



National Electric Power Regulatory Authority
Islamic Republic of Pakistan

Registrar

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Direct Phone : (051) 9206500

No. LAG 02/3585-86

01 July 2002

Chief Executive Officer,
M/s. Jamshoro Power Company Ltd.
GENCO-I, TPS,
Mohro Jabal, Dadu Road,
Jamshoro
Fax: 0221-610859

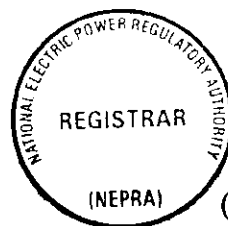
Subject: **Grant of Generation Licence GL/01/2002**
Licence Application No. LAG 02
M/s. Jamshoro Power Company Ltd.


Please refer to your application No. CEO/JPC/NEPRA/21206-10, dated 07 September 2001 for a Generation Licence.

2. Enclosed here is Generation Licence No. GL/01/2002 granted by the Authority to M/s. Jamshoro Power Company Ltd. The Licence is granted to you pursuant to Section 15 of the Regulation of Generation, Transmission and Distribution of Electric Power Act (XL of 1997).

3. Please quote above mentioned Generation Licence No. in your future correspondence with the Authority.

DA/As above.




(Mahjoob Ahmad Mirza)

Copy for information to Director General, Pakistan Environmental Protection Agency, 44-E, Office Tower, Blue Area, Islamabad.

GENERATION LICENCE

**JAMSHORO POWER
COMPANY LIMITED
MOHRO JABAL, DADU ROAD
JAMSHORO**

TERM OF THE LICENCE

TERM OF THE LICENCE

(Article 4 of the Licence) JAMSHORO POWER COMPANY LIMITED

The Rule 5 of the Licensing (Generation) Rules – 2000 stipulates that the Term of the Licence shall be commensurate with the maximum expected useful life of the units comprised in a generation facility demonstrated to the satisfaction of the Authority unless the applicant consents to a shorter period.

Jamshoro Power Company Limited has shown in its Generation Licence application Ref. No CEO/JPC/NEPRA/21206–10 dated September 07, 2001 to NEPRA expected remaining life of all of its generation facilities also included in Schedule-I of this Licence.

The maximum expected remaining life of the units installed at TPS-Jamshoro is claimed as 26 years; and the maximum expected remaining life of units installed at GTPS Kotri is claimed as 24 years.

The Licensing Group considers that the Steam Power generating units normally have a useful life of around 30 years; and the Gas Turbine generating units normally have a useful life of around 20–25 years. The units of Jamshoro Power Company Limited were commissioned in 1989/1990/1991 (TPS-Jamshoro); and 1969, 1970, 1979, 1981, 1994 (GTPS Kotri).

The Licensing Group has considered all the details provided with the licence application including the date of commissioning of generating units of Jamshoro Power Company and normal expected life for the plants of same type and technology. The Licencing Group agrees with the maximum expected remaining life claimed by the applicant of its generation facilities, and recommends that the Generation Licence be issued to Jamshoro Power Company Limited by the Authority for a period of **(Nineteen) 19 years** from the date of Grant of this Licence by the Authority.

AUTHORITY DECISION

The Authority agrees with the Licensing Group recommendation about the Term of this Generation Licence. Therefore, the Licence is granted for a term of **(Nineteen) 19 years**.

AUTHORITY

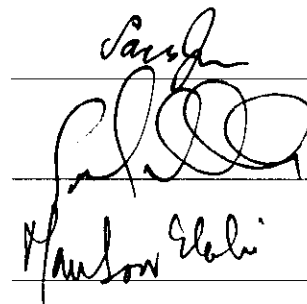
Justice (R) Saad Saood Jan, Chairman

Mr. Fazlullah Qureshi Vice Chairman

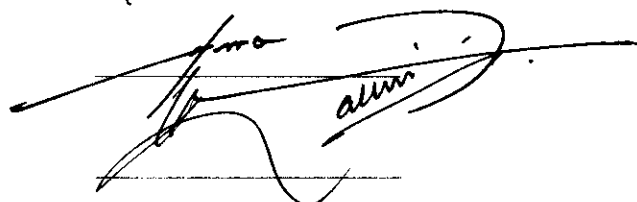
Mr. Mansoor Elahi, Member

Sardar Muhammad Sharif Khan T. St., Member

Mr. Abdul Rahim Khan, Member



Three handwritten signatures are present, each on a horizontal line. The first signature is 'Saad Jan', the second is 'Fazlullah Qureshi', and the third is 'Mansoor Elahi'.



A large, stylized handwritten signature is present, written over a horizontal line. The signature appears to be 'Sardar Muhammad Sharif Khan'.

TERM OF THE LICENCE

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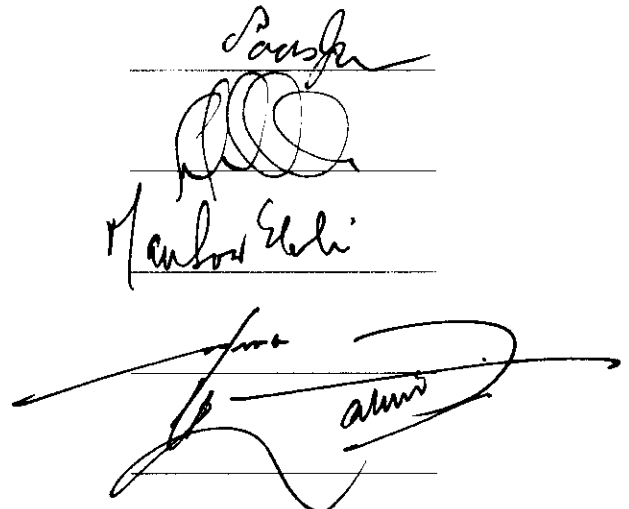
Justice (R) Saad Saood Jan, Chairman

Mr. Fazlullah Qureshi Vice Chairman

Mr. Mansoor Elahi, Member

Sardar Muhammad Sharif Khan T. St., Member

Mr. Abdul Rahim Khan, Member



The image shows four handwritten signatures, each placed above a horizontal line. The signatures are: 1. Saad Saood Jan (Chairman), 2. Fazlullah Qureshi (Vice Chairman), 3. Mansoor Elahi (Member), and 4. Sardar Muhammad Sharif Khan T. St. (Member). The signature of Abdul Rahim Khan is not visible in the image.

**National Electric Power Regulatory Authority
(NEPRA)
Islamabad - Pakistan**

GENERATION LICENCE

NO. GL/01/2002

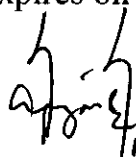
In exercise of the Powers conferred upon the National Electric Power Regulatory Authority (NEPRA) under Section 15 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (XL of 1997), the Authority hereby grants a Generation Licence to: -

**JAMSHORO POWER
COMPANY LIMITED
TPS - JAMSHORO**

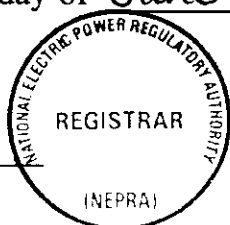
Incorporated under the Companies Ordinance, 1984
under Certificate of Incorporation
No. L 09601 of 1998-99 dated 3rd August, 1998

to engage in generation business subject to and in accordance with the Articles of this Licence.

Given under my hand this 1st day of July, Two Thousand & Two, and expires on 30th day of June, Two Thousand & Twenty One.


1.7.2002

Signed



Article 1

Definitions

In this Licence:

“Act” means the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (XL of 1997);

“Authority” means the National Electric Power Regulatory Authority constituted under Section 3 of the Act;

“Licensee” means Jamshoro Power Company Limited; and

“Rules” means the National Electric Power Regulatory Authority Licensing (Generation) Rules, 2000.

Words and expressions used but not defined herein bear the meaning given thereto in the Act or in the Rules.

Article 2

Application of Rules

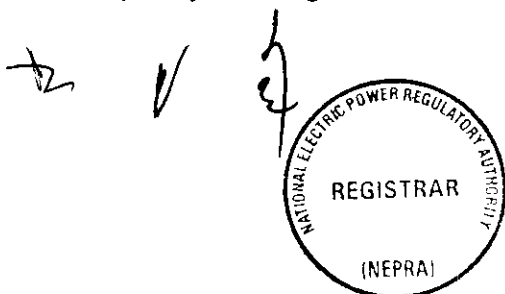
This Licence is issued subject to the provisions of the Rules, as amended from time to time.

Article 3

Generation Facilities

The location, size, technology, interconnection arrangements, technical limits, technical functional specifications and other details specific to the generation facilities of the Licensee are set out in Schedule I to this Licence.

The net capacity of the generation facilities is set out in Schedule II hereto.



Article 4

Term

This Licence is granted for a term of **Nineteen (19) years**.

Article 5

Licence Fee

The Licensee shall pay to the Authority the licence fee in the amount and manner and at the time specified in the National Electric Power Regulatory Authority (Fees) Rules, 2002.




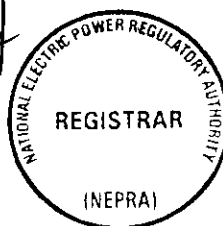
Article 6

Competitive Trading Arrangement

- (1) The Licensee shall participate in such measures as may be directed by the Authority from time to time for development of a Competitive Trading Arrangement. The Licensee shall in good faith work towards implementation and operation of the aforesaid Competitive Trading Arrangement in the manner and time period specified by the Authority:

Provided that, any such participation shall be subject to:

- (a) any contract entered into by and between the Licensee and another party prior to the enactment of the Act and for the due performance of which a sovereign guarantee has been provided by the Government of Pakistan; or

- (b) any contract entered into subsequent to the enactment of the Act between the Licensee and another party with the approval of the Authority.
- (2) Any variation or modification in the above-mentioned contracts for allowing the parties thereto to participate wholly or partially in the Competitive Trading Arrangement shall be subject to mutual agreement of the parties thereto and such terms and conditions as may be approved by the Authority.

Article 7
Maintenance of Records

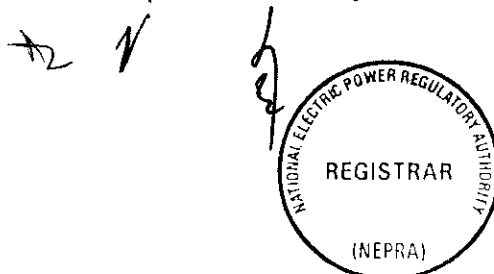
For the purpose of sub-rule (1) of Rule 19, copies of records and data shall also be retained in electronic form and all such records and data shall, subject to just claims of confidentiality, be accessible by authorized officers of the Authority.

Article 8
Compliance with Performance Standards

The Licensee shall conform to the relevant rules on performance standards as may be prescribed by the Authority from time to time.

Article 9
Compliance with Environmental Standards

The Licensee shall conform to the environmental standards as may be prescribed by the relevant competent authority from time to time.




Article 10
Provision of Information

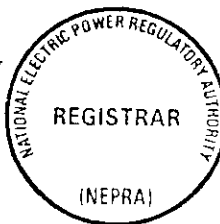
Without prejudice to the obligation of the Licensee to comply with any call for information made by the Authority from time to time under section 44 of the Act, the Licensee shall submit to the Authority the following statements of availability of the generation facilities:

- (1) Within three (3) months of the beginning of a financial year, the licensee shall prepare and submit before the Authority for its approval, the criteria upon which the licensee will:
 - (a) determine the duration and timing of planned outages of generation units;
 - (b) determine which hours of the day and days of the week a generation unit which is not subject to a planned outage will be sufficiently manned to be capable of being made available;
 - (c) determine its policy for making available generation units which are not subject to planned outages; and
 - (d) determine its policy for the temporary or permanent closure of generation units.

- (2) No later than one (1) month before the end of a financial year, the licensee shall submit to the Authority a written forecast for each generation unit expected to operate in the following financial year stating:

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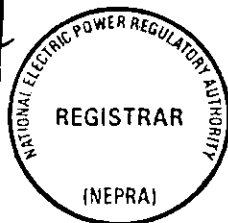


- (a) the net capacity of the unit;
 - (b) the planned outage schedule of each unit;
 - (c) best estimates of unplanned outages for each unit;
 - (d) the means by which the unit will be fuelled or expected to be primarily fuelled in the case of dual firing units;
 - (e) best expectation of any unplanned outages; and
 - (f) the factors known to the licensee likely to affect the number of outages.
- (3) No later than six (6) months into each financial year, the licensee shall submit to the Authority any changes to the best estimates submitted to the Authority under Article 10 (2) above with respect to the remainder of the financial year.
- (4) Within three (3) months of the beginning of each financial year, the licensee shall submit to the Authority a statement of actual availability of each generation unit during the previous financial year. The said statement shall compare forecasts and plans made for the previous financial year against outturns.
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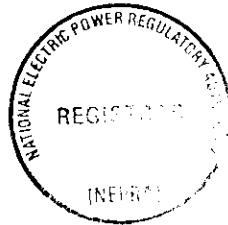
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SCHEDULE - I

- The location, size (capacity in MW), technology, interconnection arrangements, technical limits, technical functional specifications and other details specific to the generation facilities of the licensee

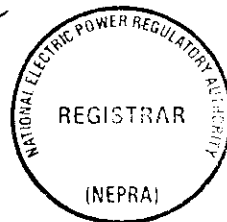
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INTRODUCTION

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INTRODUCTION

Jamshoro Power Company Limited consists of three Thermal Power Plants, located in the province of Sindh, having total capacity of 1204 MW. In all 14 units that are installed with the company out of which seven (07) are steam turbines, six (06) gas turbines and one (01) combined cycle unit.

Jamshoro Power Company Limited comprises of the following three Power Plants:

1. Thermal Power Station Jamshoro.
2. Gas Turbine Power Station Kotri.
3. Fluidized Bed Combustion Power Station Lakhra.

As per oral request during Generation Licence Public Hearing scheduled on June 03, 2002, Jamshoro Power Company requested that Lakhra Power Station be excluded from its licence application. Thus, Lakhra Power Station has been excluded from this Generation Licence.

1. Thermal Power Station, Jamshoro

The detail of power station, showing number of units, installed capacity, make year of commissioning and fuel used is given below:

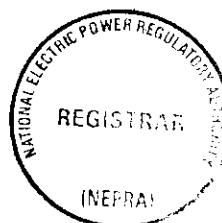
Unit No.	Installed Capacity	Make	Commissioning Date	Fuel Type
ST-1	250 MW	M/s. Mitsui, Japan	27.01.1990	Furnace Oil
ST-2	210 MW	M/s. CMEC, China	03.12.1989	Gas/Furnace Oil
ST-3	210 MW	M/s. CMEC, China	27.06.1990	Gas/Furnace Oil
ST-4	210 MW	M/s. CMEC, China	21.01.1991	Gas/Furnace Oil
Total	880 MW			

A) LOCATION

Thermal Power Station, Jamshoro is situated at Mohro Jabal in the Dadu District, on the Indus Highway at the latitude of 25°.29' North and Longitude of 68°,16' East.

The Hyderabad city located on the left bank of Indus River is approximately 18 Kms from T.P.S. Jamshoro, which is located on the right bank of the River Indus. The city of Karachi is approximately 150 Kms South West of Hyderabad city and is connected through Super Highway, National Highway and Railway. The nearest International Airport facility is at Karachi at a distance of 190 Kms.

In the vicinity of Jamshoro Plant, there is a high tension Grid Station of 500 KV/220 KV/132 KV, just adjacent to Power Plant and 132 kV/11 KV Grid Station is about 2.5 Kms to the south on Indus Highway, Liaquat University of Medical Sciences is about 5.5 Kms to the South, University of Sindh and Mehran University of Engineering & Technology, Jamshoro are about 7 Km to the South on Indus Highway. All located at Jamshoro.



Water Intake side which is source of make-up water for the Power Plant is at about 4.4Km up-stream to the Kotri (G.M.) Barrage. The total area covered by Power Station Colony, Pre-treatment, Intake Water Pump House and the road strip (30.5 meters x 5Km) from Power Station to Water Intake pump house is about 772.75 acres of land.

B) INSTALLED CAPACITY.

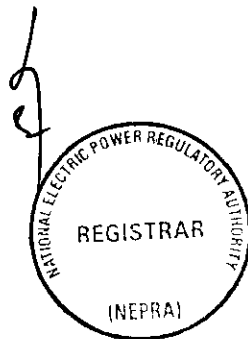
This Power Station is vital and major thermal power generating installation connected with the National grid system. This Power Station was constructed in two phases with a total installed capacity of 880 MW.

It consists of one Japanese Unit of 250 MW supplied by M/s. Mitsui & Co. Ltd. Japan & three Chinese Units of 210 MW each supplied by M/s. CMEC China.

C) FUEL.

Unit No.1 is based on furnace oil only while Unit No.2,3 & 4 are based on dual fuel combustion provision (Gas & Furnace Oil). The furnace oil is transported through Tank Lorries and Railway Wagons from Karachi. The gas is supplied by M/S Sui Southern Gas Co. Ltd. through a 16" dia gas pipe line. The maximum gas requirement for three Chinese Units is 150 MMCFT, maximum gas quota is 62 MMCFT and minimum is 53 MMCFT.

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2- **GAS TURBINE POWER STATION, KOTRI.**

The detail of Power Station showing, number of Units, installed capacity, make, year of commissioning, type of fuel used is given below:-

Unit No.	Installed Capacity	Make	Commission -ing date	Fuel Type
GT-1	15 MW	M/s. CEM France	Dec. 1969	P.Gas, HSD
GT-2	15 MW	M/s. CEM France	Jan. 1970	P.Gas, HSD
GT-3	25 MW	M/s. THOM B. V. Holland	May. 1979	P.Gas, HSD
GT-4	25 MW	M/s. THOM B.V. Holland	May. 1979	P.Gas, HSD
GT-5	25 MW	M/s. Hitachi Japan	April 1981	P.Gas, HSD
GT-6	25 MW	M/s. Hitachi Japan	May 1981	P.Gas, HSD
U-7 CC Unit	44 MW (with 4 HRSG)	M/s. HPEEC China & M/s. Cockrill Mech: Indus Belgium.	Oct. 1994	No fuel - Combined Cycle Technology
Total	174 MW			

A. **LOCATION.**

The Gas Turbine Power Station, Kotri is situated on the National Highway in site area of Kotri 150Km North of Karachi. Hyderabad City is about 12 Kms upside from the Power Station. The Power Station is at a height of 30 meters above sea level with latitude of 25°, 20' North and longitude of 68°, 15' East.

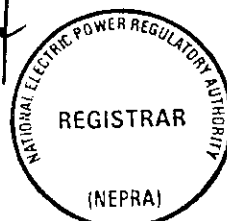
G.T.P.S. Kotri can be easily approached from North and South by means of Railway and connecting Highways. The location where the Power Station is situated on the National Highway is linked with Super Highway at a distance of about 8.5 Kms. The nearest Airport facility is at Karachi at a distance of 190 Kms

B. **INSTALLED CAPACITY.**

The total installed capacity of the Power Station is 174 MW. It comprises of 2x15MW capacity Gas Turbines of CEM France, 2x25 MW Gas Turbines of Thomassen Holland, 2x25 MW Gas Turbines of Hitachi Japan & one Combined Cycle Unit of 44 MW from M/s. HPEEC, China.

C. **FUEL.**

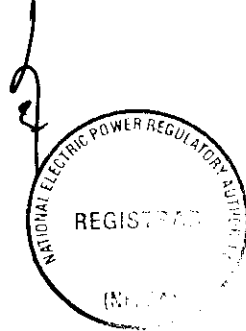
All the Gas Turbine units are designed to operate on dual fuel (i.e. Natural Gas and HSD Oil). The gas is supplied through 12 inch pipe line to the Power Station by M/s. Sui Southern Gas Company, Karachi. A minimum gas quota of 10 MMCFT is guaranteed for the Power Station. The maximum gas quota is 30



MMCFT which is subject to availability. In winter the gas quota is generally reduced to 15 MMCFT.

The HSD Oil is supplied from Karachi through road tankers for which decanting facilities exist at the plant. A storage capacity of 6600 tons of HSD Oil is available as an alternate fuel to meet the power generation demand in an emergency.

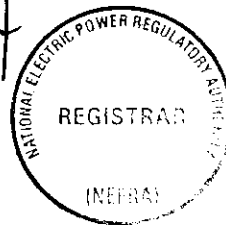
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LOCATION MAP AND SITE MAP

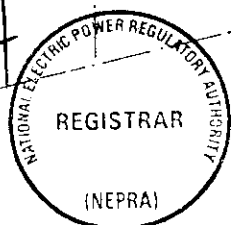
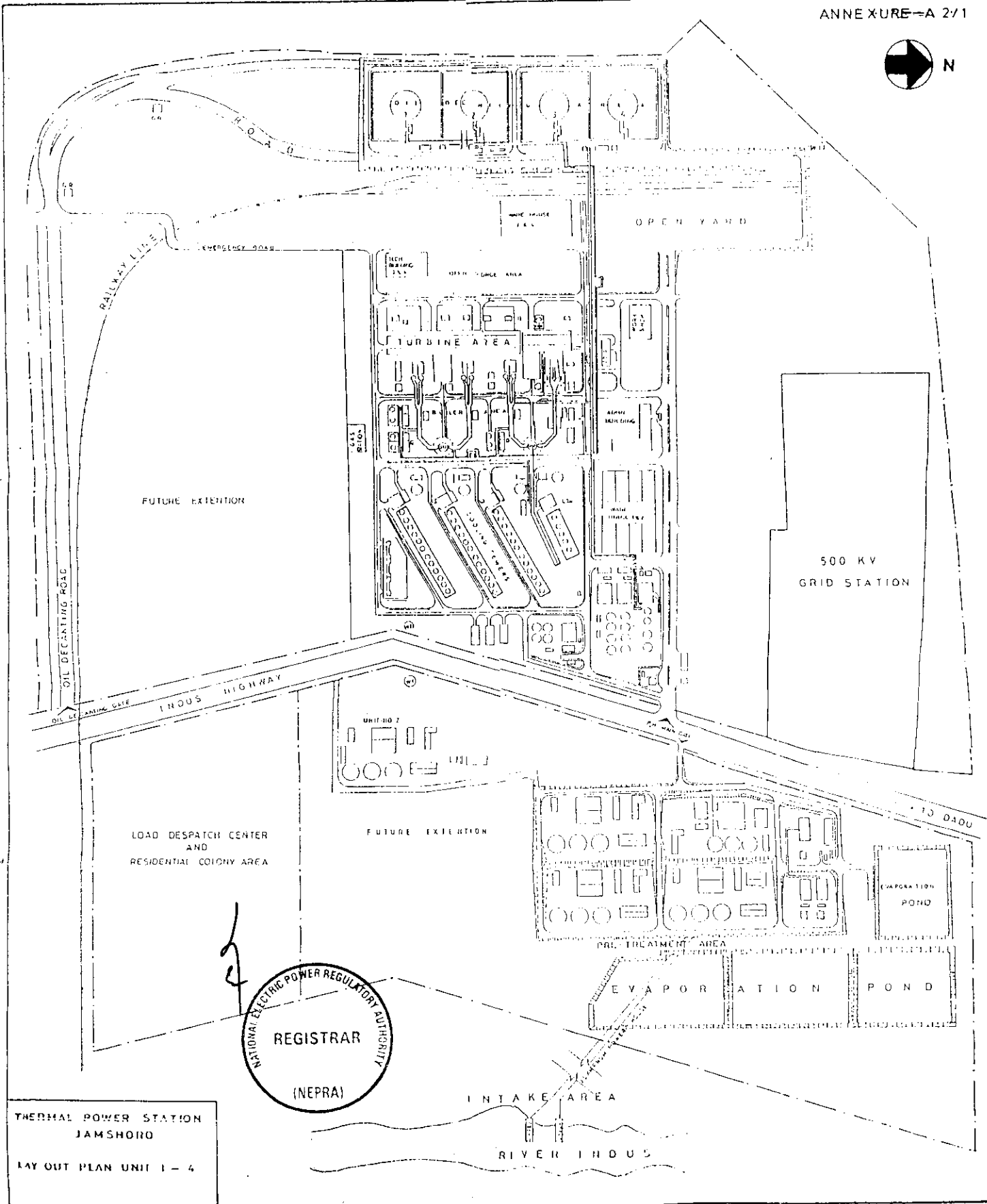
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THERMAL POWER STATION (JAMSHORO) LAY OUT PLAN UNIT 1-4

ANNEXURE-A 2/1

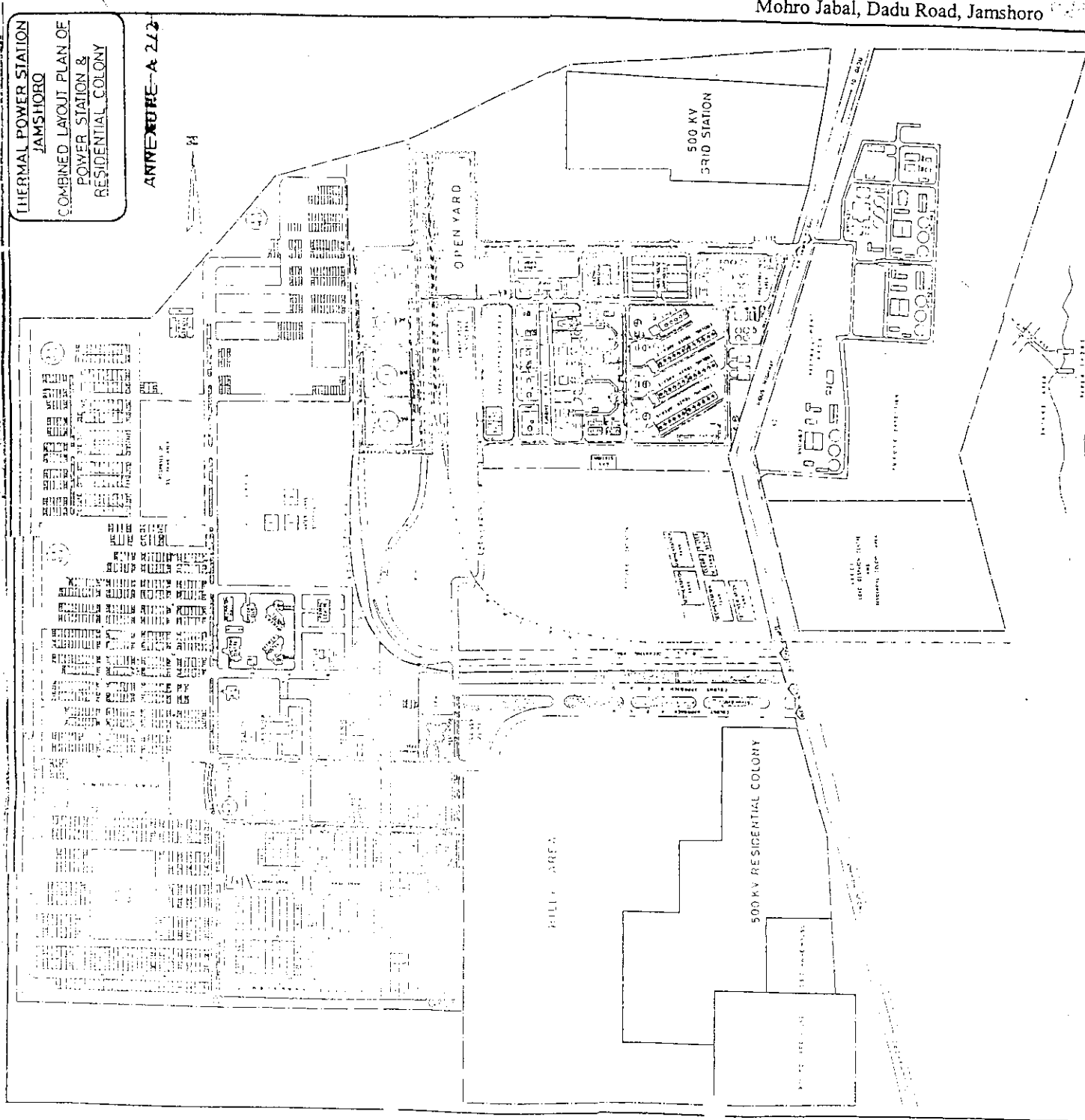


THERMAL POWER STATION
JAMSHORO
LAY OUT PLAN UNIT 1-4

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THERMAL POWER STATION
JAMSHORO
COMBINED LAYOUT PLAN OF
POWER STATION &
RESIDENTIAL COLONY

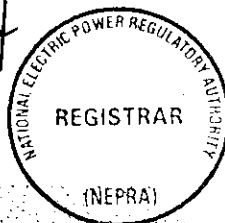
ANNEXURE-A 2/2



THERMAL POWER STATION (JAMSHORO)

COMBINED LAYOUT PLAN OF POWER STATION & RESIDENTIAL COLONY

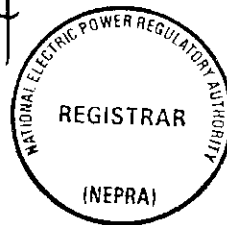
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TECHNOLOGY AND DETAILS OF UNITS

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INFORMATION AS PER SCHEDULE – III (REGULATION 3(6)).
THERMAL POWER STATION JAMSHORO.

1. LOCATION AND SITE MAPS.

Thermal Power Station, Jamshoro is located in the south of country at Mohra Jabal, Dadu District at a distance of 18Kms from Hyderabad. In the vicinity of Jamshoro Power Plant, there is a high tension 500KV/220KV/132KV Grid Station adjacent to Power Plant & 132 KV /11 KV Grid Station at about 2.5Kms to the South. Liaquat University of Medical Sciences is about 5.5Kms to the South, on Indus Highway, University of Sindh and Mehran University of Engineering Technology are about 7Kms to South, on Indus/Super Highway.

Water Intake site which is source of make up water for the Power Plant is located at the right bank of Indus river at about 5Kms East of Power Plant and about 4.4Kms up stream to the Kotri Barrage. Total area covered by Thermal Power Station Jamshoro, its colony, Pretreatment Area and Indus River Intake Pumping Station and its road strip is about 772.75 acres.

The nearest Air Port Facility is at Karachi at a distance of 190 Kms from Jamshoro. It is connected with Karachi through Super Highway. National Highway and Railway Station at Hyderabad.

Location Map enclosed at (Annexure-A1,2).

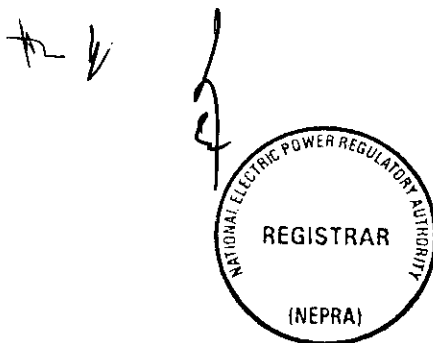
2. TECHNOLOGY. NUMBER OF UNITS.

There are (4) conventional steam power generating Units installed and are in operation at Thermal Power Station, Jamshoro. Phase-I consists of one (ST-I) Steam Turbine Power Unit of 250 MW capacity, commissioned in January 1990 with assistance & cooperation of OECF Japan. Main Consultant was Tokyo Electric Power Service Co. Ltd., Japan & main contractor was M/s. Mitsui & Co. Ltd., Japan for supply of equipment, Erection & Commissioning.

Phase-II comprises of three steam turbine power units (2,3 & 4) of 210 MW capacity each, were put into commercial operation in 1989, 1990 & 1991 with the assistance and cooperation of Peoples Republic of China.

The main Contractor for supply of equipment, erection, testing & commissioning of Units (2,3&4) were M/s. China National Machinery & Equipment Import & Export Corporation (CMEC) China.

Unit No:1 was first synchronized with National Grid on 27.01.1990, Unit No.2 on 03.12.1989, Unit No.3 on 27.6.1990 & Unit No.4 on 21.1.1991.



3. **FUEL TYPE, IMPORTED/INDIGENOUS, SUPPLIER, LOGISTICS, PIPELINE ETC.**

- a. Furnace Oil is supplied by M/S Pakistan State Oil & M/s.Shell Pakistan Ltd, through tank lorries and railway wagons. Decantation facilities are available at Power Station.
- b. Natural Gas is supplied by M/S Sui Southern Gas Co. Ltd., Hyderabad/Karachi.
- c. Fuel Supply Requirement:-

Unit No.	F.O. Requirement per day (M.T)	Gas Requirement MMCFT	HSD Oil Requirement per year. (Litres)
1	1500	--	17100
2,3&4	3600	150 MMCFT	12400
HSD oil is used during startup of boiler & during operation of House Boiler.			
However on unit-1.HSD is used during burner cutoff and re-ignition			

- d. Furnace Oil Logistics (Decanting Facility).
Attached at Annexure-B.
- e. Pipe line etc.
The gas reducing station is located in the premises of power plant, the pipeline diameter = 20".
Gas pipe line diagram attached at Annexure-C.

4. **EMISSION VALUES.**

Attached at Annexure-D.

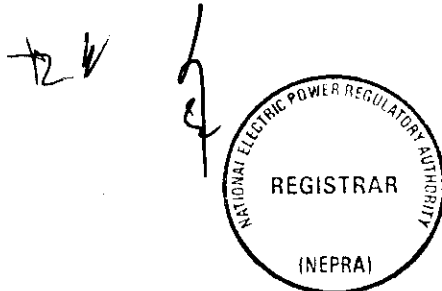
5. **COOLING WATER SOURCE (RIVER WATER).**

Intake Water Pumping Station is built at Right Bank of River Indus. 16 Intake Water Pumps are installed in the river, (04 pumps; 02 high level and 02 low level pumps for each unit) to meet water requirement.

Unit No.	Requirement (Cusec)	No. of Intake Water Pumps	Capacity of each pump.
1	Max: 10	04	590 M ³ /hrs. each
2,3&4	Max: 30	12	600 M ³ /hrs. each.

6. **INTERCONNECTION WITH NATIONAL GRID. DISTANCE AND NAME OF THE GRID. VOLTAGES LEVEL.**

- The name of Grid Station is 500KV/220KV/132KV Grid Station Jamshoro.
- 1.The distance between Power Station & Grid Station is approx. 1.5Km.
 - 2.Grid voltage level is 220KV.
 - 3.Single line diagram is attached at Annexure-H.



7. INSTALLED CAPACITY, DERATED CAPACITY, EXPECTED REMAINING LIFE.

Unit No.	Installed capacity (MW)	Derated capacity (MW)	Expected remaining life (Years).
1	250 MW	200	25
2	210 MW	170	25
3	210 MW	170	25
4	210 MW	170	26

8. DUE DILIGENCE REPORT.

It is enclosed separately.

9. REHABILITATION PLANS. PREVIOUS REHABILITATION PROGRAMME.

Attached at Annexure-E.

10. OPERATION RECORD WITH ENVIRONMENT MONITORING DATA FOR THE LAST FIVE YEARS.

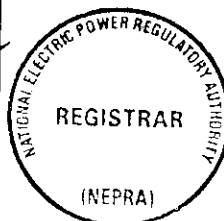
Attached at Annexure- F. F1.

11.1 PLANT COST INFORMATION ON SOURCE AND AMOUNT OF EQUITY AND DEBT.

Attached at Annexure-G.

11.2 PLANT CHARACTERISTICS: GENERATION VOLTAGE, FREQUENCY, POWER FACTOR, AUXILIARY CONSUMPTION, TIME REQUIRED TO SYNCHRONIZE TO GRID IS AS BELOW:-

Description	Unit No:1	Unit No:2	Unit No:3	Unit No:4
Generation Voltage (KV)	16.5	15.75	15.75	15.75
Ramping Rate (MW/Min)	2.0	1.0	1.0	1.0
Alternative Fuel	-	R.O.	R.O.	R.O.
Frequency (HZ)	50	50	50	50
Power Factor	0.85 Lag	0.85 Lag	0.85 Lag	0.85 Lag
Auxiliary Consumption %	8-9	8-9	8-9	8-9
Droop Setting %	4.7	4.9	4.9	4.9
Time Required to Synch. To Grid. (Hrs.)	12	6	6	6



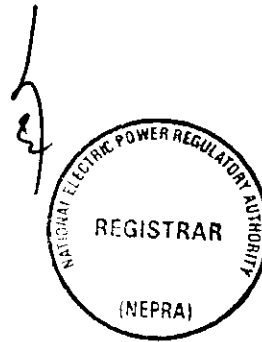
12. TRAINING & DEVELOPMENT.

A Training Centre was established at Thermal Power Station, Jamshoro in July, 1994, under the supervision of Director Training with the training facilities for Operation and Maintenance Engineers and staff of T.P.S. Jamshoro, FBC Power Station, Lakhra and DGPS, Pasni, Makran. This training center has been closed on 31.12.1999 as per instructions of WAPDA Authority.

At present, the training of Engineers & staff of T.P.S. Jamshoro, is being carried out at:

- i. Thermal Training Centre at TPS, Guddu.
- ii. Wapda Engineering Academy Nishatabad, Faisalabad.
- iii. Wapda Staff College, Islamabad.

2/1

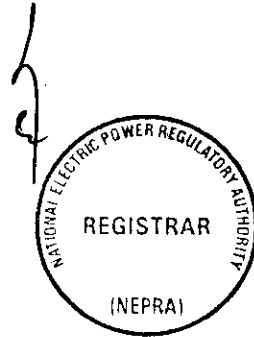


1- Thermal Power Station (T.P.S.), Jamshoro.

The detail of Power Station, showing number of units, installed capacity, derated capacity, make, year of commissioning and fuel used is given below:

Unit No:	Installed Capacity	De-rated Capacity	Make	Commissioning Date	Fuel Type
ST-1	250MW	200MW	M/s. Mitsui, Japan	27.01.1990	Furnace Oil
ST-2	210MW	170MW	M/s. CMEC, China	03.12.1989	Gas/Furnace Oil
ST-3	210MW	170MW	M/s. CMEC, China	27.06.1990	Gas/Furnace Oil
ST-4	210MW	170MW	M/s. CMEC, China	21.01.1991	Gas/Furnace Oil
Total	880MW	710MW			

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INFORMATION AS PER SCHEDULE-III (REGULATION 3(6))

GAS TURBINE POWER STATION, KOTRI.

1. LOCATION AND SITE MAP.

The Gas Turbine Power Station, Kotri is situated on the National Highway in Site area Kotri 150 Kms North of Karachi. Hyderabad City is about 12 Kms North East from the Power Station. The Power Station is at a height of 30 meters above Sea Level with latitude of 25°,20' North and longitude of 68°,15' East.

GTPS Kotri can be easily approached from North and South by means of Railway and connecting Highways. The location where the Power Station is situated on the National Highway is linked with Super Highway at a distance of about 8.5 Kms. The total area of Gas Turbine Power Station Kotri, Colony No.1, Colony No.2 and K.B. Feeder Canal Pumping Station is 103.08 acres of land.

Location and site maps attached at Annexure – A1, 2.

2. TECHNOLOGY. NUMBER OF UNITS.

This Power Station comprises of 2x15 MW Gas Turbines of M/s.CEM France. 2x25MW Gas Turbines of M/s. Thomssen B.V. Holland. 2x25 MW Gas Turbines of M/s. Hitachi Japan. & one Combined Cycle Unit of 44 MW of M/s. Harbin Power Plant Equipment Import & Export Corporation (HPEEC), China and M/s.Cockrill Mechanical Industries. (CMI), Belgium.

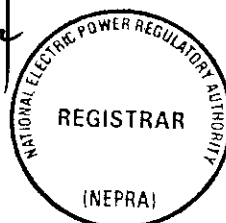
3. FUEL TYPE, IMPORTED/INDIGENOUS. SUPPLIER. LOGISTIC. PIPELINE ETC.

- a) Main Fuel is Natural Gas, which is being supplied by M/s. Sui Southern Gas Co. Ltd., Hyderabad/Karachi.
- b) The gas is supplied to Power Station, through pipeline of 12" dia. A minimum gas quota of 10MMCFT is guaranteed for this Power Station. The maximum gas quota is 30MMCFT which is subject to availability. In winter the gas quota is generally reduced to 15MMCFT.
- c) HSD oil is supplied by M/s. Pakistan State Oil (PSO), Karachi, through Tank Lorries for which decanting facilities exists at the plant. The storage capacity of 6600 tons of HSD oil is available as an alternate fuel to meet the power generation demand at the time of shortage of gas fuel.

Attached at Annexure – B.

4. EMISSION VALUES.

Attached at Annexure-C.



5. COOLING WATER SOURCE, TUBE WELLS, SEA/RIVER/CANAL.
COOLING WATER IS CANAL WATER.

An allocation of two Cusec of water has been approved by Irrigation Department, Government of Sindh. Two Nos. intake pumps are installed on the K.B. Feeder Canal, to pump out water from the canal. The clarified water is supplied to the power station for generating units as well as for drinking purpose in the two residential colonies through forwarding pumps.

S.No	Unit No:	Requirement Cusecs	No. of Intake Pumps Installed	No. of forwarding water pumps	Discharging capacity of each intake pump.	Discharging capacity of each forwarding pump.
01.	1,2,3, 4,5,6 & 7	Max: 2 cusecs for all units	02	04	80m ³ /hr	360m ³ /hr

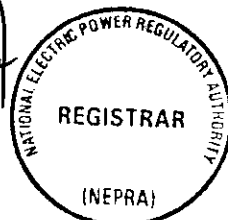
Attached at Annexure – E.

6. INTERCONNECTION WITH NATIONAL GRID COMPANY, DISTANCE AND NAME OF THE GRID, VOLTAGE LEVEL.

- a) The Gas Turbine Power Station, Kotri has its own 132KV Grid Station in the premises of Power Plant.
- b) It is connected with National Grid via following Grid Stations.
- i) 500KV/220KV/132KV Grid Station, Jamshoro.
 - ii) 132KV Muhammadi Grid Station, Hyderabad.
 - iii) 132KV NTPS Grid Station, Hyderabad.
 - iv) 132KV Grid Station, Site Kotri.
 - v) 132KV Grid Station, Thatta.
- c) Voltage Level = 132KV
- d) Single line diagram is attached at Annexure-F.

7. INSTALLED CAPACITY, DERATED CAPACITY, EXPECTED REMAINING LIFE.

Unit No.	Installed Capacity (MW)	Derated Capacity (MW)	Expected Remaining Life (Years)
1	15 MW	10 MW	04
2	15 MW	10 MW	04
3	25 MW	22 MW	13
4	25 MW	22 MW	13
5	25 MW	22 MW	15
6	25 MW	22 MW	15
7	44 MW	44 MW	24



8. DUE DILIGENCE REPORT.

It is enclosed separately.

9. REHABILITATION PLANS, PREVIOUS REHABILITATION PROGRAMME.

Attached at Annexure-I.

10. OPERATIONAL RECORD INCLUDING ENVIRONMENT MONITORING DATA FOR LAST FIVE YEARS. ENVIRONMENT RECORD.

Attached at Annexure-H, J.

11.1 PROJECT COST, INFORMATION REGARDING SOURCES AND AMOUNTS OF EQUITY AND DEBT.

Attached at Annexure-G.

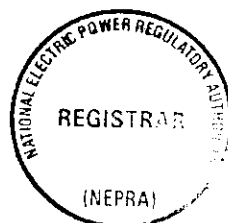
11.2 PLANT CHARACTERISTICS, GENERATION VOLTAGE

Description	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
Generation voltage (KV)	11.5	11.5	11.0	11.0	11.0	11.0	11.0
Frequency (Hz)	50	50	50	50	50	50	50
Power Factor (Lag)	0.85	0.85	0.80	0.80	0.80	0.80	0.85
Ramping Rate (MW/min)	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Alternative Fuel	HSD	HSD	HSD	HSD	HSD	HSD	Nil
Auxiliary Consumption %	7.700	7.400	0.400	0.400	1.360	1.250	7.230
Time Req: Hot Start Upto Synch: to Grid (Minutes)	20	20	20	20	20	20	20
Time req: cold start upto synch: to Grid (Minutes)	20	20	20	20	20	20	20

12. TRAINING & DEVELOPMENT.

The Engineers and staff of G.T.P.S. Kotri are getting local training at

- Gas Turbine Training Centre, 200MW G.T.P.S. Faisalabad.
- Thermal Training Centre, T.P.S. Guddu.
- WAPDA Engineering Academy, Faisalabad.
- WAPDA Staff College, Islamabad.

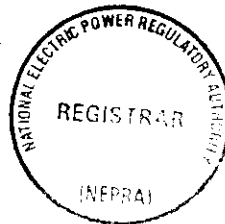


2- Gas Turbine Power Station (G.T.P.S.) Kotri.

The detail of Power Station, showing number of units, installed capacity, derated capacity, make, year of commissioning and fuel used is given below:

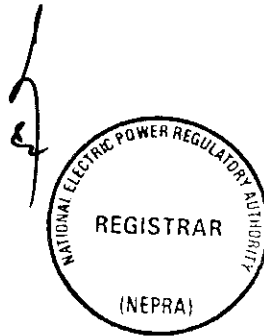
Unit No:	Installed Capacity	De-rated Capacity	Make	Commission-ing Date	Fuel Type
GT-1	15MW	10MW	M/s.CEM France	Dec. 1969	Gas/HSD Oil
GT-2	15MW	10MW	M/s.CEM France	Jan. 1970	Gas/HSD Oil
GT-3	25MW	22MW	M/s.T.B.V. Holland	May. 1979	Gas/HSD Oil
GT-4	25MW	22MW	M/s.T.B.V. Holland	Jun. 1979	Gas/HSD Oil
GT-5	25MW	22MW	M/s.Hitachi Japan	Apr. 1981	Gas/HSD Oil
GT-6	25MW	22MW	M/s.Hitachi Japan	May. 1981	Gas/HSD Oil
CC-7	44MW (with 04 HRSG)*	44MW (with 04 HRSG)*	M/s.HPEEC, China, & M/s.Cockrill Mech Industries Belgium	Oct. 1994	Comb. Cycle. Technology
Total:	174MW	152MW	In Summer, the capacity would reduce to 130MW		

* HRSG: Heat Recovery Steam Generator



PLANT CHARACTERISTICS

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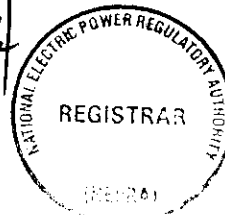


PLANT EQUIPMENT SPECIFICATIONS

THERMAL POWER STATION JAMSHORO

1. BOILER

S.No	GENERAL	UNIT NO.1	UNITS-2,3 & 4
1	MANUFACTURER	M/S Mitsui Engineering & Shipbuilding Co. Ltd. Japan	M/S Harbin Boiler Works China
2	Type	Riley Mitsui ISR-TYPE	HG-680/240-Y1
3	Drum pressure Kg/cm ²	185.5	155
4	Steam Generation (T/Hr)	782.380	680
5	Design Pressure (Kg/cm ²)	174.5	140
6.	Design Temperature Super heated Steam °C Reheated steam inlet temp: °C	541 350	541 315
7	Feed water pressure (Kg/cm ²) at economizer inlet	216	158
8	Feed water temperature °C	251.7	250.7
9	Flue gases exist temp: °C	145	145
10	Fuel consumption T/Hr	51.710 with 18 burners	48.4 with 16 burners
11	Boiler efficiency %	89.83	89.75
12	Furnace temp: °C	1299	1215
13	Total air flow entering furnace (Kg/Hr)	831000	711107
14	Exist flue gases flow (Kg/Hr)	885800	813810
15	Excess air %	5	5
16	R.O high heating calorific value (Kcal)	10650	10650
17	No. of burners	18	16
18	Type of fuel	Furnace Oil	Furnace Oil/Gas

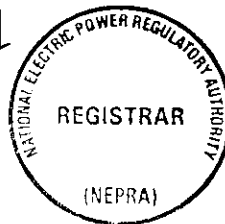


PLANT EQUIPMENT SPECIFICATIONS

THERMAL POWER STATION JAMSHORO

2. TURBINE

S.No	GENERAL	UNIT NO.1	UNITS-2,3 & 4
1	Make	Fuji Electric Co Japan	Harbin Turbine Works China
2	Type	Tandem Compound, 3 casing, Double Flow Exhaust Reaction. Reheat, condensing type	Tandem Compound, 3 casing, Double Flow Exhaust, Reaction, Reheat, condensing type
3	Output (MW)	250	210 each
4	Rated Speed (rpm)	3000	3000
5	Main Steam Pressure (Kg/cm ²)	170	132
6	Main Steam Temperature°C	538	538
7	Reheat Steam Pressure (Kg/cm ²)	38.81	22.25
8	Reheat Steam Temperature°C	538	538
9	Exhaust Steam Back Press: (Kg cm ² abs)	0.1122	0.1123
10	Design Heat Rate I) Kcal/kwh II) BTU/kwh	2284 9094.89	2366 9421.41
11	Design Efficiency (%)	37.65	36.35

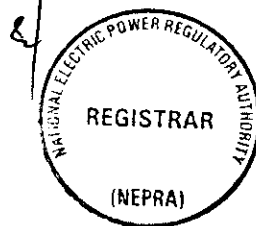


PLANT EQUIPMENT SPECIFICATIONS

THERMAL POWER STATION JAMSHORO

3. GENERATOR

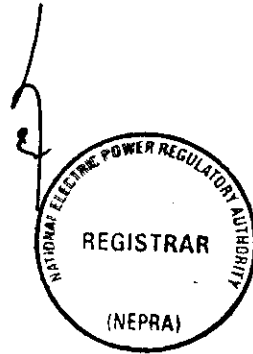
S.No	DESCRIPTION	UNIT NO.1	UNITS-2,3 & 4
01.	Manufacturer	Fuji Electric Co. Japan	Harbin Electric Machinery Works, China
02.	Type	Horizontal Cylindrical rotating Field	Horizontal Cylindrical rotating Field
03.	Rated Capacity (MVA)	294.2	247
04.	Active Power (MW)	262.5	210
05.	Rated Voltage (KV)	16.5	15.75
06.	Rated Current (KA)	10.294	9.056
07.	Power Factor	0.85 Lagging	0.85 Lagging
08.	Rated Frequency (Hz)	50	50
09.	Medium of cooling stator	Hydrogen	Water/Hydrogen
10.	Medium of cooling Rotor	Hydrogen	Hydrogen



PLANT CHARACTERISTICS

1. THERMAL POWER STATION, JAMSHORO

Description	Unit No:1	Unit No:2	Unit No:3	Unit No:4
Generation Voltage (KV)	16.5	15.75	15.75	15.75
Ramping Rate (MW/Min)	2	1	1	1
Alternative Fuel	NIL	R.O	R.O	R.O
Frequency (HZ)	50	50	50	50
Power Factor	0.85 Lag	0.85 Lag	0.85 Lag	0.85 Lag
Auxiliary Consumption %	8-9	8-9	8-9	8-9
Droop Setting %	4.7	4.9	4.9	4.9
Time Required to Synch. To Grid. (Hrs.)	12	6	6	6

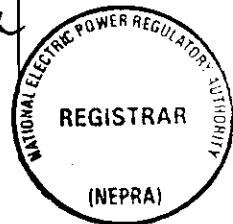


PLANT EQUIPMENT SPECIFICATIONS

THERMAL POWER STATION JAMSHORO

4. MAIN TRANSFORMER

S.No	DESCRIPTION	UNIT NO.1	UNITS-2,3 & 4
1	Manufacture	Fuji Electric Co. Japan	M/S Shenyang Transformer Works, China
2	Type	Oil immersed outdoor, oil forced air forced cooled	Oil immersed outdoor oil forced air forced cooled
3	Number	1 set	3 sets
4	Rated Capacity (MVA)	294.2	250
5	High tension voltage (KV)	220	220
6	Low tension voltage (KV)	16.5	15.75
7	Impedance voltage	15% at 294.2 MVA base	13.5% at 250 MVA
8	Frequency (Hz)	50	50

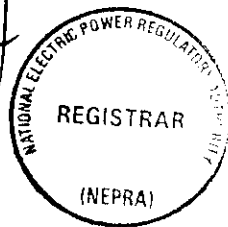


PLANT EQUIPMENT SPECIFICATIONS

GAS TURBINE POWER STATION, KOTRI

1. MAIN FEATURES OF 2x15 MW GAS TURBINES

S.NO	GENERAL	UNIT NO.1&2 (CEM)
1	ORIGINAL DESIGN	M/S BROWN BOVERI (SWISS) CAPACITY 15.0 MW EACH
2	MANUFACTURERS	M/S CIE ELECTRIC MECHANIQUE FRANCE
3	SUPPLIER	-DO-
4	CONSULTANTS	M/S ELECTRO CONCLUT OF ITALY
5	CAPITAL COST MILLION RUPPEES	21.650 (LOCAL) 30.084 (FOREIGN EXCHANGE)
6	TOTAL COST IN MILLION RUPEES	51.734
7	COST /KW (RS)	1724.46
8	COMMISIONING	UNIT NO.1 DECEMBER 1969 UNIT NO. 2 JANUARY 1970
9	DESIGN TEMP.	26.3 DEGREES C (NEMA)

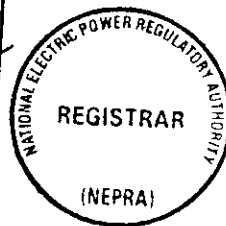


PLANT EQUIPMENT SPECIFICATIONS

GAS TURBINE POWER STATION, KOTRI

2. MAIN FEATURES OF 2x25 MW GAS TURBINES

S.NO	GENERAL	UNIT NO.3&4 (THOMSEN)
1	ORIGINAL DESIGN	M/S GENEAL ELECTRIC USA CAPACITY 25 MW EACH
2	MANUFACTURERS	M/S THOMSEN BV.HOLAND
3	SUPPLIER	-DO-
4	CONSULTANTS	M/S FICHER WEST GERMANY M/S PAKISTAN ENGINEERING SERVICE LAHORE
5	CAPITAL COST MILLION RUPPEES	94.093 (LOCAL) 85.064 (FOREIGN EXCHANGE)
6	TOTAL COST IN MILLION RUPPEES	179.160
7	COST /KW (RS)	3583.20
8	COMMISIONING	UNIT NO.3 MAY 1979 UNIT NO. 4 MAY.1979
9	DESIGN TEMP.	15°C (ISO)

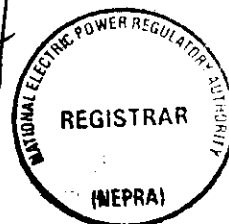


PLANT EQUIPMENT SPECIFICATIONS

GAS TURBINE POWER STATION, KOTRI

3. MAIN FEATURES OF 2x25 MW GAS TURBINES

S.NO.	GENERAL	UNIT NO.5&6 (HITACHI)
1	ORIGINAL DESIGN	M/S GENERAL ELECTRIC U.S.A.
2	DESIGN CAPACITY	25 MW EACH
3	MANUFACTURERS.	M/S HITACHI LTD. JAPAN.
4	LOAN GIVING AGENCY	OVERSEAS ECONOMIC CORPORATION FUND JAPAN.
5	SUPPLIERS.	M/S MARUBENI TOKYO JAPAN.
6	CONSULTANTS.	M/S M/S ELECTRIC POWER DEVELOPMENT CORPORATION INTERNATIONAL LTD. JAPAN
7	CAPITAL COST MILLION RUPEES	90.00 (LOCAL) 120.00 (Foreign Exchange)
8	TOTAL COST IN MILLION RUPEES	210.00
9	CONTRACT COST IN MILLION	J.YEN 1827.00 Pak Rs. 5.80
10	COST /KW (RS)	Rs. 4200.00
11	COMMISSIONING	Unit No.5 April,1981 Unit No.6 May,1981
12	UNITS GENERATED IN M.Kwh SINCE COMMISSIONING	Unit No.5 1408.437 Unit No.6 1558.216
13	AVERAGE GAS FUEL CONSUMPTION	Unit No.5 16 Cft/kwh Unit No.6 16 Cft/kwh

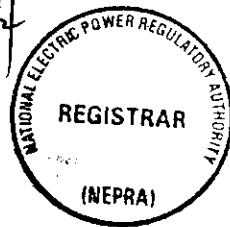


PLANT EQUIPMENT SPECIFICATIONS

GAS TURBINE POWER STATION, KOTRI

4. MAIN FEATURES OF COMBINED CYCLE UNIT NO.7

S.NO	GENERAL	UNIT NO.7 (HPEEC)
1	ORIGINAL DESIGN	M/S HPEEC, CHINA
2	MANUFACTURERS	M/S HPEEC, CHINA M/S COCKERILL MECHANICAL INDUSTRIES. BELGIUM
3	SUPPLIER	-DO-
4	CONSULTANTS	M/S EWBANK PREECE LTD. U.K M/S NESPAK. PAKISTAN
5	CAPITAL COST MILLION RUPPEES	567.888 (LOCAL) 1056.343 (FOREIGN EXCHANGE)
6	TOTAL COST IN MILLION RUPEES	1624.231
7	COST /KW (RS)	36914.00
8	COMMISIONING	OCTOBER. 1994
9	STEAM TEMP.	473°C



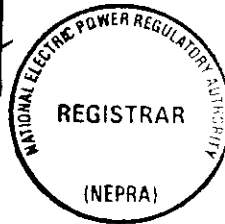
PLANT EQUIPMENT SPECIFICATIONS

GAS TURBINE POWER STATION, KOTRI

5. HEAT RECOVERY STEAM GENERATOR (HRSG)

S.NO	DESCRIPTION	44 MW UNIT NO.7 C.C.P
1	MANUFACTURER	M/S COCKERILL MANUFACTURING INDUSTRIES
2	BOILER TYPE	HG-F 16968-GTI
3	MAX: WORKING PRESSURE	54.3 BAR
4	HEATING SURFACE	16968 M ²
5	RATED STEAMING CAPACITY	44.98 T/Hr
6	DESIGN TEMPERATURE	515°C
7	MANUFACTURING SR.NO.	2169
8	YEAR	1993

1. C.C.P = Combined Cycle Thermal Unit
2. HRSG = Heat Recovery Steam Generator

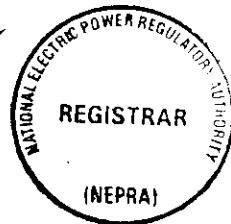


PLANT EQUIPMENT SPECIFICATIONS

GAS TURBINE POWER STATION, KOTRI

6. GENERATOR

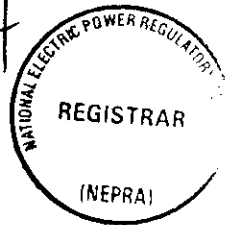
S.NO.	DESCRIPTION	UNITS-1&2	UNITS-3&4	UNITS-5&6	UNIT-7
01.	TYPE	WT 5210	BDAX 7084	PF B.LAW	QFQ-50-2
02.	MANUFACTURER	FABRIQUE EN FRANCE PAR ESTABLISHMENT HAVRE	BRUSH ELECTRIC AL M/C LTD.	HITACHI LTD. TOKYO JAPAN	M/S HARBIN ELECTRIC MACHINERY WORKS CHINA
03.	VOLTAGE (KV)	11.5	11.0	11.0	11.0
04.	RATING (MVA)	20	32.437	30.25	62.5
05.	SPEED (RPM)	3000	3000	3000	3000
06.	AMPERES (A)	1000	1702	1588	3280
07.	FREQUENCY (Hz)	50	50	50	50
08.	POWER FACTOR	0.85 Lag	0.8 Lag	0.8 Lag	0.85Lag



PLANT CHARACTERISTICS

2. GAS TURBINE POWER STATION, KOTRI

Description	Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7
Generation voltage (KV)	11.5	11.5	11.0	11.0	11.0	11.0	11.0
Frequency (Hz)	50	50	50	50	50	50	50
Power Factor	0.85Lag	0.85Lag	0.80Lag	0.80Lag	0.80Lag	0.80Lag	0.85Lag
Ramping Rate (MW/min)	2.0	2.0	2.0	2.0	2.0	2.0	1.0
Alternative Fuel	HSD	HSD	HSD	HSD	HSD	HSD	Nil
Auxiliary Consumption %	7.7	7.4	0.4	0.4	1.36	1.25	7.23
Time Req: Hot Start Upto Synch: to Grid (Minutes)	20	20	20	20	20	20	20
Time req: cold start upto synch: to Grid (Minutes)	20	20	20	20	20	20	20

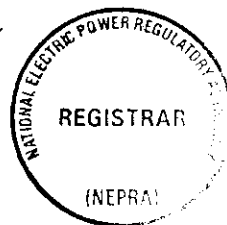


PLANT EQUIPMENT SPECIFICATIONS

GAS TURBINE POWER STATION, KOTRI

7. MAIN TRANSFORMER

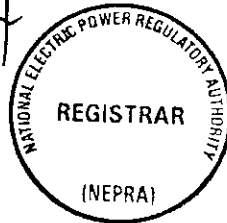
Sr: No	DESCRIPTION	UNITS-1&2	UNITS-3&4	UNITS-5&6	UNIT-7
1	TYPE	S.NO.H24616	145/31.5	IFC 76	SF 27-63000/141 TA
2	MAKE	FABRIQUE EN FRANCE PAR ESTABLISHMENT HAVRE	SMIT	HITACHI LTD. TOKYO JAPAN	M/S SHENYANG TRANSFORMER WORKS CHINA
3	VOLTAGE (KV) LV HV	10.500 132	11.0 132	11.0 132	11.0 132
4	RATING (MVA)	20	31.5	29	63
5	AMPERE (A)	1100	1653	1520	LV 669.4 HV 336.4
6.	PERCENTAGE IMPEDANCE	8.72	Unit-3=10.79 Unit-4= 8.56	7.95	12.3
7	POWER FACTOR (LAG)	0.85	0.8	0.8	0.85
8	YEAR	1968	1977	1980	1993
9	TYPE OF COOLING	ON AF	ON AF	ON AN/ON AF	ON AN/ON AF
10	NO. OF PHASES	3-PHASE	3-PHASE	3-PHASE	3-PHASE



FUEL SOURCES

2/1

2/1

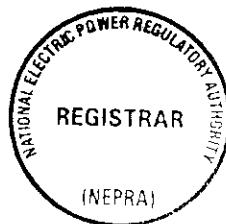


DAILY DECANTATION AT TPS, JAMSHORO.

Sr. No.	Phase	Oil Decanting to Main R.O. Tanks.		No. of receiving pumps	No. of Plate Forms	Receiving Pumps Capacity to Tank
		Road Tank Lorries	Railway Wagon			
1	I (Unit-1)	100-150 (37 Tons) 3700 Tons	Three Oil Special 1600x3 =4800	04 Nos.	01 No. with 60 No terminal points	60 KL/Hr. each pump
2	II (Units 2,3&4).	100 (37 Tons) 3700 Tons	Nil	04 Nos.	01 No. with 60 No terminal points	73KL/Hr. each pump
Total:		3700 Tons	4800 Tons			

OIL REQUIREMENT

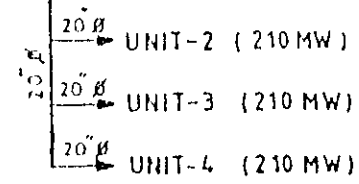
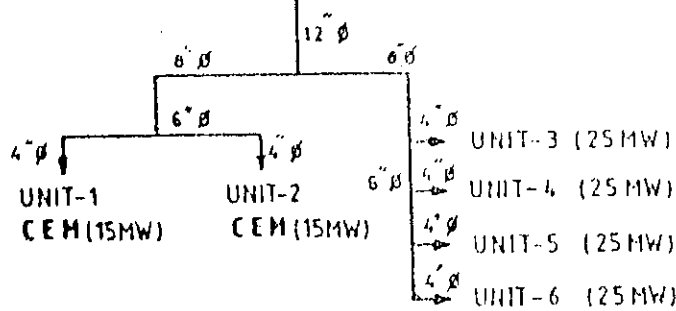
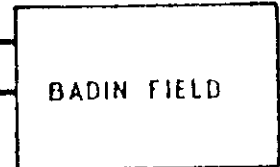
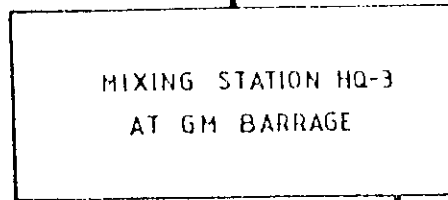
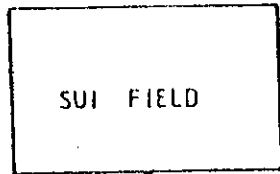
Unit No.	Unit Ratings	Consumption/Day
Unit No.1	250 MW	1500 MT
Unit No.2	210 MW	1200 MT
Unit No.3	210 MW	1200 MT
Unit No.4	210 MW	1200 MT
TOTAL	880 MW	5100 MT/DAY



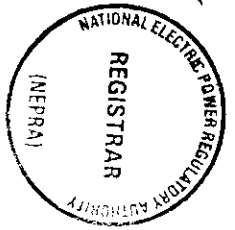
GAS SUPPLY LINE TO T.P.S JAMSHORO & KOTRI

TO KARACHI

ANNEXURE -B



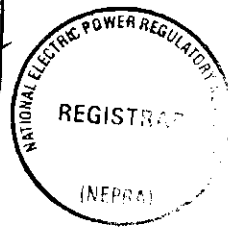
12" ϕ
INTERMIX GAS



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GENERATION PERFORMANCE STANDARDS

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JAMSHORO POWER COMPANY LIMITED

JULY 1999 TO JUNE 2000

S.NO	POWER STATIONS	PERFORMANCE INDICATORS									
		Total Installed Capacity (MW)	Derated capability (MW)	Max: Load (MW)	Total units generated (MWH)	Load Factor (%)	Plant utilization factor (%)	Plant Availability factor (%)	Plant capacity factor (%)	Gross Heat Rate (BTU/KWH)	Thermal Efficiency (%) :
01.	TPS, JAMSHORO	880	710	510	2469259.62	55.27	31.94	57.31	71.83	10247.866	33.3
02.	GTPS, KOTRI	174	152	152.5	620195.00	46.43	40.5	96.10	100.32	9433.66	36.2

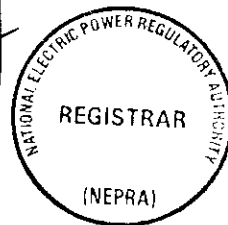


Generation Licence
Jamshoro Power Company Limited
Mohro Jabal, Dadu Road, Jamshoro

EMISSION VALUES

to 1

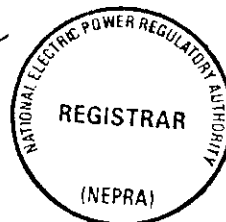
2



EMISSIONS VALUES

1. THERMAL POWER STATION, JAMSHORO

JANUARY-2000				JULY-2000			
FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)	FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)
GAS	----	125.37	----	GAS	----	73.51	----
HSD	0.259	0.202	----	HSD	0.018	0.014	----
F.OIL	1229.91	241.62	7.55	F.OIL	1662.00	326.57	10.20
	1229.91	367.192	7.55		1662.018	400.094	10.20
FEBRUARY-2000				AUGUST-2000			
FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)	FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)
GAS	----	129.54	----	GAS	----	74.29	----
HSD	0.125	0.097	----	HSD	0.221	0.172	----
F.OIL	340.35	66.88	2.09	F.OIL	1753.43	344.53	10.77
	340.473	196.517	2.09		1753.651	418.992	10.77
MARCH-2000				SEPTEMBER-2000			
FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)	FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)
GAS	----	94.59	----	GAS	----	97.37	----
HSD	0.554	0.431	----	HSD	0.140	0.109	----
F.OIL	1430.02	280.98	8.78	F.OIL	1199.68	235.73	7.37
	1430.574	376.001	8.78		1199.82	333.209	7.37
APRIL-2000				OCTOBER-2000			
FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)	FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)
GAS	----	94.49	----	GAS	----	111.95	----
HSD	0.300	0.233	----	HSD	0.006	0.0048	----
F.OIL	1572.86	309.05	9.66	F.OIL	885.38	173.97	5.44
	1573.16	403.773	9.66		885.386	285.924	5.44
MAY-2000				NOVEMBER-2000			
FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)	FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)
GAS	----	109.85	----	GAS	----	107.94	----
HSD	0.300	0.233	----	HSD	0.085	0.067	----
F.OIL	1699.17	333.87	10.43	F.OIL	249.55	49.03	1.53
	1699.47	443.953	10.43		249.635	157.037	1.53
JUNE-2000				DECEMBER-2000			
FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)	FUEL	SOX (TONNE S)	NOX (TONNE S)	PARTICULATE (TONNES)
GAS	----	113.12	----	GAS	----	104.34	----
HSD	0.128	0.100	----	HSD	0.094	0.073	----
F.OIL	1972.65	387.61	12.11	F.OIL	390.74	76.78	2.40
	1972.78	500.83	12.11		390.83	181.193	2.40

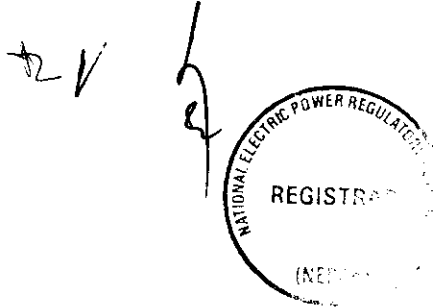


EMMISSION VALUES

2. GAS TURBINE POWER STATION, KOTRI

S.NO.	FACTOR EFFECTING NATURAL ENVIRONMENT	WASTE/IMPURITY	TONS/MONTH	DISPOSAL METHOD
01.	Emission	1) SO ₂ 2) NO ₂ 3) CO ₂	9282.3 9050251.4 23371.926	High temperature flue gases at 490°C are used in four HRSGs, then discharged into the atmosphere at about 150°C.

(HRSG) = Heat Recovery Steam Generators



COOLING WATER SOURCES

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2



COOLING WATER SOURCE

1. THERMAL POWER STATION, JAMSHORO

The cooling water source is River Water. An allocation of 40 cusecs of water has been allowed by the Irrigation Department Govt. of Sindh.

Intake Water Pumping Station is built at Right Bank of River Indus. 16 Intake Water Pumps are installed in the river, (04 pumps for each unit) to meet water requirement of power plant and residential colony. On each unit two pumps are for low water level and two for high water level.

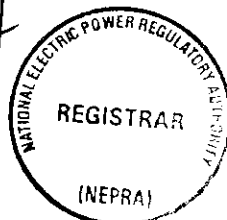
Unit No.	Requirement (Cusec)	No. of Intake Water Pumps	Capacity of each pump.
1	Max: 10	04	590 M ³ /hrs. each
2,3&4	Max: 30	12	600 M ³ /hrs. each.

2. GAS TURBINE POWER STATION, KOTRI

The cooling water source is canal water through K.B. Feeder.

An allocation of two Cusec of water has been approved by Irrigation Department, Government of Sindh. Two Nos. intake pumps with discharging capacity of 80m³/hr are installed on the K.B. Feeder Canal, to pump out water from the canal. The clarified water is supplied to the power station for generating units as well as for drinking purpose in the two residential colonies through forwarding pumps having discharging capacity of 360m³/hr.

S.No	Unit No:	Requirement : Cusecs	No. of Intake Pumps Installed	No. of forwarding water pumps	Discharging capacity of each intake pump.	Discharging capacity of each forwarding pump.
01.	1,2,3, 4,5,6 & 7	Max: 2 cusecs for all units	02	04	80m ³ /hr	360m ³ /hr



CANAL SIDE WATER CLARIFICATION PLANT

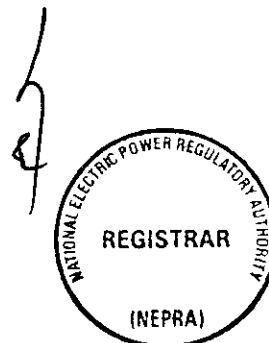
GAS TURBINE POWER STATION, KOTRI

The water intake system/clarifier is installed at K.B. Feeder Canal (down stream of Indus River) which is 05 Kms away from the power station

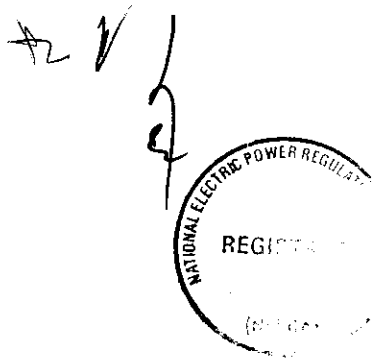
The intake system comprises the following equipments and installations:

- Water Intake Pumps = 02 Nos
- Receiving Pond, 375m³ each = 02 Nos
- Clarifiers 360 m³ each = 02 Nos
- Clarifier storage tank = 01 No
- GRP line 10" dia = Approx: 05 Kms
- Forwarding Pumps = 04 Nos.
- Sludge pumps = 02 Nos
- Chemical dosing pump = 02 Nos
- Poly chemical mixing pump = 01 No
- Alum dosing pumps = 02 Nos
- Calcium Hypochloride pumps = 02 Nos
- Calcium Hypochloride solution
Mixing pump = 01 No
- Mud scrapers for clarifier = 02 Nos
- Boosting pumps = 02 Nos
- Sludge pumps = 03 Nos
- Air compressor = 01 No

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INTER CONNECTION WITH NATIONAL GRID



INTERCONNECTION WITH NATIONAL GRID

1. THERMAL POWER STATION, JAMSHORO

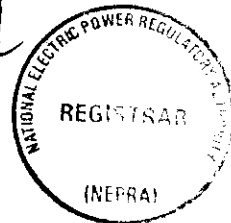
Thermal Power Station, Jamshoro is connected with 500KV/220KV/132KV National Grid through 220 KV & 132 KV Power Cables.

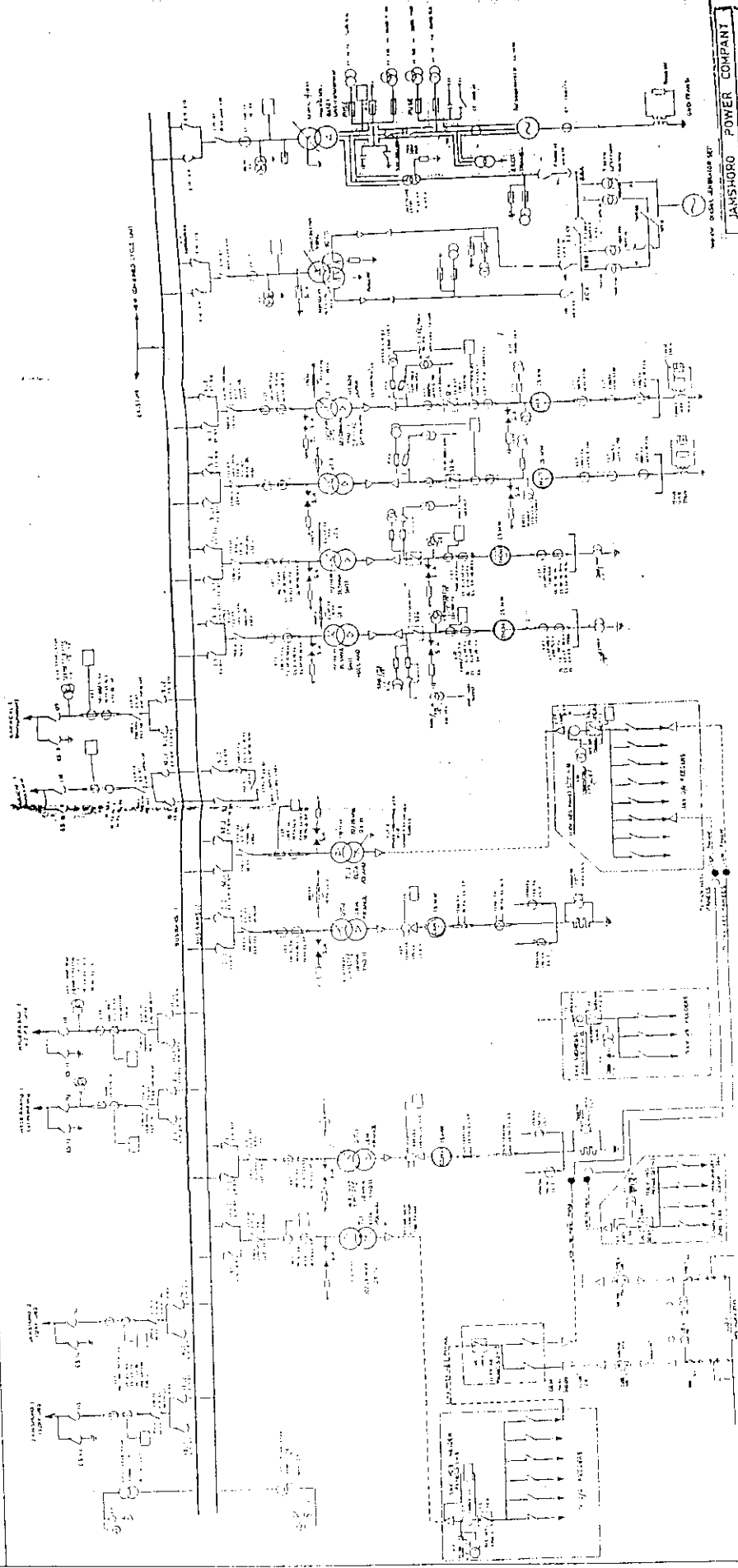
1. The distance between Power Station & Grid Station is approx. 1.5Km.
2. Grid voltage level is 220KV.

2. GAS TURBINE POWER STATION, KOTRI

- a) The Gas Turbine Power Station, Kotri has its own 132KV Grid Station in the premises of Power Plant.
- b) It is connected with National Grid via following Grid Stations.
 - i) 500KV/220KV/132KV Grid Station, Jamshoro.
 - ii) 132KV Muhammadi Grid Station, Hyderabad.
 - iii) 132KV NTPS Grid Station, Hyderabad.
 - iv) 132KV Grid Station, Site Kotri.
 - v) 132KV Grid Station, Thatta.

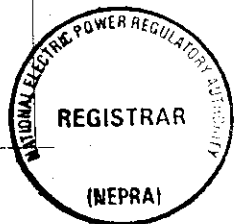
c) Voltage Level = 132KV





JAMSHORO POWER COMPANY	
SINGLE LINE DIAGRAM	
GAS TURBINE POWER STATION ADIRI	
DATE	15/05/2010
BY	ENGR. MOHAMMAD SAJJAD
CHECKED BY	ENGR. MOHAMMAD SAJJAD
APPROVED BY	ENGR. MOHAMMAD SAJJAD
SCALE	AS SHOWN
PROJECT NO.	10000000000000000000
REVISION	NO. 01

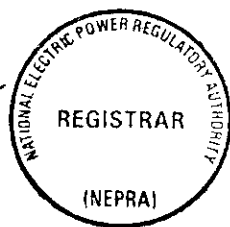
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PROJECT COST INFORMATION

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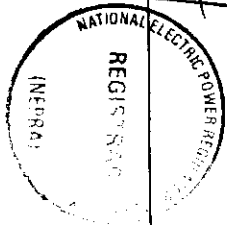
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COST ABSTRACT

THERMAL POWER STATION JAMSHORO

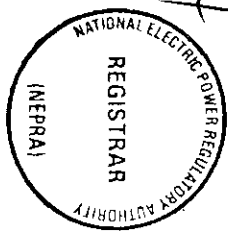
UNITS	DATE OF COMMISSIONING	NAME OF CONTRACTOR AND COUNTRY	CONSULTANTS	CAPITAL COST (RS. IN MILLION)			FINANCING
				Local	Foreign	Total	
250 MW Unit No.1	January, 1990	1. M/S Mitsui & Co. Ltd. Japan 2. M/S F.W.O Pakistan	1. M/S Tokyo electric Power Service Co. Ltd. Japan 2. M/S Noon Qayoom & Co. Lahore	3049.070	3670.930	6720.000	Foreign Exchange Component through loan by Overseas Economic Cooperation Fund (OECF) Japan. Japanese Yen 21736 Million
210 MW Unit No.2 210 MW Unit No.3 210 MW Unit No.4	December 1989 June, 1990 January 1991	1. M/S C.M.E.C China 2. M/S HPEEC China	1. Pakistan Engineering Services (Pvt) Ltd. Karachi Pakistan. 2. M/S Lahmeyer International Germany.	7094.686	1899.03	8933.716	UNIT NO.2 Foreign Exchange Component through own cash resources US\$ 57,685.563 Million <u>UNIT NO.3&4</u> a) 90% supplier's credit US\$ 103,549.320 Million b) 10% Foreign Exchange component through own resources US\$ 11,505.480 Million



COST ABSTRACT

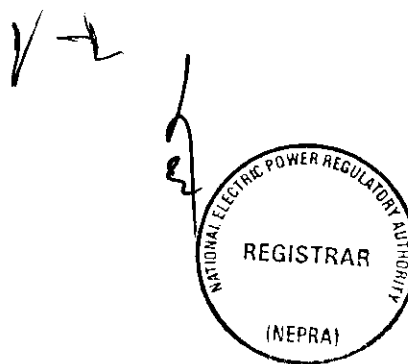
GAS TURBINE POWER STATION, KOTRI

UNITS	DATE OF COMMISSIONING	NAME OF CONTRACTOR AND COUNTRY	CONSULTANTS	P.C-1 COST (RS. IN MILLION)			FINANCING (Figures in Million)
				Local	Foreign	Total	
2x15 MW Unit-1&2	December, 1969 & January 1970	M/S CIE Electric Mechanique France	M/S Electro Consult of Italy	21.650	30.084	51.734	
2x25 MW Unit-3&4	May, 1979 May, 1979	M/S Thomssen B.V.Holland	1. M/S Fitchner, Germany 2. M/S P.E.S, Lahore Pakistan	94.043	85.064	179.107	
2x25 MW unit-5&6	April, 1981 & May, 1981	M/S Hitachi Ltd. Japan	M/S Electric Power Development Corporation Int. Japan.	90.000	120.000	210.000	
44 MW Unit-7	October, 1994	M/S HPEEC, China	M/S EWBANK Preece, England	744.839	1056.343	1801.182	



SCHEDULE - II

- The net capacity of the licensee's generation facilities



GENERATION CAPACITY

(JAMSHORO POWER COMPANY LIMITED, GENCO-I)

Unit No.	Date of Comm.	Installed Capacity (MW)	Derated Capacity (MW)	Net Capacity* after Aux. Consumption (MW)
TPS — JAMSHORO				
1.	27-01-1990	250	200	182.00
2.	03-12-1989	210	170	154.70
3.	27-06-1990	210	170	154.70
4.	21-01-1991	210	170	154.70
GTPS — KOTRI				
1.	Dec, 1969	15	10	9.23
2.	Jan, 1970	15	10	9.26
3.	May, 1979	25	22	21.91
4.	May, 1979	25	22	21.91
5.	Apr, 1981	25	22	21.70
6.	May, 1981	25	22	21.72
7.	Oct, 1994	44	44	40.82
	TOTAL	1054.00 MW	862.00 MW	792.65 MW

* **Indicative Figures only:** These figures have been estimated based on historic average auxiliary consumption provided by the licensee. The net capacity available to NGC Licensee for dispatch and other purchasers will be determined through procedures contained in the Grid Code, applicable documents or bilateral contracts.

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