



Registrar

National Electric Power Regulatory Authority

Islamic Republic of Pakistan

2nd Floor, OPF Building, G-5/2, Islamabad.

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E-mail : office@nepra.org.pk

Direct Phone : (051) 9206500

No. NEPRA/R/LAG-23/12052

3-11-2004

General Manager (Hydel),
WAPDA,
WAPDA House,
Shahrah-e-Quaid-e-Azam,
Lahore

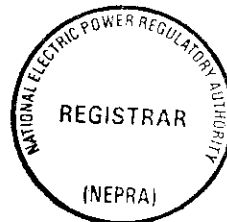
Subject: **Grant of Generation Licence No. GL(Hydel)/05/2004**
WAPDA for its Hydel Power Stations

Please refer to your Application No. 2298/GMH/DHO/G-182 dated 23.04.2003 for a Generation Licence.

2. Enclosed here is Generation Licence No. GL(Hydel)/05/2004 granted by the Authority to WAPDA for its Hydel Power Stations. The Licence is granted 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
3.11.04
(Mahjoob Ahmad Mirza)

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

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

GENERATION LICENCE

NO. GL (HYDEL)/05/2004

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:

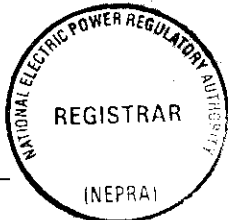
**Water and Power Development Authority for
Its Hydel Power Stations
(Combined Installed Capacity: 6463.16MW)**


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

Given under my hand this 3rd day of November, Two Thousand & Four and expires on 2nd day of November, Two Thousand & Thirty Four.



Registrar





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 **Water and Power Development Authority for its Hydel Power Stations**: and

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

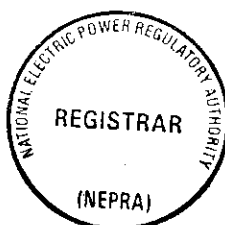
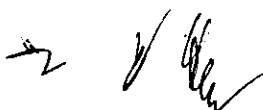
Words and expressions used but not defined herein bear the meaning given thereto in the Act or in the Rules.

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 thirty (30) years.

Article 5

Licence Fee

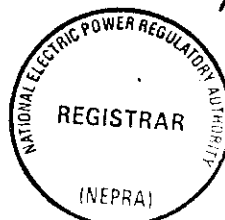
The Licensee shall pay to the Authority the licence fee in the amount and manner and at the time specified in the National Electric Power Regulatory Authority (Fees) Rules, 2002.

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 Licence and another party with the approval of the authority.

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- (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

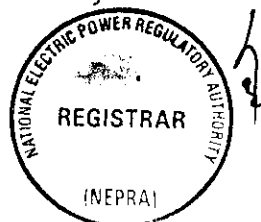
The Licensee shall conform to the environmental standards as may be prescribed by the relevant competent authority from time to time.

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

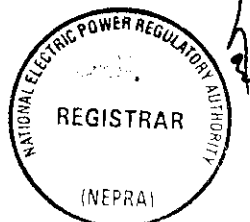
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Act, the Licensee shall submit to the Authority the following statements of availability of the generation facilities:

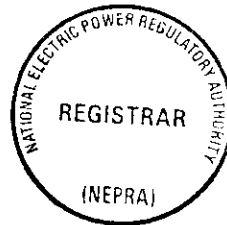
1. Within three (3) months of the beginning of a financial year, the licensee shall prepare and submit a statement for approval by the Authority specifying in detail the criteria upon which the licensee will:
 - (a) determine the duration and timing of planned outages of generation units;
 - (b) determine 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:
 - (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 paragraph 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.

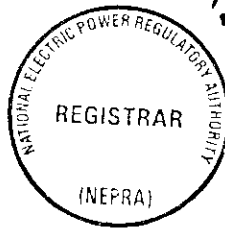
 



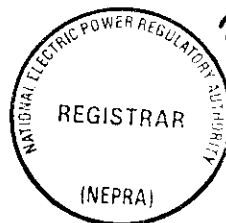
Schedule – I

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.



INTRODUCTION

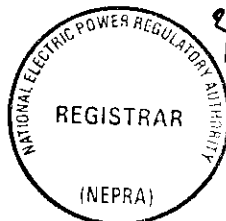


HYDEL POWER STATION

TARBELA

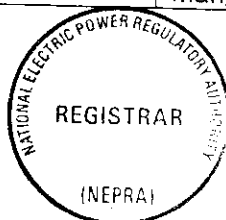
General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES TARBELA HYDEL POWER STATION

1-	Location	Tarbela Power Station is located on Right Bank, of River Indus at Tarbela in Distt. Abbottabad. The location map & general layout plan of Tarbela is attached (Annex.1)					
2-	Plant	Type	Total Capacity	No of Units			
3-	Head	Storage	3478 MW	14			
		Maximum	Minimum				
4-	Technology	440 ft	190 ft				
5-	Tunnel	Francis, No. of Units = 14					
	Total No. of Tunnel	No	Length		Dia		
	i) No. of Power Tunnels	5			At Intake	At Penstock	
	ii) No. of Irrigation Tunnels	3	T1,T2=2400 ft.T3=2700 ft.		45.0 ft.	43.5 ft.	
6-	Due diligence report/ Expected Life	2	T4=2700 ft T5=3675 ft.		45.0 ft.	36.0 ft.	
7-	Rehabilitation Plan	Attached/50 Years					
8-	Operation record for last five years	Nil					
	Year	Energy Produced	Running Hours	Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability
		MKWH	(%)	(%)	(%)	(%)	(%)
	1997-98	15108.273	72.83	00.15	06.70	20.26	93.15
	1998-99	16463.262	75.32	00.14	04.94	19.58	94.92
	1999-2000	14739.567	76.62	01.56	04.75	17.16	93.69
	2000-2001	12826.638	67.93	-	06.89	25.18	93.11
	2001-2002	13525.604	65.52	-	05.52	28.86	95.38
	Operation Constraints	The annual Power Generation depends upon reservoir level and irrigation indent given by IRSA.					
9-	Consents	The Power House was installed with approval of Govt. of Pakistan but the approval is not traceable at present.					
10-	Length of Transmission Line	CCT		Voltage (KV)	Length (KM)		
		Tarbela-Gatti -I		500	329.69		
		Tarbela-Gatti -II		500	321.00		
		Tarbela-Scheikh Muhammad -I		500	113.07		
		Tarbela-Rewat		500	110.89		
		Tarbela-Burhan -I		220	035.01		
		Tarbela-Burhan -II		220	035.01		
		Tarbela-Burhan -III		220	035.04		
		Tarbela-Sangjani -IV		220	062.05		
		Tarbela-Mardan -I		220	067.00		
		Tarbela-Mardan -II		220	067.00		
11-	Peaking/Base Operation	The loading of the station depends upon the water releases allowed by IRSA and requirement of N.P.C.C. Generally during High Flow Period, it is operated for base load where as during Low Flow Period, it is utilized for peaking.					
12-	Plant Characteristics	Generator Voltage		Power Factor			
		Units(1-10) = 13.8 KV		Units(1-4)	= 0.85		
		Units(11-14) = 18.0 KV		Units(5-10)	= 0.95		
				Units(11-14)	= 0.90		
				Frequency	= 50 Hz		
				Automatic Control = Scada Control			
13-	Training and Development	Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.					

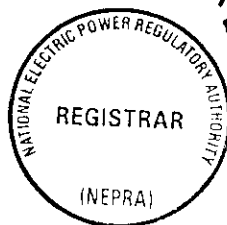


HYDEL POWER STATION

MANGLA

General/Technical information of each Hydel Power Station

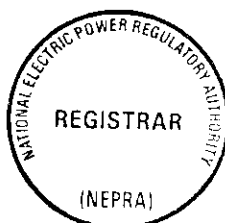
- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES MANGLA HYDEL POWER STATION

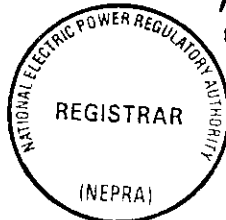
1-	Location		Mangla Power Station is located on River Jhelum at Mangla near Mirpur. (Annex.1)				
2-	Plant		Type	Total Capacity		No of Units	
3-	Head		Storage	1000 MW		10	
4-	Technology		Maximum 363 ft		Minimum 192 ft		
5-	Tunnel		Francis, No. of Units = 10				
	Total No. of Tunnel		No.	Length		Dia	
	i) No. of Power Tunnels		5			At Intake	At Penstock
	ii) No. of Irrigation Tunnels		5	1560 ft. each		30 ft	26 ft
6-	Due diligence report/ Expected Life		-	-		-	
7-	Rehabilitation Plan		Attached/50 Years				
8-	Operation record for last five years		Nil				
	Year	Energy Produced	Running Hours	Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability
		MKWH	(%)	(%)	(%)	(%)	(%)
	1997-98	6103.717	79.26	0.05	2.22	18.47	97.73
	1998-99	4778.531	73.37	0.07	4.79	21.77	95.14
	1999-2000	3184.766	63.03	0.15	3.94	32.88	95.91
	2000-2001	2799.951	53.19	0.19	5.79	40.82	94.01
	2001-2002	3398.891	56.04	0.05	5.41	38.50	94.54
	Operation Constraints		The annual Power Generation depends upon reservoir level and irrigation indent given by IRSA.				
9-	Consents		The Power House was installed with approval of Govt. of Pakistan but the approval is not traceable at present.				
10-	Length of Transmission Line		CCT		Voltage (KV)	Length (KM)	
			Mangla-Ghakhar-I		220	111.09	
			Mangla-Ghakhar Express -II		220	113.07	
			Mangla-Ghakhar -III		220	113.07	
			Mangla-KSK -I		220	170.06	
			Mangla-KSK -II		220	170.06	
			Mangla-KSK -III		220	172.09	
			Mangla-New Rawat -I		220	79.09	
			Mangla-New Rawat -II		220	79.09	
			Mangla-Jhelum-N/Rawat -I		132	123.91	
			Mangla-Gujar Khan-N/Rawat -I		132	88.36	
			Mangla-Gujar Khan-N/Rawat -II		132	88.36	
			Mangla-Old Rawat -I		132	90.00	
			Mangla-Old Rawat -II		132	90.00	
			Mangla-Rajar-Kharian -I		132	61.00	
			Mangla-Kharian -II		132	61.00	
			Mangla-Kharian -III		132	61.00	
			Mangla-Scarp -I		132	189.06	
			Mangla-Scarp -II		132	109.03	
			Mangla-Mirpur		132	8.00	

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-2-

11-	Peaking/Base Operation	The loading of the station depends upon the water releases allowed by IRSA and requirement of N.P.C.C. Generally during High Flow Period; it is operated for base load where as during Low Flow Period, it is utilized for peaking.	
12-	Plant Characteristics	Generator Voltage Units(1-10) = 13.2 KV	Power Factor Units (1-10)=0.8 Frequency =50 C/S <u>Automatic Generation Control:</u> Automatic Load Frequency Control is installed on Units 3,4,7&8. <u>Ramping Rate:</u> N.A. <u>Control Metering & Instrumentation:</u> Analogous type.
13-	Training and Development	A training center has been established at Mangla. It is catering to Technical training needs of Operation & Maintenance of Engineers and Self-working in all Hydel Power Stations of WAPDA. In addition to its training programme, the Training Directorate has also been engaged in following activities.	
		i)	<u>Compilation of History of Major Faults in Hydel Power Stations:</u> The training center Mangla has also been assigned the job of compilation of "History of Major Faults in Hydel Power Stations" aimed at sharing the experience amongst the Power Plant Personnel and providing ready made information to the new entrants in the field of Hydro Power Generation. The major faults History has been compiled from 1956 to May 1991 and the work to up date the faults History is in progress.
		ii)	<u>Computer Orientation Course:</u> Computer Orientation Courses are also being run at the Training Center. Initially course for Stenographers/Typists have been started and ultimately, it will be extended to diploma holders/Sub Engineers and Junior/Senior Engineers.

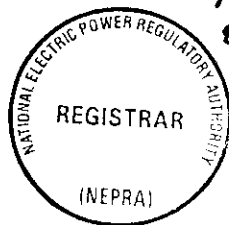


HYDEL POWER STATION

WARSAK

General/Technical information of each Hydel Power Station

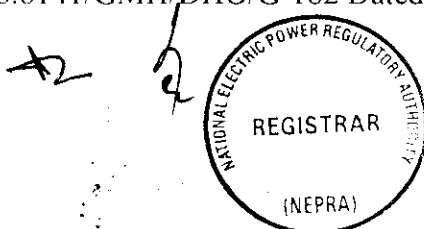
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- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES WARSAK HYDEL POWER STATION

1-	Location		Warsak Power Station is located on River Kabul at about 30 KMs from Peshawar in North West Frontier Province of Pakistan (NWFP) (Annex.1).				
2-	Plant		Type	Total Capacity		No of Units	
			Storage	240 MW *		6	
3-	Head		Maximum		Minimum		
			150 ft		130 ft		
4-	Technology		Francis, No. of Units = 6				
5-	Tunnel		No	Length		Dia	
	Total No. of Tunnel		1			At Intake	At Penstock
	i) No. of Power Tunnels		1	365 ft.		39 ft.	39 ft
	ii) No. of Irrigation Tunnels		2	-		-	-
6-	Due diligence report/ Expected Life		Attached/another 25 Years after completion of rehabilitation.				
7-	Rehabilitation Plan		Warsak Rehabilitation Project is in progress.				
8-	Operation record for last five years						
	Year	Energy Produced	Running Hours	Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability
		MKWH	(%)	(%)	(%)	(%)	(%)
	1997-98	380.992	23.22	0.15	75.31	01.32	24.54
	1998-99	719.061	45.59	1.41	42.64	10.36	55.95
	1999-2000	895.059	52.13	0.27	34.05	13.55	65.68
	2000-2001	917.522	55.67	1.15	19.38	22.79	78.46
	2001-2002	857.752	54.41	1.68	22.04	21.87	76.28
	Operation Constraints		i. Choking at Intake Gates due to trash. ii. Stator temperatures. iii. Heavy silt contents in River Kabul. iv. AAR				
9-	Consents		The Power House was installed with approval of Govt. of Pakistan but the approval is not traceable at present.				
10-	Length of Transmission Line		CCT		Voltage (KV)	Length (KM)	
			Warsak-Peshawar Cantt. -I		132	24.1	
			Warsak-Jamrud -II		132	27.69	
			Warsak-Shahi Bagh -I		132	25.91	
			Warsak-Shahi Bagh -II		132	25.91	
11-	Peaking/Base Operation		Mostly runs as base load, with delivery of peak load for minimum time period during evening.				
12-	Plant Characteristics		Generator Voltage		Power Factor		
			Units(1-6) = 11 KV		Units(1-4) = 1.0		
					Units(5-6) = 0.85		
					Frequency = 50 Cycles		
					Automatic Control = Manual		
13-	Training and Development		Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel organization.				

* Installed Capacity is 242.96MW w.r.t GM Hydel Fax No.6141/GMH/DHO/G-182 Dated 1st November 2004

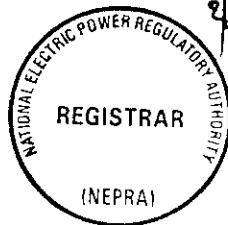


HYDEL POWER STATION

GHAZI BAROTHA

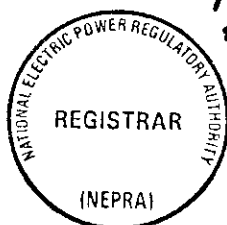
General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



NEW GENERATION FACILITIES OF GHAZI BAROTHA HYDEL POWER STATION

1-	Location	Ghazi Barotha Hydel Power Station is located near Village Barotha 63 Km downstream of Tarbela about 10 KM West of Attack City (Annex.3).		
2-	Plant	Type	Total Capacity	No of Units
		Run-off-the canal with small storage for Peak Hrs.	1450 MW	5
3-	Head	Maximum	Minimum	
		74 meter	69 meter	
4-	Technology	Francis, No. of Units = 5 , (290 MW each		
5-	Tunnel	-		
6-	ESSA	-		
7-	Detailed Feasibility Report	Available in record.		
8-	Resettlement Issues	NIL (Settled)		
9-	Consents	Attached (Annex.4)		
10-	Infrastructure development	Completed		
11-	- Interconnection with N/G - Length of Transmission Lines:-	In completion stage (i)Two circuit 500 KV Tarbela-Brotha-Rawat = 156 KM (ii)Two circuit 500 KVTarbela-Brotha-Ghatti = 80 KM		
12-	Project Cost	Rs 123 Billion		
13-	- Project Schedule - Expected life	Commissioning from May 2003 to April 2004 Civil structure:- 100 years Elect./Mech. Equipment:- 50 years.		
14-	Peaking/Base Operation	Peak load operation		
15-	Plant Characteristics	Generator Voltage	Power Factor	
		Units(1-5) = 18 KV	Units(1-5) = 0.95	
			Frequency = 50 Hz	
			<u>Automatic Generation Control:</u> Metering etc. = Digital	
			<u>Ramping Rate:</u> N.A.	
			<u>Control Metering & Instrumentation:</u> Digital	
16-	System studies, load flow, short circuit, stability.	Already carried out during the feasibility studies.		
17-	Training and Development	Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.		

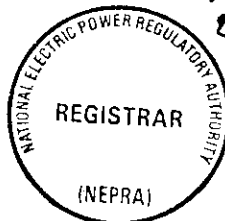


HYDEL POWER STATION

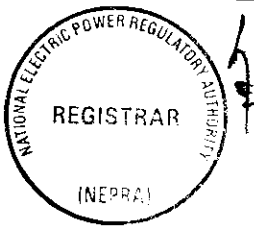
CHASHMA

General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES CHASHMA HYDEL POWER STATION

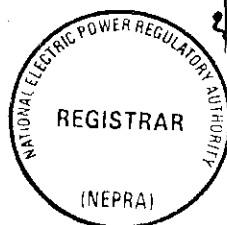
1-	Location	Chashma Hydel Power Station is located on Right abutment of Chashma Barrage in Dist. Mianwali of Punjab Province (Annex.1).					
2-	Plant	Type	Total Capacity		No of Units		
3-	Head	Run of the river	184 MW		8		
4-	Technology	Maximum	Minimum				
5-	Tunnel	13.8 meter	3 meter				
6-	Due diligence report/ Expected Life	Bulb type, No. of Units = 8.					
7-	Rehabilitation Plan	The Power House is fed through 1000 meter long and 136 meter wide Headrace water channel.					
8-	Operation record	Attached/60 Years.					
		Nil					
		The handing over of Units to WAPDA was completed on 27.07.2001. The operation record from July, 2001 to April, 2002 is as under:					
	Month	Energy Produced	Running Hours	Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability
		MKWH	(%)	(%)	(%)	(%)	(%)
	July 01	53.053	79.81	3.66	16.53	-	79.81
	Aug. 01	73.844	92.31	1.34	06.35	-	92.31
	Sep. 01	62.179	93.83	0.32	05.84	-	93.93
	Oct. 01	86.960	92.69	0.24	06.90	0.17	92.86
	Nov. 01	74.740	90.00	-	05.87	4.13	94.13
	Dec. 01	53.789	66.13	0.01	03.51	30.35	96.48
	Jan. 02	37.067	42.38	0.07	00.52	57.03	99.41
	Feb. 02	42.697	58.89	0.02	00.56	40.53	99.42
	Mar. 02	50.363	62.88	0.13	00.91	36.08	98.96
	Apr. 02	65.469	81.95	-	00.54	17.51	99.46
	2001-02	72.918	79.81	2.32	04.26	15.28	95.09
8	Operation Constraints	1. The annual Power Generation depends upon Head available and irrigation indent given by IRSA. 2. Choking of Intake Gates due to heavy trash.					
9-	Consents	Attached (Annex.2)					
10-	Length of Transmission Line	CCT		Voltage (KV)	Length (KM)		
		i. Chashma-Wanbuchran-1		132	33.357		
		ii. Chashma-Wanbuchran-2		132	33.357		
		iii. Chashma Left Bank-1		132	1.71		
		iv. Chashma Left Bank-2 (future)		132	1.71		
11-	Peaking/Base Operation	It is run off the river plant and loading generally depends upon the water releases available/allowed by IRSA from Chashma Barrage.					
12-	Plant Characteristics	Generator Voltage		Power Factor			
		Units(1-8) = 11 KV		Units(1-8) = 0.90			
				Frequency = 50 C/S			
				Automatic Generation Control: Manual			
				Ramping Rate: N.A.			
				Control Metering & Instrumentation: Analogous type.			
13-	Training and Development	Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.					

HYDEL POWER STATION

RENALA

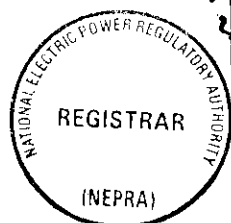
General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES RENALA HYDEL POWER STATION

1-	Location		Renala Hydel Power Station is located on Lower Bari Doab Canal near Renala Town Distt. Okara (Annex.1).				
2-	Plant		Type	Total Capacity		No of Units	
			Run of Canal	1.1 MW		5	
3-	Head		Maximum		Minimum		
			10 ft		7 ft.		
4-	Technology		Francis, (Horizontal Shaft) No. of Units = 5				
5-	Penstock		No.	Length		Diameter internal	
	Total No. of Penstock		N.A.				
6-	Due diligence report/ Expected life		Attached/15 Years				
7-	Rehabilitation Plan		Nil				
8-	Operation record for last five years						
	Year	Energy Produced	Running Hours	Forced Outage Hours -	Maintenance Hours	Stand by Hours	Operation Availability
		MKWH	(%)	(%)	(%)	(%)	(%)
	1997-98	4.789	74.73	-	19.57	06.00	80.73
	1998-99	4.473	68.90	-	21.28	09.82	78.72
	1999-2000	5.460	82.98	-	06.51	10.51	93.49
	2000-2001	3.611	65.03	-	10.97	24.11	89.13
	2001-2002	2.625	55.62	1.34	08.84	34.18	89.90
	Operation Constraints		The annual Power Generation depends upon the water allocation in the canal.				
9-	Consents		The Power House was installed with approval of Govt. of India but the approval is not traceable at present.				
10-	Length of Transmission Line (Radial feeder for Lift Irrigation System).		CCT			Voltage	Length
			11 KV feeder EHKL.			(KV)	(KM)
						11	60
11-	Peaking/Base Operation		Meant for local load of Lift Irrigation Pumping Stations.				
12-	Plant Characteristics		Generator Voltage		Power Factor		
			Units(1-5)=3.3 KV		Units (1-5) = 0.8		
					Frequency = 50 C/S		
					Automatic Generation Control: Manual		
					Ramping Rate: N.A.		
					Control Metering & Instrumentation: Analogous type.		
13-	Training and Development		Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.				

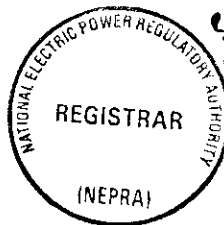


HYDEL POWER STATION

CHICHOKI

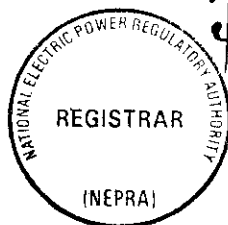
General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES CHICHOKI HYDEL POWER STATION

1-	Location		Chichoki Hydel Power Station is located on Upper Chenab Canal (UCC) near village Joyanwala about 20 KMs from Sheikhpura (Annex.1).					
2-	Plant		Type	Total Capacity		No of Units		
			Run of Canal	13.2 MW		3		
3-	Head		Maximum		Minimum			
			27.7 ft		22.3 ft			
4-	Technology		Kaplan, No. of Units = 3					
5-	Penstock		No.	Length		Diameter internal		
	Total No. of Penstock		N.A.					
6-	Due diligence report/ Expected life		Attached/30 years					
7-	Rehabilitation Plan		Nil					
8-	Operation record for last five years							
	Year	Energy Produced	Running Hours	Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability	
		MKWH	(%)	(%)	(%)	(%)	(%)	
	1997-98	43.915	54.97	4.27	08.18	32.57	87.54	
	1998-99	29.750	38.80	2.11	06.67	52.42	91.22	
	1999-2000	28.420	32.90	9.75	08.36	48.97	81.87	
	2000-2001	22.877	29.43	2.42	09.14	59.00	88.43	
	2001-2002	25.776	33.82	0.02	09.83	56.15	89.97	
	Operation Constraints		The annual Power Generation depends upon the water allocation in the canal.					
9-	Consents		Attached (Annex.6)					
10-	Length of Transmission Line		CCT				Voltage (KV)	Length (KM)
			Chichokimallian-Attabad-Shaikhpora				66	18
11-	Peaking/Base Operation		Operated as base load according to the water share in the Upper Chanab Canal.					
12-	Plant Characteristics		Generator Voltage		Power Factor			
			Units (1-3)=3.3 KV		Units (1-3) = 0.8			
					Frequency = 50 C/S			
					Automatic Generation Control: Manual			
					Ramping Rate: N.A.			
					Control Metering& Instrumentation: Analogous type.			
13-	Training and Development		Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.					

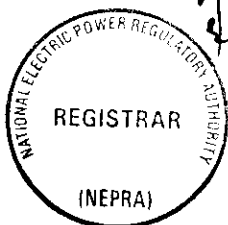


HYDEL POWER STATION

NANDIPUR

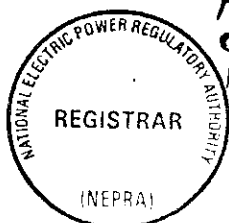
General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES NANDIPUR HYDEL POWER STATION

1-	Location		Nandipur Hydel Power Station is located on Upper Chenab Canal (UCC) about 10 KMs from Gujranwala on Gujranwala Sialkot Road (Annex.1).						
2-	Plant		Type	Total Capacity		No of Units			
3-	Head		Run of Canal	13.8 MW		3			
4-	Technology		Maximum	Minimum					
5-	Penstock		24.4 ft	19.5					
6-	Total No. of Penstock		Kaplan, No. of Units = 3						
7-	Due diligence report/ Expected Life		No.	Length		Diameter internal			
8-	Rehabilitation Plan		N.A.						
9-	Operation record for last five years		Attached/30 years						
10-	Year		Energy Produced		Running Hours -	Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability
11-	MKWH		Running Hours -		Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability	
12-	1997-98		45.4429		54.33	0.008	7.23	38.43	92.76
13-	1998-99		37.6488		45.20	0.013	5.22	49.56	94.76
14-	1999-2000		37.0967		47.20	0.007	9.10	43.70	90.90
15-	2000-2001		33.6614		41.95	0.003	10.83	47.22	89.17
16-	2001-2002		34.792		41.89	0.006	12.27	45.84	87.73
17-	Operation Constraints		The annual Power Generation depends upon the water allocation in the canal.						
18-	Consents		Attached (Annex.5)						
19-	Length of Transmission Line		CCT		Voltage (KV)		Length (KM)		
20-	Nandipur-Daska		66		20				
21-	Nandipur-Gujranwala		66		10				
22-	Peaking/Base Operation		Operated as base load according to the water share in the Upper Chanab Canal.						
23-	Plant Characteristics		Generator Voltage		Power Factor				
24-	Units (1-3) = 3.3 kv		Units (1-3) = 0.8						
25-	Frequency = 50 C/S								
26-	Automatic Generation Control: Manual								
27-	Ramping Rate: N.A.								
28-	Control Metering & Instrumentation: Analogous type.								
29-	Training and Development		Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.						

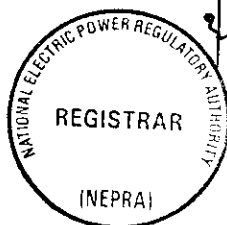


HYDEL POWER STATION

SHADIWAL

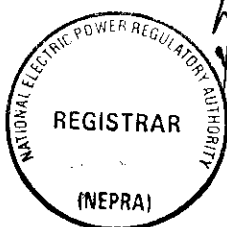
General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES SHADIWAL HYDEL POWER STATION

1-	Location		Shadiwal Hydel Power Station is located on Upper Jhelum Canal (UJC) about 133 KMs Down Stream of Mangla and about 7 KMs from Gujrat (Annex.1).				
2-	Plant		Type	Total Capacity		No of Units	
3-	Head		Run of Canal	13.5 MW		2	
4-	Technology		Maximum	Minimum			
5-	Penstock		24.5 ft		17 ft		
6-	Due diligence report/ Expected Life		Kaplan, No. of Units = 2				
7-	Rehabilitation Plan		No.	Length		Diameter internal	
8-	Operation record for last five years		N.A.				
	Year	Energy Produced	Running Hours	Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability
		MKWH	(%)	(%)	(%)	(%)	(%)
	1997-98	34.408	47.99	0.01	7.57	44.43	92.42
	1998-99	37.468	57.37	0.04	7.17	35.42	92.79
	1999-2000	37.693	58.19	0.10	11.30	30.41	88.60
	2000-2001	42.666	64.40	-	08.29	27.31	91.71
	2001-2002	37.401	63.90	0.03	9.55	25.52	89.42
	Operation Constraints		The annual Power Generation depends upon the water allocation in the Upper Jhelum Canal regulated by the Irrigation Department.				
9-	Consents		Attached (Annex.4)				
10-	Length of Transmission Line		CCT		Voltage (KV)	Length (KM)	
11-	Peaking/Base Operation		Shadiwal-Gujrat		132	9.6	
12-	Plant Characteristics		Generator Voltage		Power Factor		
			Units (1-2)=11 KV		Units (1-2) = 0.9		
					Frequency = 50 C/S		
					Automatic Generation Control: Manula		
					Ramping Rate: N.A.		
					Control Metering & Instrumentation: Analogous type.		
13-	Training and Development		Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.				



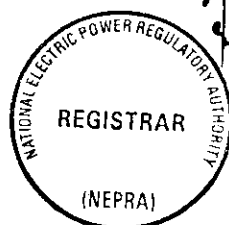
HYDEL POWER STATION

RASUL

General/Technical information of each Hydel Power Station

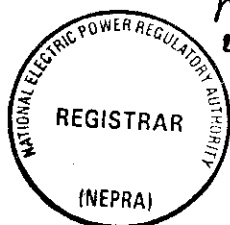
- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.

+2



EXISTING GENERATION FACILITIES RASUL HYDEL POWER STATION

1-	Location		Rasul Hydel Power Station is located on Upper Jhelum Canal (UJC) about 74 KMs Down Stream of Mangla (Annex.1).				
2-	Plant		Type	Total Capacity		No of Units	
3-	Head		Run of Canal	22 MW		2	
4-	Technology		Maximum		Minimum		
5-	Penstock		85.05 ft		80.35 ft		
6-	Total No. of Penstock		Kaplan, No. of Units = 2				
7-	Due diligence report/ Expected life		No.	Length		Diameter internal	
8-	Rehabilitation Plan		2	281 ft.		21 ft.	
9-	Operation record for last five years		Attached/30 years				
10-	Year		Construction of spillway is under process for optimum output.				
11-	Energy Produced		Construction of spillway is under process for optimum output.				
12-	MKWH		Construction of spillway is under process for optimum output.				
13-	Running Hours		Construction of spillway is under process for optimum output.				
14-	Forced Outage Hours		Construction of spillway is under process for optimum output.				
15-	Maintenance Hours		Construction of spillway is under process for optimum output.				
16-	Stand by Hours		Construction of spillway is under process for optimum output.				
17-	Operation Availability		Construction of spillway is under process for optimum output.				
18-	1997-98		Construction of spillway is under process for optimum output.				
19-	1998-99		Construction of spillway is under process for optimum output.				
20-	1999-2000		Construction of spillway is under process for optimum output.				
21-	2000-2001		Construction of spillway is under process for optimum output.				
22-	2001-2002		Construction of spillway is under process for optimum output.				
23-	Operation Constraints		The annual Power Generation depends upon the water allocation in the canal regulated by the Irrigation Department.				
24-	Consents		Attached (Annex.3)				
25-	Length of Transmission Line		CCT		Voltage (KV)		Length (KM)
26-	Rasul-Malikwal				66		38.4
27-	Rasul-Malikwal –II				66		38.4
28-	Rasul-Kharian (D/C Bundled)				132		42.0
29-	Rasul-Kharian (Bundled)				132		42.0
30-	Peaking/Base Operation		Operated as base load according to the water share in the canal.				
31-	Plant Characteristics		Generator Voltage		Power Factor		
32-	Units (1-2) =11 KV				Units (1-2) = 0.88		
33-					Frequency = 50 C/S		
34-					Automatic Generation Control: Manual.		
35-					Ramping Rate: N.A.		
36-					Control Metering & Instrumentation: Analogous type.		
37-	Training and Development		Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.				

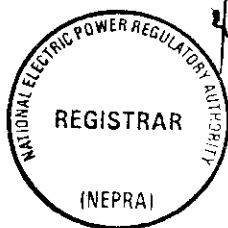


HYDEL POWER STATION

DARGAI

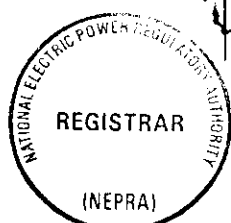
General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES DARGAI HYDEL POWER STATION

1-	Location		Dargai Hydel Power Station is located on Upper Swat Canal in Malakand Agency near Dargai Distt. Malakand Agency (Annex.1).				
2-	Plant		Type	Total Capacity		No of Units	
			Run of canal	20 MW		4	
3-	Head		Maximum		Minimum		
			243 ft		239 ft		
4-	Technology		Francis Vane Turbine (Horizontally Mounted) No. of Units = 4				
5-	Penstock	No.	Length		Dia		
	Total No. of Pensotck		N.A.				
6-	Due diligence report/ Expected Life		Attached/25 years.				
7-	Rehabilitation Plan		Nil				
8-	Operation record for last five years						
	Year	Energy Produced	Running Hours	Forced Outage Hours	Mainte- nance Hours	Stand by Hours	Operation Availability
		MKWH	(%)	(%)	(%)	(%)	(%)
	1997-98	166.455	77.43	0.70	21.93	-	77.43
	1998-99	137.764	89.50	3.94	06.50	-	89.50
	1999-2000	137.923	88.81	1.18	10.23	-	88.81
	2000-2001	133.421	85.57	-	-	-	-
	2001-2002	134.970	84.87	-	-	-	-
	Operation Constraints		Trash during flood season.				
9-	Consents		The Power House was installed with approval of Govt. of Pakistan but the approval is not traceable at present.				
10-	Length of Transmission Line		CCT		Voltage (KV)	Length (KM)	
			Dargai-Mardan		132	59.27	
			Dargai-Jabban		66	5.51	
			Dargai-Chakdara		132	30.07	
11-	Peaking/Base Operation		Runs on base load.				
12-	Plant Characteristics		Generator Voltage		Power Factor		
			Units (1-4) = 11 KV		Units (1-4) = 0.85		
					Frequency = 50 C/S		
					Automatic Generation Control: Manual		
					Ramping Rate: N.A.		
					Control Metering & Instrumentation: Analogous type		
13-	Training and Development		Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.				

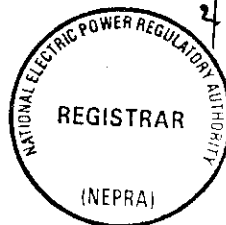


HYDEL POWER STATION

JABBAN

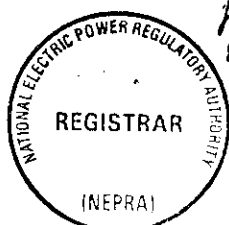
General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES JABBAN HYDEL POWER STATION

1-	Location	Jabban Hydel Power Station is located on Upper Swat Canal in Footing of Malakand towards North of Dargai Town , Malakand Agency (Annex.1).					
2-	Plant	Type	Total Capacity		No of Units		
3-	Head	Run of canal	19.6 MW		5		
		Maximum			Minimum		
		250 ft			245 ft		
4-	Technology	Francis Vane Turbine (Horizontally Mounted). No. of Units = 5					
5-	Penstock	No.	Length		Dia		
	Total No. of Penstock				At Intake	At Penstock	
	No. of Power Tunnels		Benton Tunnel 3.5 Km. Aux. Tunnel 3.5 Km Burkit Tunnel 0.91 Km		10 ft. 18 ft. 10 ft.	- - -	
6-	Due diligence report/ Expected Life	Attached/25 years.					
7-	Rehabilitation Plan	NIL.					
8-	Operation record for last five years						
	Year	Energy Produced	Running Hours	Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability
		MKWH	(%)	(%)	(%)	(%)	(%)
	1997-98	102.134	73.47	7.51	19.02	-	73.47
	1998-99	129.272	81.83	5.68	12.49	-	81.83
	1999-2000	132.105	85.26	5.32	09.37	-	85.26
	2000-2001	111.377	67.60	-	-	-	-
	2001-2002	123.695	-	-	-	-	-
	Operation Constraints	Trash during flood season.					
9-	Consents	The Power House was installed with approval of Govt. of Pakistan but the approval is not traceable at present.					
10-	Length of Transmission Line	CCT		Voltage (KV)	Length (KM)		
		Jabban-Dargai Tielink		66	5.51		
		Jabban-Mardan -I		66	46.74		
		Jabban-Mardam -II		66	46.74		
		Jabban-Chaldara (Disconnected & Spare)		66	26.58		
11-	Peaking/Base Operation	Mostly runs as base load, with delivery of peak load for minimum time period during evening.					
12-	Plant Characteristics	Generator Voltage		Power Factor			
		Units (1-5) = 11KV		Units (1-5) = 0.85			
				Frequency = 50 C/S			
				Automatic Generation Control: Manual			
				Ramping Rate: N.A.			
				Control Metering & Instrumentation: N.A.			
13-	Training and Development	Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.					

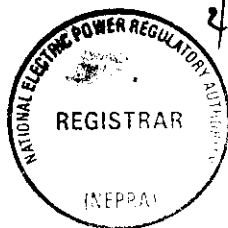


HYDEL POWER STATION

CHITRAL

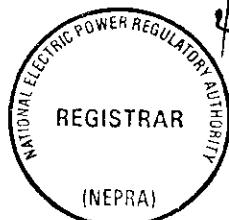
General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.



EXISTING GENERATION FACILITIES CHITRAL HYDEL POWER STATION

1-	Location		Chitral Hydel Power Station is located on Lutko River, Garam Chashma Road 7 kMs East of Chitral Town (Annex.1).				
2-	Plant		Type	Total Capacity		No of Units	
3-	Head		Run of canal	1 MW		4	
			Maximum		Minimum		
4-	Technology		110 ft		106 FT.		
			a) Units 1 & 2 QSSBERGER (Cross Flow).				
5-	Penstock		b) Units 3 & 4 Francis (Horizontal)				
	Total No. of Penstock		No.	Length		Dia	
6-	Due diligence report/ Expected Life		N.A.				
7-	Rehabilitation Plan		Attached/25 years				
8-	Operation record for last five years		Nil				
	Year	Energy Produced	Running Hours	Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability
		MKWH	(%)	(%)	(%)	(%)	(%)
	1997-98	4.004	86.86	11.43	1.71	-	86.86
	1998-99	4.199	88.38	07.62	4.00	-	88.38
	1999-2000	4.212	90.65	01.18	8.17	-	90.65
	2000-2001	4.606	82.06	-	0.82	17.12	99.18
	2001-2002	3.984	79.68	-	1.30	19.02	98.70
	Operation Constraints		Nil				
9-	Consents		The Power House was installed with approval of Govt. of Pakistan but the approval is not traceable at present.				
10-	Length of Transmission Line		CCT			Voltage (KV)	Length (KM)
			11 KV Feeders:				
			Feeding consumers directly			-	-
			Without Grid Station.				
11-	Peaking/Base Operation		Chitral Hydel Power House is not synchronized with National Grid directly feeds a separate 11 KV line according to considerable variation in load during routine and peak hours.				
12-	Plant Characteristics		Generator Voltage		Power Factor		
			Units (1-4)=415 V		Unit (1-4)	= 0.96	
					Frequency	= 50 C/S	
					Automatic Control = Manual		
13-	Training and Development		Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.				

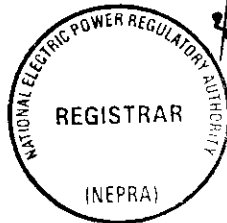


HYDEL POWER STATION

KURRAM GARHI

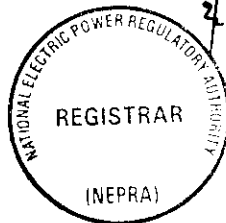
General/Technical information of each Hydel Power Station

- Location (Location maps, site map).
- Plant: run of the river/run of canal/storage.
- Head: minimum, maximum.
- Technology: Francis, Pelton etc, size and number of units.
- Tunnel (s) if existing: length, diameter.
- Rehabilitation plan, previous rehabilitation programmes.
- Operations record for the last five years, operation constraints.
- Consents.
- Length of transmission lines.
- Peaking/base load operation.
- Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control, metering and instrumentation.
- Training and development.

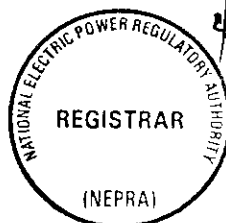
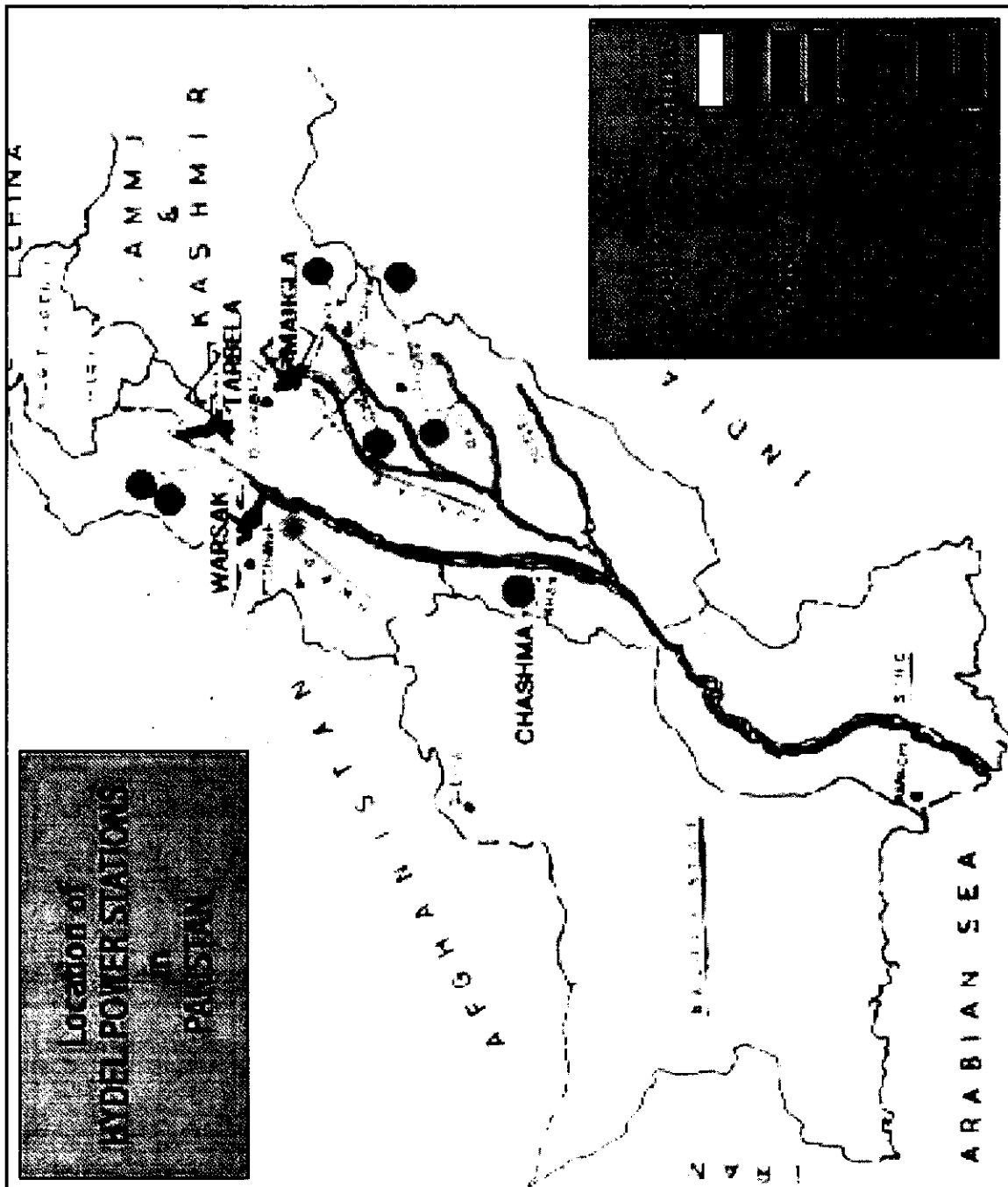


EXISTING GENERATION FACILITIES KURRAM GARHI HYDEL POWER STATION

1-	Location	a) Kurram Garhi Power Station No.1 located at distance of 12 KMs in West North of Bannu City. b) Kurram Garhi Power Station No.2 located at distance of 8 KMs in West North of Bannu City. (Annex.1) c) Both stations are located on River Kurram.					
2-	Plant	Type	Total Capacity			No of Units	
		Run of canal	4 MW			4	
3-	Head	Maximum			Minimum		
		60 ft.			60 ft.		
4-	Technology	Francis, No. of Units = 2.					
5-	Tunnel	No.	Length			Dia	
	Total No. of Tunnel					At Intake	At Penstock
	No. of Power Tunnels		Penstock length – 29.7 Meters			1650 mm	-
6-	Due diligence report/ Expected Life	Attached/30 years-					
7-	Rehabilitation Plan						
8-	Operation record for last five years						
	Year	Energy Produced	Running Hours	Forced Outage Hours	Maintenance Hours	Stand by Hours	Operation Availability
		MKWH	(%)	(%)	(%)	(%)	(%)
	1997-98	29.661	90.47	0.33	08.68	00.52	90.99
	1998-99	24.655	81.00	2.54	16.19	00.27	81.27
	1999-2000	18.243	70.00	0.05	00.13	29.37	99.37
	2000-2001	10.999	52.68	1.39	00.13	24.99	77.67
	2001-2002	13.225	58.80	1.77	10.32	29.11	87.91
	Operation Constraints	Choking of intake gates in flood seasons due to trash.					
9-	Consents	The Power House was installed with approval of Govt. of Pakistan but the approval is not traceable at present.					
10-	Length of Transmission Line	CCT			Voltage (KV)	Length (KM)	
		Kurram Garhi-Bannu			66	16.37	
11-	Peaking/Base Operation	Base Load.					
12-	Plant Characteristics	Generator Voltage			Power Factor		
		Units (1-4) = 11 KV			Units (1-4) = 0.8		
					Frequency = 50 C/S		
					Automatic Control = Manual		
13-	Training and Development	Training facilities are available at Hydel Training Centre, Mangla for the whole Hydel Organization.					

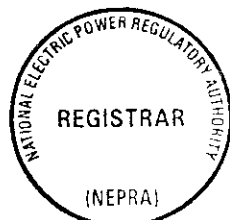


Annex-I



Generation Licence to
Hydel Power Stations
WAPDA, WAPDA HOUSE, LAHORE

OTHER DETAILS



Regulation 3(5)(b)

PROFILE OF APPLICANT

WAPDA was established in 1959 under Wapda Act 1958 and took over all the existing Thermal & Hydel Generating Units having total capacity of 119MW. In order to put the country on fast track of development, the task of power development was under taken by Wapda for executing a number of Hydel & Thermal Generation Projects due to which the generating capacity rose to 636MW in 1964-65, 1331MW in 1970, 3000MW in 1980, 7000MW in 1990, about 15000MW in 2000 and present capacity is 17215MW as per following data.

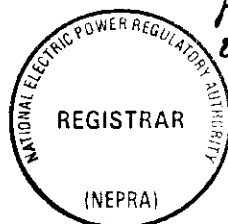
Hydel	6460 MW (including Ghazi Barotha)
Thermal	4685 MW
IPPs	<u>6070 MW</u>
Total Capacity	<u>17215 MW</u>

Wapda Hydel Organization being part & parcel of Wapda was established in the present set up in 1974, headed by a General Manager in Wapda House Room No.186. The purpose of this organization was:

- 1) To control operation & maintenance of existing Hydel Power Station.
- 2) To give technical assistance to Wapda for development & promotion of Hydro Power in the country being cheaper & environment friendly source of energy.

Since 1974, the Hydel Organization successfully carried out operation & maintenance of all Hydel Power Stations working under its administrative and technical control.

G licence



The office of General Manager(Hydel) is a subordinate office of Water & Power Development Authority(WAPDA) which comprised of Chairman and three Members i.e. Member(Power), Member(Water) & Member(Finance).

The office of General Manager (Hydel) consists of following staff in the head office:-

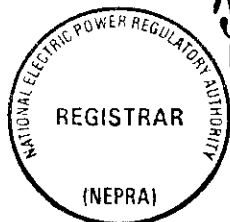
- 1) General Manager(Hydel) WAPDA, Wapda House, Lahore.
- 2) Chief Engineer Hydel Operation along with one Director, two Deputy Directors, one Assistant Director & supporting Tech./Clerical Staff.
- 3) Chief Engineer Hydel Development along with one Director, one Deputy Director & supporting Staff.
- 4) Manager Finance (Hydel) along with Sr. B&AO, B&AOs & supporting Accounts Staff.
- 5) Deputy Director (Admn.) along with one Sr. Supdt. & supporting Clerical Staff.
- 6) Director Hydel Civil, along with one Assistant Director & supporting Staff.

The detail of Hydel Power Stations working under the control of WAPDA is as under:

1) Hydel Power Station Tarbela.

Tarbela Power Station consisting of Power Station No.1, having 1750MW capacity (10 units of 175MW each) & Power Station No.2 having 1728MW capacity (04 units of 432MW each). Both the Power Stations are well equipped with Electrical, Mechanical & Protection Workshops/Labs. & Testing/Measuring equipment. Under the Chief Engineer(Power) Tarbela, there are three Resident

G licence



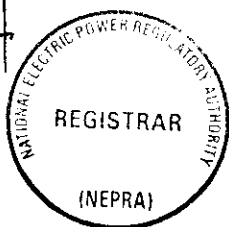
Engineers each for Electrical, Mechanical & Protection. Under each Resident Engineer, there are Senior Engineers, Junior Engineers, Foremen & other Technical Staff meant for maintenance of the plant. Hospital, Mosques, Market, Clubs, Community Center and Play Grounds are also provided for the employees of the Power Station.

2) Hydel Power Station Ghazi Barotha.

Ghazi Barotha Power Station is under commissioning stage will have total installed capacity of $5 \times 290\text{MW} = 1450\text{MW}$. Under Chief Engineer (M&E), there are 3 Resident Engineers i.e. Resident Engineer (Electrical), Resident Engineer (Mechanical), Resident Engineer (Protection) & Resident Engineer (Gates) common for Ghazi Barotha & Tarbela. The Project Staff along with Consultants are also under Supervision of Chief Engineer (M&E).

3) Hydel Station Mangla & Five Small Hydel Power Stations(Punjab)

Mangla Power Station has installed capacity of $10 \times 100\text{MW} = 1000\text{MW}$. Under Chief Engineer, Mangla, six Resident Engineers/ S.Es are working i.e. Resident Engineer Power Station, Resident Engineer, Civil, S.E. Small Hydels, S.E. Surveillance, Director Training, P.D. Mangla Raising Project & S.E. Hydrology. Mangla Power House has provided all the necessary protection/ measuring & testing equipments, workshops & labs for routine & periodical maintenance of Plant & Auxiliaries, Five Small



G licence

Page 36 of 39 - Schedule - 1

Hydel Power Stations i.e. Rasul(22MW), Shadiwal(13.MW), Nandipur(13.8MW) Chichoki((13.2MW) & Renala(1.1MW) are also attached with Chief Engineer, Mangla under the supervision of S.E. Small Hydel Power Station. Mangla Training Centre is meant for Basic & Advanced, Training of Hydel Engineer & Tech. Staff. Hospital, School, Mosques, Markets, Clubs, Community Center & Play Grounds are available for social activities and welfare of the employees.

4) Hydel Power Station Warsak & Four Small Hydel Power Stations(NWFP)

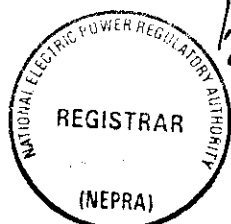
Warsak Power Station with installed capacity of 240MW (6X40MW) was commissioned in 1960. Under Chief Engineer Warsak, there is Resident Engineer Power Station responsible for Operation & Maintenance of Power House & a Project Engineer supervising the rehabilitation work. The Power House is well equipped with workshops, labs. testing & measuring instruments.

The Small Hydel Power Stations in NWFP i.e. Dargai(20MW), Jabban(19.6MW), Kurram Garhi (4MW) & Chitral (1MW) are also working under Chief Engineer, Warsak in a smooth manner.

5) Hydel Power Station Chashma.

It is a new Power Station having bulb turbines commissioned in 2000-2001 having installed capacity of 184MW (8 X 23MW).

G licence

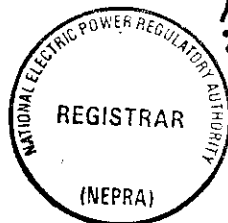


Under Chief Engineer/P.D. Chashma, R.E. Chashma Power Station is controlling the Power House with the help of Operation & Maintenance Staff. All the maintenance facilities like Workshop, Labs., Testing & Measuring instruments are available at Power Station.

WAPDA Hydel Organization is very efficiently maintaining all the Hydel Power Stations which have very important role in the development of the country.

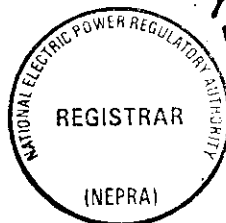
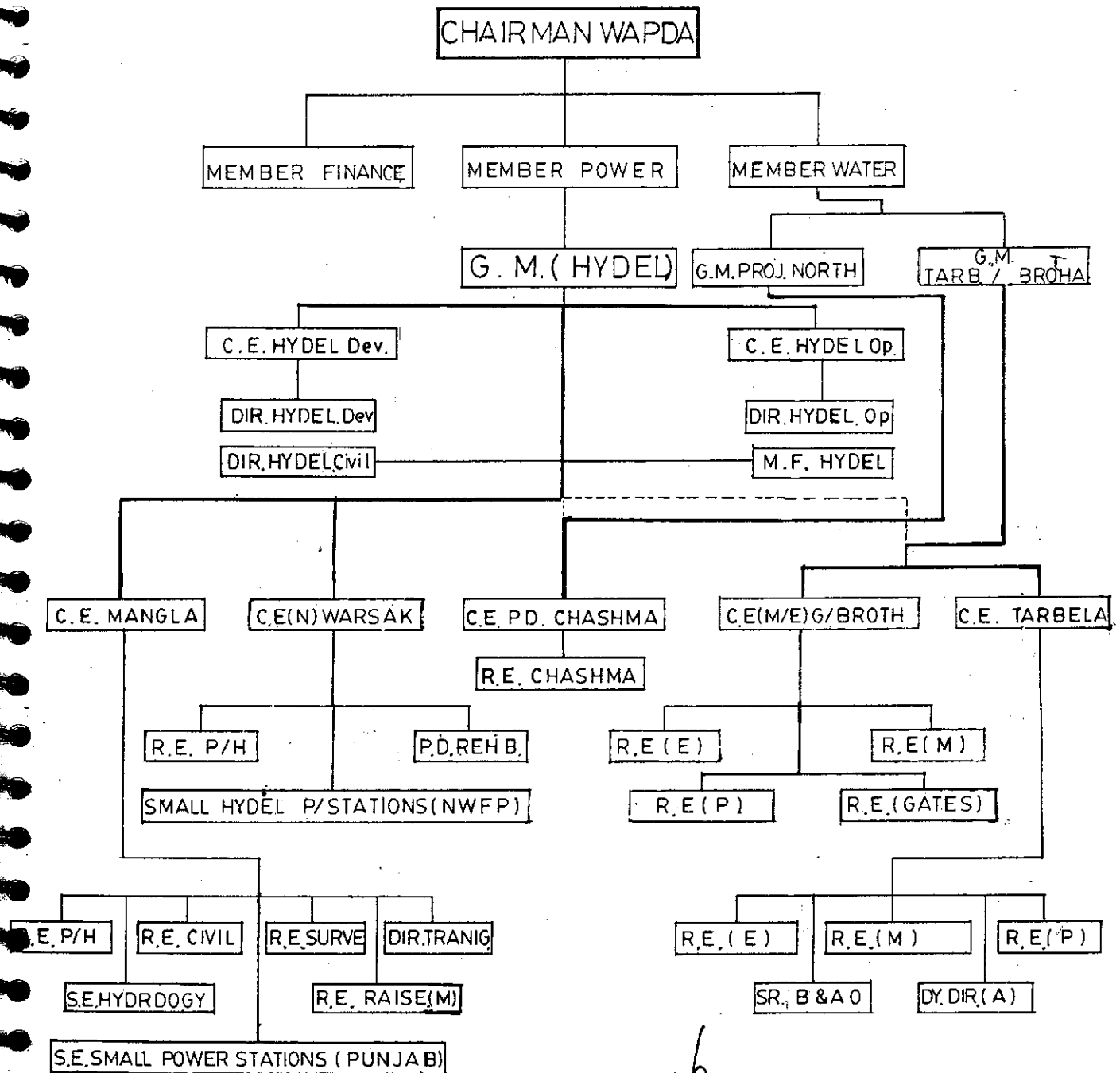
WAPDA is making all out efforts to develop & utilize the Hydel Power Potential to max. possible extent being cheaper & environment friendly source of energy.

The Organizational chart of Wapda Hydel formation is also attached.



ORGANIZATION CHART

Generation Licence
Hydel Power Stations
WAPDA, WAPDA HOUSE LAHORE

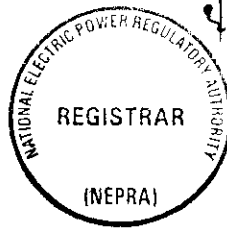


SCHEDULE – II

SCHEDULE – II

The net capacity of the licensee's generation facilities

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GENERATION CAPACITY

(Hydel Power Stations)

S. No.	Station Name	No. of Units	Type	Total Capacity
1	TARBELA Hydel Power Station	14	Storage	3478 MW
2	MANGLA Hydel Power Station	10	Storage	1000 MW
3	WARSAK Hydel Power Station	6	Storage	242.96 MW
4	GHAZI BAROTHA Hydel Power Station	05	Run-off-the canal with small storage for Peak Hrs.	1450 MW
5	CHASHMA Hydel Power Station	08	Run of the river	184 MW
6	RENALA Hydel Power Station	05	Run of Canal	1.1 MW
7	CHICHOKI Hydel Power Station	03	Run of Canal	13.2 MW
8	NANDIPUR Hydel Power Station	03	Run of Canal	13.8 MW
9	SHADIWAL Hydel Power Station	02	Run of Canal	13.5 MW
10	RASUL Hydel Power Station	02	Run of Canal	22 MW
11	DARGAI Hydel Power Station	04	Run of Canal	20 MW
12	JABBAN Hydel Power Station	05	Run of Canal	19.6 MW
13	CHITRAL Hydel Power Station	04	Run of Canal	1 MW
14	KURRAM GARHI Hydel Power Station	04	Run of Canal	4 MW

