicant shall provide written confirmation of satisfactory operation of the combined cycle power plants certified by the Owners; and

8) The proposed 3,000 rpm gas turbine shall be of similar model to the gas turbines, of which more than one (1) gas turbine have the experience of successful commercial operating hours with at least 7,500 hours on the Pre-qualification closing date. The Contractor shall submit the operation data of the said three (3) gas turbines based on attached data forms (Application Form (6)) with written confirmation letter(s) of the Owner(s) of them. The "similar model" shall mean the model, which fully complies with all the following conditions:

(1) The air compressor: the same type, same number of stages and same inlet air flow with same or better materials and the same rotating speed.

(2) The combustor: the same number of combustion liners and with same or better materials

(3) The turbine: the same type, same number of stages, same turbine inlet temperature with same or better materials and the same rotating speed.

9) The Bidder shall identify the manufacturers from whom he intends to procure the gas turbine, steam turbine, heat recovery steam generator and electric generator. Each manufacturer of the above major equipment except the gas turbine shall have the experience with design and manufacturing of more than one (1) equipment for the last five (5) years with similar size and specification to

equipment to be provided for the Project. The experience of the manufacturer with the relevant equipment shall be submitted in accordance with the attached data forms (Application Forms (7), (8) and (9)); and

10) The generator manufacturer shall be qualified as a manufacturer to be able to provide the similar generator to the Project with either of the following two (2) conditions;

(1) The manufacturer has experience with construction of at least three (3) air cooled generators over 260 MVA as per IEC 34 or equivalent standards.

(2) The manufacture has experience with construction of at least three (3) air cooled generators over 150 MVA and at least three (3) hydrogen cooled generators over 500MVA as per IEC 34 or equivalent standards.

The information of the air and hydrogen cooled generators shall be provided with attached Application Form (9); and.

11) The Bidder shall submit the following documents

(1) Experience and performance on multi-shaft type similar or larger sized unfired combined cycle power plants outside its domicile country.

(2) Experience with the construction on a full turnkey basis of more than one (1) combined cycle power plant (block) of which each capacity is not less than 250 MW in Commonwealth of Independent States (CIS) and Turkey with similar climatic, geographical and economical conditions.

(3) Supporting letter(s) from the plant owner(s) to certify that the operating experience of the multi-shaft type combined cycle power plant meets the requirements stated in above Sub-clause 2.2-7).

(4) Experience and performance of the Manufacturers to be engaged for supply of such major equipments as gas turbine, heat recovery steam generator, steam turbine, electric generator required in above Sub-clause 2.2-9).

(5) Copy of the association agreement with the gas turbine manufacturer in case

the Bidder is a trading firm, a Joint Venture, or a Consortium.

(6) Audited annual report of the Bidder for the last five (5) years.

12) The SJSC "Uzbekenergo" reserves the right to cancel the pre-qualification process and to reject any application without informing the applicant of the reason why the pre-qualification process has been canceled or the Bidder has been rejected. Only firms pre-qualified under this procedure shall be invited to bid.

13) The Bidder must have suitably qualified personnel required to perform the Project. The Bidder must submit the information on a prime candidate and on alternate for each of the following personnel. Both of them must meet the experience requirements specified below:

Position	Total Experience (Years)	In similar Works (Year)
Project Manager	25	15
Project Engineer	20	10
Site Manager	20	10
Lead Mechanical Engineer	15	8
Lead Electrical Engineer	15	8
Lead Control Engineer	15	8
Lead Civil/Structural Engineer	15	8

The total experience means the total years when the personnel has been engaged in design, engineering and supervising activities in the equipment manufacturers and/or engineering firms. The similar works mean the experience of the personnel with the design, engineering, and supervising activities in the equipment manufacturers and/or engineering firms similar to their works to be engaged in this Project

2.3 Supporting Data

The Applicant shall append the following supporting documents to the attached Application Forms:

(1) A copy of the business registration certificate by a competent relevant Authority in the domicile country of the Applicant stating the full name of him, the person or persons or board authorized to represent the Applicant, and the date and place of registration as a Contractor. (If the Applicant is a Trading firm, a Joint Venture or a Consortium, the certificate must state the scope, the paid-up capital, the duration and the date of incorporation of the company and the names of all directors of the board. Further, in case of a joint company, the share holding structure of the company shall be stated.); and

(2) Certificate by a public accountant for the Applicant's financial statements; and

(3) Copies of completion certificates issued by the relevant owners or engineers of the projects as listed in the particular experience record (Application Form (3)) to indicate that such projects were satisfactorily completed by the Applicant including each member company of a Joint Venture or Consortium.

2.4 Joint Venture or Consortium

1) Joint Venture or Consortium must comply with the following requirements:

(1) The followings are the minimum qualification requirements for formation of a Joint Venture or Consortium:

(i) The lead partner shall meet not less than forty (40) percent of all the qualifying criteria given in the above paragraphs 2.2.4) and 2.2.5).

(ii) Each of the other partners shall meet individually twenty five (25) percent of all the qualifying criteria given in the above paragraphs 2.2.4) and 2.2.5).

(iii) The Joint Venture or Consortium must satisfy collectively the criteria of the above paragraphs 2.2.5), 2.2.7) to 2.2.11) and 2.2.13). Individual members must each satisfy the requirements of the above paragraphs of 2.2.3) and 2.2.6).

(2) The re-formation of a Joint Venture or Consortium after pre-qualification, and any change in a pre-qualified Joint Venture or Consortium, shall be subject to the written approval of SJSC "Uzbekenergo" prior to the Bid closing date. Such application for approval may be rejected in the following cases:

(i) Partners withdraw from the Joint Venture or Consortium and the remaining partners do not meet the qualification criteria; or

(ii) The new partner(s) to the Joint Venture or Consortium is (are) not qualified, individually or as another Joint Venture or Consortium; or

(iii) The new formation may result in substantial degradation of its competence to perform the Project.

(3) Any Bid shall be signed so as to legally bind all partners, jointly and severally, and shall be submitted with a copy of the Joint Venture or Consortium Agreement, as in Application Form 2A and 2B, providing the joint and several liability with respect to the Contract.

2) The pre-qualification of a Joint Venture or Consortium does not necessarily pre-qualify any of its partners individually or as a partner in any other Joint Venture or association. In case of dissolution of the Joint Venture or Consortium, each one of the constituent firms may be pre-qualified if he comply with all the pre-qualification criteria, subject to the written approval of SJSC "Uzbekenergo".

2.5 Conflict of Interest

The Applicant (including all members of a Joint Venture or Consortium) must not be affiliated (i.e., subsidiary, parent or partner), nor have been affiliated (i.e., subsidiary, parent or partner) in the past, with the consultant or any other entity that will prepare the design, technical specifications, and other pre-qualification and Bid documents for the Project, or that will be employed as an Engineer for the Project. Any such association may result in the disqualification of the Applicant.

2.6 Updating Pre-qualification Information

Bidders shall be required to update the financial statements provided for pre-qualification at the time of submission of their Bids to confirm their continued compliance with the qualification criteria and verification of the information provided. The Bidder shall be rejected if the Applicant's qualification is no longer held at the time of Bid.