

Registrar

National Electric Power Regulatory Authority Islamic Republic of Pakistan

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No. NEPRA/R/LAG-23/ 32 5-30

January 09, 2015

General Manager (Hydel) Operations Water and Power Development Authority (WAPDA) 186 - WAPDA House, Shahrah-e-Quaid-e-Azam, Lahore

Subject: Modification-IV in Generation Licence No. GL(Hydel)/05/2004, dated 03.11.2004 – WAPDA for its Hydel Power Stations

It is intimated that the Authority has approved "Licensee Proposed Modification" in Generation Licence No. GL(Hydel)/05/2004 (issued on November 03, 2004) in respect of Water and Power Development Authority (WAPDA) for its Hydel Power Stations pursuant to Regulation 10(11) of the NEPRA Licensing (Application & Modification Procedure) Regulations, 1999.

2. Enclosed please find herewith determination of Authority in the matter of Licensee Proposed Modification of WAPDA of its Hydel Power Stations along with Modification-IV in the Generation Licence No. GL/(Hydel)/05/2004 as approved by the Authority.

Encl:/As above



(Syed Safeer Hussain)

Copy to:

- 1. Secretary, Ministry of Water and Power, Government of Pakistan, Islamabad
- 2. Secretary, Ministry of Finance, Government of Pakistan, Islamabad
- 3. Chief Executive Officer, NTDC, 414-WAPDA House, Lahore
- 4. Chief Operating Officer, CPPA, 107-WAPDA House, Lahore
- 5. Director General, Pakistan Environmental Protection Agency, Plot No. 41, Street No. 6, H-8/2, Islamabad.

National Electric Power Regulatory Authority (NEPRA)

<u>Determination of Authority</u> <u>in the Matter of Licensee Proposed Modification (LPM) of</u> <u>Water and Power Development Authority</u> <u>(WAPDA)</u>

January 05, 2015 Application No. LAG-23

(A). Background

(i). The Authority has granted a Generation Licence [No. GL (HYDEL) /05/2004, dated November 3, 2004 and subsequent Modifications made thereto] to WPDA for a cumulative Installed Capacity of 8547.56 MW.

(ii). The above mentioned Generation Licence has been granted for twenty two (22) distinct Hydel Power Stations, located across the country in all the Provinces.

(B). <u>Communication of LPM</u>

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(i). In accordance with Regulation-10 of the NEPRA Licensing (Application & Modification Procedure) Regulations, 1999 (the Regulations), WAPDA communicated an LPM on January 27, 2014 for inclusion of two (02) new Hydel Power Stations/Plants including (a). Diamer Basha Dam Project/ Hydropower Project-DBHPP (4500 MW) and (b). Dasu Hydropower Project-DHPP (4320 MW).

(ii). WAPDA in "the text of the proposed modification" submitted that it intended to get included two of its future projects namely DBHPP and DHPP in its Generation Licence. Regarding "the statement of the reasons in support of the modification" WAPDA submitted that it is actively pursuing its development program and for this purpose an application for modification in Generation License has been submitted to the Authority in respect of near to completion and financial close development projects, due to main reasons (a). To offer details of WAPDA, hydro power development projects like; description and

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manner of execution, estimate of costs and benefits, environmental impact etc. for scrutiny and concurrence by NEPRA, (b). To justify the consumption of return on investment allowed by NEPRA in tariff of WAPDA on hydro power development projects as per Public Sector Development Programme (PSDP) approved by Govt. of Pakistan (GoP) during the construction phase, and (c). To facilitate NEPRA to periodically monitor development activities vis-à-vis expenditure as planned. Regarding the "statement of the Impact on the Tariff, Quality of Service (QoS) and the performance by the Licensee of its obligations under the Licence", WAPDA submitted that a detailed analysis regarding projected impact in the matter, justifying the inclusion of the above power plants has already been submitted through a separate Tariff Petition. About the QoS and Performance , WAPDA submitted that the inclusion of the above power plants would improve and forced outages of existing power stations will be reduced due to better planned maintenance.

(C). Processing of LPM

(i). After completion of all the required information by WAPDA, the Registrar submitted the case for consideration of the Authority. The Authority considered the communicated LPM in its Regulatory Meeting held on March 06, 2014 and accepted the same for further processing.

(ii). The Registrar in terms of Regulation-10(4) of Regulations published on March 30, 2014 a notice about the communicated LPM in one English and one Urdu daily newspapers, informing general public, stakeholders and interested affected parties about the same and invited for comments in favor or against the LPM.

(iii). Furthermore, separate notices were also sent to Experts, Government Ministries and Representative Organizations etc. for submitting their views and comments in the matter.



(D). <u>Comments of Stakeholders</u>

(i). In reply to the above, the Authority received comments from four (04) stakeholders. These included Central Power Purchasing Agency (CPPA) of National Transmission & Despatch Company Limited (NTDC), Alternative Energy Development Board (AEDB), Ministry of Petroleum and Natural Resources (MoP&NR) and Energy & Power Department Government of Khyber Pakhtunkhwa (EPDGoKPK).

(ii). The salient points of the comments offered by the said mentioned stakeholders are summarized in the following paragraphs: -

- (a). CPPA in its comments stated that it has no objection on modification of Generation License of WAPDA, subject to meeting of all conditions laid down in the NEPRA Licensing (Generation) Rules, 2000 (the Rules) amended to date;
- (b). AEDB in its comments supported the Modification;
- (c). MoP&NR commented that as such no gas is required in for utilization in these projects. Therefore, MoP&NR has no objection to the LPM of WAPDA; and
- (d). EPDGoKPK in its comments objected that DBHPP and DHPP are almost in the same location, on same tributary and having almost similar capacity, therefore the difference in tariff is not understandable. Moreover, as the power generation goes high then per unit cost goes down. Before starting the projects the resettlement be carried out and resettlement funds may immediately be allocated. For DBHPP, as two power houses are located one each in KPK and Gilgit-Baltistan (GB), therefore before starting the project, it is necessary that both the stakeholders sit together to resolve the issue of land disputes as well as NHP. Federal



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Govt. as per Article-157(i) to take concurrence of GoKPK before construction of DHPP.

(iii). The perspective of WAPDA on the aforesaid position of EPDGoKPK was sought. In its rejoinder on the observations of EPDGoKPK, WAPDA submitted that DBHPP is a multipurpose project having dam with live water storage capacity of 6.1 MAF whereas DHPP is run of river project. Cost of dam involved in DBHPP is basic reason for difference in cost and tariff. These issues will be settled when WAPDA will file petition in NEPRA for determination of tariff on completion of the projects. Regarding resettlement issue it was submitted that WAPDA is Government owned organization and GoP is taking care of resettlement issue. Further, Deputy Commissioners of respective areas and Chief Secretaries of KPK and GB are on board with reference to issues regarding settlement. Regarding concurrence of GoKPK on the construction of DHPP, it was submitted that Decision of Council of Common Interest is available in this regard, which has representatives of all provinces.

(iv). The Authority considered the comments of stakeholders and rejoinders of the WAPDA and found the same satisfactory. In view of the said, the Authority considered appropriate to process the application of WAPDA for the modification of its Generation Licence as stipulated in the Regulations and Rules.

(E). Approval of LPM

(i). The importance of electricity in the development of the economy of any country is of imperative nature. The Economic Growth of any country is directly linked with the availability of safe, secure, reliable and cheaper supply of electricity. In view of the said reasons, the Authority is of the considered opinion that for sustainable development, all indigenous power generation resources including Coal, Hydel, Wind, Solar and other Renewable Energy (RE) resources must be developed on priority basis.

(ii). The existing energy mix of the country is heavily skewed towards the costlier thermal power plants, mainly operating on imported furnace oil. The PONER REGISTRAR REGISTRAR NEPRA continuously increasing trend in fuel prices is not only creating pressure on the precious foreign exchange reserves of the country but is also an environmental concern. Therefore, in order to achieve sustainable development it is imperative that all indigenous resources are given priority for power generation and their development is encouraged.

(iii). In view of the above, the Authority contemplates that the initiative of WAPDA for exploiting the hydro potential of the country for power generation very encouraging and vital. This will help in overcoming the severe shortage of electricity in the country and will trigger Industrial growth thereby helping in raising the GDP of the country which is on the decline due to shortage of electricity.

(iv). During the proceedings an issue of applicability of the NEPRA Act, was brought before the Authority. It was pointed out that one of the Power House of DBHPP would be situated in the territory of GB where NEPRA Act is not extended. The Authority has considered the issue and is of the view that in the instant LPM it has been proposed by WAPDA to construct and operate a plant which shall be located in GB to sell electricity in Pakistan. It is relevant to state that from such generation plant the electricity shall be exclusively utilized by the citizens/consumers of Pakistan through WAPDA which is a licensee of NEPRA and located in Pakistan. Besides location of the plant in GB, location of licensee, sale of electricity and prospective consumers shall be from Pakistan. It may also be added that all the investments shall be made by WAPDA for provision of electricity to the consumers of Pakistan therefore, it can be said that WAPDA should be legally entitled to claim costs of construction of the plant. The Authority has also observed that GB has been given legislative and administration powers by the GoP through GB (Empowerment and Self-Governance) Order, 2009. Prime Minister of Pakistan has been made Chairman of the Legislative Assembly of GB. In a Judgment of Supreme Appellate Court of GB reported as 2010 GBLR 1 SUPREME-APPELATE-COURT-GILGIT, it has been held that for all practical purposes GB is a territory of Pakistan within the meaning of Article-1 of the Constitution of Pakistan which defines territories of Pakistan. Therefore in peculiar case the one in hand, WAPDA is entitled to get VERNE from NEPRA being a licensee

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and LPM should not be refused merely on the technical ground. WAPDA is however directed to seek all administrative permissions/consents from council or relevant agencies of GB to carry out with the project.

(v). As regard to impact of tariff of the instant LPM on the consumers, the Authority observes that WAPDA has already been granted tariff for the DBHPP and DHPP projects through determination dated June 27, 2014. WAPDA is directed to strictly comply with the terms and conditions of its earlier tariff determination as well as determination dated June 27, 2014.

(vi). In view of the above, the Authority hereby approves the LPM in terms of Section-26 of the NEPRA Act, specifically when no stakeholder has come forward to oppose the LPM. The LPM is approved and Generation Licence (No. GL (Hydel)/05/2004, dated November 3, 2004) of WAPDA is modified for addition of DBHPP and DHPP thereby increasing the total Installed Capacity of WAPDA (Hydel) to 17359.96 MW from the existing 8547.56 MW.

(vii). The Face Sheet indicating the required changes alongwith Revised/Modified Schedule-I & II of the Generation Licence are attached as Annexure to this determination. The grant of such LPM would be subject to the provisions contained in the NEPRA Act, applicable documents and relevant rules framed there under.

<u>Authority</u>



National Electric Power Regulatory Authority (NEPRA)

Islamabad – Pakistan

GENERATION LICENCE GL(HYDEL)/05/2004

In exercise of the Powers conferred upon the National Electric Power Regulatory Authority (NEPRA) under Section-26 of the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 the Authority hereby modifies the Generation Licence granted to WAPDA (on November 03, 2004 and expiring on November 02, 2034), to the extent of changes mentioned as here under:-

- (i). Installed capacity mentioned in the Face Sheet may be read as 17359.96 MW instead of 8547.56 MW;
- (ii). Changes in Schedule-I attached as Modified/Revised Schedule-I; and
- (iii). Changes in Schedule-II attached as Modified/Revised Schedule-II.

This <u>Modification-IV</u> is given under my hand this <u>09</u> of <u>January</u> <u>Two Thousand & Fifteen</u>

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<u>SCHEDULE-I</u> (Modified/Revised)

Installed/ISO Capacity (MW), De-Rated Capacity at Mean Site Conditions (MW), Auxiliary Consumption (MW) and the Net Capacity at Mean Site Conditions (MW) of the Generation Facilities of Licensee is given in this Schedule.



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LOCATION MAP OF WAPDA HYDEL POWER PROJECTS



<u>Hydel Power Station</u> <u>Tarbela</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Tarbela

PLANT DETAILS

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1.	Loc	ation	On Right Bank, of River Indus at Tarbela in Distt. Swabi, in the province of Khyber Pakhtunkhwa						
	Plant		Type Total C		Capacity	No. of Units			
Ζ.	Plant		Storag	е	3478	B MW		14	
	Head		N	laxin	num	Minimum		um	
J.				440	ft	190 ft		ft	
4.	Tec	hnology	Francis T	urbi	nes	• · · · · · · · · · · · · · · · ·			
	Tun	nel	No.		Leng	th	Dia	ameter	
	Total No. of Tunnel		5		-		At Intake	At Penstock	
5.	(i).	No. of Power Tunnels	3	Т	T1, T2 = 2400 ft. T3 = 2700 ft. T4 = 2700 ft T5 = 3675 ft		45.0 ft.	43.5 ft.	
	(ii).	No. of Irrigation Tunnels	2				45.0 ft.	36.0 ft.	
6.	Mini Use Ger	Minimum Expected Useful Life of the 50 Ye Generation Facility					L		
7.	Peaking/Base Operation		Generally during High Flow Period, the plant is operated for base load where as during Low Flow Period; it is utilized for peaking purpose.					le plant is Low Flow	
		- ····				Units (1-10) = 13.8 KV			
			Generator Voltage			Units (11-14) = 18.0 KV			
8.	Plar	nt Characteristics	Power Factor			Units (1-4) = 0.85			
					ctor	Units (5-10) = 0.95			
					Units (11-14) = 0.90				
			REGITINO ANT	STR	TORY AUTHORIZA		Modified/Re	Page 7 of 123 of vised Schedule –I (Modification-IV)	

		Frequency	50 Hz	
		Automatic Generation Control	Yes	
	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	ССТ	Voltage (KV)	Length (KM)
		Tarbela-GZBR-I	500	073.20
		Tarbela-GZBR-II	500	076.20
		Tarbela-Peshawar	500	113.07
		Tarbela-Rewat	500	110.89
9.		Tarbela-Burhan-I	220	035.01
		Tarbela Burhan-II	220	035.01
		Tarbela Burhan-II	220	035.04
		Tarbela-ISPR	220	062.05
		Tarbela-Mardan-I	220	067.00
		Tarbela-Mardan-II	220	067.00



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<u>Hydel Power Station</u> <u>Mangla</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Mangla

PLANT DETAILS

1.	Locat	tion	On Rive & Kashi	er Jh mir.	elum at Mangla	i near M	r Mirpur, Azad Jammu		
2	Plant		Туре		Total Capacity		No. of Units		
2. Tidit		Stora	ge	1000 MW			10		
3	Head			Max	imum		Minimum		
 				39	97 ft		195	ft	
 4.	Tech	nology	Francis	Turb	ines				
	Tunn	el	No.		Length		Diam	eter	
	Total Tunn	No. of el	5			At Int	ake	At Penstock	
5.	(i).	No. of Power Tunnels	5	1560 ft. each		31	ft.	26 ft.	
	(ii).	No. of Irrigation Tunnels	-			-		-	
6.	Minimum Expected Useful J. Life of the 50 Years Generation Facility								
7.	Peak Oper	ing/Base ation	Plant is operated for base loa Flow Period, where as during utilized for peaking.				nerally Flow	during High Period, it is	
		Generator Voltage			Uni	ts (1-10)) = 13.2 KV		
			Power Factor				Units (1-10) = 0.8		
8. Plant Characteristics		Frequency				50 Hz			
			Automatic Generation Control			rol Fre	Automatic Load Frequency Control is installed on Units 3, 4, 7&8		
				De rional Elector	REGISTRAR		Modified/f	Page 13 of 123 of Revised Schedule –I (Modification-IV)	

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		сст	Voltage (KV)	Length (KM)
		Rawalpindi-I (MRB)	132	2.12
		Rawalpindi-II (Gujar Khan)	132	55.00
		Rawalpindi-III (New Rawat)	132	86.91
		Kharian-I (Rajar)	132	48.00
		Kharian-II (NBE-2)	132	7.00
1		Kharian-3 (NBE-1)	132	7.00
	Interconnection	Scarp-I (Dinga)	132	71.00
	Arrangements	Scarp-2 (Kuthialan Sheikhan)	132	109.00
9	length of	Mirpur (MPR-3)	132	7.79
•	Transmission	Old Rawat-I (Kallar Syedan)	132	78.00
	level details	Old Rawat-II (Dudyal)	132	36.60
		Ghakhar-I	220	114.90
		Ghakhar-II	220	113.70
		Ghakhar-III (New Ghk)	220	145.00
	1	Kalashah Kaku-I	220	173.00
		Kalashah Kaku-II	220	173.00
		Kalashah Kaku-III	220	172.00
		Mangla New Rawat-I	220	79.00
		Mangla New Rawat-II	220	79.00



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<u>Hydel Power Station</u> <u>Warsak</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life

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- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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General lay out of Warsak Power Station



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Hydel Power Station, Warsak

PLANT DETAILS

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1.	Loc	ation	located on right bank of River Kabul, on the boundary of Mohmand and Khyber Agencies							
			Type Total Car		Total Capa	acity		No. of Units		
2.	Plant		Run of River 242.96 I		242.96 N	1VV	W 06			
3	Head			Maxin	num		Minimum			
<u> </u>	Head			150	ft		1	30 ft		
4.	Tec	hnology	Franci	s Turbir	le					
	Tun	nel	No.		Length		D	iametei	-	
	Total No. of Tunnel (i). No. of Power Tunnels		1		-	A	t Intake	Pe	At nstock	
5.			1		827 ft.		39 ft.	3	9 ft.	
	(ii).	No. of Irrigation Tunnels				-	_			
6.	Mini Use Ger	mum Expected ful Life of the peration Facility	25 Years after completion of rehabilitation.							
7.	Pea Ope	king/Base eration	Generally during normal and high flow period operated for base load whereas during lean period it is utilized for peaking					ds, it is n water		
			Generator Voltage Units (1			its (1-6	5) = 13.1	2 KV		
			Power Factor			Units (1-4) = 1.0				
8.	Plar	nt 				Units (5-6) = 0.85				
		Characteristics		Frequency			50 Hz			
				Control			No			
					ССТ			Voltage (KV)	Length (KM)	
			Line:1	Warsak Warsak	Power House to GSS			132	03.603	
		T details		GSS W	arsak to GSS S	Shahi Bagh 2		23.513		
9.		length of		Warsak Power Hou Sakhi Chashma				132	26.690	
	volta	age level details		GSS Sakhi Cha Shahi Bagh				05.260		
	etc.	etc.)		ne:3 Warsak Power House to GSS Peshawar Cantt				132	26.315	
				Warsak Power House to GSS Jamrud				132	27.690	



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<u>Hydel Power Station</u> <u>Ghazi Brotha</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life

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- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Type

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Hydel Power Station, Ghazi Barotha

PLANT DETAILS

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1.	Loca	ation	Near Village Barotha 63 KM downstream of Tarbela about 10 KM West of Attock City, Punjab						
	2. Plant		Type To Cap		To Cap	otal acity	N	No. of Units	
2.			Run of River small storage peak Hours	with e for s.	1450 MW		5		
3	Hea	d	Ma	aximum			Minimum		
0.	Tiea		74	Meter			6	69 Meter	
4.	Tec	hnology	Francis Turbine						
	Tunnel		No.	Ler	Length		Diameter		
	Total No of Tunnel		5		-		ake	At Penstock	
5.	(i).	No of Power Tunnel	5	222	Meter	10.6 N	/leter	8.7 Meter	
	(ii).	No. of Irrigation Tunnels	-		-	-		-	
6.	Mini Exp Life Gen Faci	mum ected Useful of the eration ility	50 Years						
7.	Pea Ope	king/Base eration	Peak Load Operation						
			Generator Voltage			Units (1-5) = 18 KV			
			Power I	actor		Units	(1-5) =	= 0.9	
8.	Plar	nt iracteristics	Frequency			Frequ	Frequency = 50 Hz		
	Unaracteristics		Automatic Generation Control				Yes		



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	Interconnection	ССТ	Voltage (KV)	Length (KM)
	Arrangements	Barotha Gatti-I	500	308.8
9.	(CCT details, length of Transmission	Barotha Gatti-II	500	303.7
		Barotha Rawat-I	500	108.0
		Barotha Rawat-II	500	109.0
	Line, voltage	Barotha Tarbela-II	500	76.7
	level details	Barotha Tarbela-I	500	73.2
	etc.)	Barotha-Sheikh Muhammsdi	220	123.0
		Barotha-Mardan	220	85.0



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<u>Hydel Power Station</u> <u>Chashma</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

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Hydel Power Station, Chashma

PLANT DETAILS

1.	Location	On Right abutment of Chashma Barrage in Dist. Mianwali, Province of Punjab.						
		Туре	Total Capacit	of Units				
2.	Plant	Run of River	184 MW		8			
3.	Head	Max	imum	Minir	mum			
		13.8	meter	3 m	eter			
4.	Technology	Bulb type Tu	Bulb type Turbine					
5.	Tunnel	The Power House is fed through 1000 meter long and 136 meter wide Headrace water channel.						
6.	Minimum Expected Useful Life of the Generation Facility	30 Years.						
7.	Peaking/Base Operation	It is run off the river plant and loading generally depends upon the water releases available.						
	· · · · · · · · · · · · · · · · · · ·	Generator	Voltage	Units (1-8)	= 11 KV			
	Plant	Power Factor		Units (1-8) = 0.90				
8.	Characteristics	Frequency		50 Hz				
		Automatic Generation No						
	Interconnection		ССТ		Length			
	Arrangements	Dikhan		(KV)	(KM)			
9.	length of	Chashma Lei	ft Bank-II	132	1 71			
	Transmission	Wanbuchran	-	132	33.357			
	Line, voltage level details etc.)	Wanbuchran	-11	132	33.357			





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<u>Hydel Power Station</u> <u>Renala</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life

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- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Renala

PLANT DETAILS

1.	Location	Located on Lower Bari Doab Canal near Renala Town District Okara.							
0		Туре	Total C	Capacity	No. of Units				
Ζ.		Run of River	1.1	MW	5				
		Maximur	n		Minimum				
3.	Head	10 ft			7 ft				
4.	Technology	Francis Turbine (Horizontal	Shaft)	·····				
	Penstock	No.	Ler	igth	Diameter Internal				
5.	Total No. of Penstock	Nil							
6.	Minimum Expected Useful Life of the Generation Facility	30 Years							
7.	Peaking/Base Operation	Meant for local lo	ad of Lift Ir	rigation Pu	Imping Stations.				
		Generator Vo	ltage	Units (1-5) = 3.3 KV					
_	Plant	Power Fac	tor	Units (1-5) = 0.8					
8.	Characteristics	Frequenc	;y	50 Hz					
		Automatic Generation Control		No					
	Interconnection	ССТ	Voltag	e (KV) Length (KM					
9.	(CCT details, length of Transmission Line, voltage level details etc.)	11 KV feeder EHKL	11		60				



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<u>Hydel Power Station</u> <u>Chichoki</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Chichoki

PLANT DETAILS

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1.	Location	Located on Upper Chenab Canal (UCC) near village Joyanwala about 20 KMs from Sheikhupura.						
2	Plant	Туре	Total Ca	apacity N		o. of Units		
		Run of River	13.2 N	/IVV		3		
3.	Head	Maximu	m		Min	imum		
		27.7 ft		22.3 ft				
4.	Technology	Kaplan Turbine			-			
	Penstock	No.	Lengt	h	Dian	neter Internal		
5.	Total No. of Penstock	N.A						
6.	Minimum Expected Useful Life of the Generation Facility	30 Years.						
7.	Peaking/Base Operation	Operated as base load according to the water share in the upper Chenab Canal.						
		Generator Vo	ltage	Unit	s (1-3) = 3.3 KV		
8.	Plant Characteristics	Power Fac	tor	Units (1-3) = 0.8				
		Frequenc	у	50 Hz				
		Automatic Generation Control			N	0		
	Interconnection	ССТ	•	Voltage	(KV)	Length(KM)		
	Arrangements (CCT details	Chichokimall Attabad (CC	ian - K-I)	66		18		
9.	length of Transmission	Chichokimallian - Attabad (CCK-II)		66		31		
	Line, voltage level	Outgoing feeder (1-A)		11		128		
	details etc.)	Outgoing feede	er (1-A)	11		0.25		
		Outgoing feede	er (1-A) 🗍	11		80		

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<u>Hydel Power Station</u> <u>Nandipur</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

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Hydel Power Station, Nandipur

PLANT DETAILS

lent]

1.	Location	On Upper Chenab Canal (UCC) about 10 KMs from Gujranwala on Gujranwala Sialkot Road.							
2	Plant	Type Total Ca		apacity	No. of Units				
<u> </u>		Run of River 13.8 M		MW	3				
3	Head	Maxim	um		Minimum				
<u> </u>		24.4	ft		19.5 ft				
4.	Technology	Kaplan Turbine							
5	Penstock	No.	Length		Diameter Internal				
5.	Total No. of Penstock	N.A	N.A						
6.	Minimum Expected Useful Life of the Generation Facility	30 Years.							
7.	Peaking/Base Operation	Operated as base load according to the water share in the upper Chenab Canal.							
		Generator \	/oltage	Units	(1-3) = 3.3 KV				
	Plant Characteristics	Power Fa	actor	Units (1-3) = 0.8					
8.		Frequer	псу	50 Hz					
		Automatic Generation Control		No.					
	Interconnection	ССТ	Volt	age (KV)	Length (KM)				
	Arrangements (CCT details.	Nandipur-Dask	a	66	15				
9.	length of Transmission	Nandipur- Gujranwala		66	15				
	Line, voltage level	NDP-4		11	-				
	· · · ·	L							



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Hydel Power Station Shadiwal

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Shadiwal

PLANT DETAILS

1.	Location	On Upper Jhelum Canal (UJC) about 133 KMs Down Stream of Mangla and about 7 KMs from Gujrat							
2	Plant	Type Total Capacity			otal acity	No. of Units		f Units	
		Run of Riv	er	13.5	MW		()2	
3.	Head	Maxii	mun	n		Minimum			
		24.	5 ft			1	7 ft		
4.	Technology	Kaplan Tur	bine	es					
	Tunnel	No.	Length (KM)			Diameter		meter	
5.	Total No. of Tunnel			03		At Intake		At Penstock	
		01				-		-	
6.	Minimum Expected Useful Life of the Generation Facility	30 Years.							
7.	Peaking/Base Operation	Operated a in the uppe	as b er Jh	ase loa elum C	d accord anal.	ding to	the	water share	
		Genera	tor \	/oltage		Units (1-2) = 11KV			
	Plant	Power Factor				Units (1-2) = 0.9			
8.	Characteristics	Frequency				50 Hz			
		Automatic Generation Control		n	No.				
	Interconnection Arrangements	C	сст		Vc (ltage KV)	Le	ength (KM)	
9.	(CCT details, length of Transmission Line, voltage level details etc.)	Shadiv	Shadiwal-Gujrat			132		9.6	



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<u>Hydel Power Station</u> <u>Rasul</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

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Hydel Power Station, Rasul

PLANT DETAILS

1.	Location	On Upper Jhelum Canal (UJC) about 74 KMs Down Stream of Mangla.						
		Туре	Total C	apacity	No. of Units			
Ζ.	Plant	Run of River	22	MW	2			
2		Maxim	um	М	inimum			
J.	пеао	85.05	i ft	8	0.35 ft			
4.	Technology	Kaplan Turbine						
	Penstock	No.	No. Length					
5.	Total No. of Penstock	2	281	ft.	21 ft.			
6.	Minimum Expected Useful Life of the Generation Facility	30 Years.						
7.	Peaking/Base Operation	Operated as in the Canal.	base load a	according to	the water share			
		Generator	Voltage	Units (1-2) = 11KV				
	Plant Characteristics	Power F	actor	Units (1-2) = 0.88				
8.		Freque	ency	50 Hz				
		Automatic G Cont	eneration rol	No				
	Interconnection	CC	Γ	Voltage (K	V) Length(KM)			
	Arrangements	Rasul-Ma	alikwal	66	38.4			
a	length of	Rasul-Ma	ikwal-II	66	38.4			
9.	Transmission	Rasul-Khar Bundi	ed)	132	42.0			
	Line, voitage level details etc.)	Rasul-Khariar	(Bundled)	132	42.0			
POWER REGIN								



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<u>Hydel Power Station</u> <u>Dargai</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

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Hydel Power Station, Dargai

PLANT DETAILS

Tous-

1.	Loc	ation	On Upper Swat Canal in Malakand Agency near Dargai Distt. Malakand Agency, Khyber Pakhtunkhwa.					
2	Plant		Туре	с	Total apacity	No. of Units		
<i></i>			Run of Rive	er 2	20 MW		4	
3.	Hea	ıd	Maxim	ium		Minimun	ו	
			243	ft		239 ft		
4.	Тес	hnology	Francis Tur	bine (Ho	rizontally N	lounted)		
	Tun	nel	No.	Le	ngth	Dia	meter	
	Tota	Total No. of Tunnel		**	At intake	At Penstock		
5.	(i)	No of Penstock	04	57	′5 ft.	75 in.	66 in.	
	(ii)	No. of Irrigation Tunnels	-		-			
6.	Use Ger	ful Life of the neration Facility	25 Years.					
10.	Pea Ope	king/Base eration	Base Opera	ition				
			Generato	r Voltage	Ur	Units (1-4) = 11 KV		
	Plant Characteristics		Power Factor		U	Units (1-4) = 0.85		
0.			Frequency			50 Hz		
			Automatic (Con	on	No			
	Inte Arra	rconnection angements	ССТ			Voltage (KV)		
9.		T details, length	Dargai-Mardan			132	59.27	
		e, voltage level	Dargai-		66	5.51		
	deta	ails etc.)	Dargai-Ċ	hakdara		132	30.07	
			C POW	ER REGULA		Modified/Re	Page 58 of 123 of vised Schedule –I (Modification-IV)	

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<u>Hydel Power Station</u> <u>Chitral</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Chitral

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PLANT DETAILS

Kel

	1.	Loca	tion	On right b Chitral in t	ank of riv the provi	village Sin /ber Pakhtu	goor in District ınkhwa.		
	2.	Plant	t	Type To Cap		Total Capacity	No	of Units	
				Run of	River	1 MW		4	
	3.	Head	ł	I	Maximun	۱	М	inimum	
┝					110 ft			106 ft	
	4.	Technology		Units ⁻	1 & 2	OSS	BERGER (Cross Flow)	
				Units 3	3 & 4	F	Francis (Horizontal)		
		Tunn		No.	Ler	ngth	Dia	ameter	
		Total Tunn	No. of	02		-			
	5.	(i)	No of Penstock	02		-	Unit No 1 &	$\frac{3}{2} = 3.33$ ft.	
		(ii)	No. of Irrigation Tunnels	-			Unit NO 3 & 4 =3.71 ft.		
	6.	Minin Expe Life c Gene Facili	num cted Useful of the eration ity	25 Years.					
	10.	Peak Oper	ing/Base ation	Chitral Hy National (according routine an	del Pow Grid dire to cons d peak h	er House ctly feeds siderable ours.	is not synchronized with Is a separate 11 KV line variation in load during		
Γ				Genera	ator Volta	age	Units (1-	4) = 415 V	
		Diant		Power Factor			Units (1	(-4) = 0.96	
	8.	Char	actoristics	Frequency			50) Hz	
		Characteristics		Automatic Generation					
				C	ontrol		No		
		Intero Arrar	connection ngements	ССТ	Voltage		Voltage (KV)	Length (KM)	
	9.	(CCT lengt	details, h of	L	ine-1		11	6.721	
		Line, detai	voltage level ls etc.)	Line-2			11	7.421	
				RE CONTRACTOR	GISTRA	THOMA HUTHO	Modifie	Page 63 of 123 of d/Revised Schedule –I (Modification-IV)	
				J. X	NEPRA*				

<u>Hydel Power Station</u> <u>Kurram Garhi</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

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				ATT AND A DESCRIPTION OF A				17			
66KV		66 KV Line	The second second						<u></u>		
Breaker											
controlling Bannu.									and the second second		
			66KV L	ine							
									66 1	W Line	9
									1 - 1 - 1 - 1 - 1		
		66KV						_		_	
		Transformer	66/11KV				2	5 MVA	02 Nos Trans	forme	rs
	T/	F		T/F	66/11KV				66/11 KV		66/11 KV T/F
							66/11KV T	/F	1		
	11 KV			11 KV							
	ili i se se i										
						11 KV					
						OCB 3 No:	5		11KV Link Fee	eder	
				1 2	3		k/Garhi P/S	5.2	5 kms	1	KGarhi P/S -
			E	nergized all	eady o/lo	aded					
	One 11K	VOCB	3	00/5 each 0	СВ	1					
	not energ	jized									
	400/5						(One of	utgoing D/Sh	ah Fee	der
						271-11-11	4	100/5	C.T.		
MXL/Graph File P.3				10000 - 10 - 10 - 10 - 10 - 10 - 10 - 1			trate in a de ja				



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Hydel Power Station, Kurram Garhi

PLANT DETAILS

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1.	Loc	ation	Kurram Kurram	Ghari Hyde 12 Km Nor	el Powe th West	Power Station is located on river West of Bannu city				
2	Pla	nt	т	уре	Tota	I Capacity	No. of Units			
∠ .			Run	of River		4MW	04			
3	He	ad		Maximum		Minimum				
0.				60 ft.			60 ft.			
4.	Тес	hnology	Francis	Francis Turbine						
	Tun	inel	No.	Leng	th		Dia			
5.	Total No. of Tunnel		-	-		At Intake	At Penstock			
	(i)	No. of Power Tunnel	4	60 ft		1.65 M	1.7 M			
	(ii)	No of Irrigation Tunnel	-	-		_	-			
6.	Min Exp Life Ger Fac	imum ected Useful of the neration ility	50 Years.							
7.	Pea Ope	king/Base eration	Base Load.							
			Generator Voltage			Units (1-4) = 11 KV				
	Plant		Po	ower Factor	•	Units (1-4) = 0.80				
ð.	Cha	racteristics	F	requency		5	i0 Hz			
			Autom	atic Genera	ation		No			
	Inte	rconnection		ССТ	Vo	tage (KV)	Length (KM)			
a	Arrangements (CCT details, length of Transmission Line, voltage level details etc.)		Kurram Garhi- Bannu			11/66	30			
୪ .			Daud Shah			11	48			



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<u>Hydel Power Station</u> <u>Gomal Zam</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Gomal Zam

PLANT DETAILS

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	1.	Location	Right Bank of Gomal River at Khajuri Kach in South Waziristan Agency about 60KM/ West of District Tank in Khyber Pakhtunkhwa.								
	2	Plant	Туре	acity	of Units						
	<u>د</u> .		Storage	17.4 M	W 2						
			Maximu	ım		Minim	um				
	3.	Head	106.5 m (st	age-1)	74.24 m (stage-1)						
-			113.0 m (st	age-2)		90.79 (sta	age-2)				
	4.	Technology	Vertical Francis	Turbines							
			No.	Lengt	h	Dia	meter				
	5.	Tunnel	4	1070 50	۲. 4	At Intake	At Penstock				
				1279.50	5 IL	10 ft	10 ft				
	6.	Peak/Base Load Operation	The plant will be used for peak load (17.4 MW) as well as base load (8.7 MW) depending on the availability of water.								
	7.	Minimum Expected Useful Life of the Generation Facility	50 years								
			Generator V	nits (1-2) =	(1-2) = 11 KV						
		Plant	Power Fa	ctor	0.85						
	8.	Characteristics	Frequen	су	50 Hz						
			Automatic Ge Contro	Yes							
		Interconnection Arrangements	ССТ		Vo (ltage KV)	Length (KM)				
i.	9.	(CCT details, length of	Gomal Zam	-Tank	132		56				
		Line, voltage level details etc.)	Gomal Zam	-Wana		132	55				
			REGISTR	AR AUTHOR		Modified/Re	Page 71 of 123 of vised Schedule –I (Modification-IV)				

Jinnah Hydel Power Station

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Jinnah Hydel Power Station

PLANT DETAILS

1.	Location	On the Indus River on the right side of the Jinnah Barrage as a bypass arrangement, approximately 5 KM downstream of Kalabagh Town in District Mianwali.							
	Diant	Type Total C		al Capacity		No. of Units			
∠ .	Plant	Run of River	96 M	w		08			
3.	Head	Maximu	n		Ν	/linimum			
	Tashnalasy	6.2 m				3.2 m			
4.	Тесппоюду	Buib (Pit Type)		<u> </u>					
	Tunnel	No.	Leng	th		Diameter			
5.	Total No. of Channel	1	1800 includ Tailra	m ling Be ace		Bed Width = 133 m			
8.	Peak/Base Load Operation	Base load operation.							
9.	Minimum Expected Useful Life of the Generation Facility	50 years							
		Generator V	oltage	Units (1-8) = 11 KV					
10.	Plant	Power Fac	Units (1-8) = 0.90						
	Characteristics	Frequen	су			50 Hz			
		Automatic Ger Contro	neration			Yes			
	Interconnection Arrangements	ССТ	Volta	ge (KV)	Length (KM)			
7.	(CCT details, length of Transmission	Jinnah-Mari Daudkhel Line-	I 13	82 KV		7.5			
	Line, voltage level details etc.)	Jinnah-Mari Daudkhel Line-I	132 KV			7.5			



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<u>Hydel Power Station</u> <u>Allai Khwar</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

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Hydel Power Station, Allai Khwar

PLANT DETAILS

1.	Locat	ion	On left bank tributary of the River Indus at Besham Distt. Battagram, in Khyber Pakhtunkhwa.							
2	Plant		Type Total		Total Cap	acity	No. of Units			
∠ ,	1 iani		Stora	ge	121 M	N		02		
3	Head		Maxim	um		М	inimum			
0.	Ticau		697 ו	m ·		(687 m			
4.	Tech	nology	Pelton W	heel V	ertical Shaf	't Turb	ines			
	Tunn	el	No.	L	ength		Diar	neter		
	Total Tunn	No. of el	1	2.	395 Km	A	t Intake	At Penstock		
5.	(i).	Power Tunnels (Headrace)	1	2.3	366 Km	2.5 m		2.5 m		
	(ii).	Irrigation Tunnels	Nil							
6.	Peak/Base Load Operation		Generally during High Flow Period, the plant will be operated for base load whereas during Low Flow Period, it will be utilized for peaking.							
7.	Minim Exper Life o Gene Facili	num cted Useful f the ration ty	50 years							
			Generator Voltage			Units (1-2) = 11 KV				
	Plant		Power Factor			0.85				
8.	Chara	acteristics	Fi Fi	requen	су	50 Hz				
			Automatic Generation Control		neration I	Yes		es		
		- 1		CCT		Volta	ge(KV)	Length(KM)		
		connection	Allai	S/Y-IS	PR-I	2	20	180.5		
	(CCT	details,	Allai	S/Y-IS	PR-II	2	20	180.5		
9.	lengti Trans	n of smission	Allai S/	Y-Khar P/H	n Khwar	1	32	16		
	Line, voltage level details etc.)		Allai S/Y-Duber Khwar P/H			132		59		



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<u>Hydel Power Station</u> <u>Duber Khwar</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Ishkumon y Ste Cris Karimabya ils. K Yusin Chalt Gupis 6 Mostul Nattor, Gakmeh tarent N G F. AG GILGIT Sazin C 24417 NAI Kolon osh hald Duber Khwai 8178 /I nmutai U endu HPP Nang Gill DIR otan Noron We eshorn kal) Kughan Mah Juidu Botaram vagai MINGAOR Boloko Handibbrg MAL KAND . Ogl ullah ioroui! 10000 al Tortiela 2 UZAFFARABAD Son Dur MARDAN BARAMU BBOT adda Cha JIKMO BAGH Resalu 0110 FIDWAR nurc Rowala Kot PUNCH inan AD AMA Meadhar Rahta CITYFatehjar KOTL C TRIDI and huigh Basal Mondro Sind Jand om 1 shah Gular CNausha Pindi Gheb Bhagw unbai SAHAR 77 AIHED



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Hydel Power Station, Duber Khwar

PLANT DETAILS

1	Locat	ion	On left bank tributary of the River Indus at Be Distt. Kohistan in Khyber Pakhtunkhwa.					ıs at Besham,	
2	Plant		Тур	be	Total C	pacity No		o. of Units	
			Stora	age	130	MW		2	
3	Head		Maxin	num .		N	linimum		
	Ticau		540.	5 m			528 m		
4	Tech	nology	Pelton	Wheel	Turbines		2. -		
	Tunn	el	No.	Le	ngth		Diam	eter	
	Total	No. of				At In	take	At Penstock	
5	(i).	No. of Power Tunnels (Headrace)	1	1 1237.6 m		2.6 m		2.6 m	
	(ii).	No. of Irrigation Tunnels	Nil	Nil					
6.	6. Peak/Base Load Operation		Generally during High Flow Period, the plant will be operated for base load whereas during Low Flow Period, it will be utilized for peaking.						
7.	Minim Expe Life o Gene Facili	num cted Useful if the ration ty	50 years						
		•	Generator Voltage				Units (1-	2) = 11 KV	
			Power Factor				0.85		
8.	Plant Characteristics		Frequency				50 Hz		
			Automatic Generation Control			n	Yes		
	Intero Arran	connection agements		CC	Т		/oltage (KV)	Length (KM)	
10	(CCT	details,	C	KHP-	KHP		132	32.3	
10.	Transmission Line, voltage level details etc.)		DKHP-AKHP				132	50.5	
			ELECT	REG	ER REGULA	TORY AL	Modifie	Page 87 of 123 o ed/Revised Schedule – (Modification-IV	

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<u>Hydel Power Station</u> <u>Khan Khwar</u>

- (a). Location (location maps, site map)
- (b). Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d). Technology: Francis, Pelton, etc. size, number of units
- (e). Tunnel(s) if existing: length, diameter
- (f). expected life
- (g). Interconnection with national grid company, length of transmission line(s)
- (h). Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Khan Khwar

PLANT DETAILS

	1.	Locat	ion	Right tributar Shangla, in K	esham, Distt.					
	2	Diant		Туре	Total Capa	acity	No. of Units			
	۷.			Storage	72 MV	/ 3 (2x	34MW+1x4MW)			
	3	Head		Maxim	num	Minimum				
	J.	Tieau		257	m	2	247 m			
	4.	Techr	nology	Unit (1&2) Fr Unit (3) Turge	ancis Turbino o	9				
		Tunne	el	No.	Length	D	iameter			
	F	Total Tunne	No. of el			At Intake	At Penstock			
	5.	(i).	No. of Power Tunnels (Headrace)	1	4540m	3.80 m	3.25m			
	6.	Peak/ Opera	/Base Load ation	Generally during High Flow Period, the plant will be operated for base load whereas during Low Flow Period, it will be utilized for peaking.						
	7.	Minim Expec Life o Gene Facili	num cted Useful if the tration ty	50 Years						
				Generato	r Voltage	Units (1-3) = 11 KV			
	Q	Plant	Power	Factor	Units Units	(1-2) = 0.85 (3) =0.8				
	0.	Chara	acteristics	Frequ	iency		50 Hz			
				Automatic (Con	Generation trol	Yes				
	-	Interc	connection	cc	т	Voltage (KV)	Length (KM)			
	9.	Arran (CCT	igements details, h of	KKHP-	DKHP	132	32.3			
	Tra Lin def		smission voltage level ls etc.)	ККНР-АКНР		132	16.5			
×				ALL CON	ALL ALCONT		Page 92 of 123 of			
				STITUTE	GISTRAR	Mod	med/Kevised Schedule –I (Modification-IV)			

Tarbela Hydel Power Station <u>4th Extension</u>

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

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Tarbela Hydel Power Station, 4th Extension

PLANT DETAILS

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1.	Location	On Right Bank, of River Indus at Tarbela Distt. Swabi, in Khyber Pakhtunkhwa.								
2	Diant	Туре	Total	Total Capacity		No. of Units				
Ζ.	Plant	Storag	e 14	10 M	W	· · · · ·	03			
2	Llaad	N	laximum			Minim	um			
5.			137.1 m			75.7	m			
4.	Technology	Francis 7	Turbines							
	Tunnel	No. Length			Dia	meter				
5.	Total No. of Tunnel	1	2997 ft.			At Intake 45.0 ft	At Penstock 36.0 ft.			
6.	Minimum Expected Useful Life of the Generation Facility	35 Years								
7.	Peaking/Base Operation	Plant after construction will be operated in accordance with requirements of NPCC.								
		Generator Voltage			18KV					
	Plant	Power Factor			0.9 (Lagging)					
8.	Characteristics	Frequency			50 Hz					
		Automatic Generation Control Yes								
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	The powerhouse will be connected with existing Tarbela switchyard having six 220 KV and four 500 KV outgoing Transmission Lines.								



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<u>Hydel Power Station</u> <u>Keyal Khwar</u>

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Keyal Khwar

PLANT DETAILS

	1.	Loca	tion	Right tributary of the River Indus at Keyal Khwar Distt. Kohistan in KHYBER PAKHTUNKHWA.				
	2	Plant		Туре	Total Capac	ity No.	of Units	
	2.		•	Storage	122 MW		2	
-	3.	Gros	s Head	Maxii	num	Mini	mum	
		1		737.	5 m	721	.5 m	
	4.	Tech	nology	Pelton Turbine				
		Tunn	el	No.	Length	Dia	meter	
r		Total Tunn	No. of el		-	At Intake	At Penstock	
	5.	(i).	No. of Power Tunnel	1	7.16 Km	3.2 m	2.2 m	
		(ii)	No. of Irrigation Tunnel	-	-	-	-	
	6.	Peak Oper	/Base Load ation	Base Load operation as per requirement of NPCC				
	7.	Minir Expe Life d Gene Facil	num ected Useful of the eration ity	50 Years				
		Plant		Generato	r Voltage	11	KV	
				Power Factor		0.	85	
	8.	Char	acteristics	Frequency		50	Hz	
				Automatic (Con	Generation trol	Y	es	
		Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)		ССТ		Voltage (KV)	Length (KM)	
	9.			Keyal-Duber-I		132	3.00	
				Keyal-Duber-II		132	3.00	
Les	Life		REGIS	REGELATORY AUTHOR	Modifie	Page 102 of 123 of d/Revised Schedule –I (Modification-IV)		

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<u>Hydel Power Station</u> <u>Golen Gol</u>

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Golen Gol

PLANT DETAILS

1.LocationOn Golen Gol Nullah, 25 Km from KHYBER PAKHTUNKHWA.						Km fron	n Distt	. Chitral in		
	2	Diant		Туре	То	tal Capac	city	No. of Units		
	Ζ.	Piar	it.	Run of River		106 MW		03		
	3			Gro	DSS		<u>.</u>	Rate	d	
	J.	1100		439.	3 m			423.3 m		
	4.	Technology		Pelton Turbin	ies					
		Tun	nel	No.		Length		Diameter		
		Total No. of Tunnel		3		-	In	At take	Steel Liner	
	5.	(i)	No of Power Tunnel	3		3.81 Km	4	.1m	3.2 m	
		(ii)	No of Irrigation Tunnel			-		-	-	
	6. Peak/E		k/Base Load eration	Base Load Operation Plant						
	7.	Minimum Expected Useful Life of the Generation Facility		35 Years						
		Plant Characteristics		Generato	r Volt	tage		11 K	V	
				Power Factor			0.80			
	8.			Frequency		50 Hz				
				Automatic Generation Control		Yes				
		Interconnection Arrangements		ССТ		Voli (K	Voltage Length (KV) (KM)		Length (KM)	
Ling	9.	leng Tra	gth of nsmission	Golen Gol Tmergara	to 1	1:	32		145	
1		Line deta	e, voltage level ails etc.)	Timergara Chakdara	to 1	1:	32		53	



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<u>Hydel Power Station</u> <u>Jabban</u>

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

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Hydel Power Station, Jabban

PLANT DETAILS

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1.	Loc	cation	On Swat River in Distt. Malakand, in KHYBEI PAKHTUNKHWA.					
2	DIa	nt	Туре	Total Ca	apacity	No. of Units		
۷.	Fid	111	Run of River	22 1	MW		04	
2	. Head		Maximum			Minimum		
5.			614.4	48 m		537.08 m		
4.	Те	chnology	Horizontal Fra	ancis Turt	oines			
	Tu	nnel	No.	Length		Diai	iameter	
	Tot Tu	tal No. of nnel		-	At I	ntake	At Penstock	
5.	(i)	No of Power Tunnel	4	165 m	1.	9 m.	1.677 m	
	(ii)	No of Irrigation Tunnel	-	_		-	-	
6.	Peak/Base Load Operation		Base Operation					
7.	Minimum Expected Useful Life of the Generation Eacility		50 Years					
-			Generator Voltage			1	1 KV	
0	Pla	ant	Power Factor			0.85 (Lagging)		
0.	Ch	aracteristics	Frequency			50 Hz		
			Automatic Generation Control		n	Yes		
	Int Ari	erconnection rangements	CCT Vol		Voltage (KV)	ltage KV) Length (K		
9.	(C) len	CT details, agth of ansmission	Jabban to Chakdara)	132		19.38	
	I ransmission Line, voltage level details etc.)		Jabban to Jalala/Mard	an	n 132 26.62		26.62	



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<u>Hydel Power Station</u> <u>Diamer Basha</u>

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

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Hydel Power Station, Diamer Basha

PLANT DETAILS

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ſ	1.	Location	Diamer Basha Dam, 40 km downstream of Chilas the district headquarter of Diamer in Gilgit-Baltistan					
			Туре	Total Capad	city	No. of	Units	
	2.	Plant	Storage	4500 MV	1	12 (375 MW Each)		
	3.	Head	Maxi 204	mum 2 m		Minimum 100.5 m		
	4.	Technology	Francis Turbi	ines				
		Tunnel (s)	No. Length		Diameter			
		Total No. of Tunnels (Head Races L&R Bank)	04	3477 m (490.6+450 1165.5+ 137	.1+ A 1.0)	t Intake	At Penstock	
	5.	No. of Power Tunnels	12 .	1840 m (160.1x6 146.5x6)	+	7.2 m	7.2 m	
		No. of Irrigation Tunnels (Lowe Level/ Flushing Outlets)	07	1170.4 m (7x167.2)		5x09m& 2x072m	-	
	6.	Peak/Base Load Operation		l Operat	Operation			
	7.	Minimum Expected Useful Life of the Generation Facility	50 Years					
			Generato	r Voltage		-		
	0	Plant	Power Factor		-			
	9.	Characteristics	Frequ	lency	50 Hz			
			Automatic Generation Control		-			
	10.	i. To be confirmed as per Feasibility	ССТ		Voltage (KV)		gth (KM)	
		Integrated Power	DOWER RED		-		-	
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Evacuation from North.			
ii. Reportedly, the Feasibility Study			
circuits of 500 kV transmission line comprising two circuits for right			
bank power house to Mardan via Swat Valley, and two circuits	_	-	-
for Right bank power house Via			an a
Chilas - Babusar Pass - Kunhar			
Valley - Monsehra - Rawat			

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Hydel Power Station Dasu

- (a).Location (location maps, site map)
- (b).Plant: run of the river, storage, weir
- (c). Head: minimum, maximum
- (d).Technology: Francis, Pelton, etc. size, number of units
- (e).Tunnel(s) if existing: length, diameter
- (f). expected life
- (g).Interconnection with national grid company, length of transmission line(s)
- (h).Peaking/base load operation
- (i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation



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Hydel Power Station, Dasu

PLANT DETAILS

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1.	Location	Left bank of Indus River, 7 KM upstream from Dasu Town, District Kohistan, Khyber Pakhtunkhwa						
2	Diant	Type Total Capac		acity	No. of Units			
Ζ.	Plant	Run of River	4320 M	W	12			
3	Head	Maxin	num		Minimum			
.	neau	179.5	51 m			131.94	m	
4.	Technology	Francis Turbir	nes			••• •••		
		No.	Length	ı	Diameter		neter	
5	Tunnel(s)				Atl	ntake	At Penstock	
J.		04	450 m (E	ach)	1	2m	5.5m	
		04	450 m (Each)		1	<u>2m</u>	5.5m	
					1	2m	5.5m	
				· · ·		2m	5.5m	
6.	Peak/Base Load Operation	Base Load Operation						
7.	Minimum Expected Useful Life of the Generation Facility	30 Years						
		Generator Voltage 16.5 KV				V		
8	Plant	Power Factor			0.9(Lagging)			
0.	Characteristics	Frequency			50 Hz			
	· · ·	Automatic Generation Control				Yes		
	Two (02) Double Circuit 500KV	ССТ	Volta (K)		Itage KV) Length (KM		gth (KM)	
9.	Transmission Lines. From Dasu	-		500		140		
	to Mansehra	-		500 140		140		



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SCHEDULE-II

(Modified/Revised)

Installed/ISO Capacity (MW), De-Rated Capacity at Mean Site Conditions (MW), Auxiliary Consumption (MW) and the Net Capacity at Mean Site Conditions (MW) of the Generation Facilities of Licensee is given in this Schedule.



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SCHEDULE-II (Modified/Revised)

Sr. No.	Power Station	Installed Capacity (MW)	Auxiliary Consumption (MW)	Net Capacity (MW)
1.	Hydel Power Station Tarbela	3478	1.3	3,476.70
2.	Hydel Power Station Mangla	1000	1.1	998.90
3.	Hydel Power Station Warsak	242.96	0.8	242.16
4.	Hydel Power Station Ghazi Brotha	. 1450	1.1	1,448.90
5.	Hydel Power Station Chashma	184	0.8	183.20
6.	Hydel Power Station Renala	1.1	0.1	1.00
7.	Hydel Power Station Chichoki	13.2	0.2	13.00
8.	Hydel Power Station Nandipur	13.8	0.2	13.60
9.	Hydel Power Station Shadiwal	13.5	0.2	13.30
10.	Hydel Power Station Rasul	· 22	0.2	21.80
11.	Hydel Power Station Dargai	20	0.2	19.80
12.	Hydel Power Station Chitral	1	0.1	0.90
13.	Hydel Power Station Kurram Garhi	4	0.1	3.90
14.	Hydel Power Station Gomal Zam	17.40	0.3	17.10



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15.	Hydel Power Station Jinnah Hydel	96	0.5	95.50
16.	Hydel Power Station Allai Khwar	121	0.3	120.70
17.	Hydel Power Station Duber Khwar	130	0.3	129.70
18.	Hydel Power Station Khan Khwar	72	0.3	71.70
19.	Hydel Power Station Tarbela, 4 th Extension	1410	0.8	1,409.20
20.	Hydel Power Station Keyal Khwar	122	0.3	121.70
21.	Hydel Power Station Golen Gol	106	0.3	105.70
22.	Hydel Power Station Jabban	22	0.2	21.80
23.	Hydel Power Station Diamer Basha	4500	2	4,498.00
24.	Hydel Power Station Dasu	4320	2	4,318.00
	Grand Total	17359.96	13.7	17346.26



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