National Electric Power Regulatory Authority
Islamic Republic of Pakistan

Registrar

NEPRA Tower, Ataturk Avenue(East), G-5/1, Islamabad
Ph: +92-51-9206500, Fax: +92-51-2600026
Web: www.nepra.org.pk, E-mail: registrar@nepra.org.pk

No. NEPRA/R/LAG-23/ 325-30

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

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(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)

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

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). Communication of LPM

(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.

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(D). Comments of Stakeholders

(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). <u>Approval of LPM</u>

(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

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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 license 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.

Authority

Maj. (R) Haroon Rashid
Member

Khawaja Muhammad Naeem
Member

Habibullah Khilji
Member/Vice Chairman

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09.01.15

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 **Modification-IV** is given under my hand this 09 of **January Two Thousand** & **Fifteen**

Registrar

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SCHEDULE-I
(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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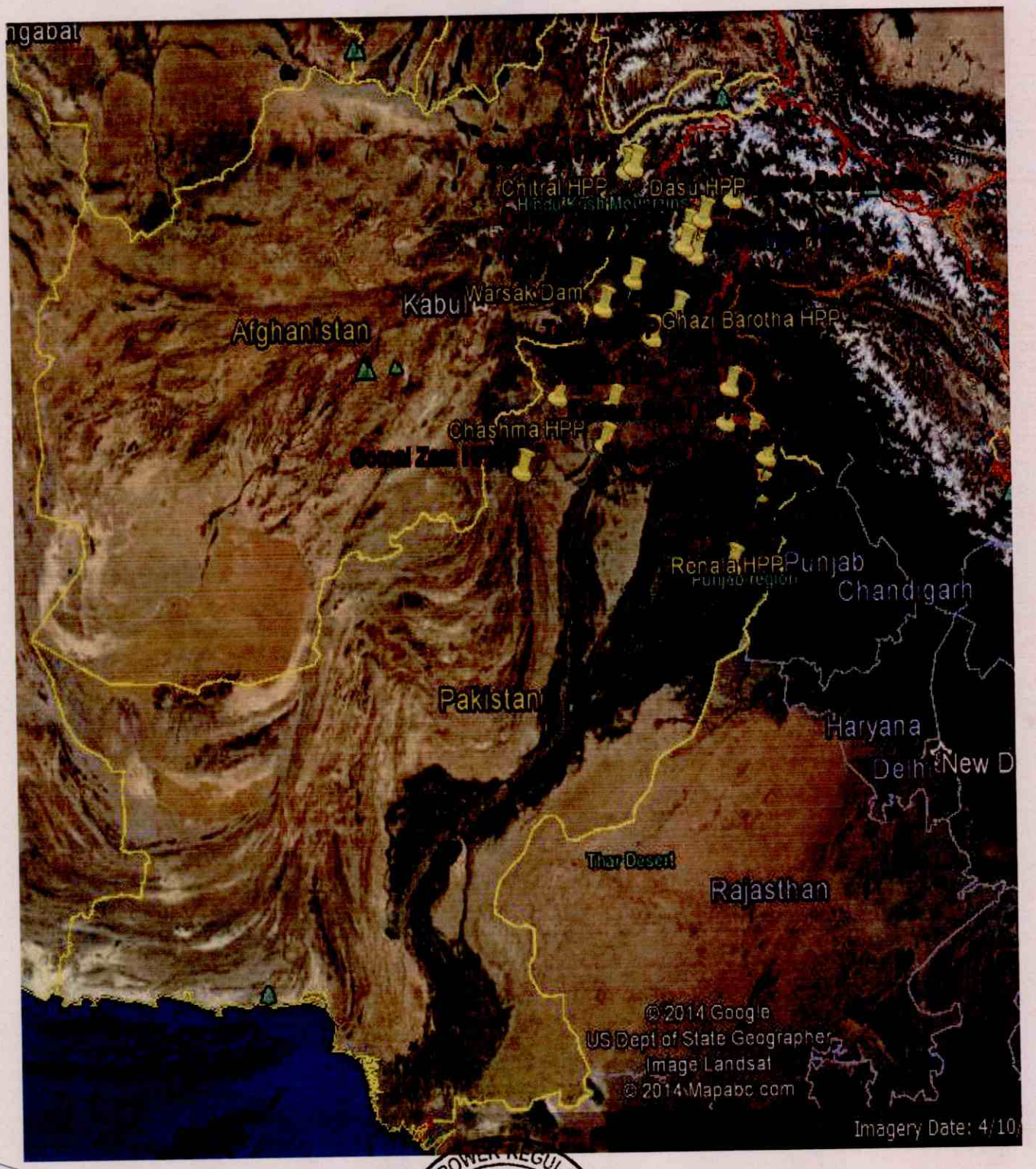
LOCATION MAP OF WAPDA HYDEL POWER PROJECTS



Hydel Power Station
Tarbela

(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

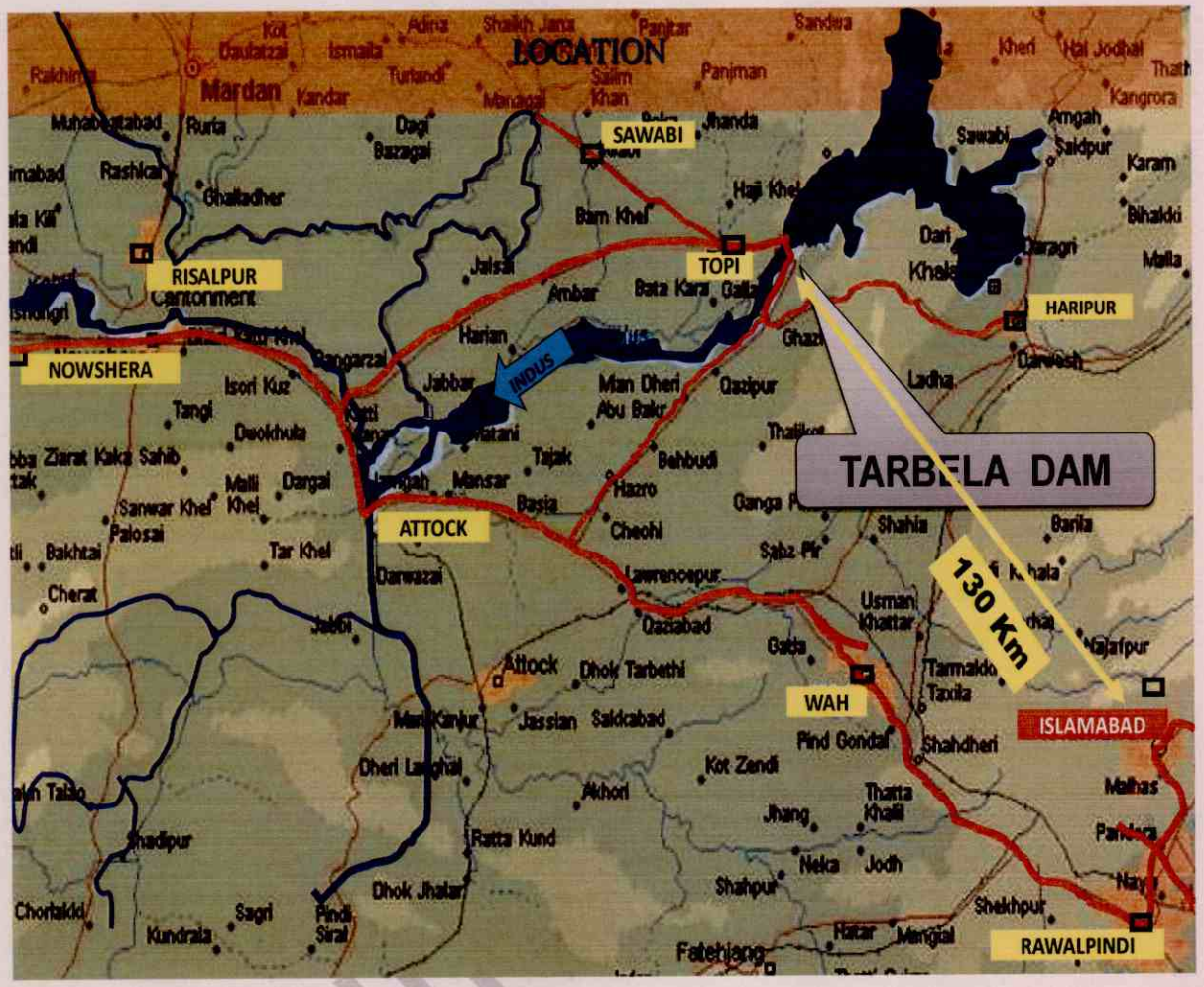
(e). Tunnel(s) if existing: length, diameter

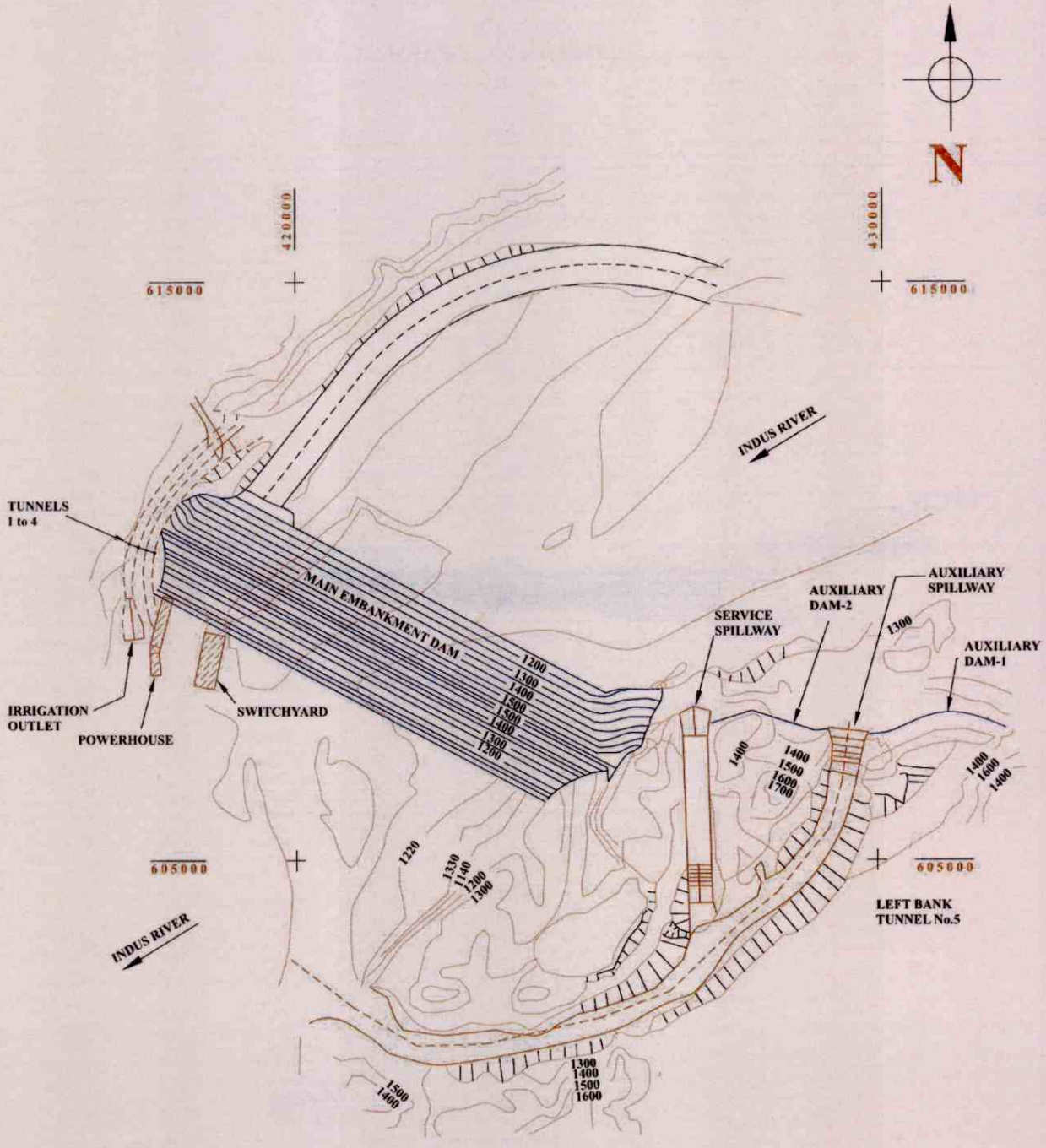
(f). expected life

(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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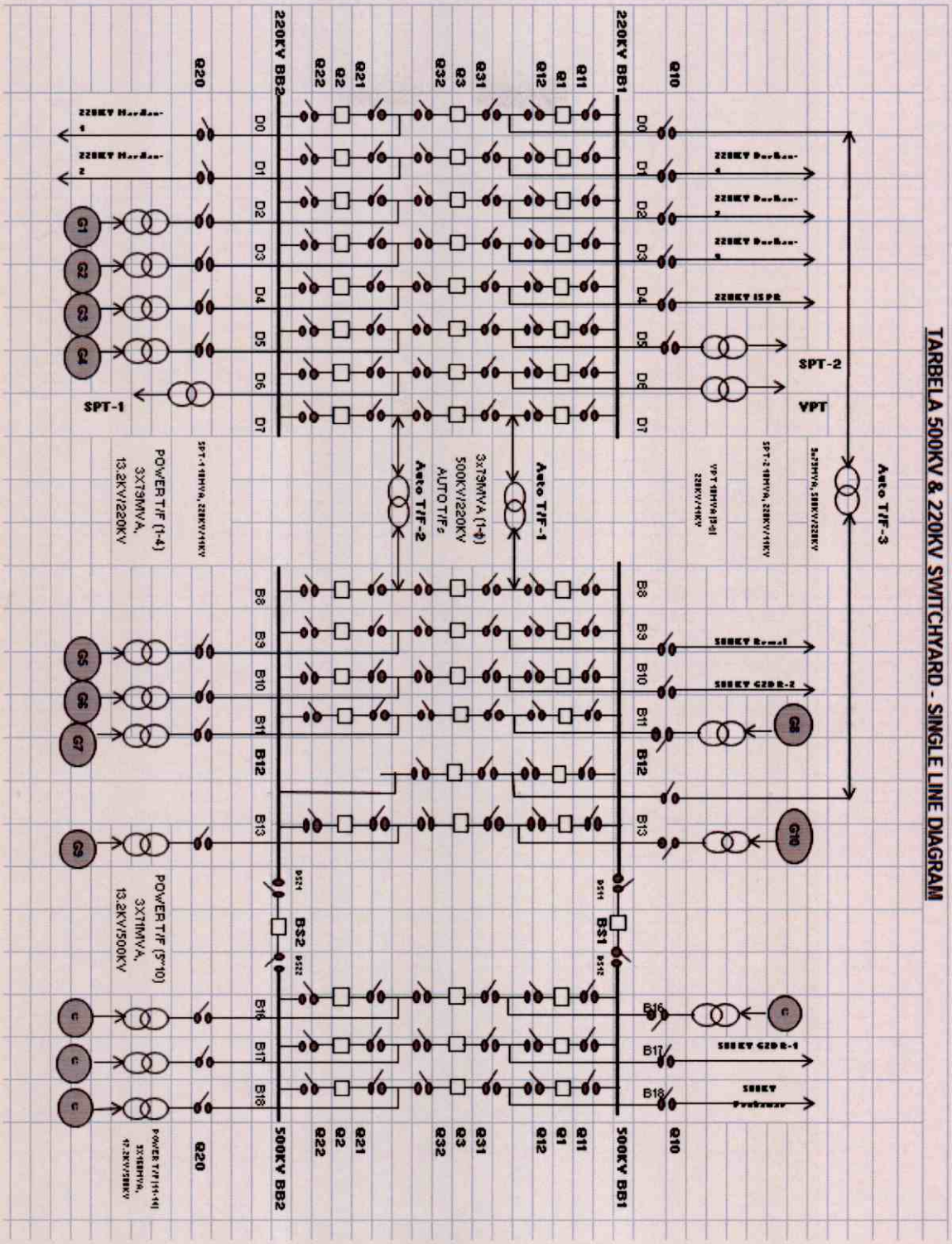

Hydel Power Station, Tarbela

PLANT DETAILS

1.	Location	On Right Bank, of River Indus at Tarbela in Distt. Swabi, in the province of Khyber Pakhtunkhwa				
2.	Plant	Type	Total Capacity	No. of Units		
		Storage	3478 MW	14		
3.	Head	Maximum		Minimum		
		440 ft		190 ft		
4.	Technology	Francis Turbines				
5.	Tunnel	No.	Length	Diameter		
	Total No. of Tunnel	5	-	At Intake	At Penstock	
	(i). No. of Power Tunnels	3	T1, T2 = 2400 ft. T3 = 2700 ft.	45.0 ft.	43.5 ft.	
	(ii). No. of Irrigation Tunnels	2	T4 = 2700 ft T5 = 3675 ft	45.0 ft.	36.0 ft.	
6.	Minimum Expected Useful Life of the Generation Facility	50 Years				
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.				
8.	Plant Characteristics	Generator Voltage	Units (1-10) = 13.8 KV			
			Units (11-14) = 18.0 KV			
		Power Factor	Units (1-4) = 0.85			
			Units (5-10) = 0.95			
			Units (11-14) = 0.90			

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		Frequency	50 Hz	
		Automatic Generation Control	Yes	
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	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
		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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Hydel Power Station
Mangla

(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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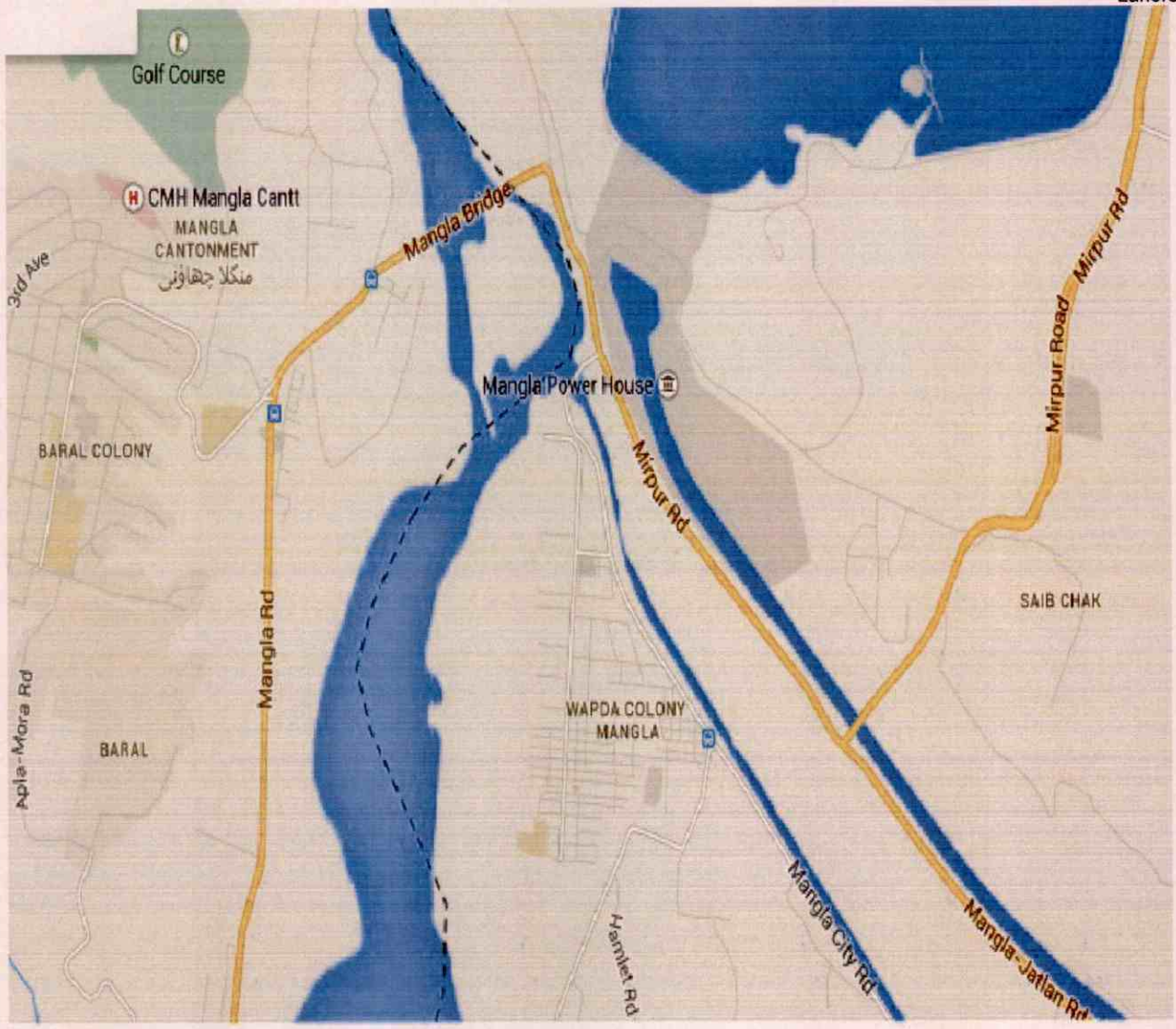

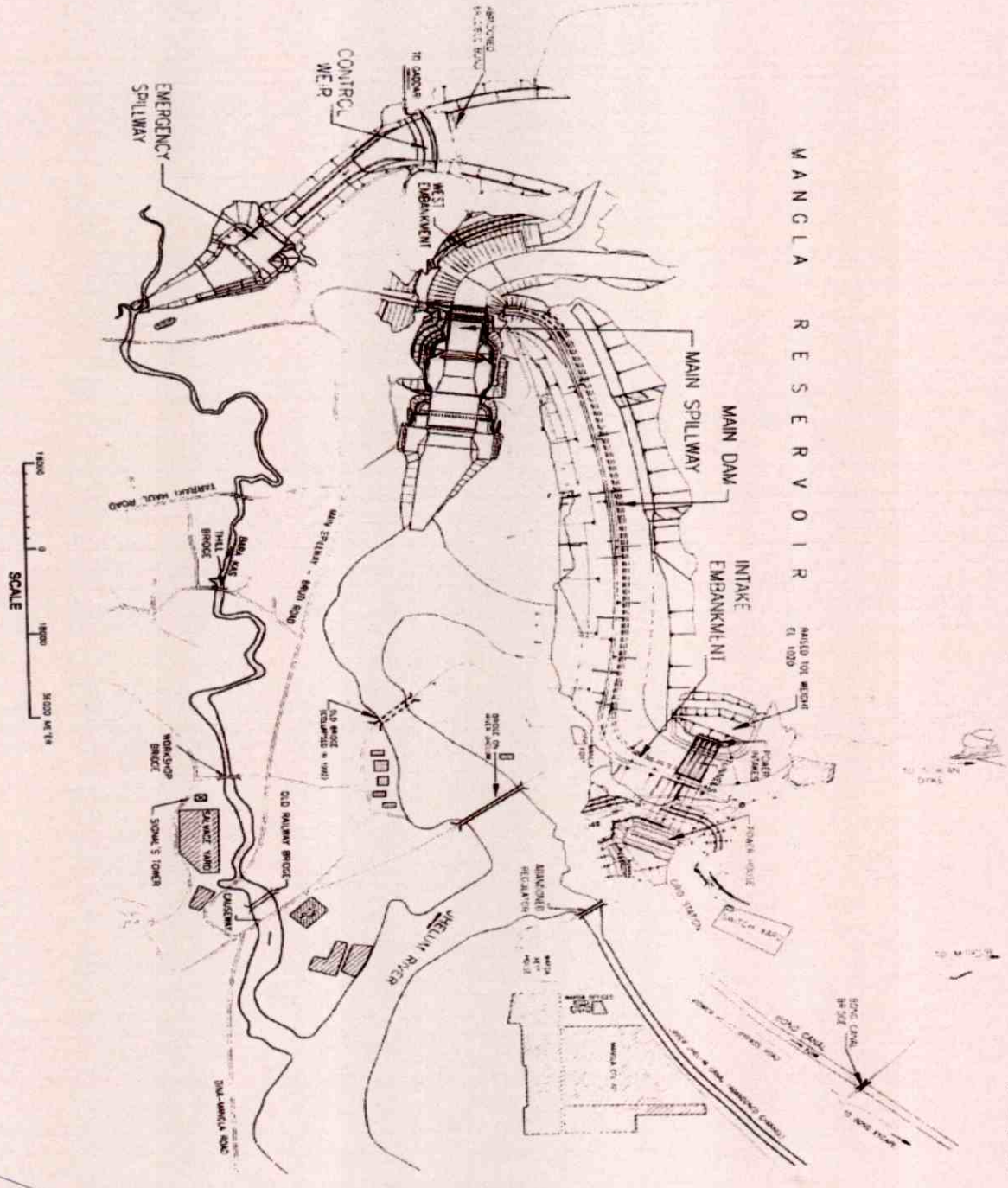

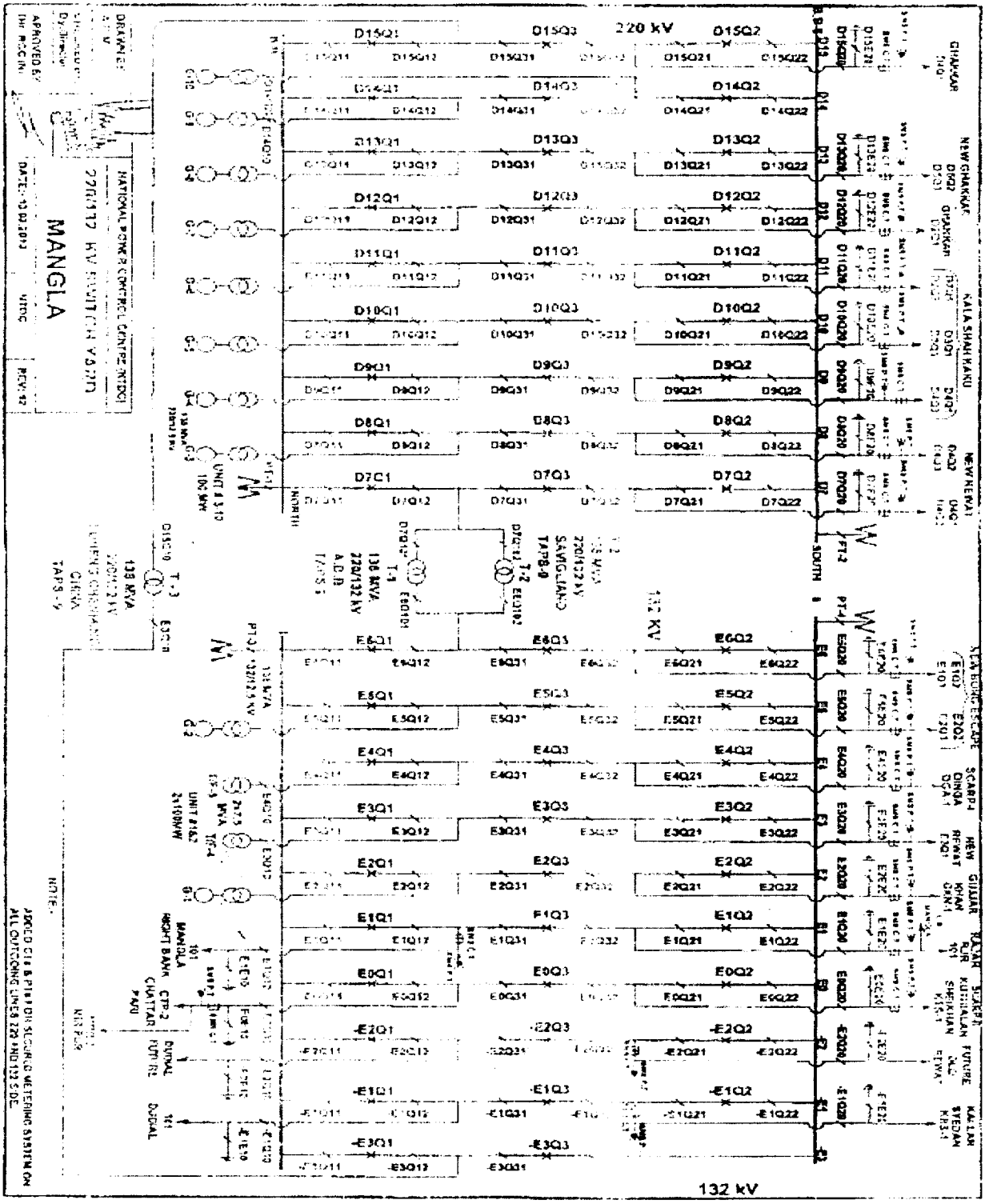

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Hydel Power Station, Mangla

PLANT DETAILS

1.	Location	On River Jhelum at Mangla near Mirpur, Azad Jammu & Kashmir.			
2.	Plant	Type	Total Capacity	No. of Units	
		Storage	1000 MW	10	
3.	Head	Maximum		Minimum	
		397 ft		195 ft	
4.	Technology	Francis Turbines			
5.	Tunnel	No.	Length	Diameter	
	Total No. of Tunnel	5		At Intake	At Penstock
	(i). No. of Power Tunnels	5	1560 ft. each	31 ft.	26 ft.
	(ii). No. of Irrigation Tunnels	-		-	-
6.	Minimum Expected Useful Life of the Generation Facility	50 Years			
7.	Peaking/Base Operation	Plant is operated for base load generally during High Flow Period, where as during Low Flow Period, it is utilized for peaking.			
8.	Plant Characteristics	Generator Voltage	Units (1-10) = 13.2 KV		
		Power Factor	Units (1-10) = 0.8		
		Frequency	50 Hz		
		Automatic Generation Control	Automatic Load Frequency Control is installed on Units 3, 4, 7&8		

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		CCT	Voltage (KV)	Length (KM)
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	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
		Kharian-3 (NBE-1)	132	7.00
		Scarp-I (Dinga)	132	71.00
		Scarp-2 (Kuthialan Sheikhan)	132	109.00
		Mirpur (MPR-3)	132	7.79
		Old Rawat-I (Kallar Syedan)	132	78.00
		Old Rawat-II (Dudyal)	132	36.60
		Ghakhar-I	220	114.90
		Ghakhar-II	220	113.70
		Ghakhar-III (New Ghk)	220	145.00
		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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Hydel Power Station
Warsak

(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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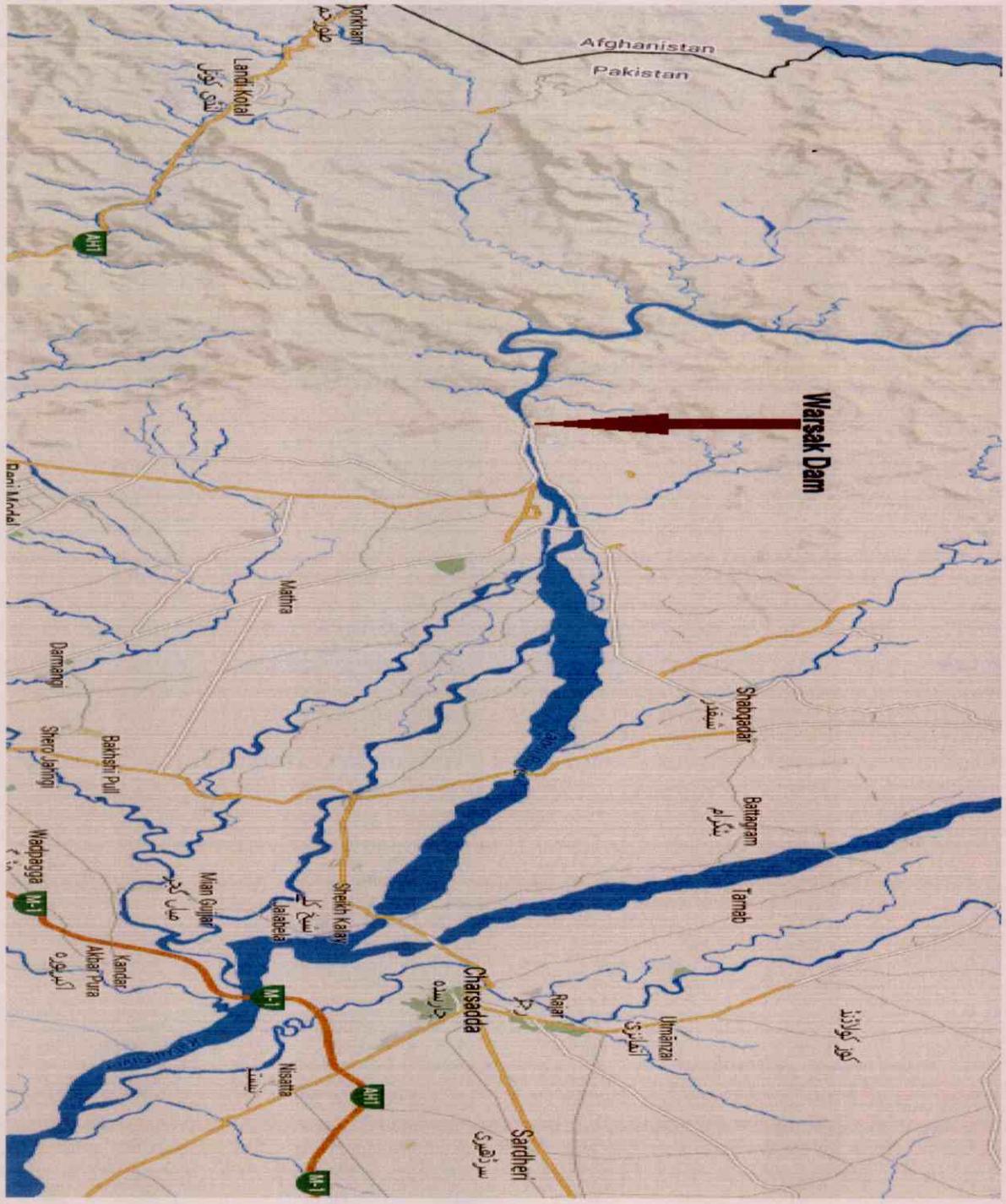
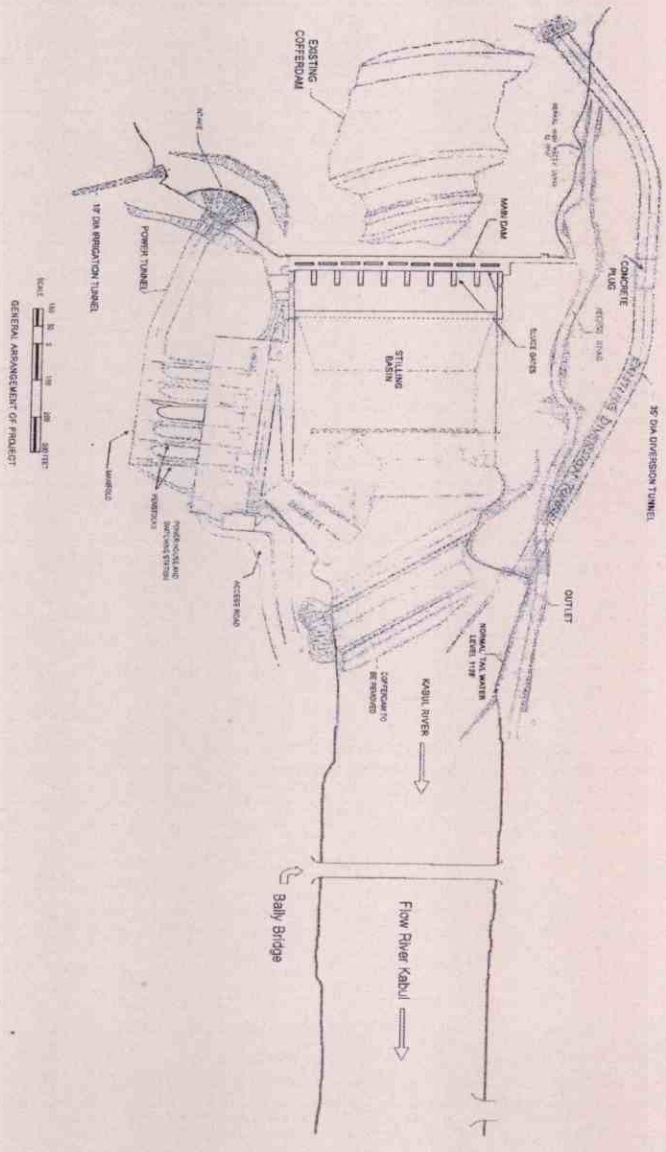
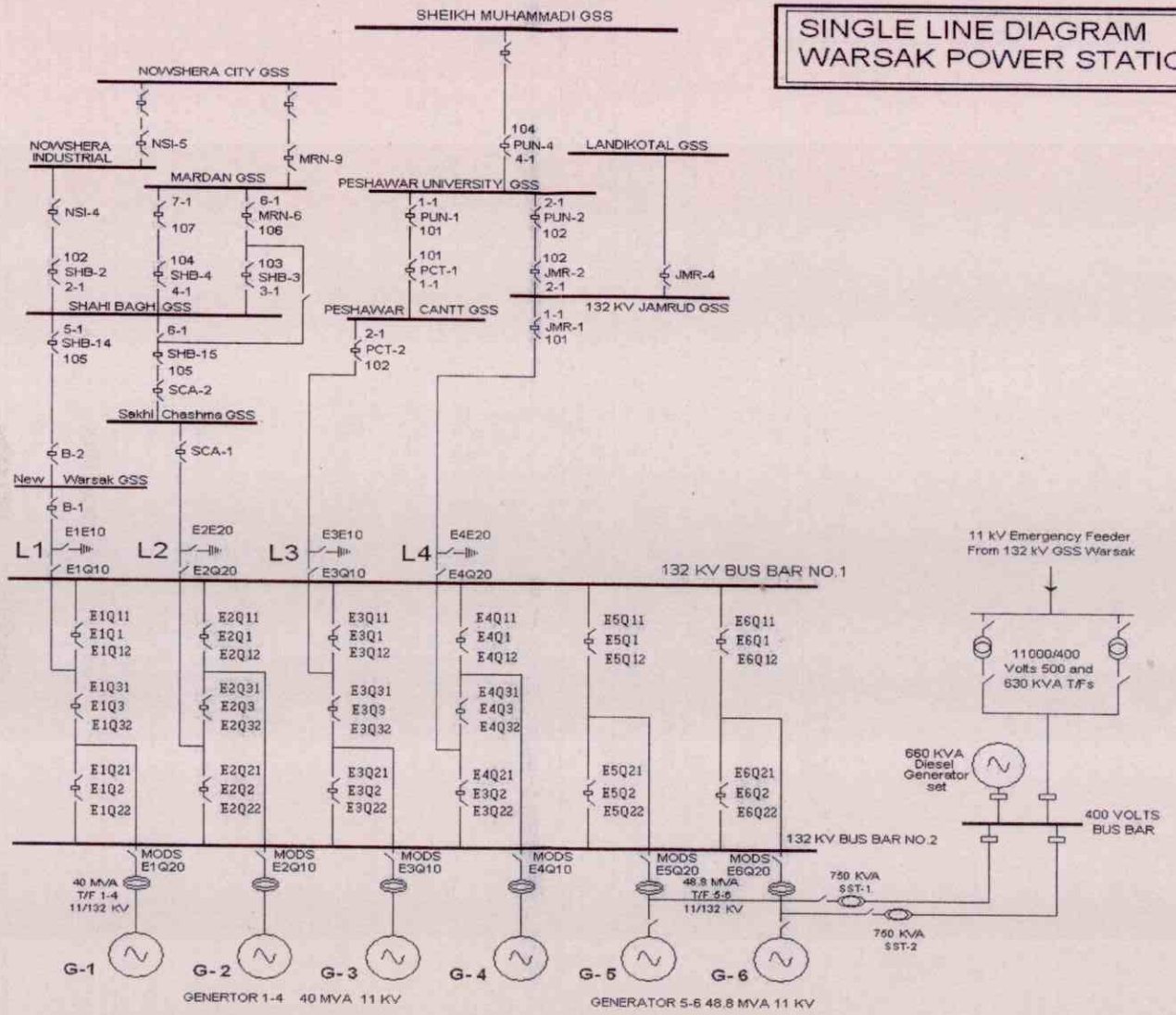


General lay out of Warsak Power Station



SINGLE LINE DIAGRAM
WARSAK POWER STATION



Hydel Power Station, Warsak

PLANT DETAILS

1.	Location		located on right bank of River Kabul, on the boundary of Mohmand and Khyber Agencies			
2.	Plant		Type	Total Capacity	No. of Units	
			Run of River	242.96 MW	06	
3.	Head		Maximum		Minimum	
			150 ft		130 ft	
4.	Technology		Francis Turbine			
5.	Tunnel		No.	Length	Diameter	
	Total No. of Tunnel		1	-	At Intake	At Penstock
	(i).	No. of Power Tunnels	1	827 ft.	39 ft.	39 ft.
	(ii).	No. of Irrigation Tunnels	-	-	-	-
6.	Minimum Expected Useful Life of the Generation Facility		25 Years after completion of rehabilitation.			
7.	Peaking/Base Operation		Generally during normal and high flow periods, it is operated for base load whereas during lean water period, it is utilized for peaking.			
8.	Plant Characteristics		Generator Voltage	Units (1-6) = 13.2 KV		
			Power Factor	Units (1-4) = 1.0		
				Units (5-6) = 0.85		
			Frequency	50 Hz		
			Automatic Generation Control	No		

9. Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT		Voltage (KV)	Length (KM)
	Line:1	Warsak Power House to GSS Warsak	132	03.603
		GSS Warsak to GSS Shahi Bagh		23.513
	Line:2	Warsak Power House to GSS Sakhi Chashma	132	26.690
		GSS Sakhi Chashma to GSS Shahi Bagh		05.260
	Line:3	Warsak Power House to GSS Peshawar Cantt	132	26.315
	Line:4	Warsak Power House to GSS Jamrud	132	27.690

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Hydel Power Station
Ghazi Brotha

(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

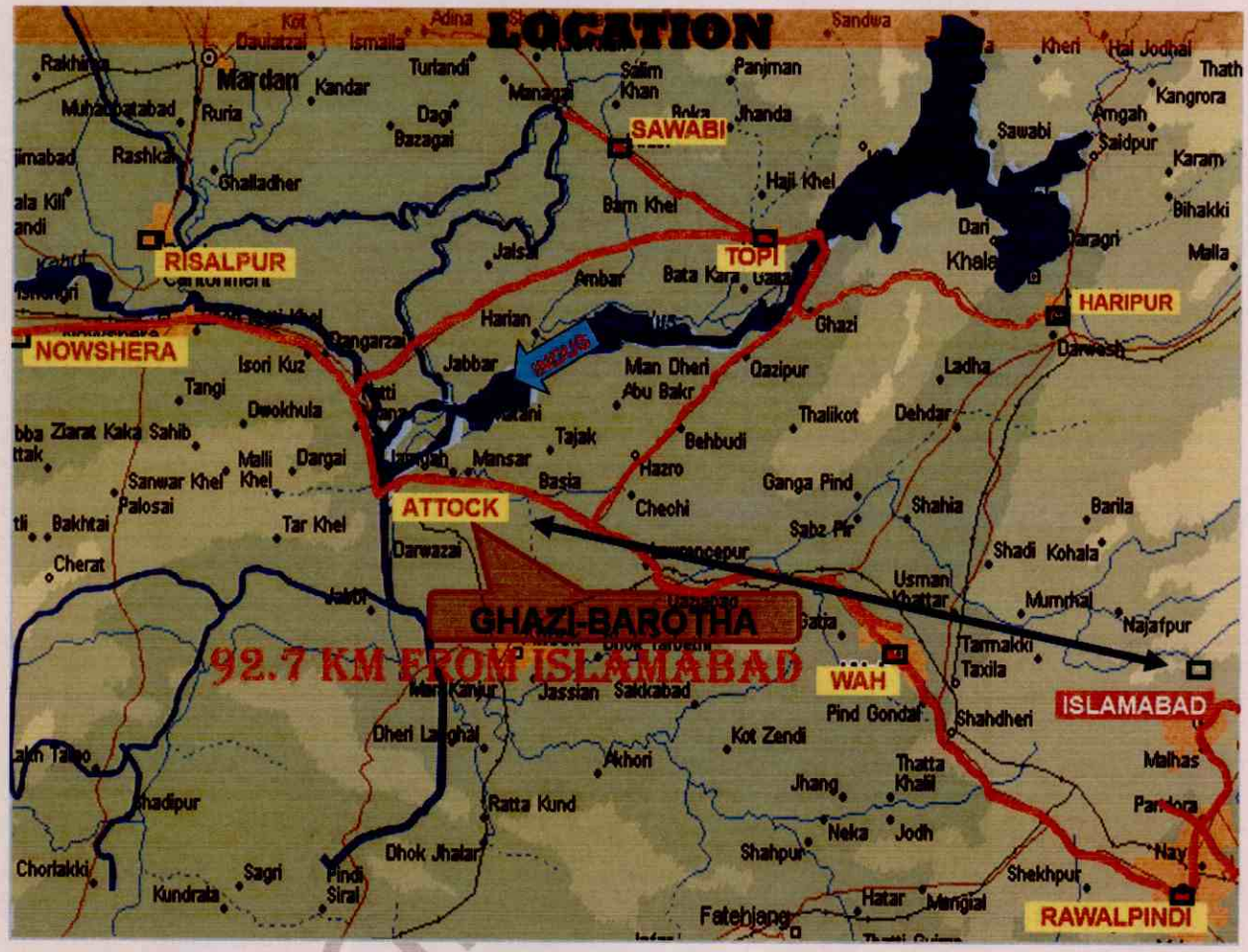
(e). Tunnel(s) if existing: length, diameter

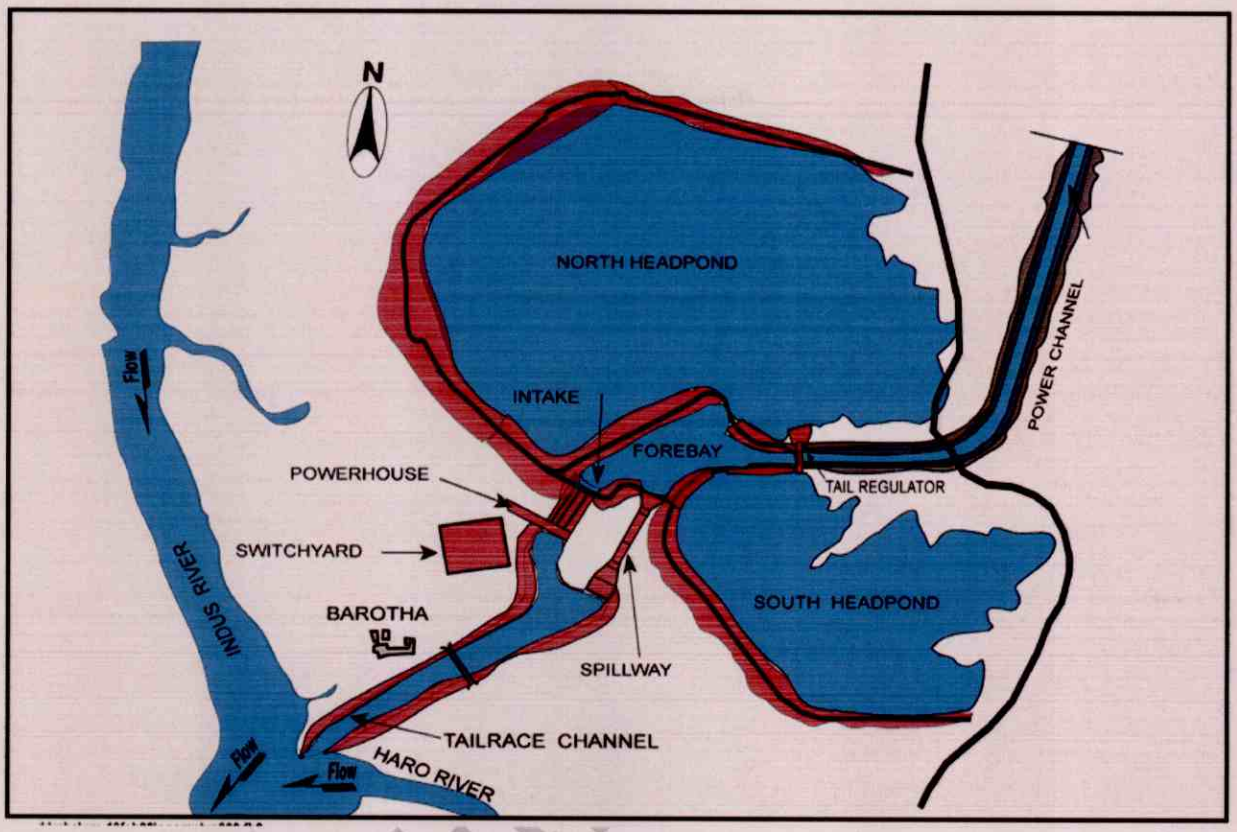
(f). expected life

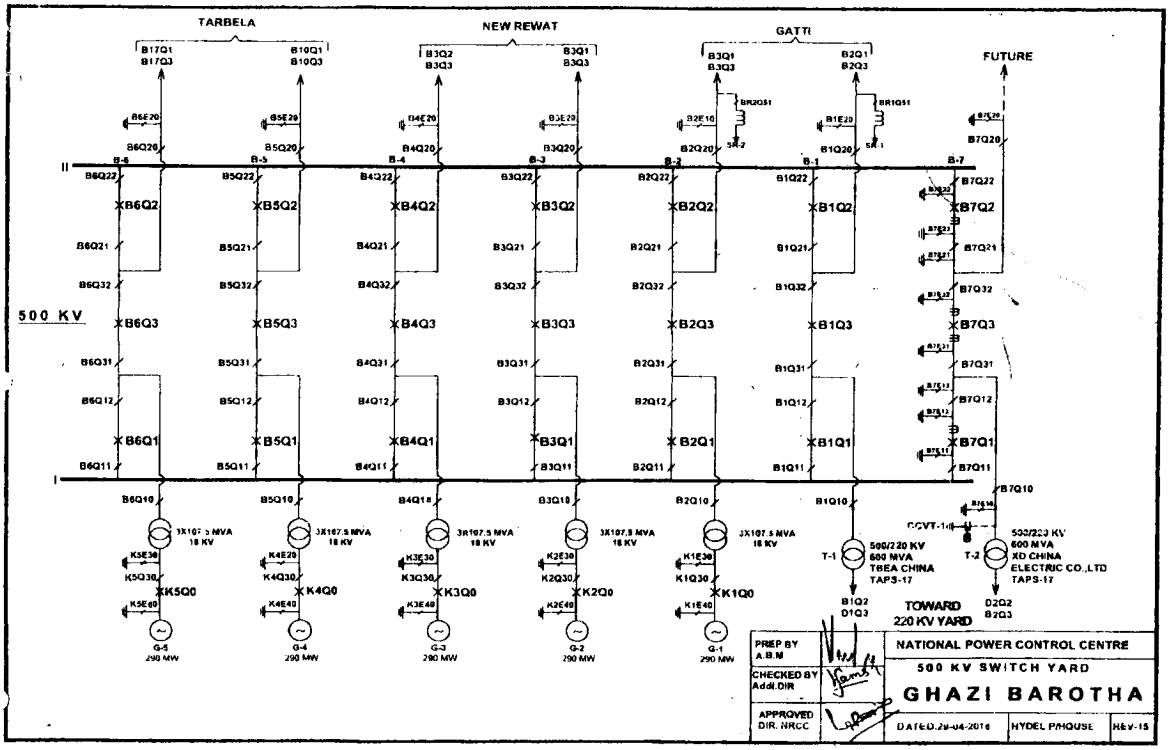
(g). Interconnection with national grid company, length of transmission line(s)

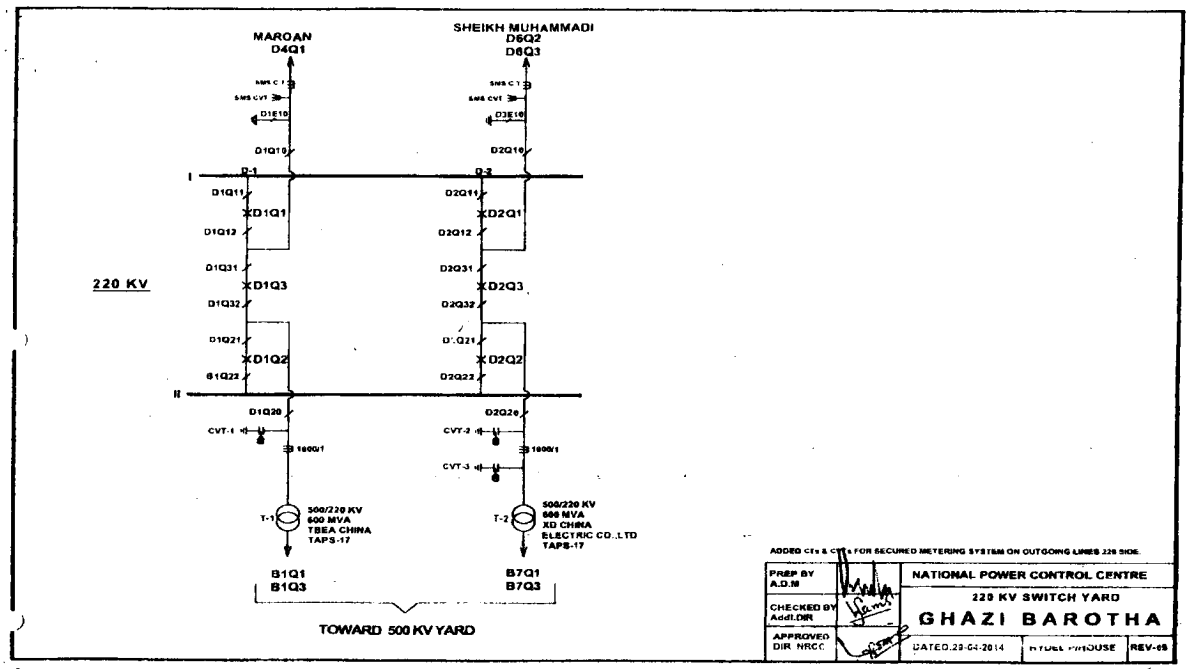
(h). Peaking/base load operation

(i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation









Hydel Power Station, Ghazi Barotha

PLANT DETAILS

1.	Location	Near Village Barotha 63 KM downstream of Tarbela about 10 KM West of Attock City, Punjab			
2.	Plant	Type	Total Capacity	No. of Units	
		Run of River with small storage for peak Hours.	1450 MW	5	
3.	Head	Maximum		Minimum	
		74 Meter		69 Meter	
4.	Technology	Francis Turbine			
5.	Tunnel	No.	Length	Diameter	
	Total No of Tunnel	5	-	At Intake	At Penstock
	(i). No of Power Tunnel	5	222 Meter	10.6 Meter	8.7 Meter
	(ii). No. of Irrigation Tunnels	-	-	-	-
6.	Minimum Expected Useful Life of the Generation Facility	50 Years			
7.	Peaking/Base Operation	Peak Load Operation			
8.	Plant Characteristics	Generator Voltage	Units (1-5) = 18 KV		
		Power Factor	Units(1-5) = 0.9		
		Frequency	Frequency = 50 Hz		
		Automatic Generation Control	Yes		

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

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Hydel Power Station
Chashma

(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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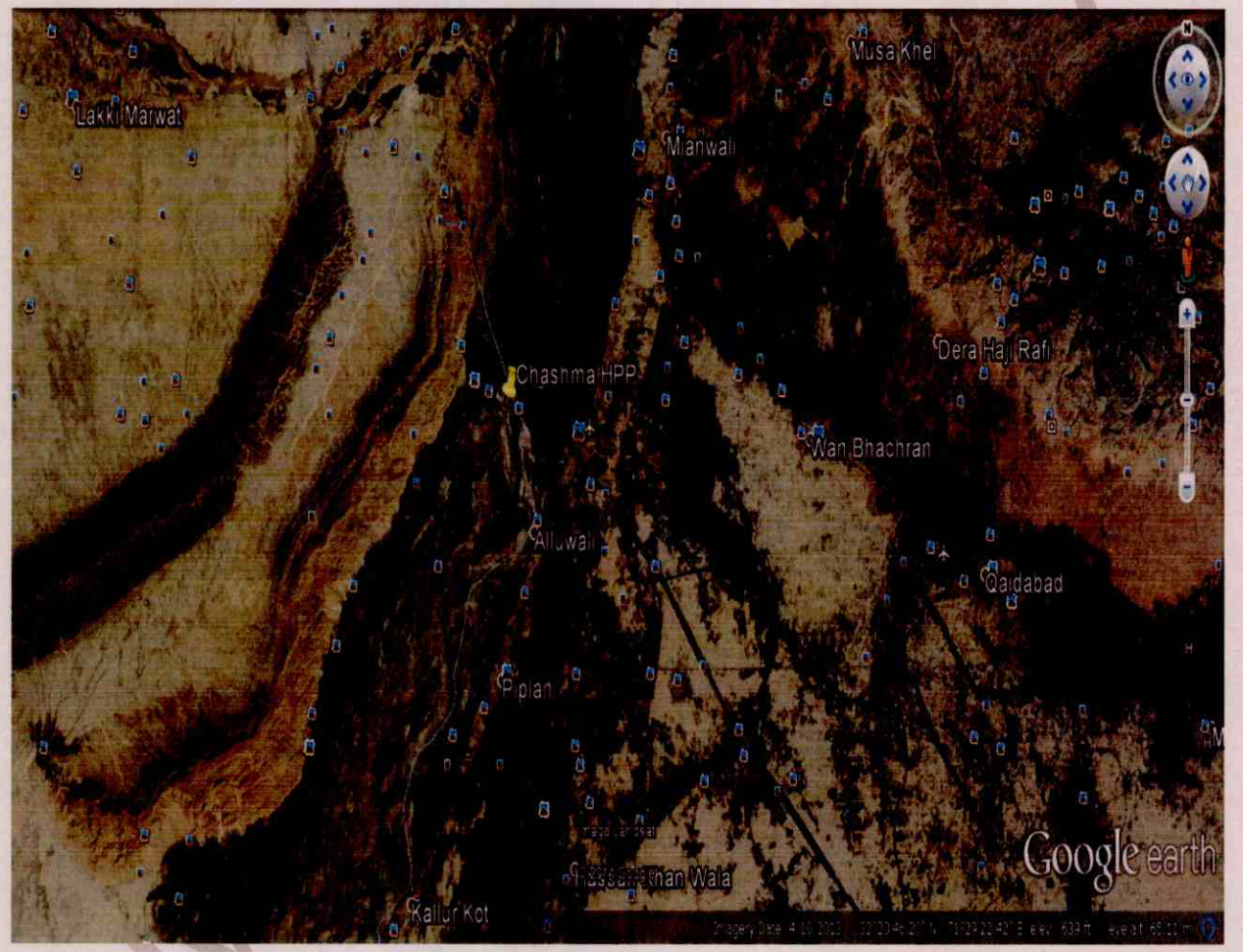

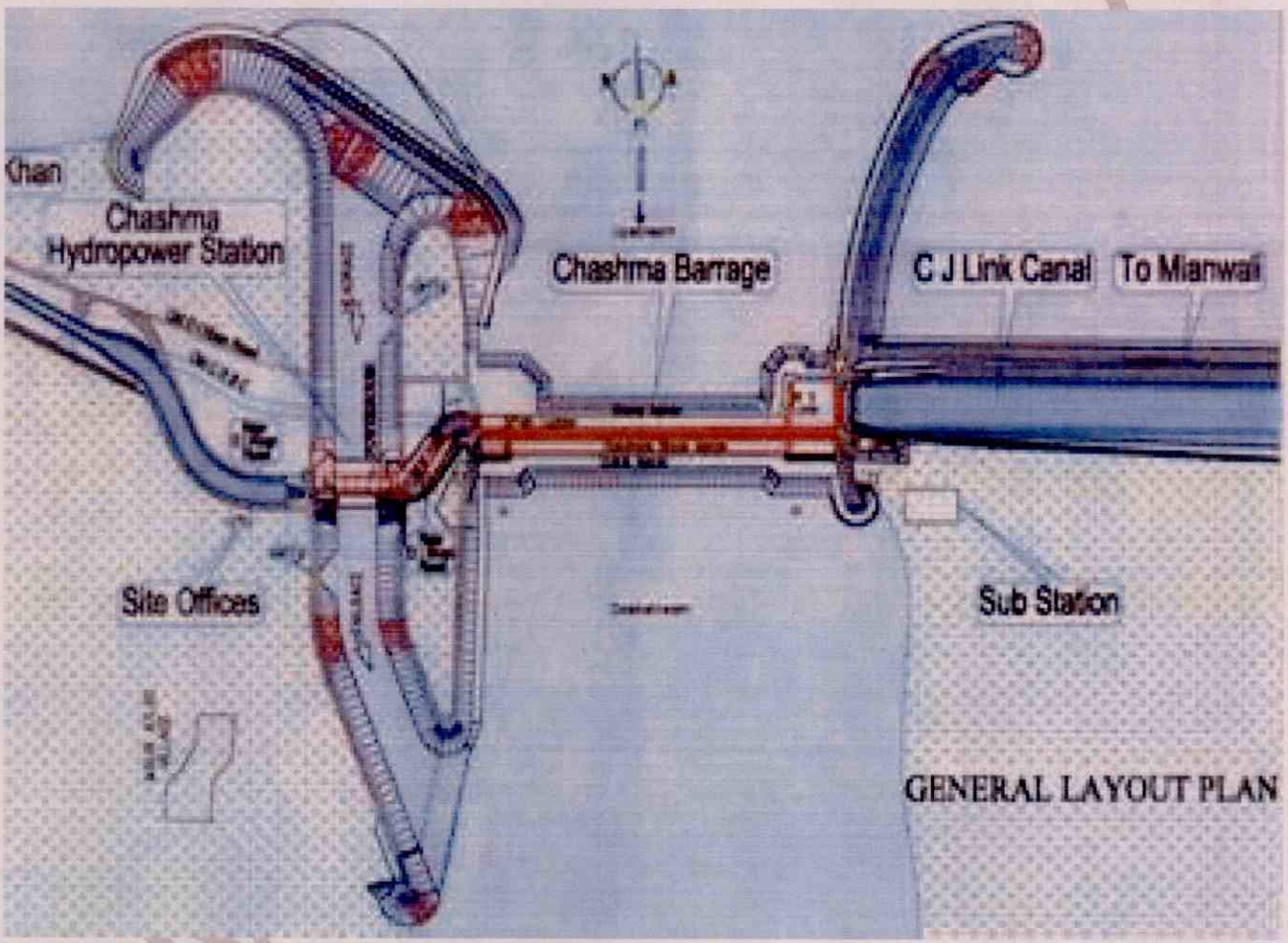

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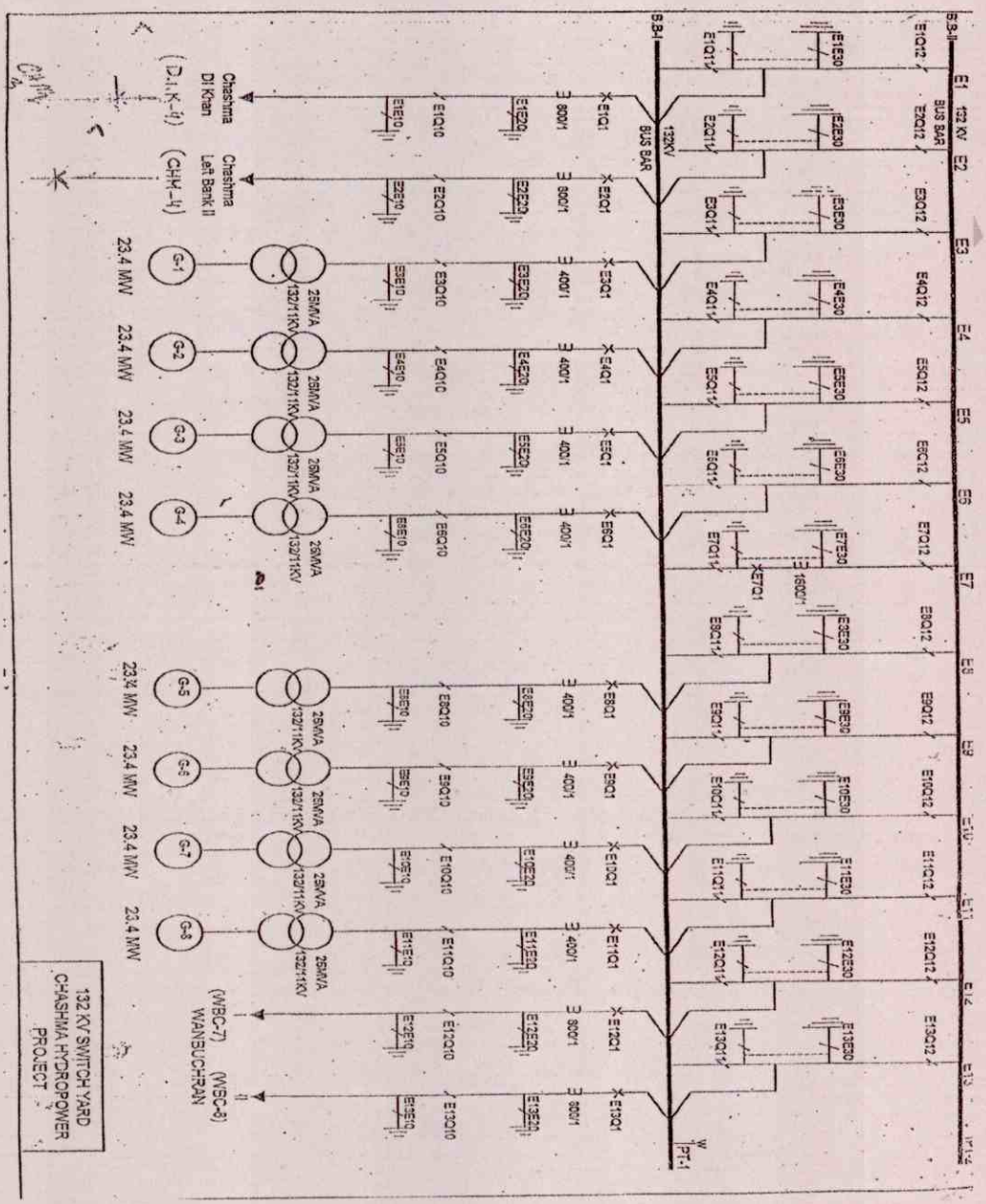

Hydel Power Station, Chashma

PLANT DETAILS

1.	Location	On Right abutment of Chashma Barrage in Dist. Mianwali, Province of Punjab.		
2.	Plant	Type	Total Capacity	No. of Units
		Run of River	184 MW	8
3.	Head	Maximum		Minimum
		13.8 meter		3 meter
4.	Technology	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.		
8.	Plant Characteristics	Generator Voltage	Units (1-8) = 11 KV	
		Power Factor	Units (1-8) = 0.90	
		Frequency	50 Hz	
		Automatic Generation Control	No	
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)
		D.I Khan	132	84
		Chashma Left Bank-II	132	1.71
		Wanbuchran-I	132	33.357
		Wanbuchran-II	132	33.357

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
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Hydel Power Station
Renala

(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

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
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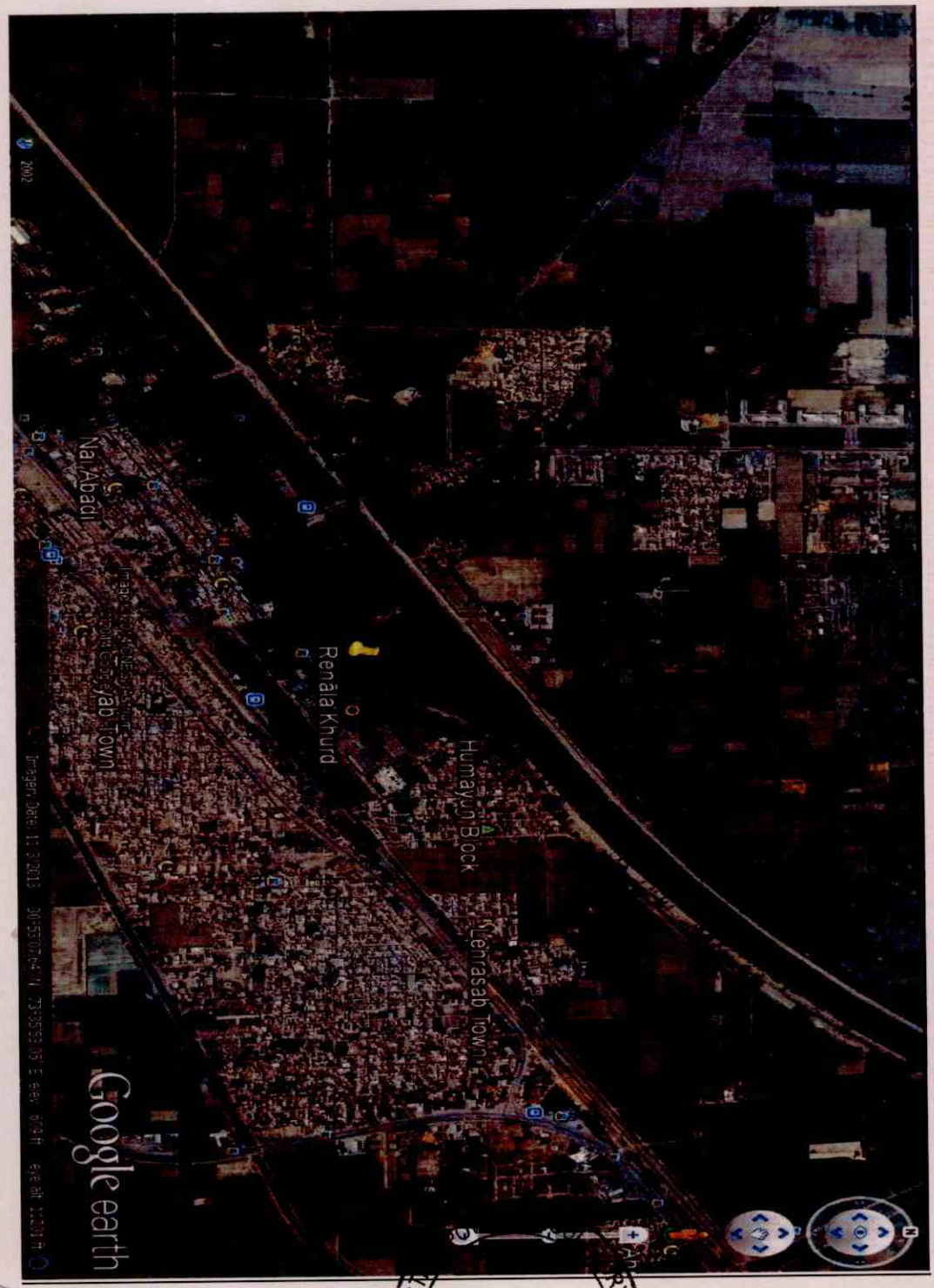

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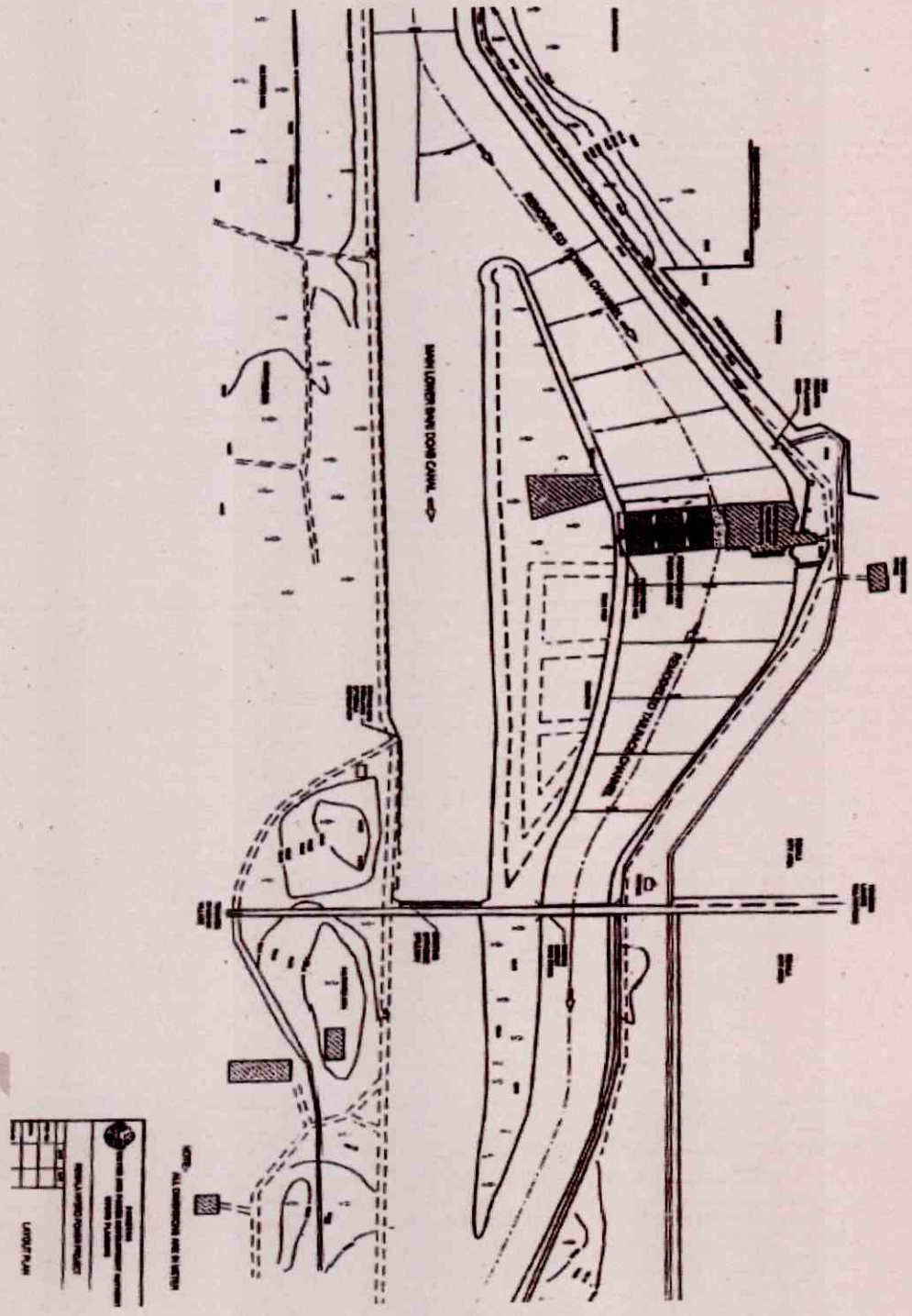

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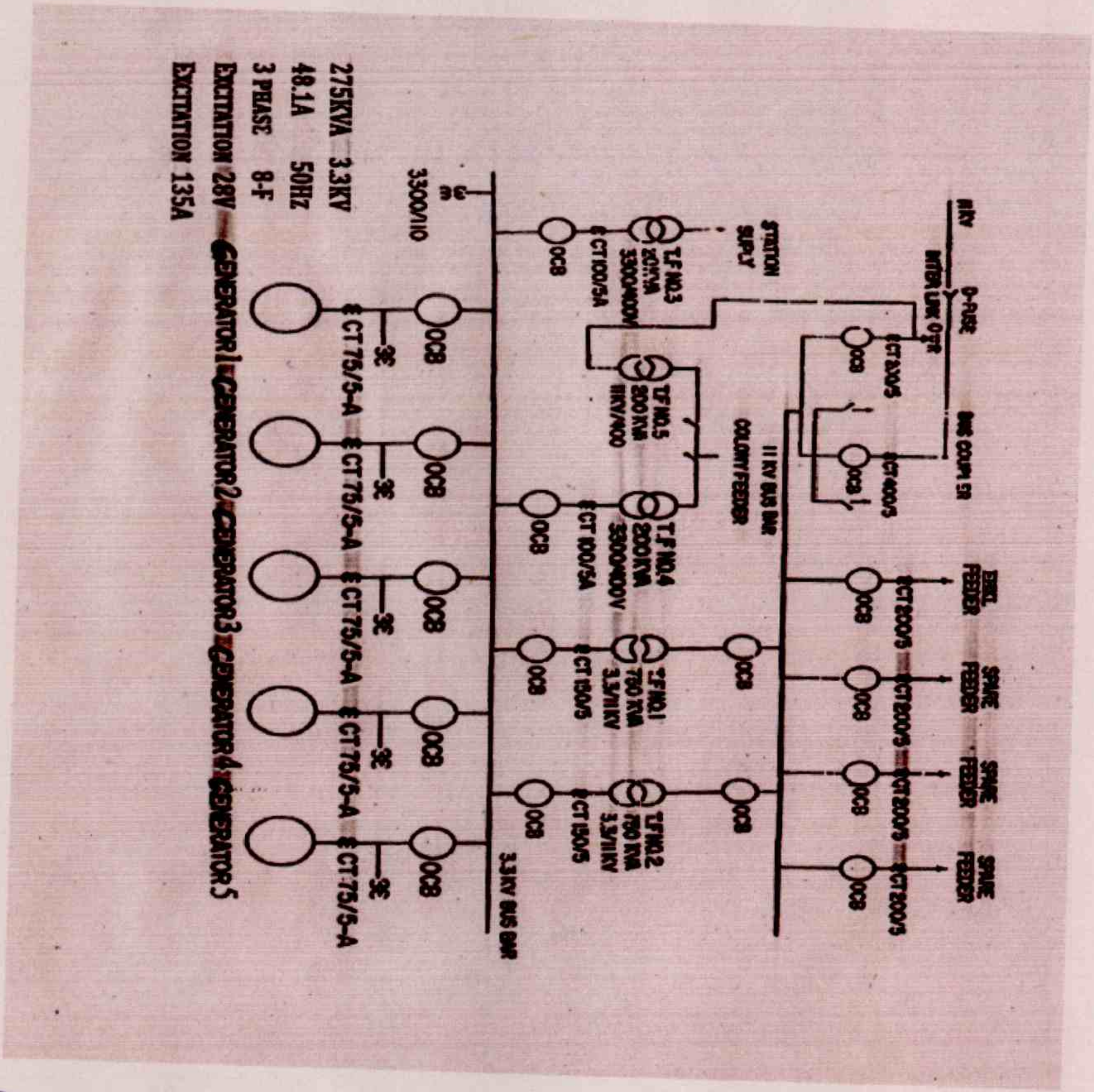

Hydel Power Station, Renala

PLANT DETAILS

1.	Location	Located on Lower Bari Doab Canal near Renala Town District Okara.		
2.	Plant	Type	Total Capacity	No. of Units
		Run of River	1.1 MW	5
3.	Head	Maximum	Minimum	
		10 ft	7 ft	
4.	Technology	Francis Turbine (Horizontal Shaft)		
5.	Penstock	No.	Length	Diameter Internal
	Total No. of Penstock	Nil		
6.	Minimum Expected Useful Life of the Generation Facility	30 Years		
7.	Peaking/Base Operation	Meant for local load of Lift Irrigation Pumping Stations.		
8.	Plant Characteristics	Generator Voltage	Units (1-5) = 3.3 KV	
		Power Factor	Units (1-5) = 0.8	
		Frequency	50 Hz	
		Automatic Generation Control	No	
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)
		11 KV feeder EHKL	11	60

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
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Hydel Power Station
Chichoki

(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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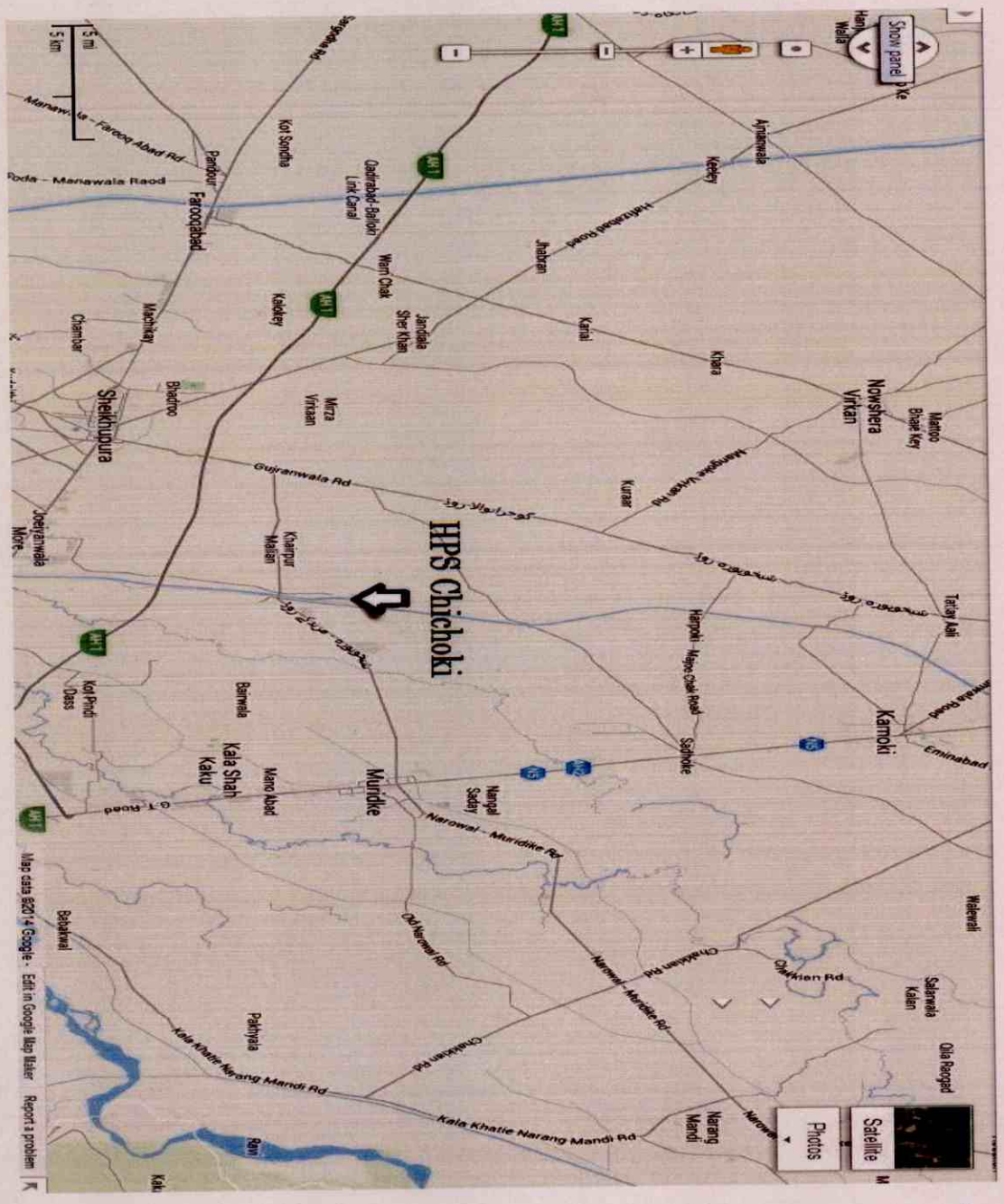

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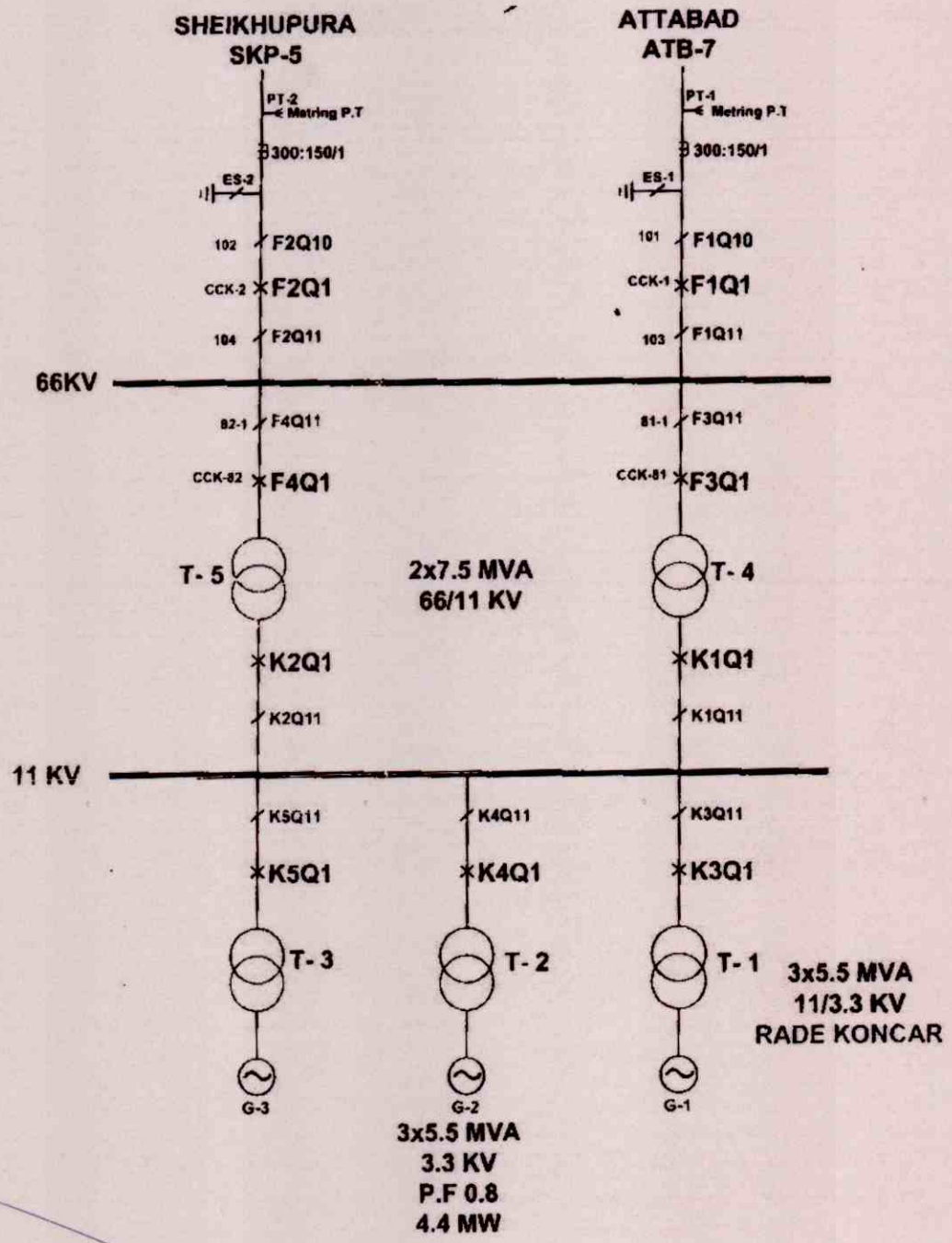

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
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Hydel Power Station, Chichoki

PLANT DETAILS

1.	Location	Located on Upper Chenab Canal (UCC) near village Joyanwala about 20 KMs from Sheikhupura.		
2.	Plant	Type	Total Capacity	No. of Units
		Run of River	13.2 MW	3
3.	Head	Maximum		Minimum
		27.7 ft		22.3 ft
4.	Technology	Kaplan Turbine		
5.	Penstock	No.	Length	Diameter Internal
	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.		
8.	Plant Characteristics	Generator Voltage	Units (1-3) = 3.3 KV	
		Power Factor	Units (1-3) = 0.8	
		Frequency	50 Hz	
		Automatic Generation Control	No	
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage(KV)	Length(KM)
		Chichokimallian - Attabad (CCK-I)	66	18
		Chichokimallian - Attabad (CCK-II)	66	31
		Outgoing feeder (1-A)	11	128
		Outgoing feeder (1-A)	11	0.25
		Outgoing feeder (1-A)	11	80

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Nandipur

(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

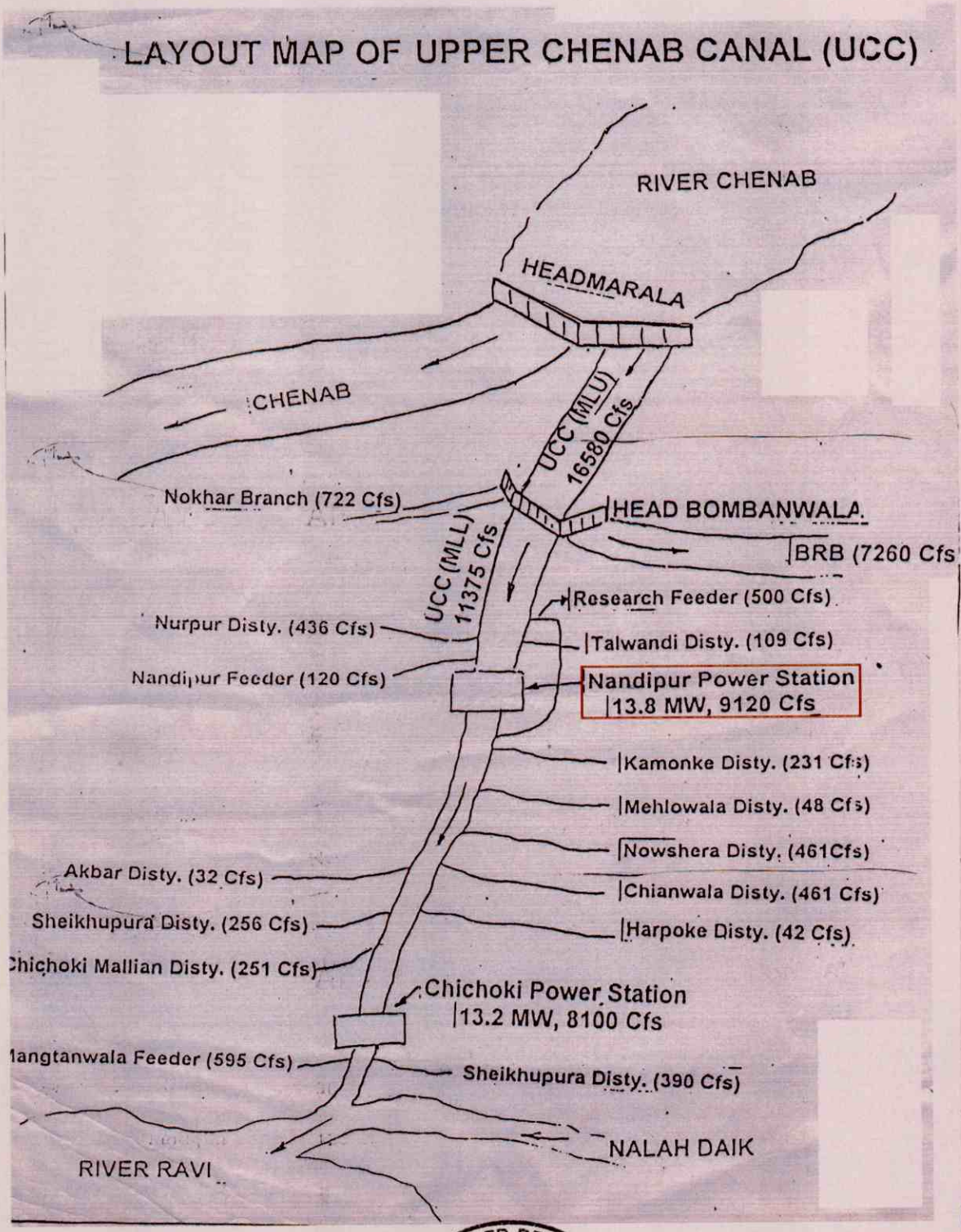
(f). expected life

(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

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA



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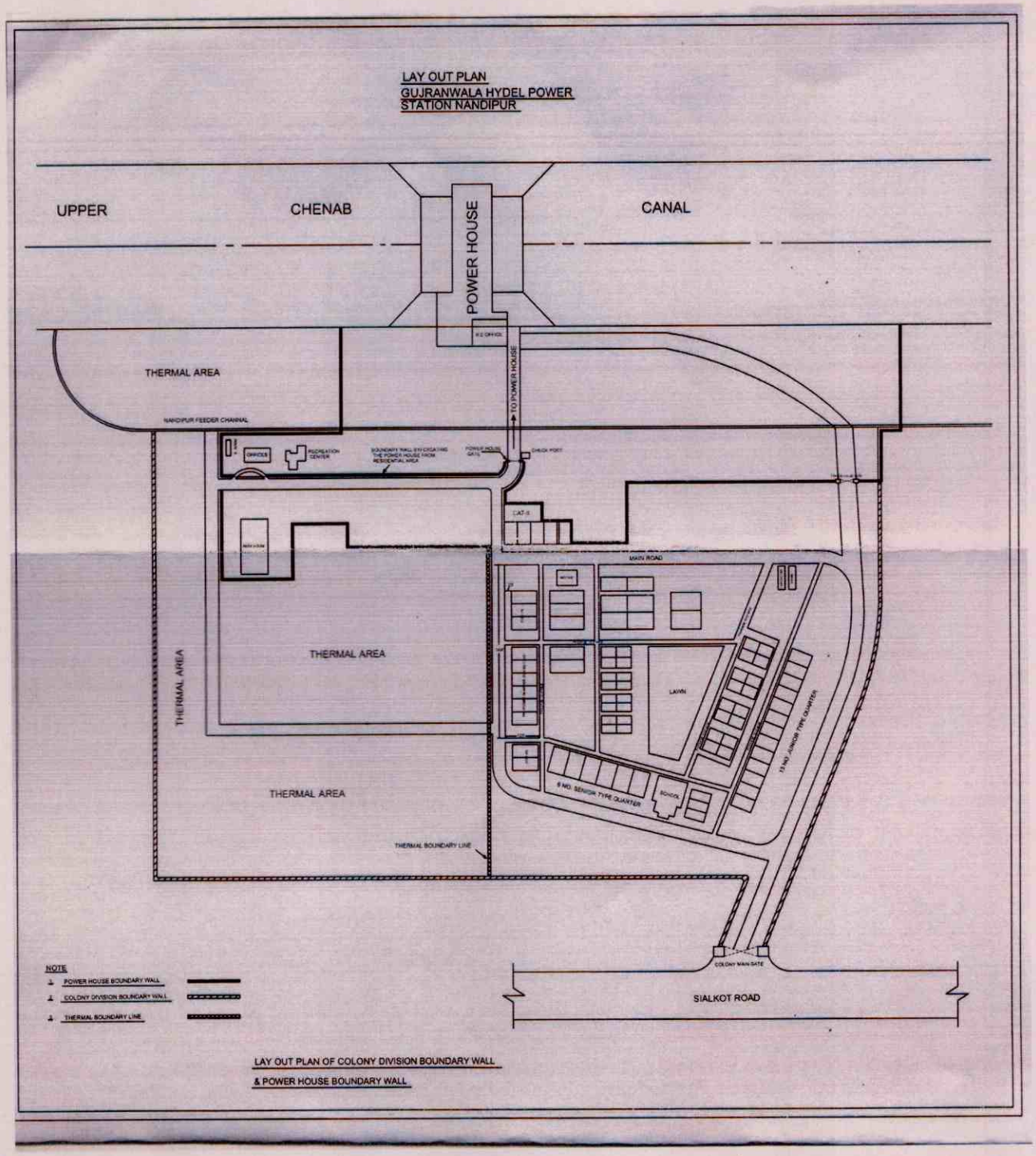

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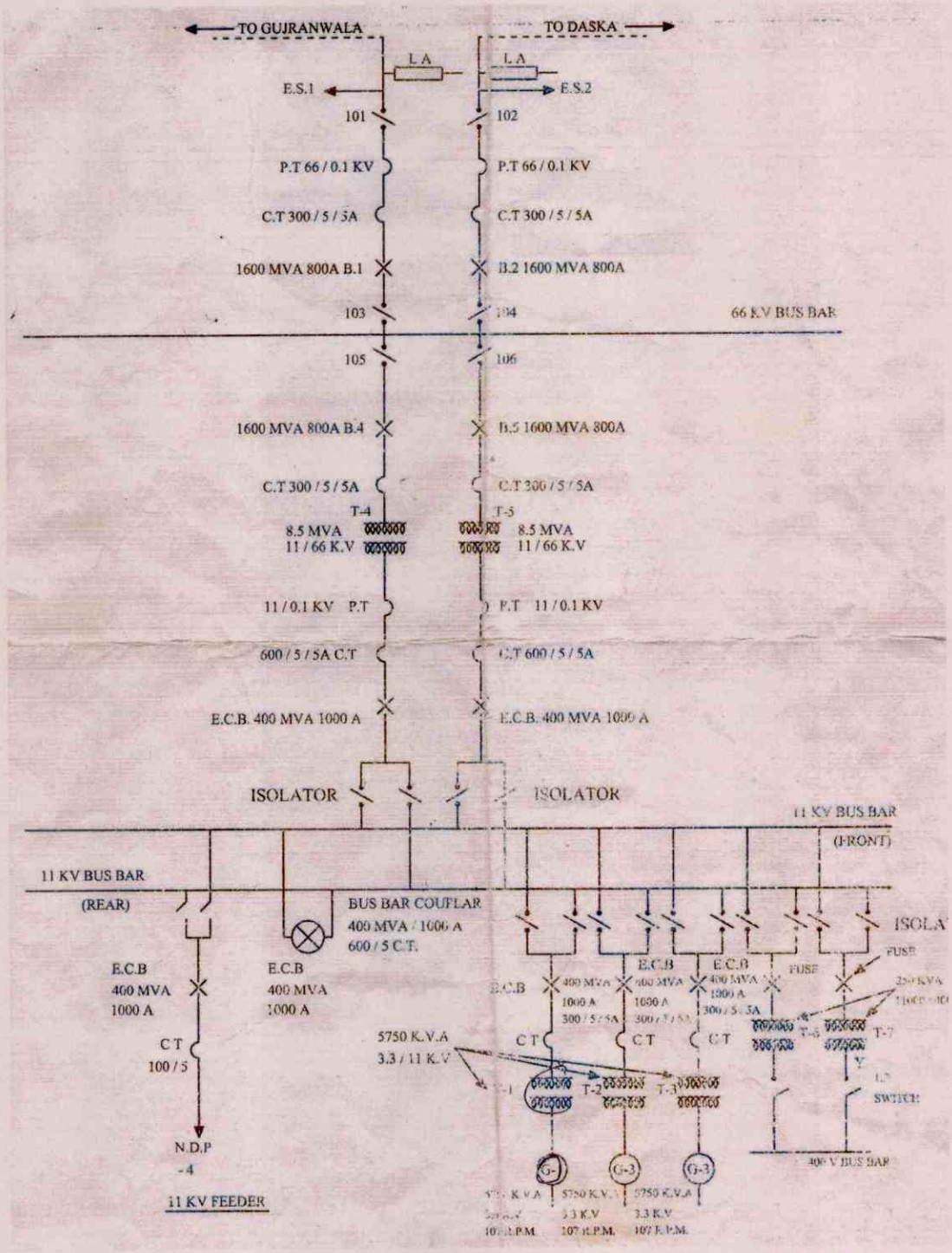


Hydel Power Station, Nandipur

PLANT DETAILS

1.	Location	On Upper Chenab Canal (UCC) about 10 KMs from Gujranwala on Gujranwala Sialkot Road.			
2.	Plant	Type	Total Capacity	No. of Units	
		Run of River	13.8 MW	3	
3.	Head	Maximum		Minimum	
		24.4 ft		19.5 ft	
4.	Technology	Kaplan Turbine			
5.	Penstock	No.	Length	Diameter Internal	
	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.			
8.	Plant Characteristics	Generator Voltage	Units (1-3) = 3.3 KV		
		Power Factor	Units (1-3) = 0.8		
		Frequency	50 Hz		
		Automatic Generation Control	No.		
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)	
		Nandipur-Daska	66	15	
		Nandipur-Gujranwala	66	15	
		NDP-4	11	-	
		NDP-5	11	-	

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

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

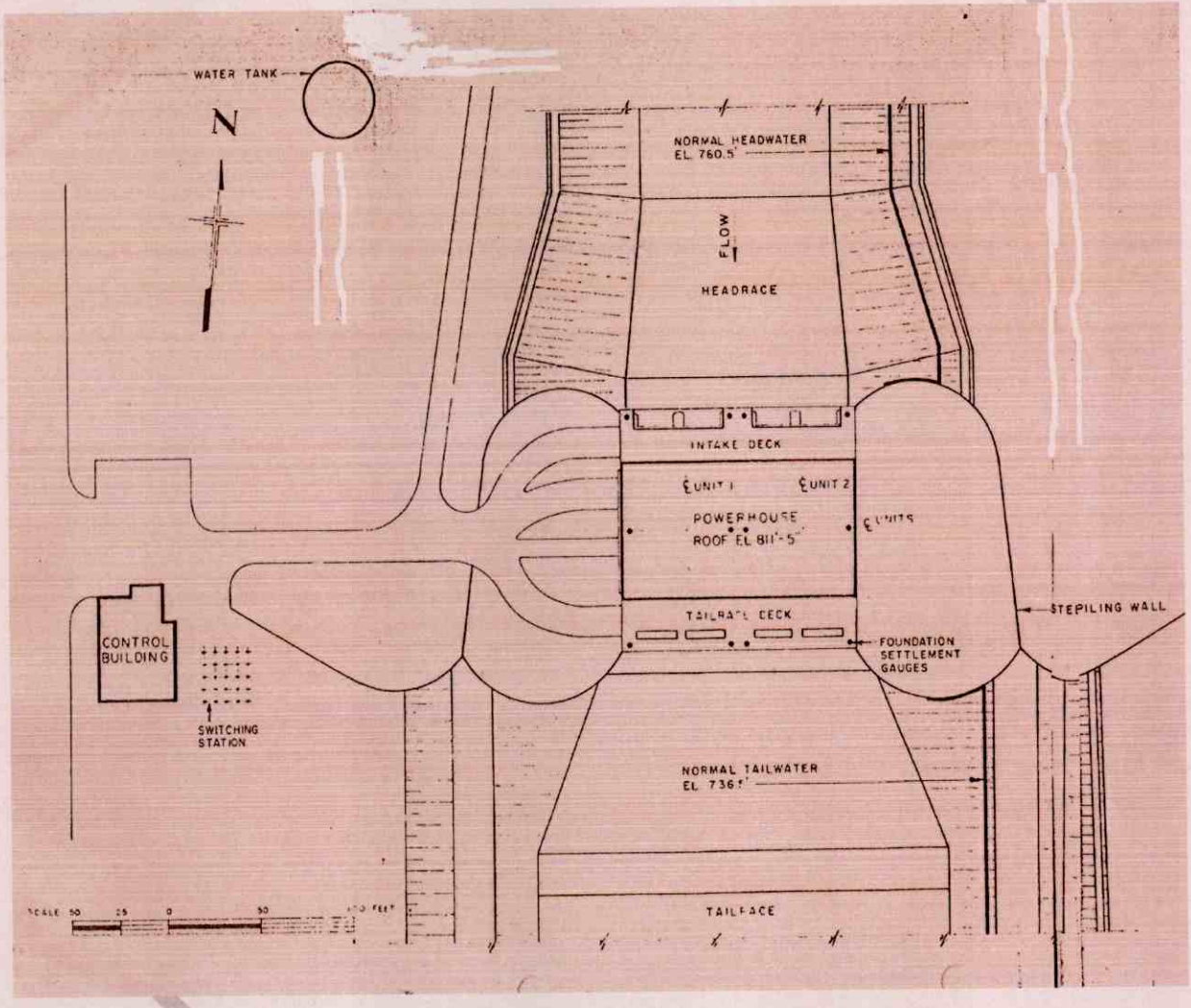
(f). expected life

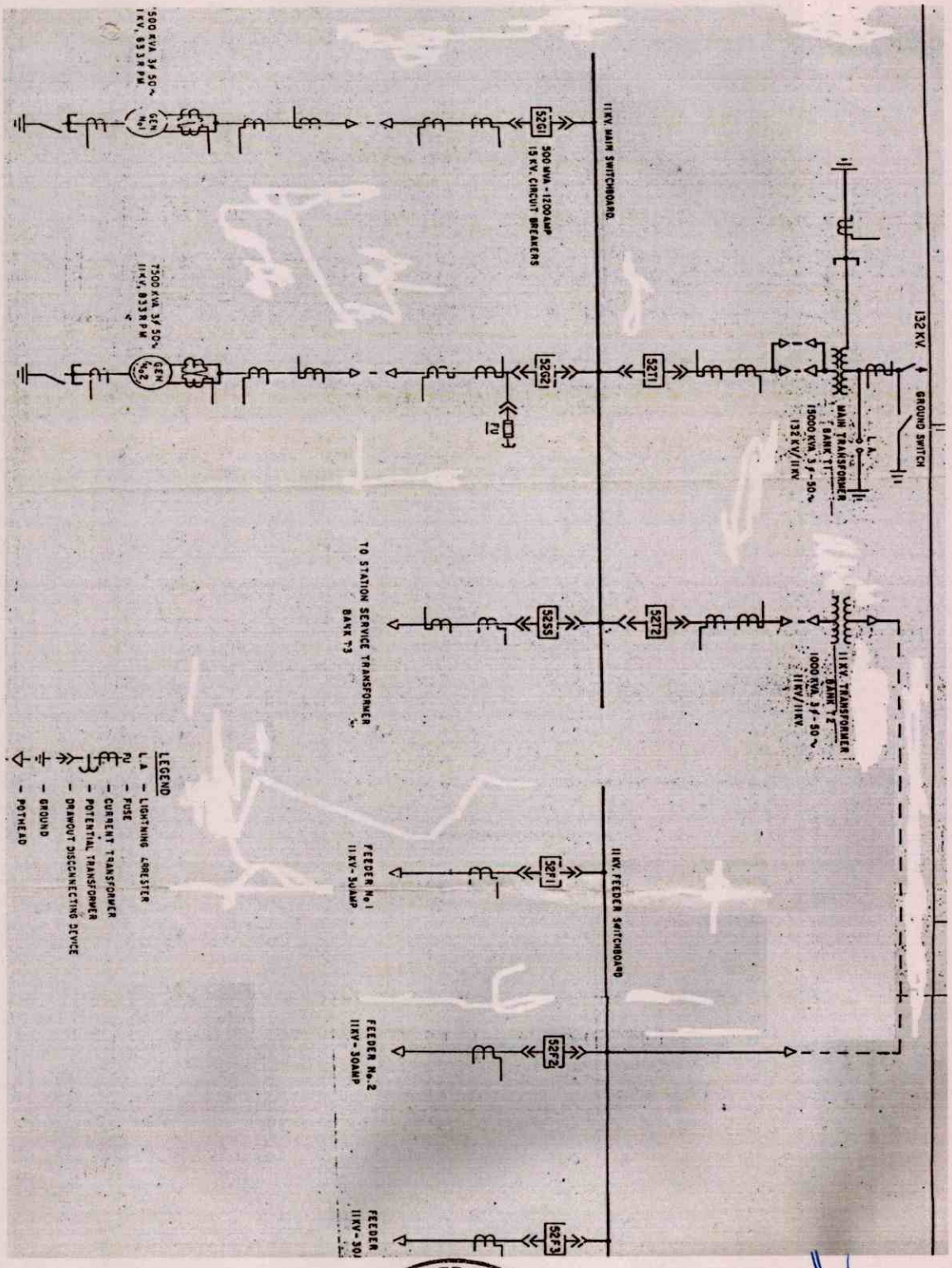
(g). Interconnection with national grid company, length of transmission line(s)

(h). Peaking/base load operation

(i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA





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	No. of Units	
		Run of River	13.5 MW	02	
3.	Head	Maximum	Minimum		
		24.5 ft	17 ft		
4.	Technology	Kaplan Turbines			
5.	Tunnel	No.	Length (KM)	Diameter	
	Total No. of Tunnel	01	03	At Intake	At Penstock
				-	-
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 Jhelum Canal.			
8.	Plant Characteristics	Generator Voltage	Units (1-2) = 11KV		
		Power Factor	Units (1-2) = 0.9		
		Frequency	50 Hz		
		Automatic Generation Control	No.		
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)	
		Shadiwal-Gujrat	132	9.6	

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Rasul

(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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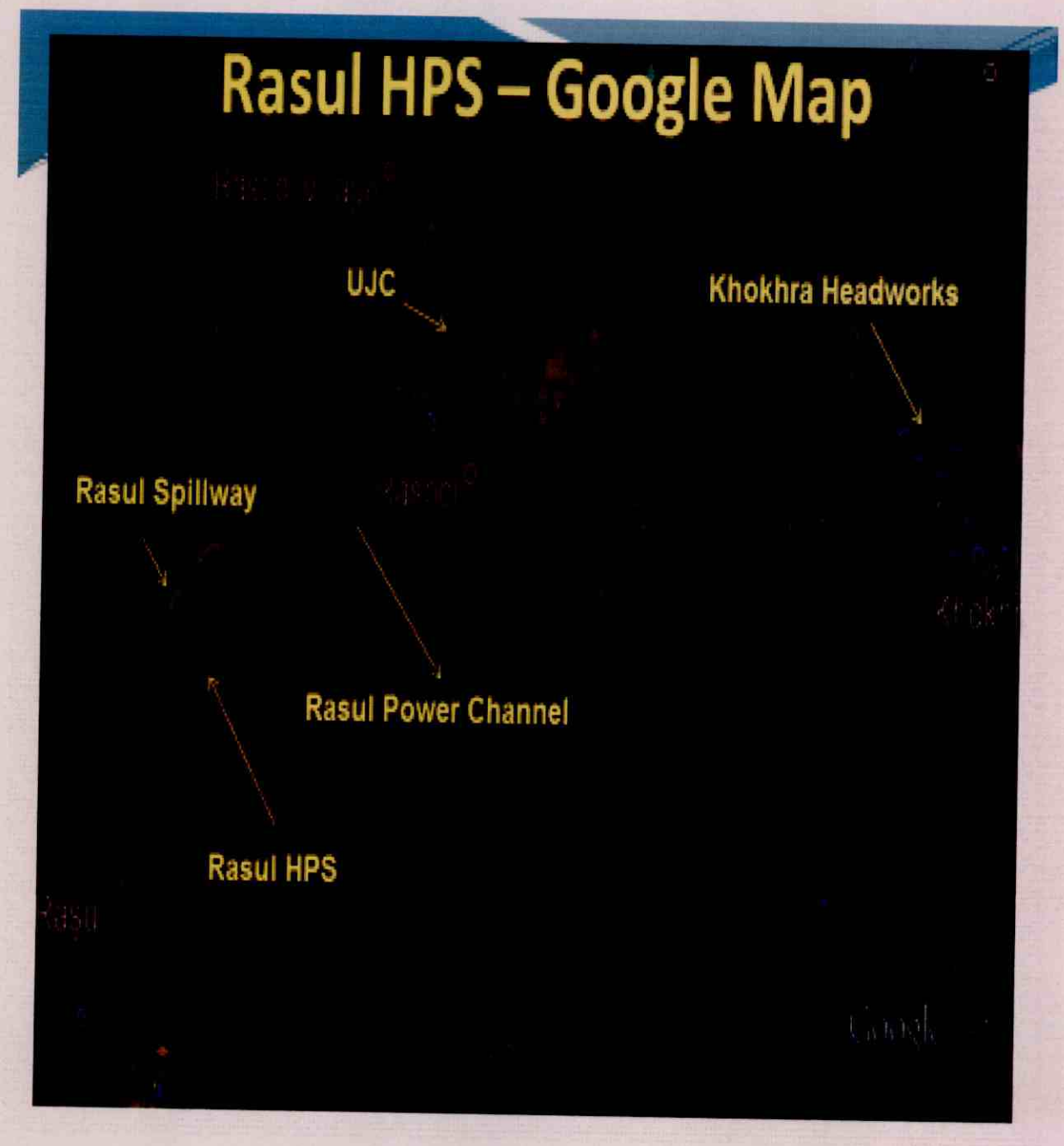

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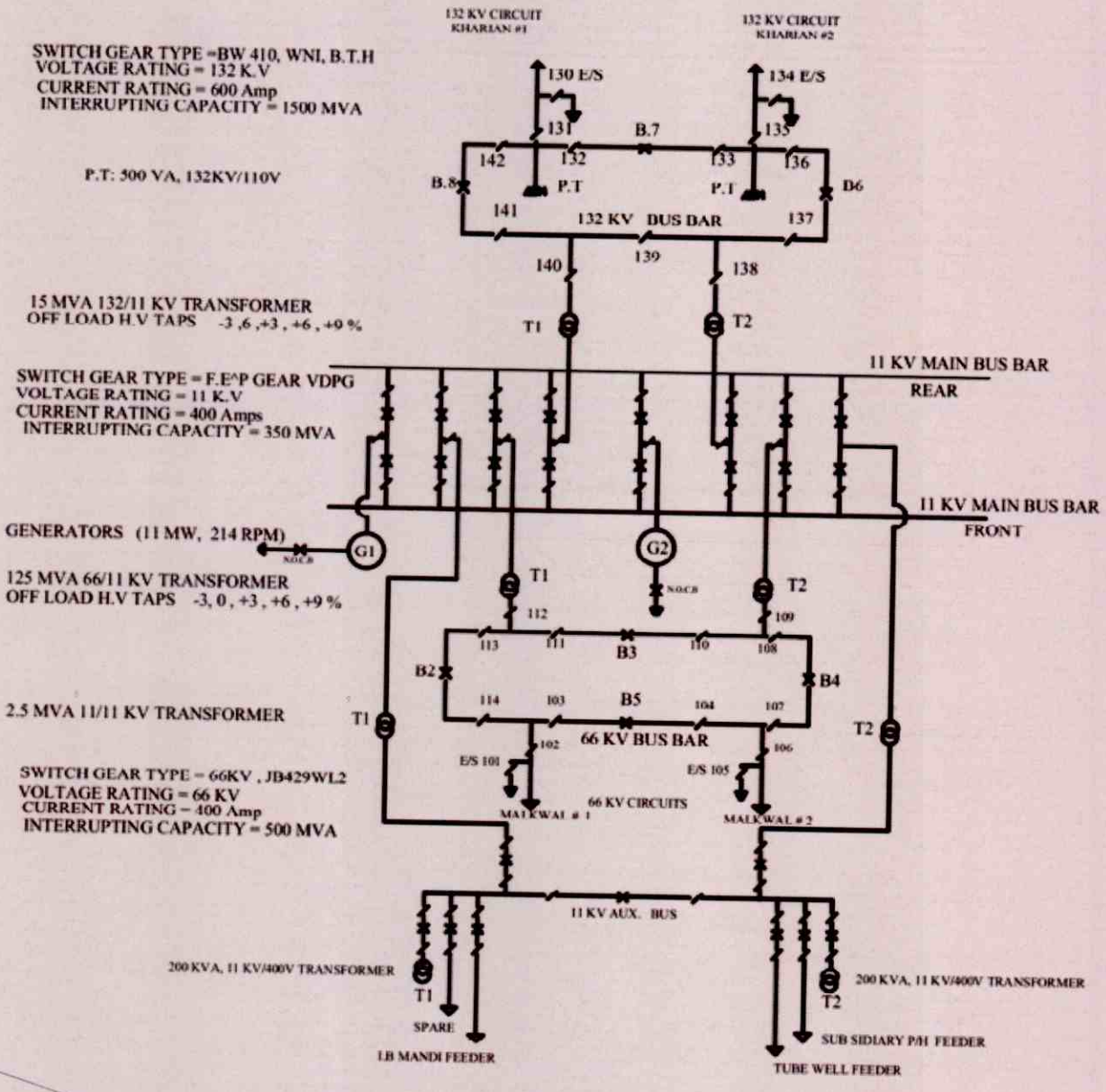


Hydel Power Station, Rasul

PLANT DETAILS

1.	Location	On Upper Jhelum Canal (UJC) about 74 KMs Down Stream of Mangla.		
2.	Plant	Type	Total Capacity	No. of Units
		Run of River	22 MW	2
3.	Head	Maximum	Minimum	
		85.05 ft	80.35 ft	
4.	Technology	Kaplan Turbine		
5.	Penstock	No.	Length	Diameter Internal
	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 base load according to the water share in the Canal.		
8.	Plant Characteristics	Generator Voltage	Units (1-2) = 11KV	
		Power Factor	Units (1-2) = 0.88	
		Frequency	50 Hz	
		Automatic Generation Control	No	
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length(KM)
		Rasul-Malikwal	66	38.4
		Rasul-Malikwal-II	66	38.4
		Rasul-Kharian (D/C Bundled)	132	42.0
		Rasul-Kharian (Bundled)	132	42.0

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Dargai

(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

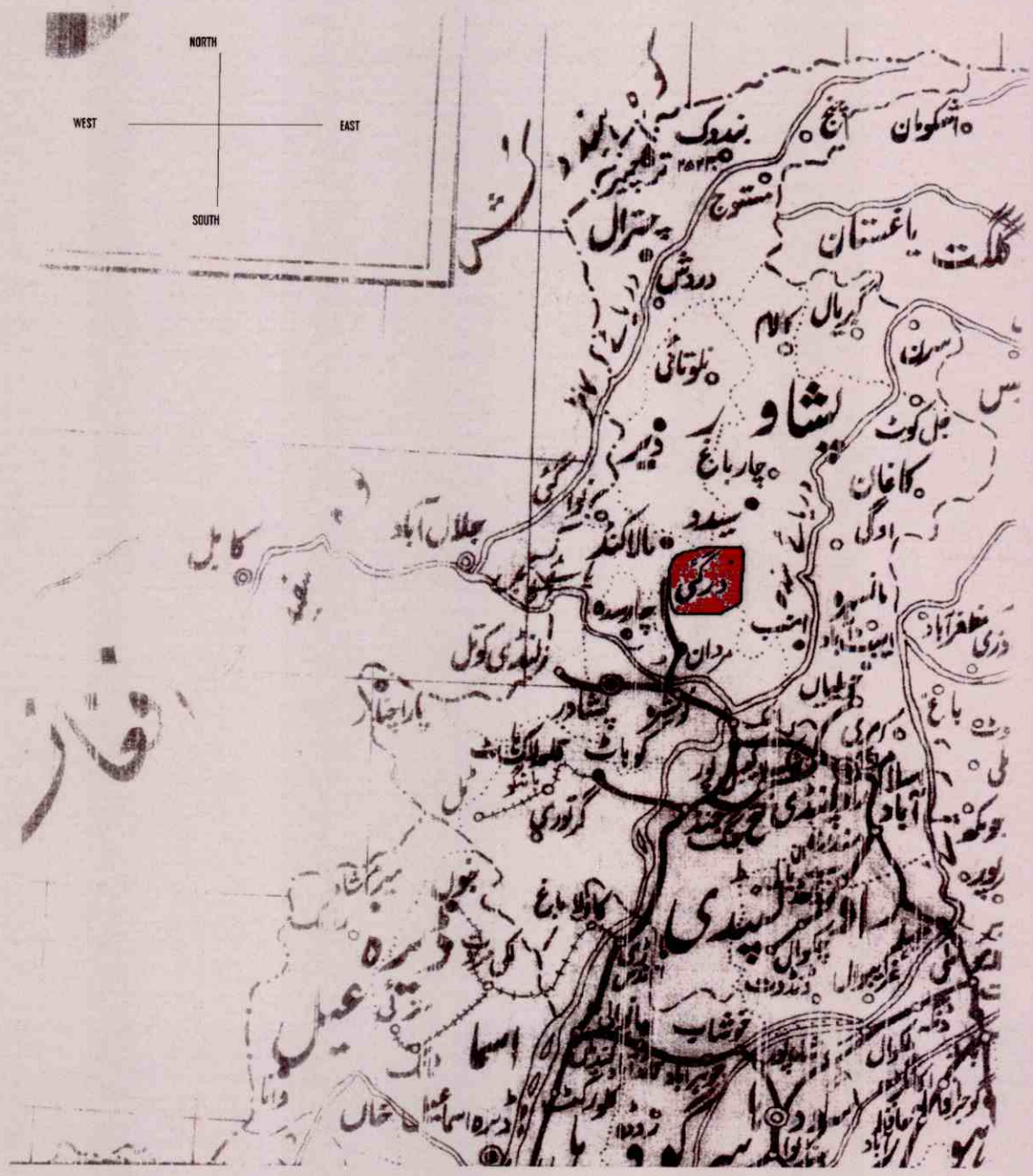
(f). expected life

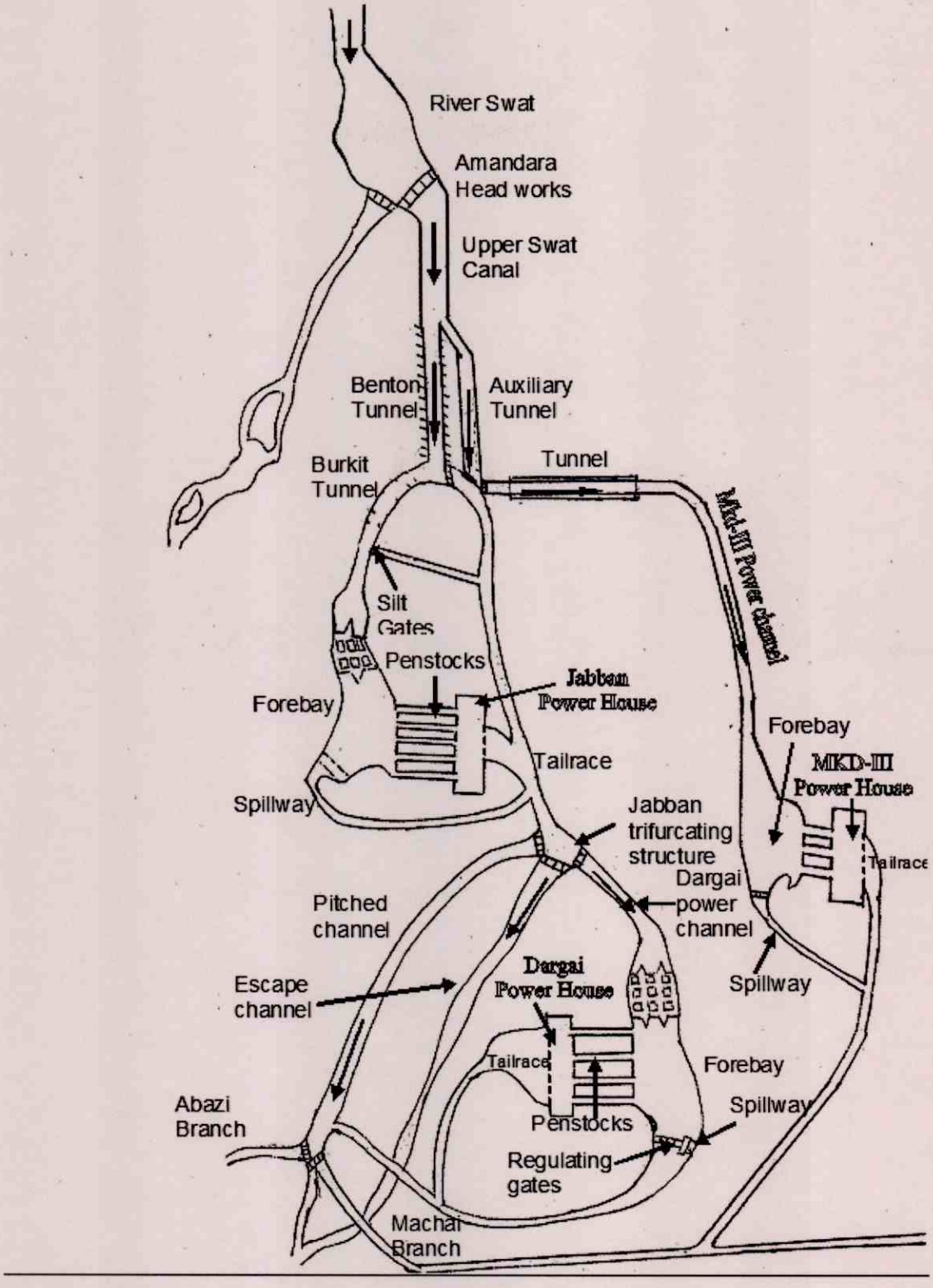
(g). Interconnection with national grid company, length of transmission line(s)

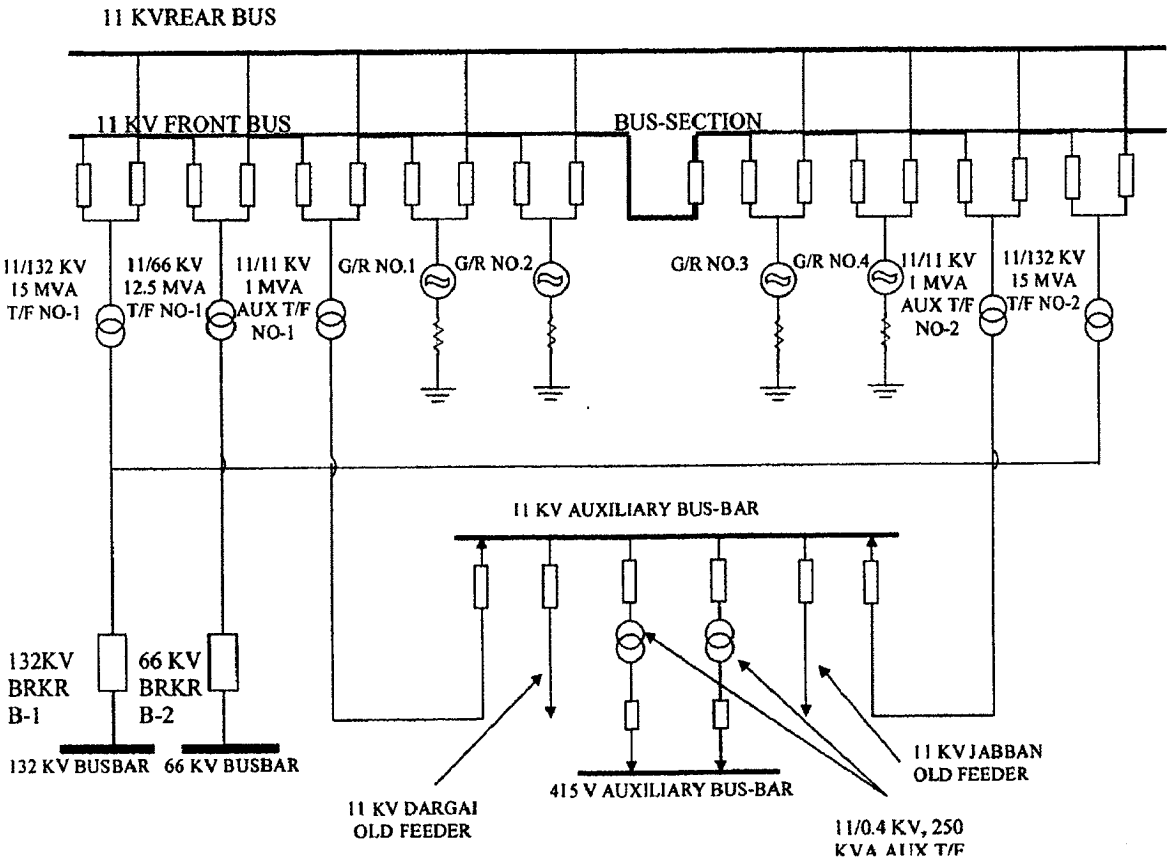
(h). Peaking/base load operation

(i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA







Hydel Power Station, Dargai

PLANT DETAILS

1.	Location	On Upper Swat Canal in Malakand Agency near Dargai Distt. Malakand Agency, Khyber Pakhtunkhwa.				
2.	Plant	Type	Total Capacity	No. of Units		
		Run of River	20 MW	4		
3.	Head	Maximum		Minimum		
		243 ft		239 ft		
4.	Technology	Francis Turbine (Horizontally Mounted)				
5.	Tunnel		No.	Length	Diameter	
	Total No. of Tunnel		-	-	At intake	At Penstock
	(i)	No of Penstock	04	575 ft.	75 in.	66 in.
	(ii)	No. of Irrigation Tunnels	-	-		
6.	Minimum Expected Useful Life of the Generation Facility	25 Years.				
10.	Peaking/Base Operation	Base Operation				
8.	Plant Characteristics	Generator Voltage	Units (1-4) = 11 KV			
		Power Factor	Units (1-4) = 0.85			
		Frequency	50 Hz			
		Automatic Generation Control	No			
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)		
		Dargai-Mardan	132	59.27		
		Dargai-Jabban	66	5.51		
		Dargai-Chakdara	132	30.07		

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Chitral

(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

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
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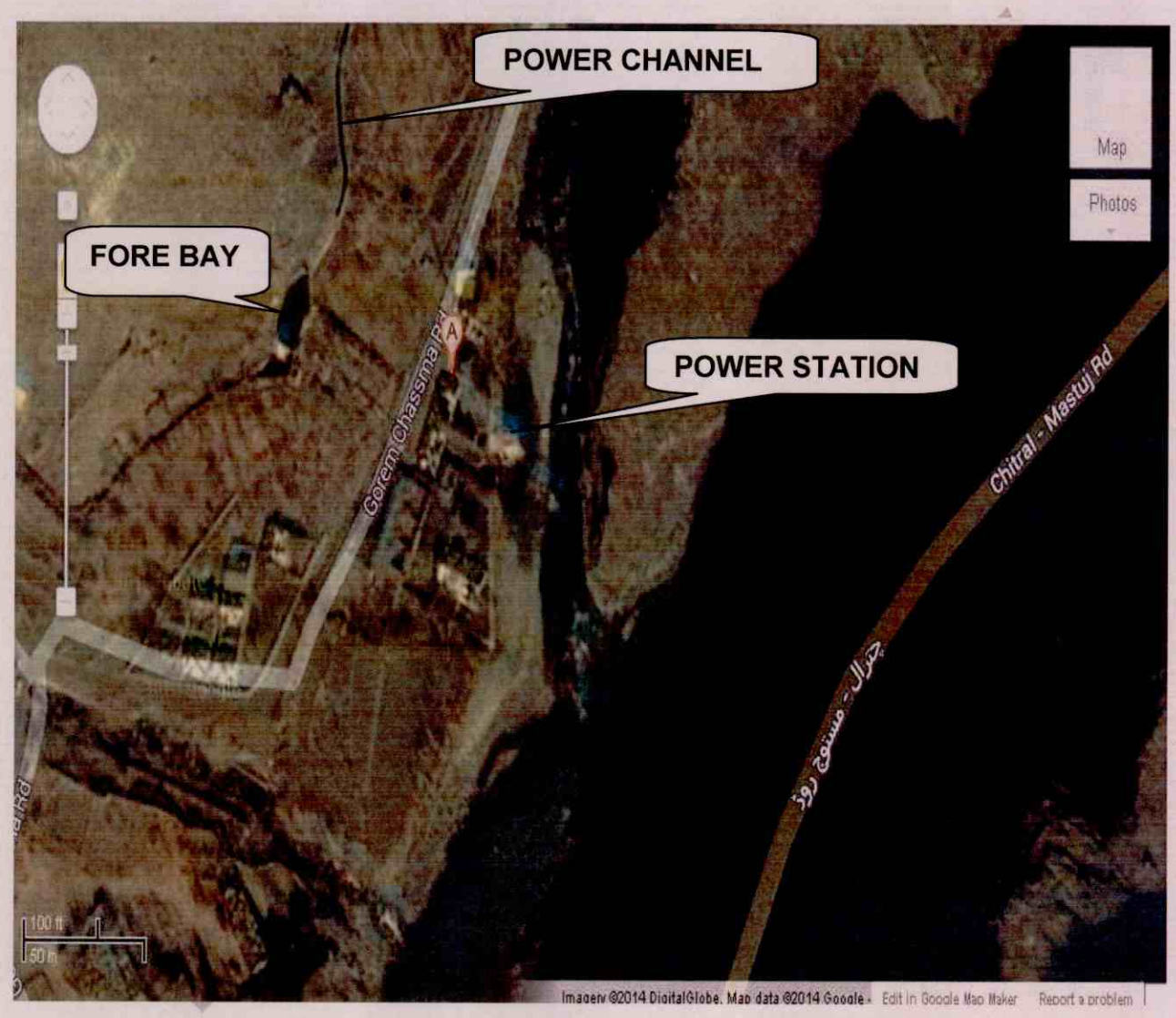

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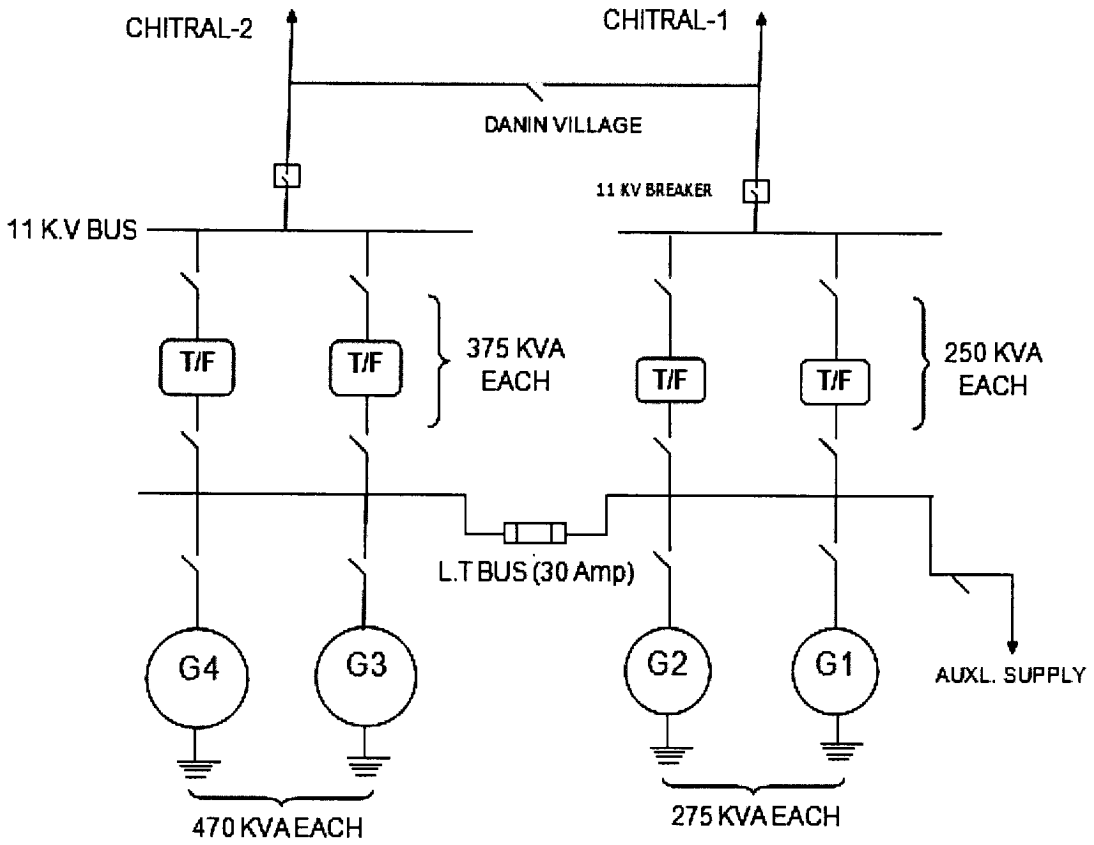


NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station, Chitral

PLANT DETAILS

1.	Location	On right bank of river Lutkho village Singoor in District Chitral in the province of Khyber Pakhtunkhwa.			
2.	Plant	Type	Total Capacity	No. of Units	
		Run of River	1 MW	4	
3.	Head	Maximum		Minimum	
		110 ft		106 ft	
4.	Technology	Units 1 & 2	OSS BERGER (Cross Flow)		
		Units 3 & 4	Francis (Horizontal)		
5.	Tunnel	No.	Length	Diameter	
	Total No. of Tunnel	02	-	Unit No 1 & 2 = 3.33 ft. Unit No 3 & 4 =3.71 ft.	
	(i) No of Penstock	02	-		
	(ii) No. of Irrigation Tunnels	-	-		
6.	Minimum Expected Useful Life of the Generation Facility	25 Years.			
10.	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.			
8.	Plant Characteristics	Generator Voltage	Units (1-4) = 415 V		
		Power Factor	Units (1-4) = 0.96		
		Frequency	50 Hz		
		Automatic Generation Control	No		
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT Voltage	Voltage (KV)	Length (KM)	
		Line-1	11	6.721	
		Line-2	11	7.421	

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Kurram Garhi

(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

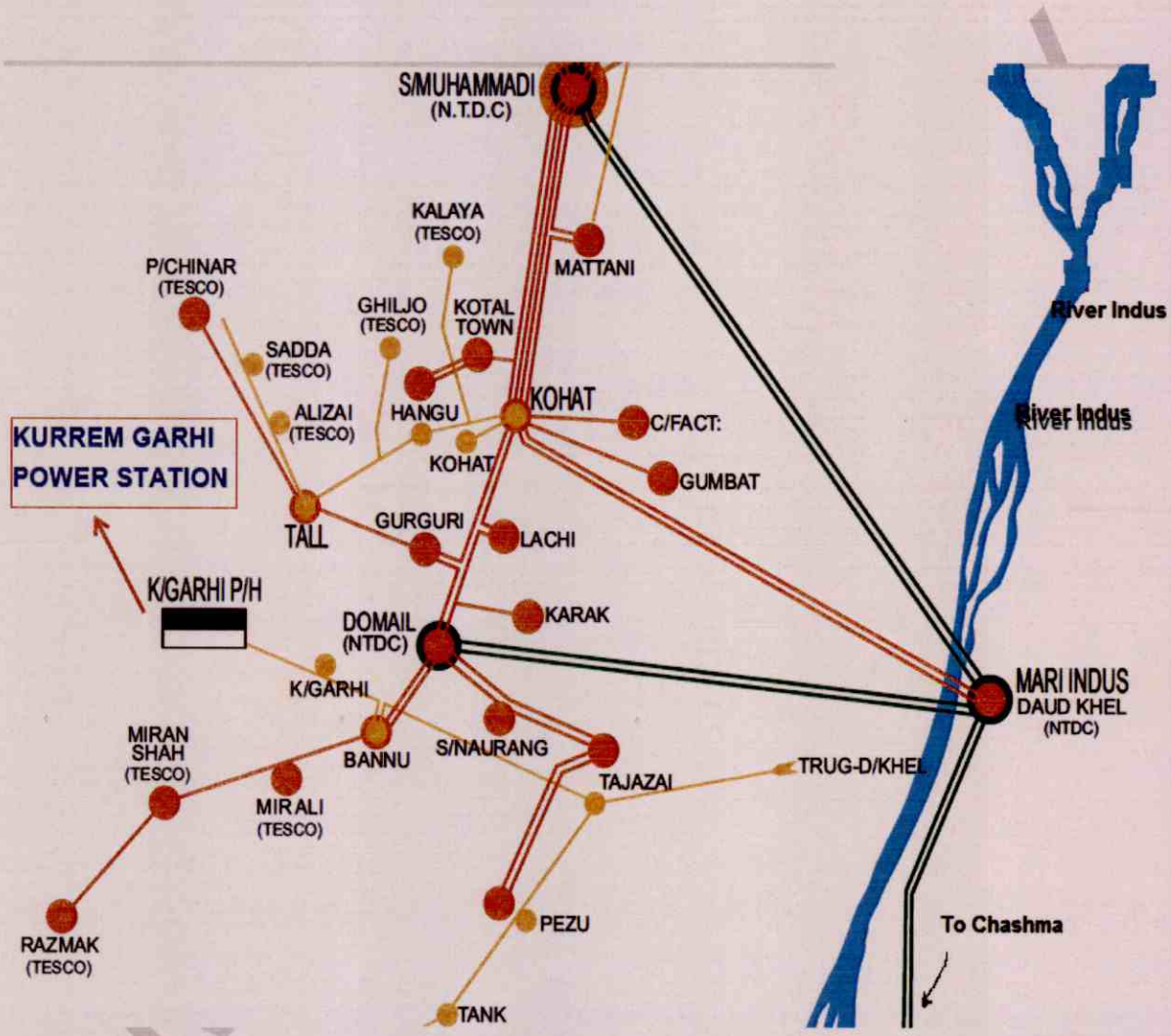
(f). expected life

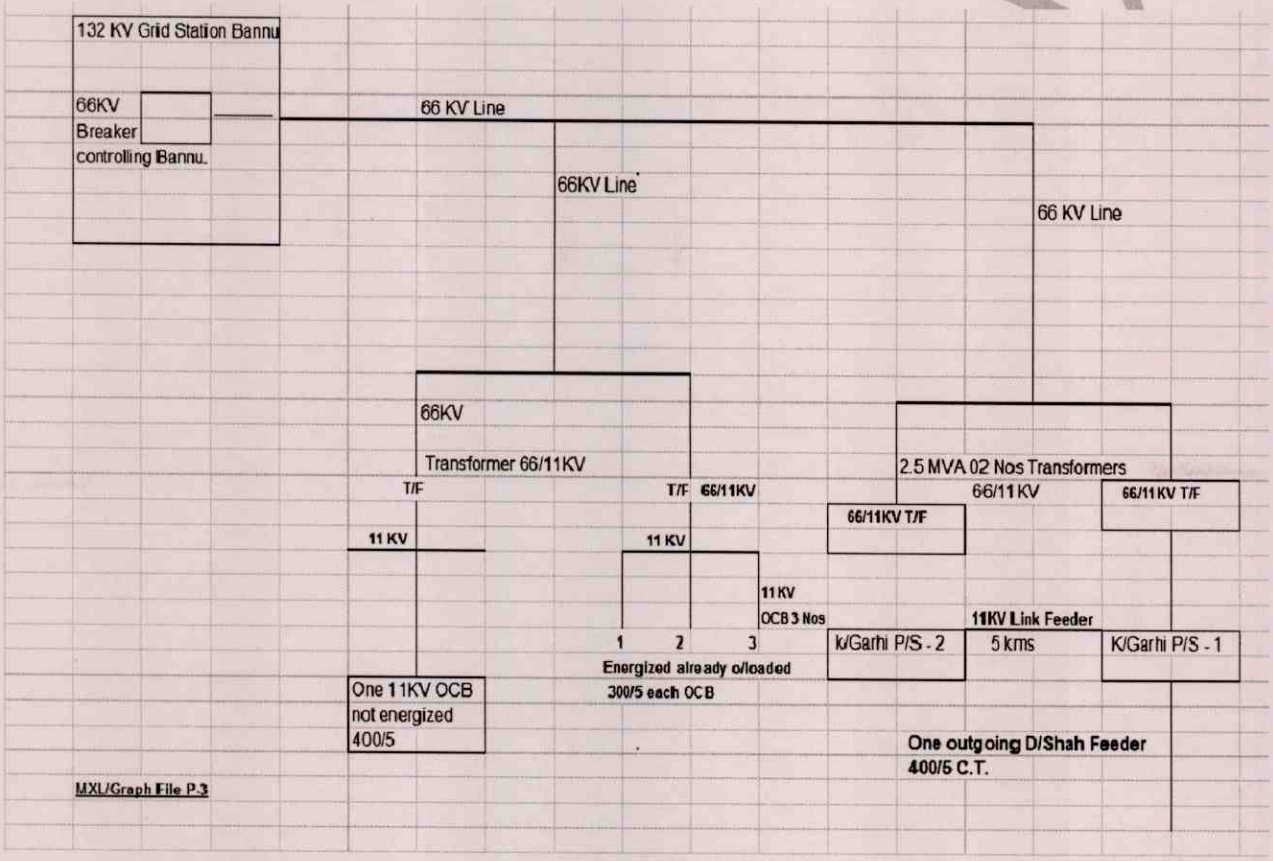
(g). Interconnection with national grid company, length of transmission line(s)

(h). Peaking/base load operation

(i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA





NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station, Kurram Garhi

PLANT DETAILS

1.	Location	Kurram Ghari Hydel Power Station is located on river Kurram 12 Km North West of Bannu city				
2.	Plant	Type		Total Capacity		No. of Units
		Run of River		4MW		04
3.	Head	Maximum			Minimum	
		60 ft.			60 ft.	
4.	Technology	Francis Turbine				
5.	Tunnel	No.	Length		Dia	
	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.	Minimum Expected Useful Life of the Generation Facility	50 Years.				
7.	Peaking/Base Operation	Base Load.				
8.	Plant Characteristics	Generator Voltage			Units (1-4) = 11 KV	
		Power Factor			Units (1-4) = 0.80	
		Frequency			50 Hz	
		Automatic Generation Control			No	
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT		Voltage (KV)		Length (KM)
		Kurram Garhi-Bannu		11/66		30
		Daud Shah		11		48

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Gomal Zam

(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

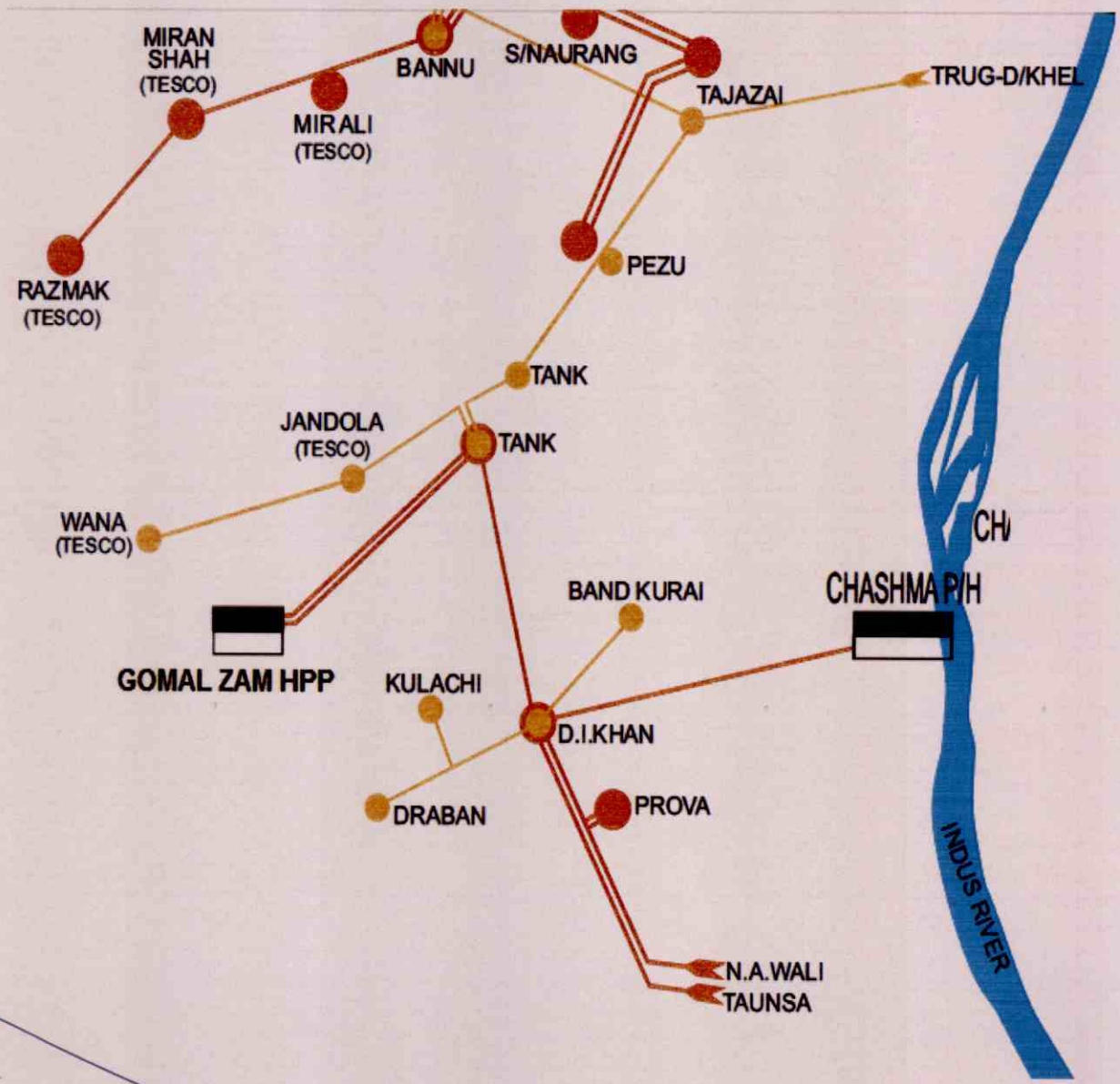
(f). expected life

(g). Interconnection with national grid company, length of transmission line(s)

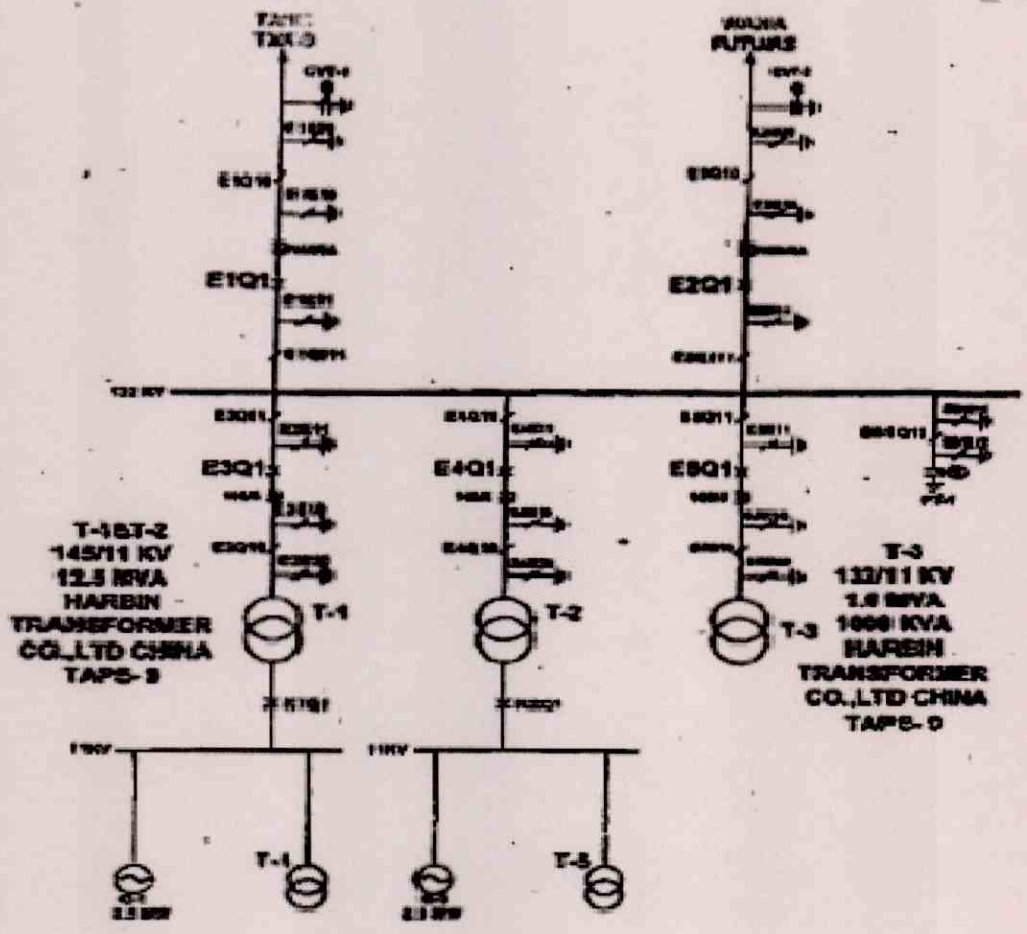
(h). Peaking/base load operation

(i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA



NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA



NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station, Gomal Zam

PLANT DETAILS

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	Type	Total Capacity	No. of Units		
		Storage	17.4 MW	2		
3.	Head	Maximum		Minimum		
		106.5 m (stage-1)		74.24 m (stage-1)		
		113.0 m (stage-2)		90.79 (stage-2)		
4.	Technology	Vertical Francis Turbines				
5.	Tunnel	No.	Length	Diameter		
		1	1279.50 ft	At Intake	At Penstock	
				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				
8.	Plant Characteristics	Generator Voltage	Units (1-2) = 11 KV			
		Power Factor	0.85			
		Frequency	50 Hz			
		Automatic Generation Control	Yes			
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)		
		Gomal Zam -Tank	132	56		
		Gomal Zam -Wana	132	55		

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

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

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
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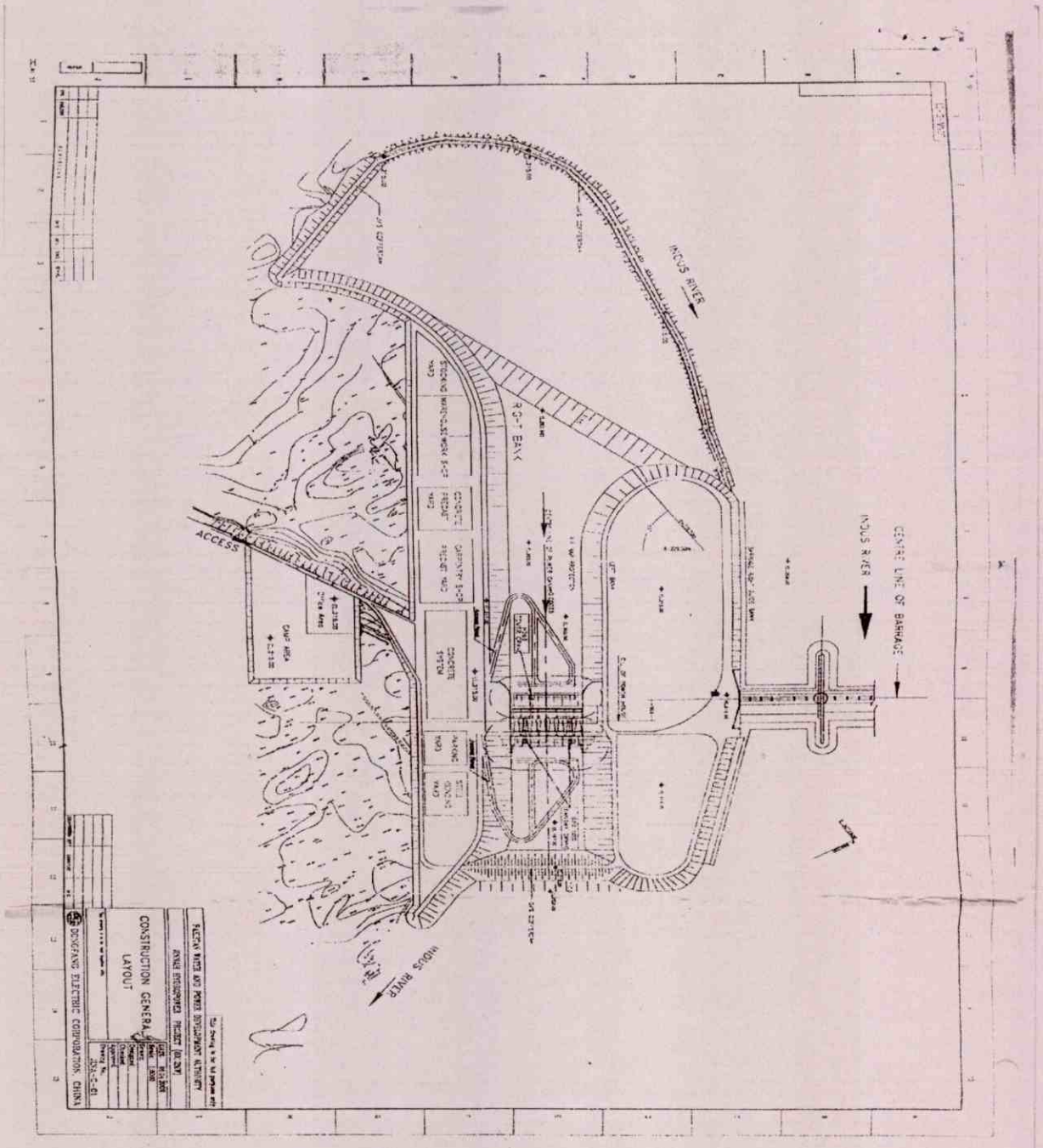
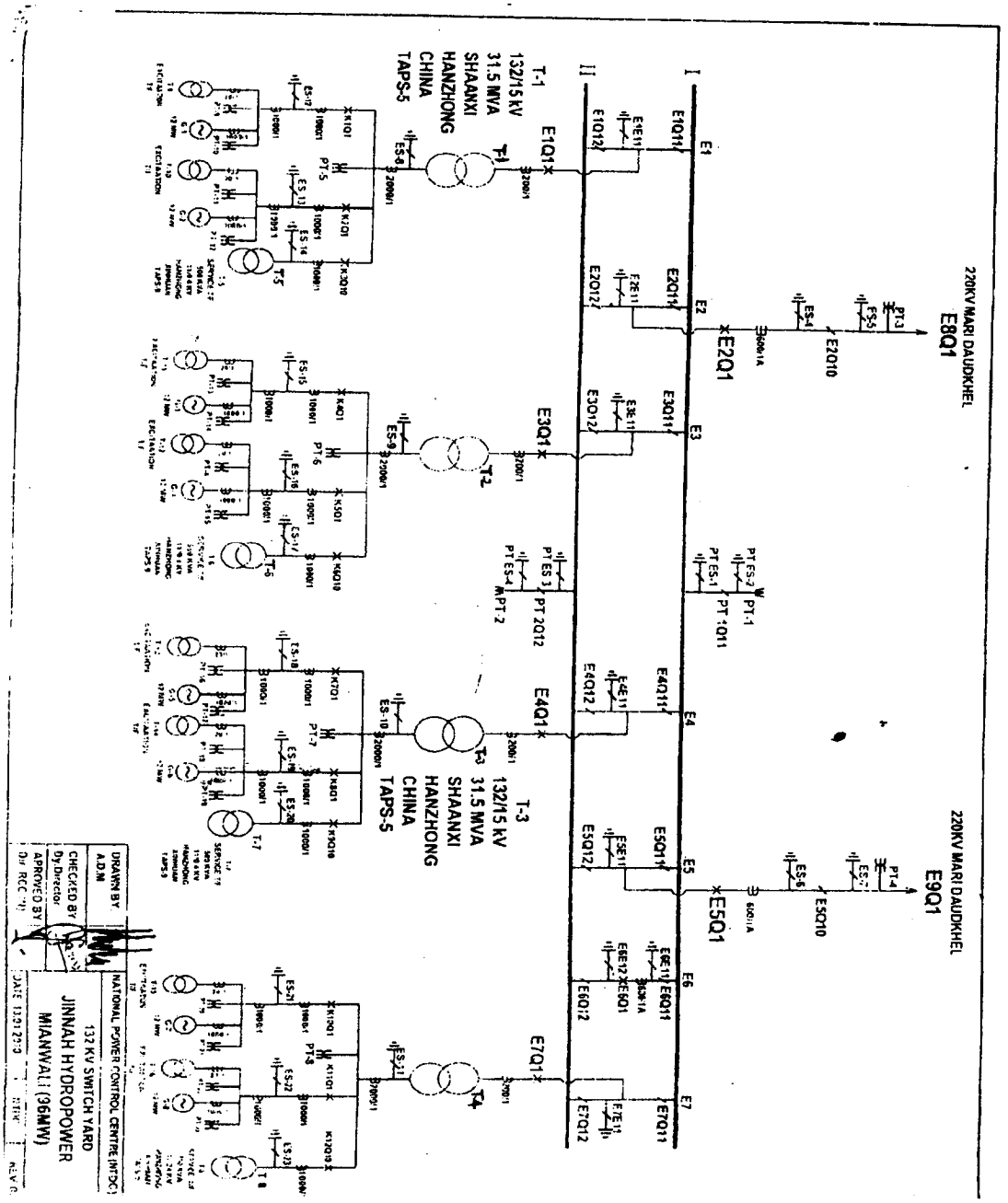




Jinnah Hydel Power Station

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.		
2.	Plant	Type	Total Capacity	No. of Units
		Run of River	96 MW	08
3.	Head	Maximum		Minimum
		6.2 m		3.2 m
4.	Technology	Bulb (Pit Type) Turbine		
5.	Tunnel	No.	Length	Diameter
	Total No. of Channel	1	1800 m including Tailrace	Bed Width = 133 m
8.	Peak/Base Load Operation	Base load operation.		
9.	Minimum Expected Useful Life of the Generation Facility	50 years		
10.	Plant Characteristics	Generator Voltage		Units (1-8) = 11 KV
		Power Factor		Units (1-8) = 0.90
		Frequency		50 Hz
		Automatic Generation Control		Yes
7.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)
		Jinnah-Mari Daudkhel Line-I	132 KV	7.5
		Jinnah-Mari Daudkhel Line-II	132 KV	7.5

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Allai Khwar

(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

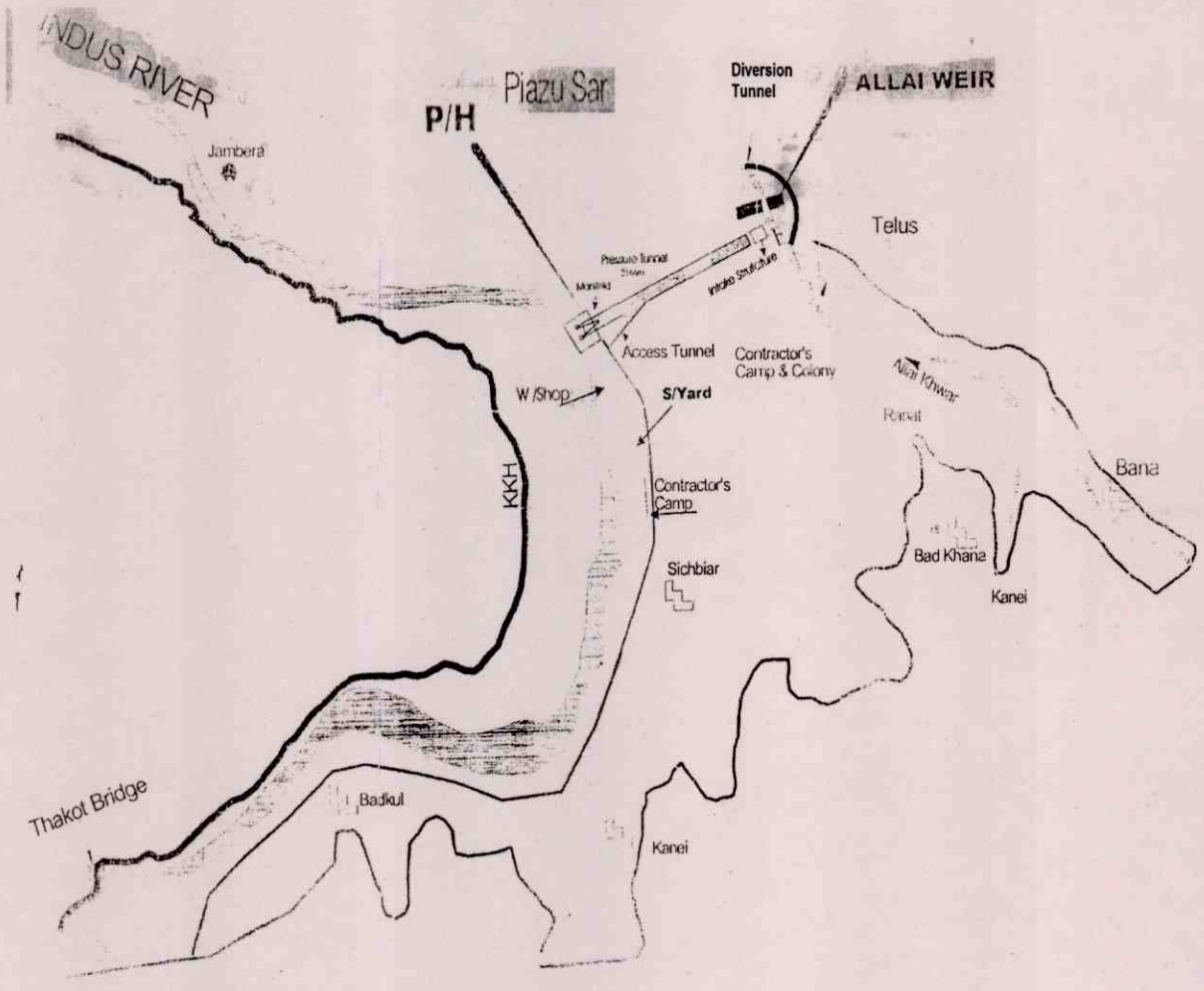
(f). expected life

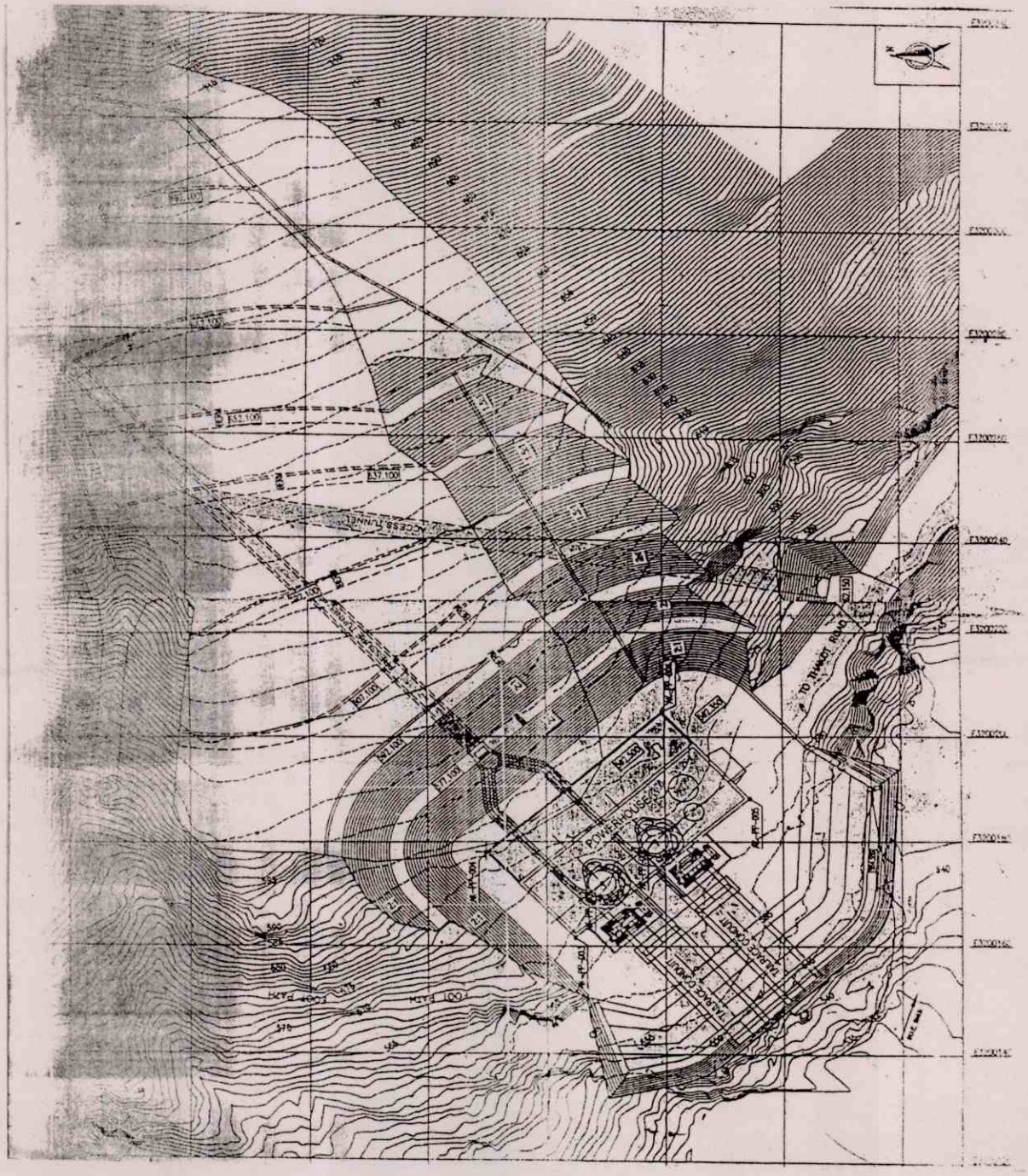
(g). Interconnection with national grid company, length of transmission line(s)

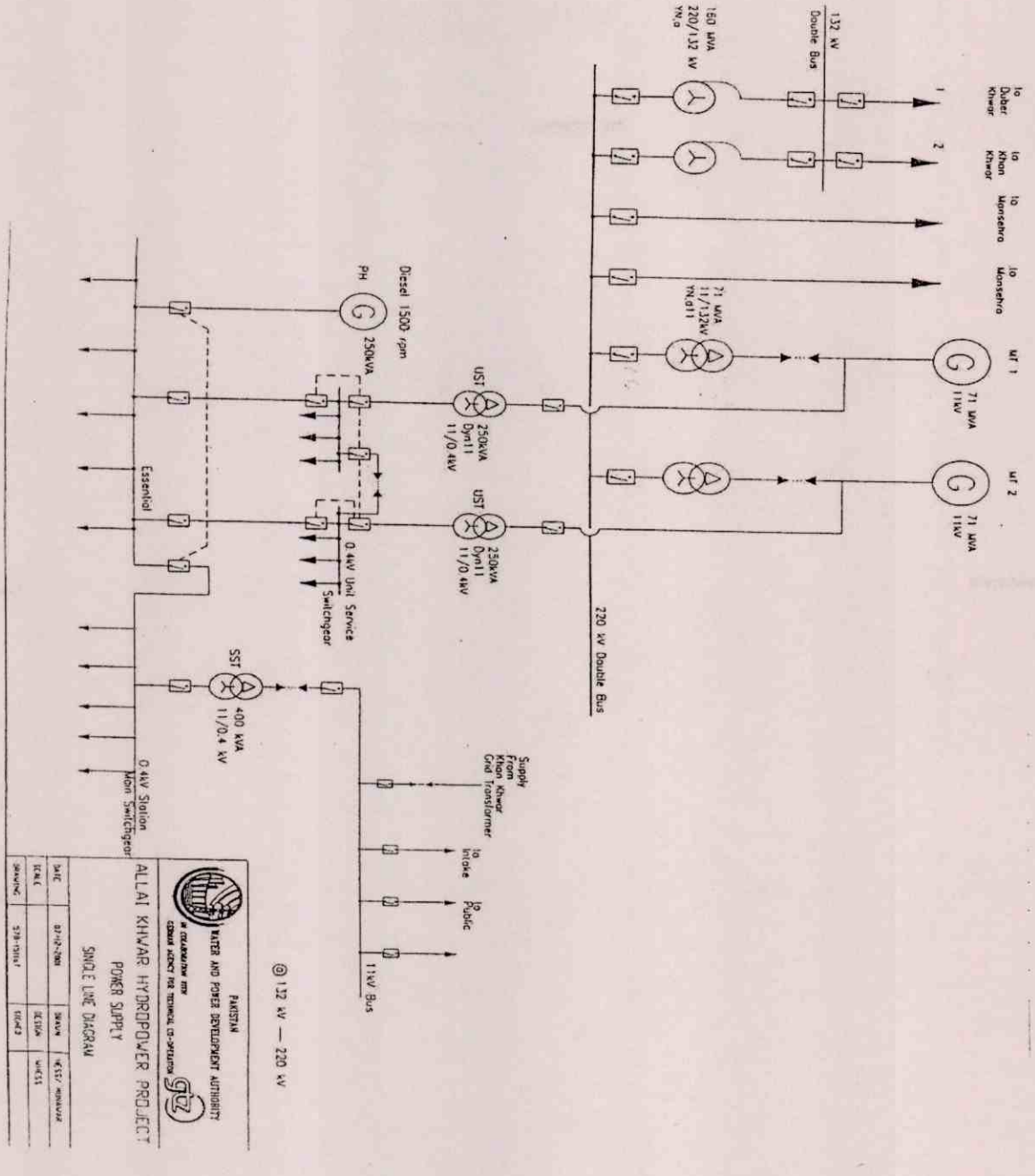
(h). Peaking/base load operation

(i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA







Hydel Power Station, Allai Khwar

PLANT DETAILS

1.	Location		On left bank tributary of the River Indus at Besham, Distt. Battagram, in Khyber Pakhtunkhwa.			
2.	Plant		Type	Total Capacity	No. of Units	
			Storage	121 MW	02	
3.	Head		Maximum	Minimum		
			697 m	687 m		
4.	Technology		Pelton Wheel Vertical Shaft Turbines			
5.	Tunnel		No.	Length	Diameter	
	Total No. of Tunnel		1	2.395 Km	At Intake	At Penstock
	(i).	Power Tunnels (Headrace)	1	2.366 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.	Minimum Expected Useful Life of the Generation Facility		50 years			
8.	Plant Characteristics		Generator Voltage	Units (1-2) = 11 KV		
			Power Factor	0.85		
			Frequency	50 Hz		
			Automatic Generation Control	Yes		
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)		CCT	Voltage(KV)	Length(KM)	
			Allai S/Y-ISPR-I	220	180.5	
			Allai S/Y-ISPR-II	220	180.5	
			Allai S/Y-Khan Khwar P/H	132	16	
			Allai S/Y-Duber Khwar P/H	132	59	

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Duber Khwar

(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

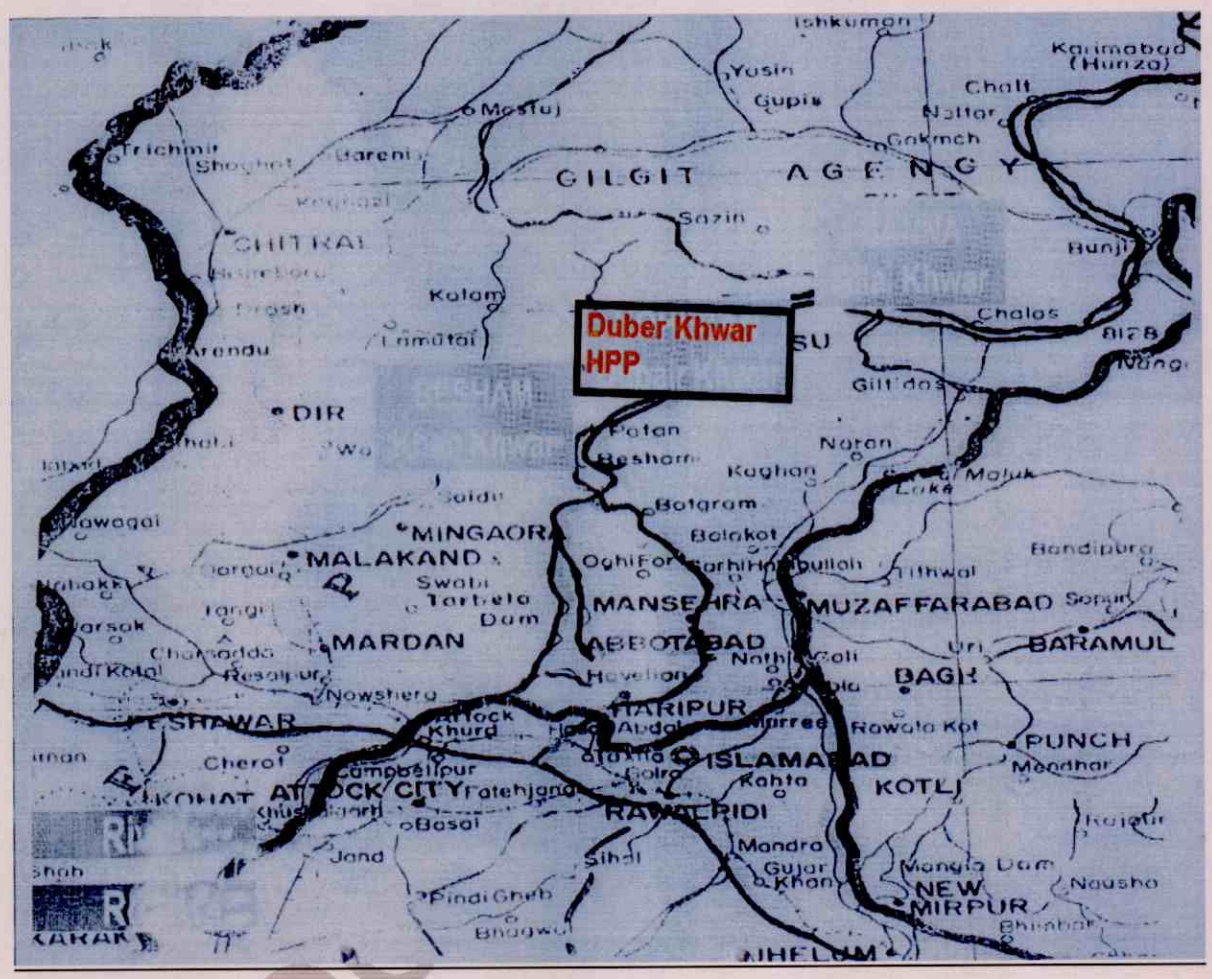
(f). expected life

(g). Interconnection with national grid company, length of transmission line(s)

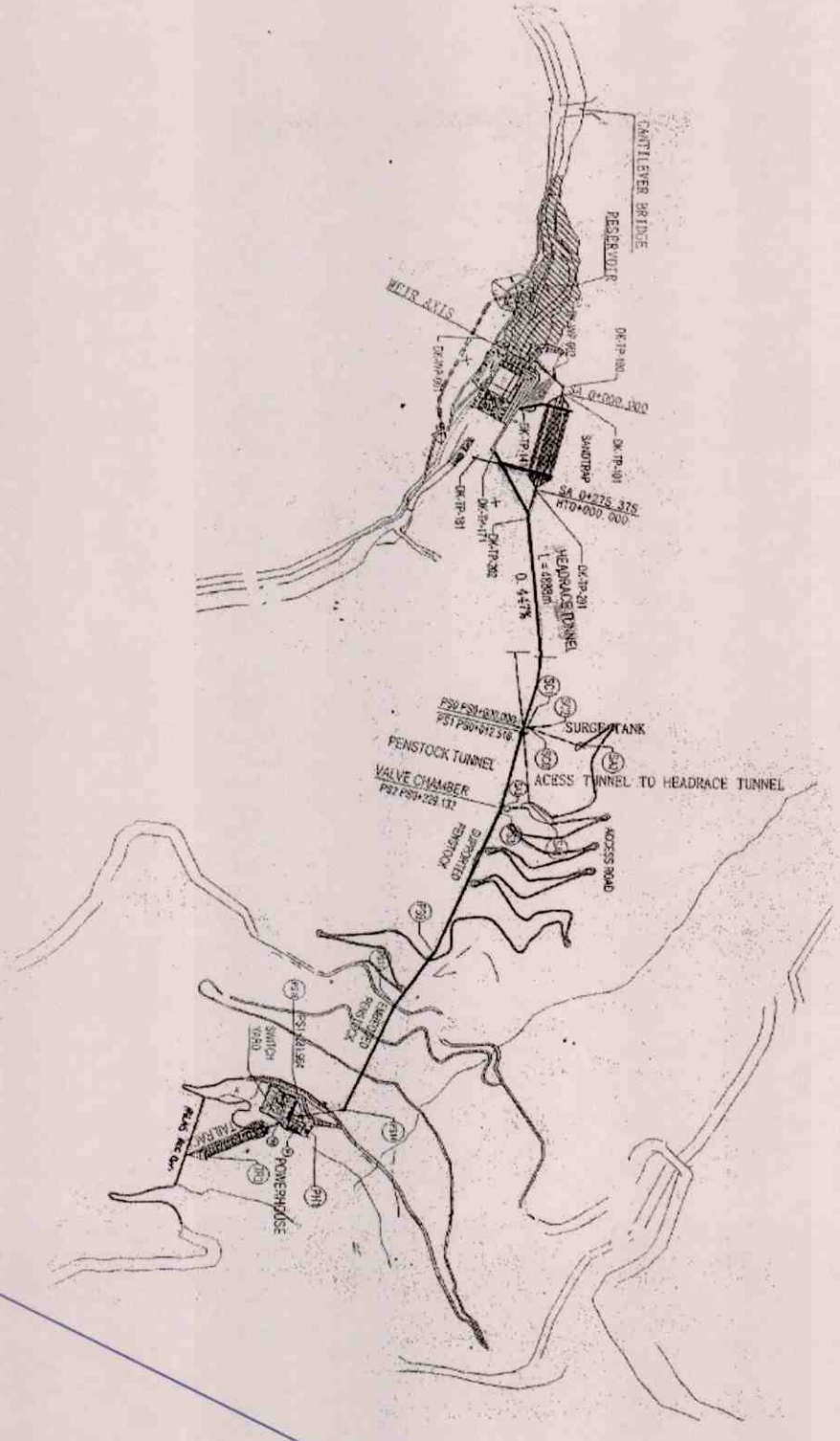
(h). Peaking/base load operation

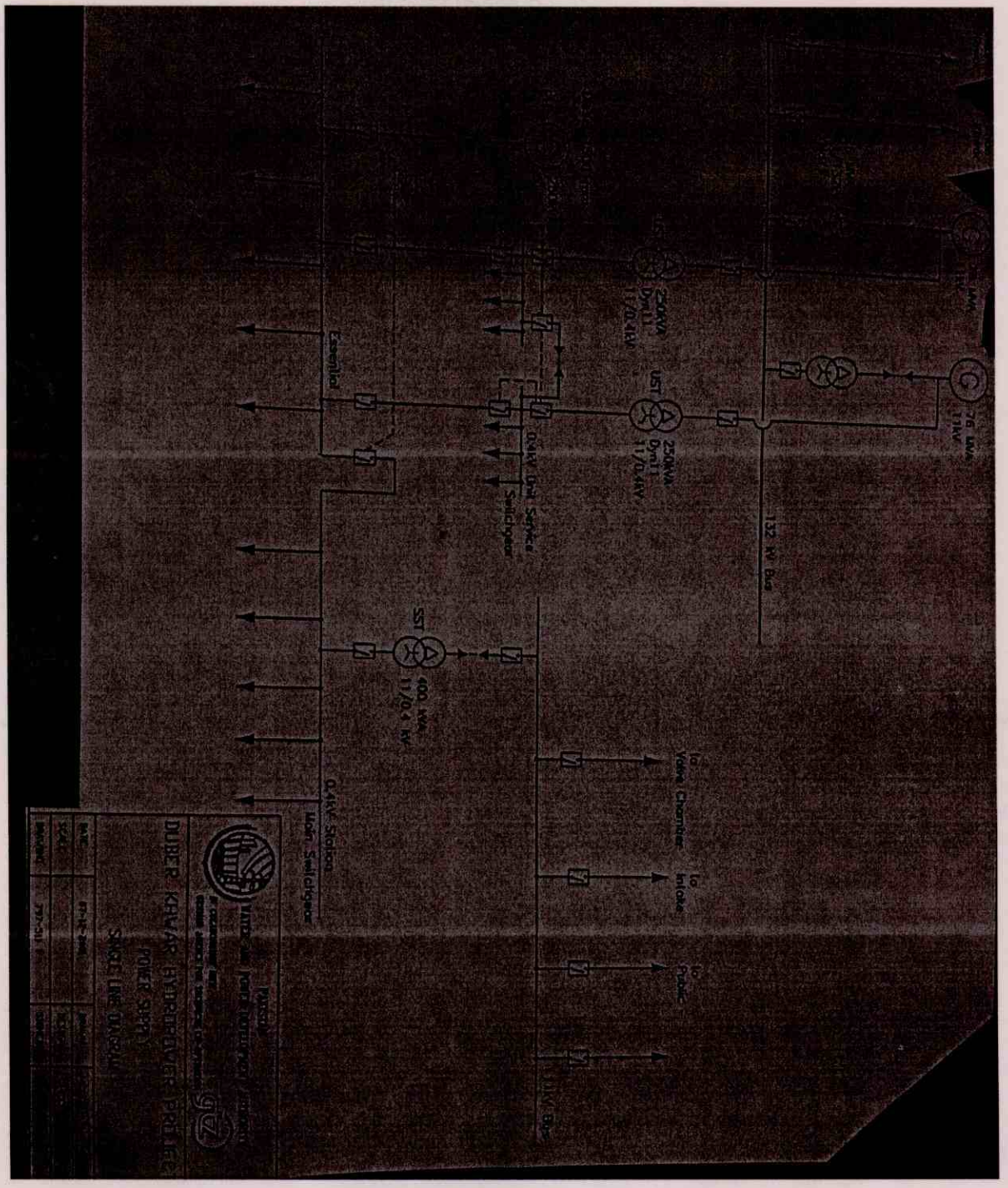
(i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

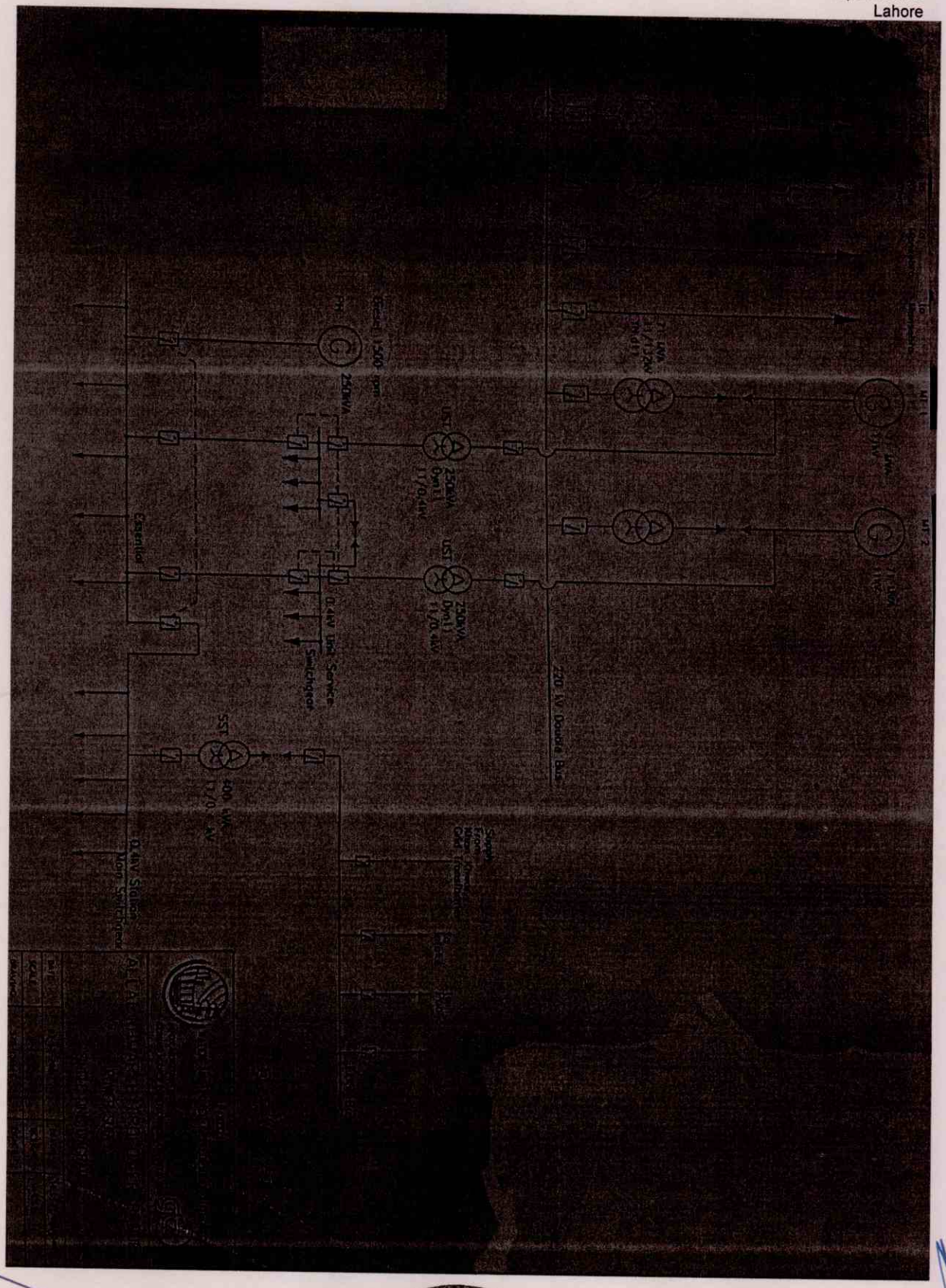
NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA



PROJECT LAYOUT PLAN







Hydel Power Station, Duber Khwar

PLANT DETAILS

1	Location	On left bank tributary of the River Indus at Besham, Distt. Kohistan in Khyber Pakhtunkhwa.				
2	Plant	Type	Total Capacity	No. of Units		
		Storage	130 MW	2		
3	Head	Maximum	Minimum			
		540.5 m	528 m			
4	Technology	Pelton Wheel Turbines				
5	Tunnel	No.	Length	Diameter		
	Total No. of Tunnel			At Intake	At Penstock	
	(i). No. of Power Tunnels (Headrace)	1	1237.6 m	2.6 m	2.6 m	
	(ii). No. of 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.	Minimum Expected Useful Life of the Generation Facility	50 years				
8.	Plant Characteristics	Generator Voltage	Units (1-2) = 11 KV			
		Power Factor	0.85			
		Frequency	50 Hz			
		Automatic Generation Control	Yes			
10.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)		
		DKHP-KKHP	132	32.3		
		DKHP-AKHP	132	50.5		

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Khan Khwar

(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

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
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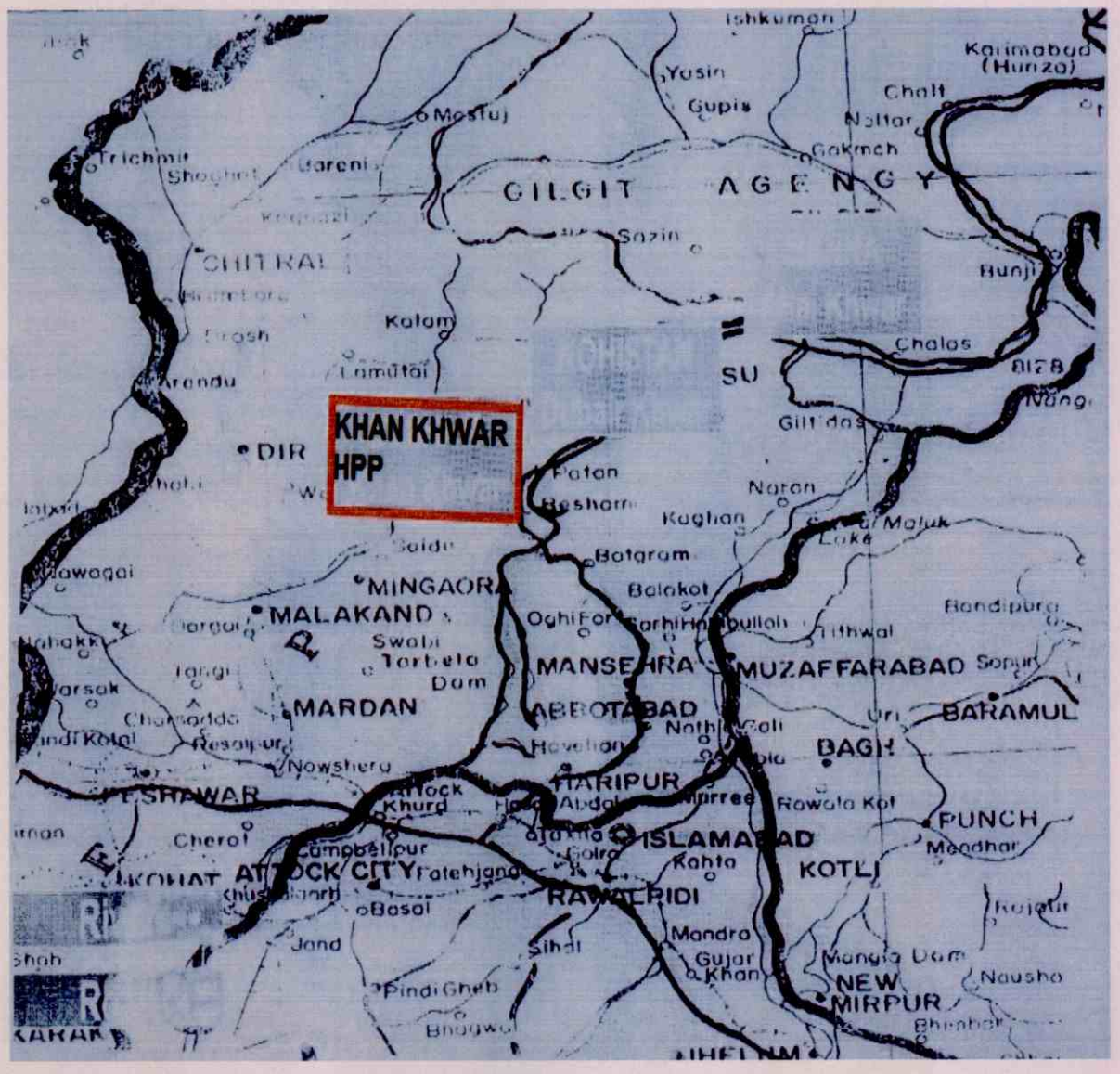

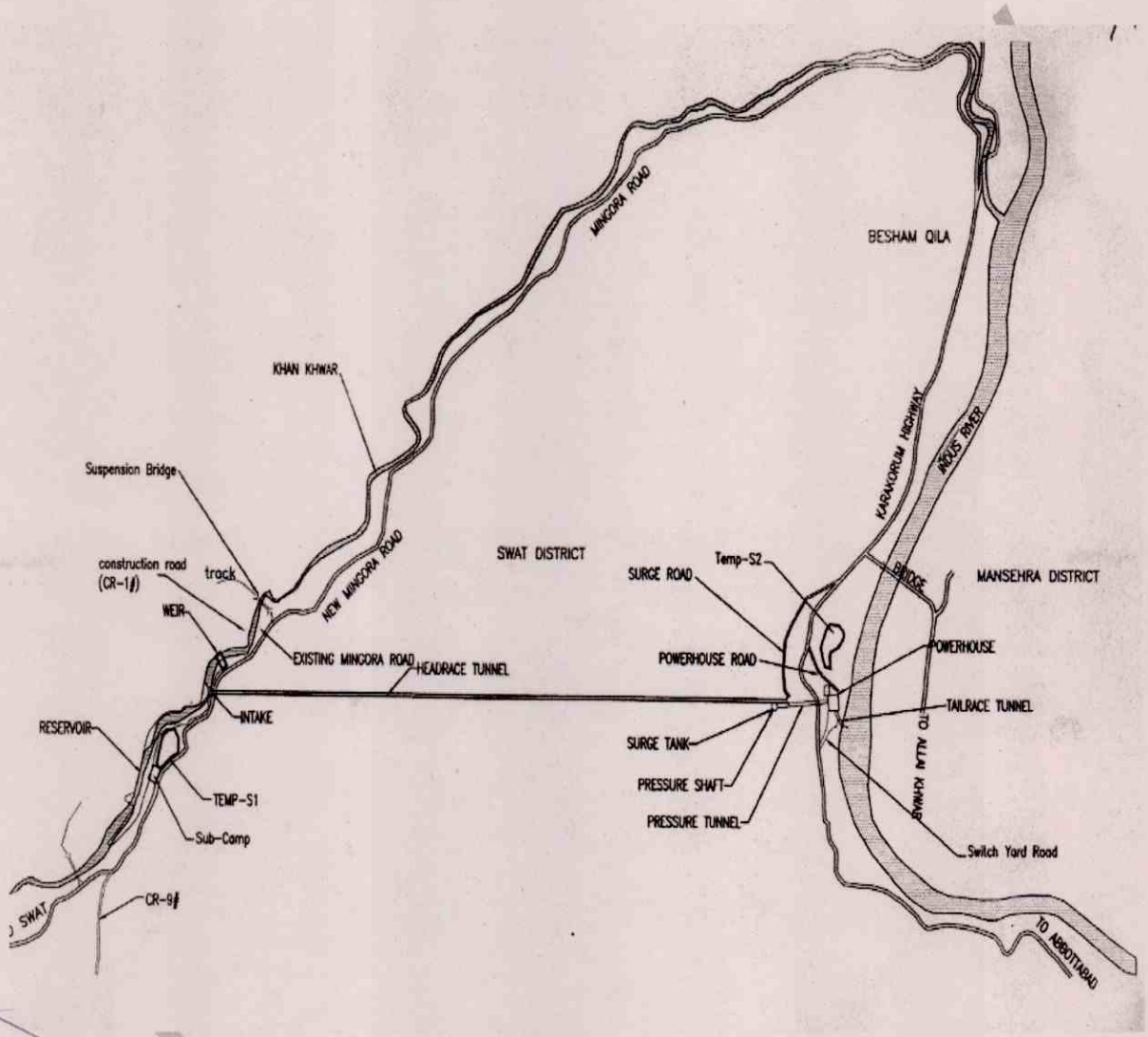

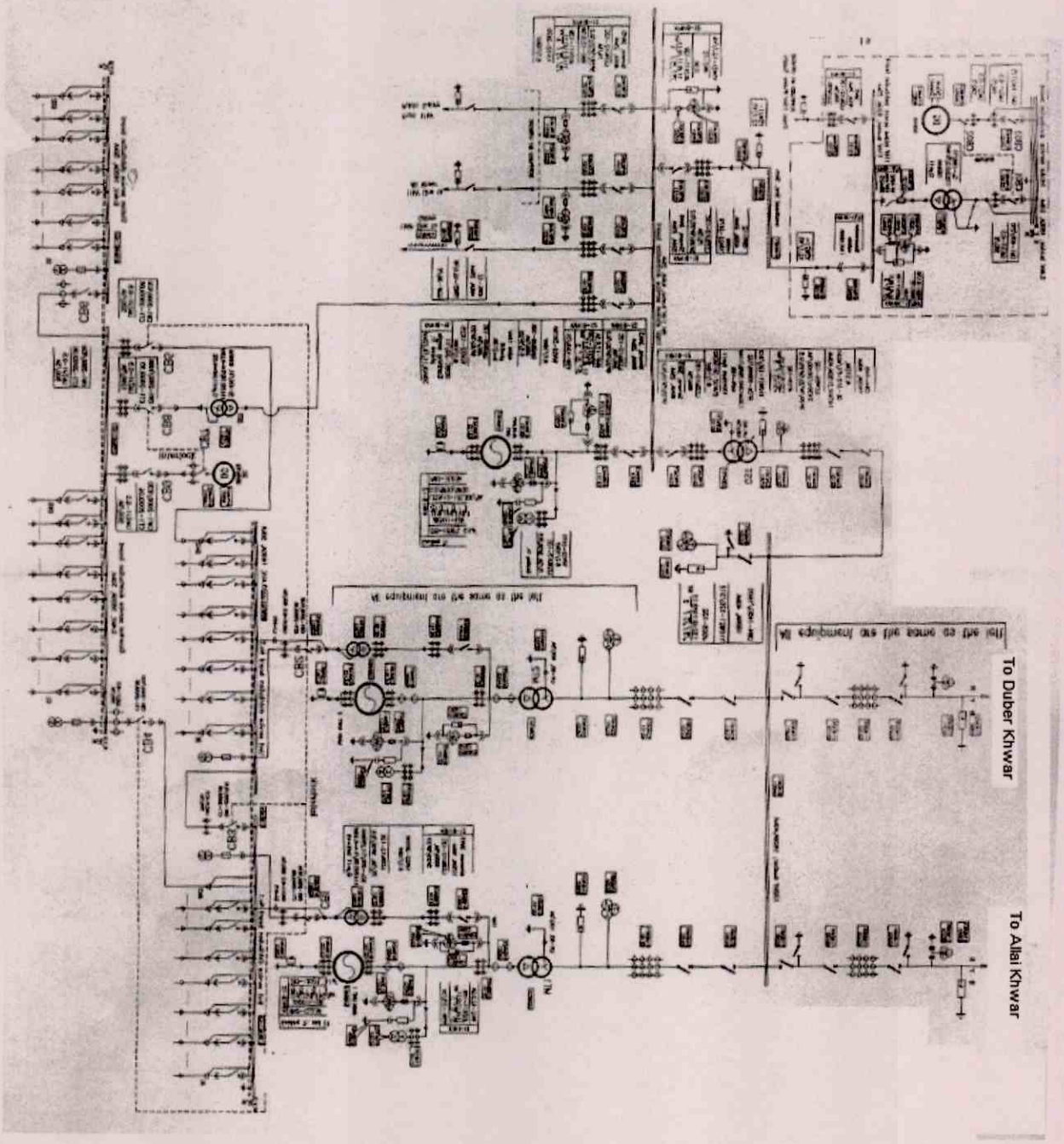

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station, Khan Khwar

PLANT DETAILS

1.	Location	Right tributary of the River Indus at Besham, Distt. Shangla, in Khyber Pakhtunkhwa.				
2.	Plant	Type	Total Capacity	No. of Units		
		Storage	72 MW	3 (2x34MW+1x4MW)		
3.	Head	Maximum		Minimum		
		257 m		247 m		
4.	Technology	Unit (1&2) Francis Turbine Unit (3) Turgo				
5.	Tunnel	No.	Length	Diameter		
	Total No. of Tunnel			At Intake	At Penstock	
	(i). No. of Power Tunnels (Headrace)	1	4540m	3.80 m	3.25m	
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.	Minimum Expected Useful Life of the Generation Facility	50 Years				
8.	Plant Characteristics	Generator Voltage		Units (1-3) = 11 KV		
		Power Factor		Units (1-2) = 0.85 Units (3) =0.8		
		Frequency		50 Hz		
		Automatic Generation Control		Yes		
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT		Voltage (KV)	Length (KM)	
		KKHP-DKHP		132	32.3	
		KKHP-AKHP		132	16.5	

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Tarbela Hydel Power Station
4th Extension

(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

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
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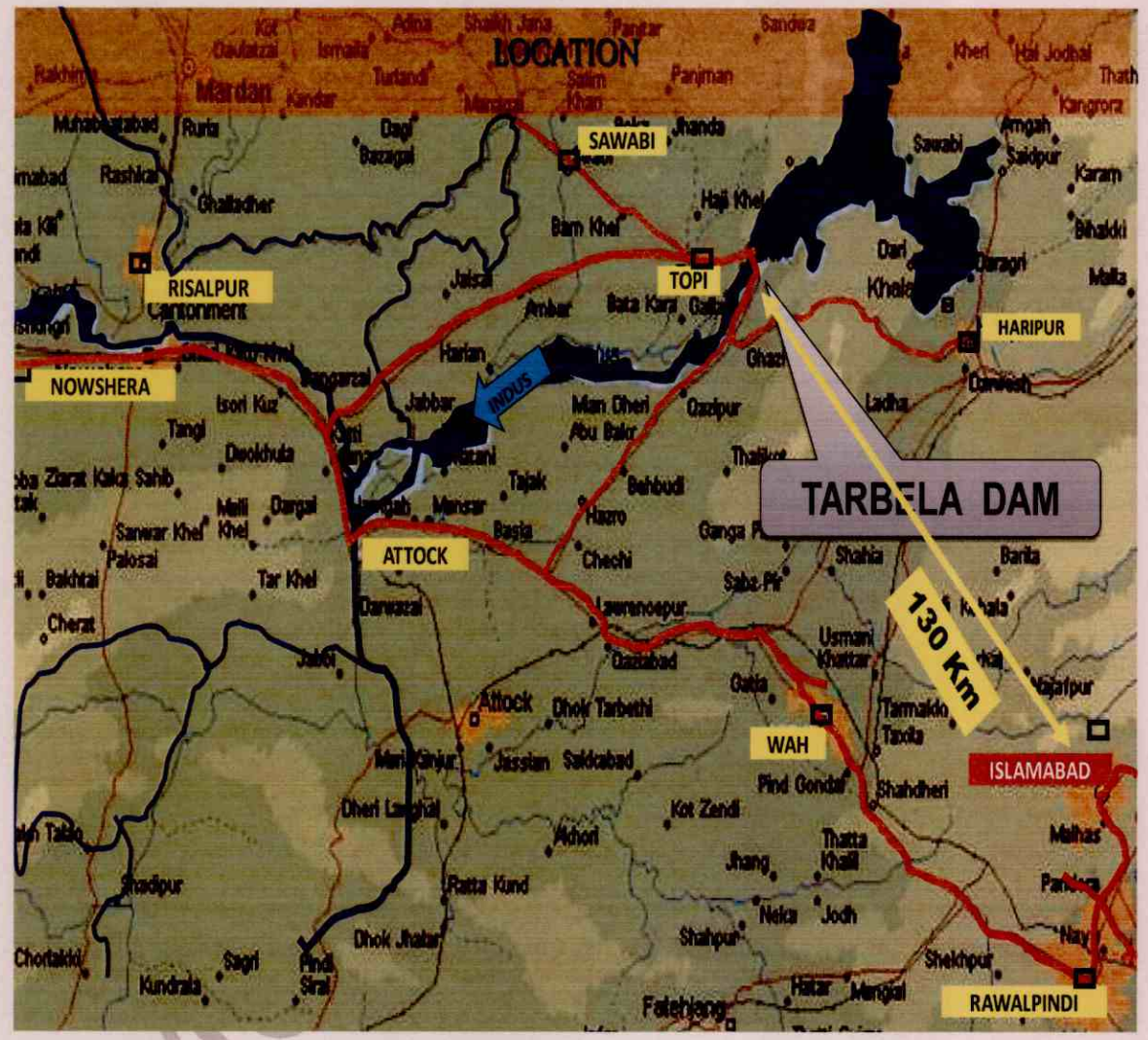
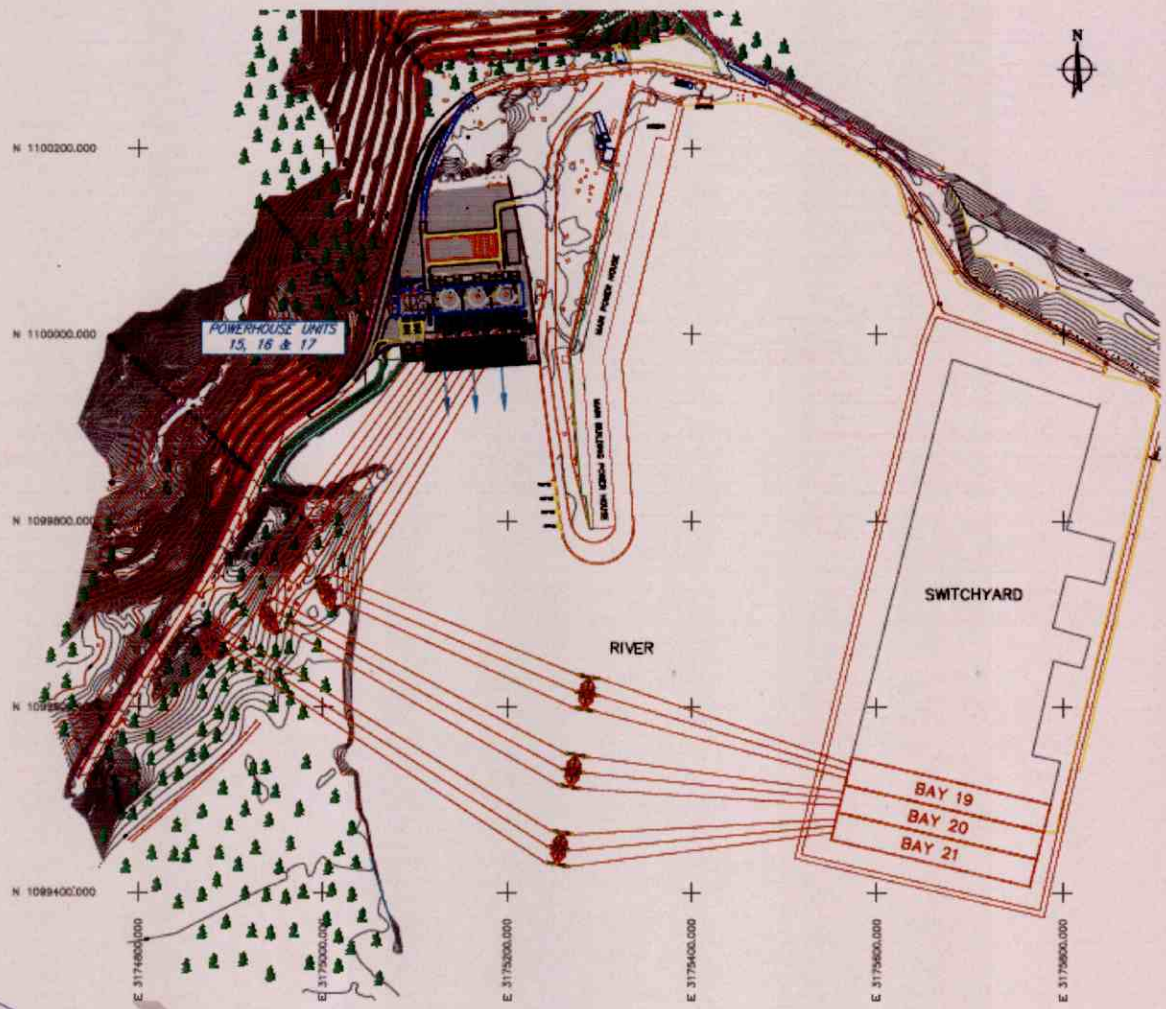
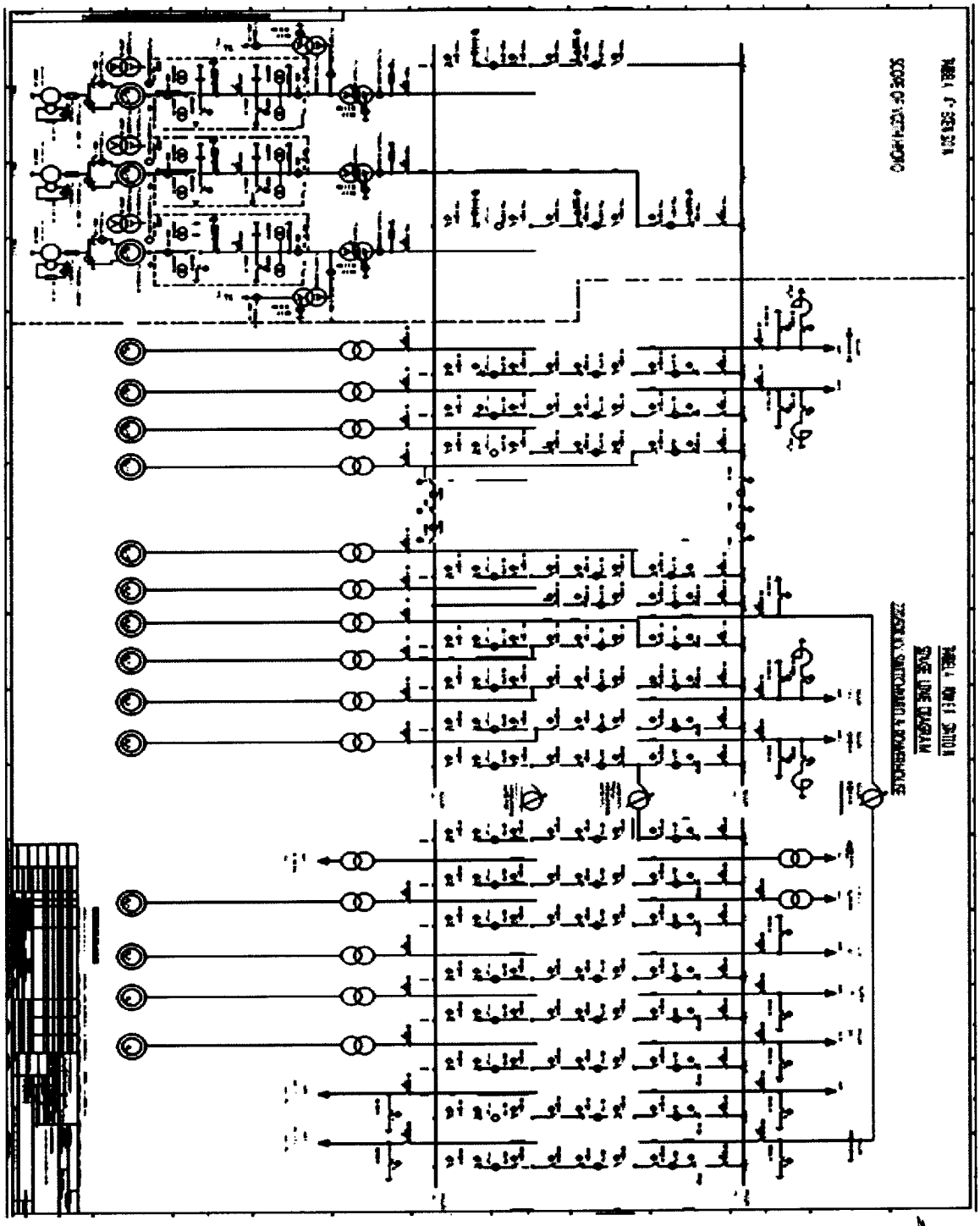






Tarbela Hydel Power Station, 4th Extension

PLANT DETAILS

1.	Location	On Right Bank, of River Indus at Tarbela Distt. Swabi, in Khyber Pakhtunkhwa.				
2.	Plant	Type	Total Capacity	No. of Units		
		Storage	1410 MW	03		
3.	Head	Maximum		Minimum		
		137.1 m		75.7 m		
4.	Technology	Francis Turbines				
5.	Tunnel	No.	Length	Diameter		
	Total No. of Tunnel	1	2997 ft.	At Intake	At Penstock	
				45.0 ft	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.				
8.	Plant Characteristics	Generator Voltage	18KV			
		Power Factor	0.9 (Lagging)			
		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.				

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Keyal Khwar

(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

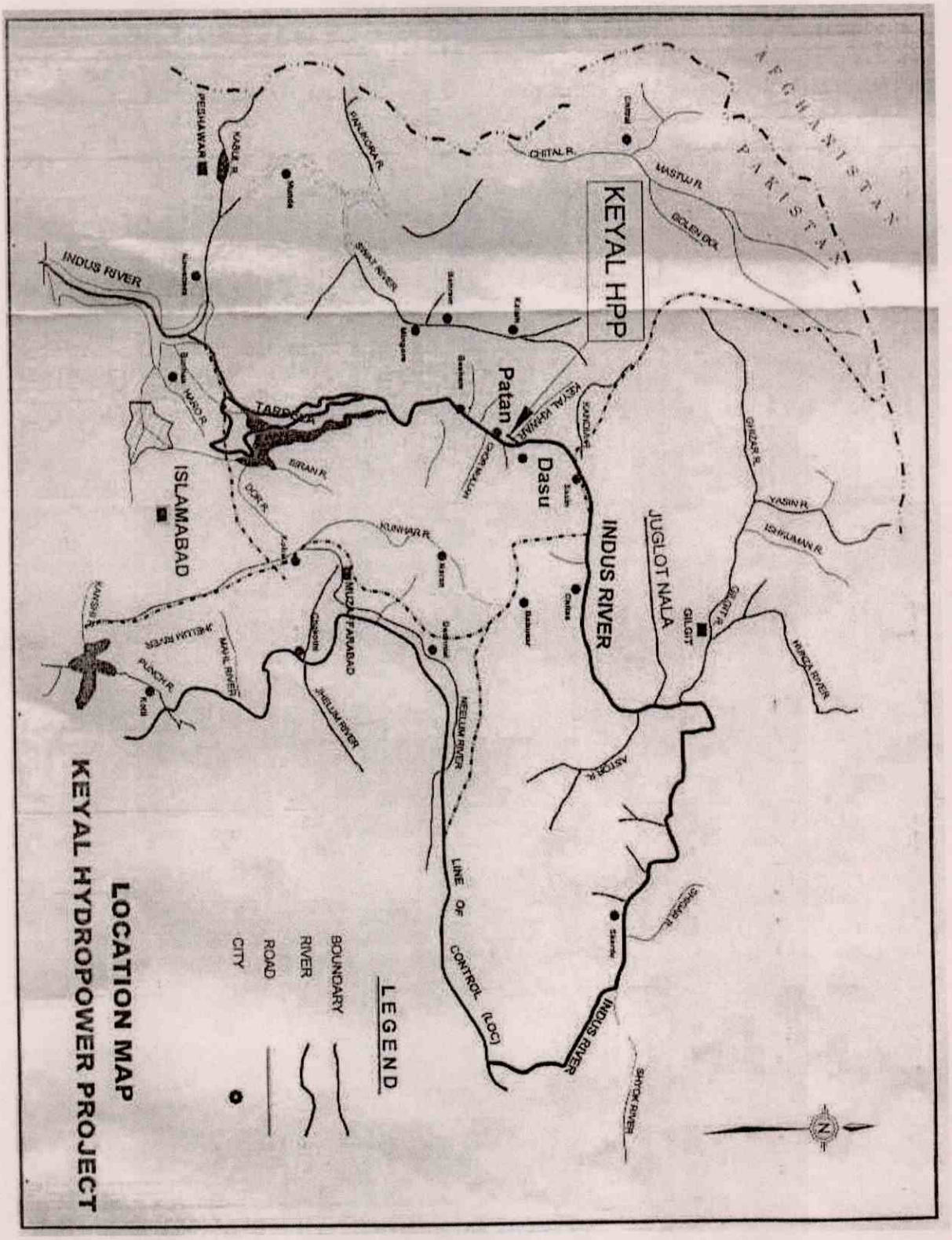
(f). expected life

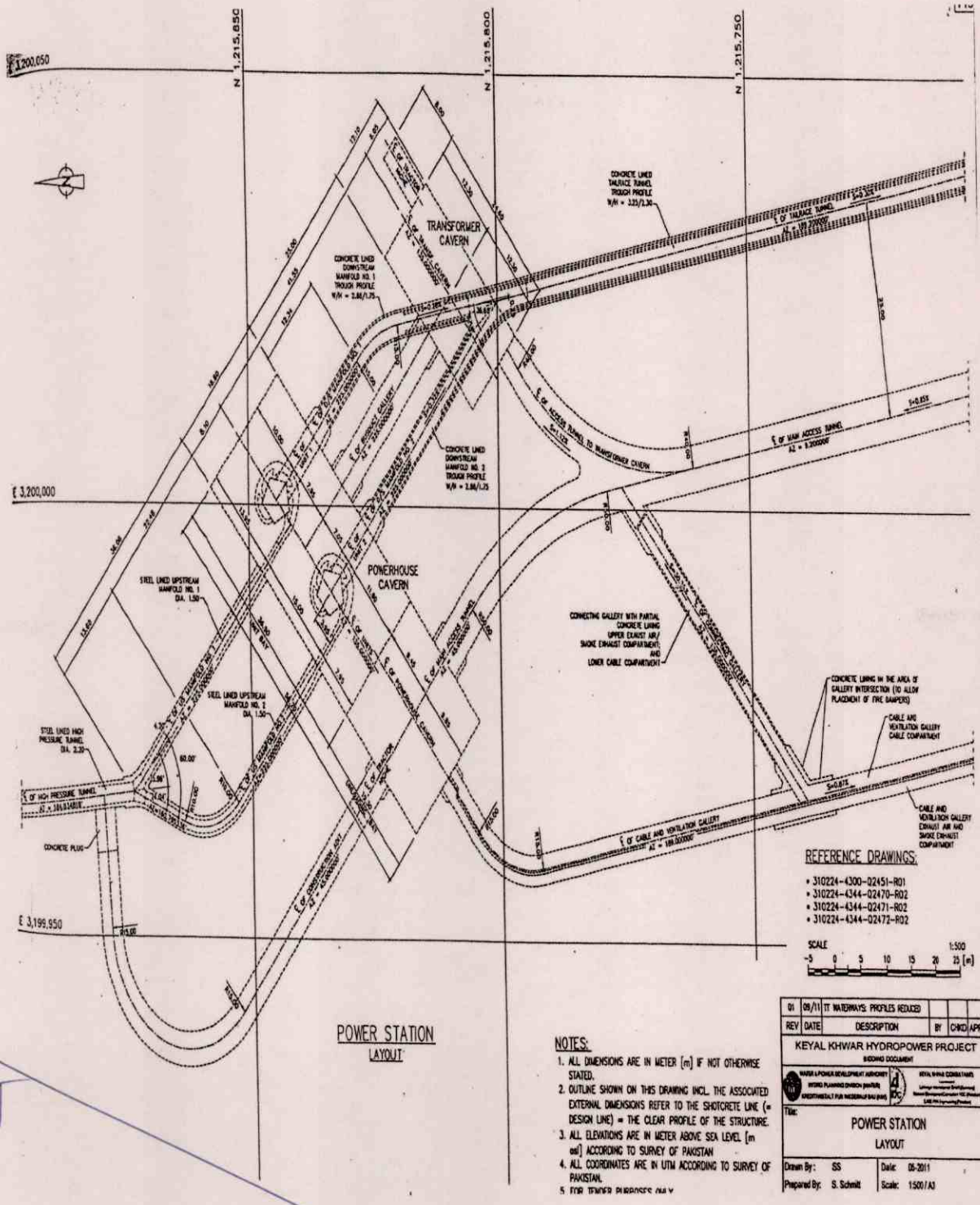
(g). Interconnection with national grid company, length of transmission line(s)

(h). Peaking/base load operation

(i). Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA





POWER STATION
LAYOUT

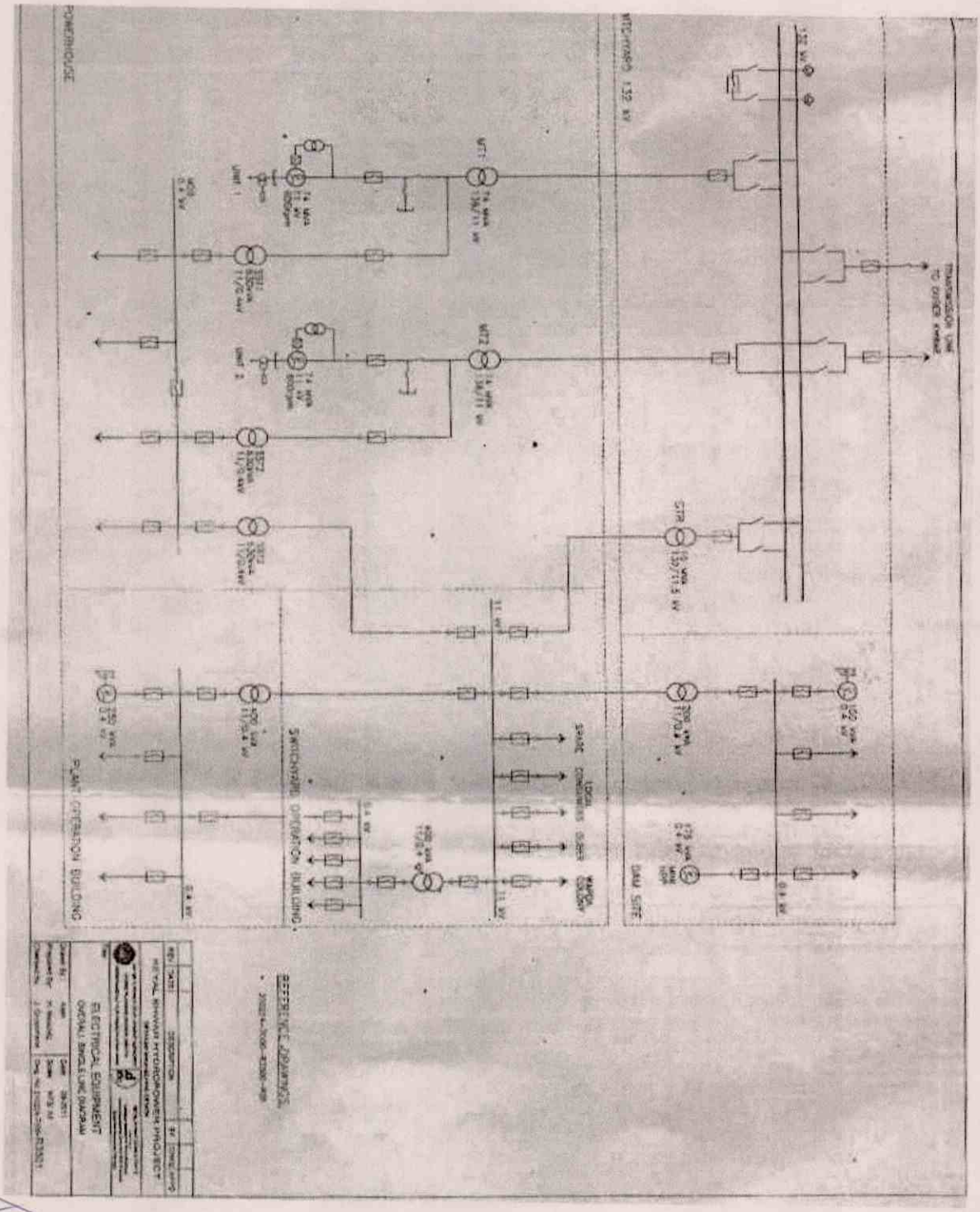
NOTES:
1. ALL DIMENSIONS ARE IN METER [m] IF NOT OTHERWISE STATED.
2. OUTLINE SHOWN ON THIS DRAWING INCL. THE ASSOCIATED EXTERNAL DIMENSIONS REFER TO THE SHOTCRETE LINE (= DESIGN LINE) = THE CLEAR PROFILE OF THE STRUCTURE.
3. ALL ELEVATIONS ARE IN METER ABOVE SEA LEVEL [m asl] ACCORDING TO SURVEY OF PAKISTAN
4. ALL COORDINATES ARE IN UTM ACCORDING TO SURVEY OF PAKISTAN.
5. FOR TENDER PURPOSES ONLY

REV	DATE	DESCRIPTION	BY	CHKD	APPD
01	09/11	TT WATERWAYS PROFILES REDUCED			

KEYAL KHWAR HYDROPOWER PROJECT
BIDDING DOCUMENT

Title: POWER STATION LAYOUT

Drawn By: SS | Date: 08-2011
Prepared By: S. Schmit | Scale: 1:500 / A3



Hydel Power Station, Keyal Khwar

PLANT DETAILS

1.	Location	Right tributary of the River Indus at Keyal Khwar Distt. Kohistan in KHYBER PAKHTUNKHWA.			
2.	Plant	Type	Total Capacity	No. of Units	
		Storage	122 MW	2	
3.	Gross Head	Maximum		Minimum	
		737.5 m		721.5 m	
4.	Technology	Pelton Turbine			
5.	Tunnel	No.	Length	Diameter	
	Total No. of Tunnel		-	At Intake	At Penstock
	(i). No. of Power Tunnel	1	7.16 Km	3.2 m	2.2 m
	(ii) No. of Irrigation Tunnel	-	-	-	-
6.	Peak/Base Load Operation	Base Load operation as per requirement of NPCC			
7.	Minimum Expected Useful Life of the Generation Facility	50 Years			
8.	Plant Characteristics	Generator Voltage	11 KV		
		Power Factor	0.85		
		Frequency	50 Hz		
		Automatic Generation Control	Yes		
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)	
		Keyal-Duber-I	132	3.00	
		Keyal-Duber-II	132	3.00	

NATIONAL ELECTRIC POWER REGULATORY AUTHORITY
REGISTRAR
NEPRA

Hydel Power Station
Golen Gol

(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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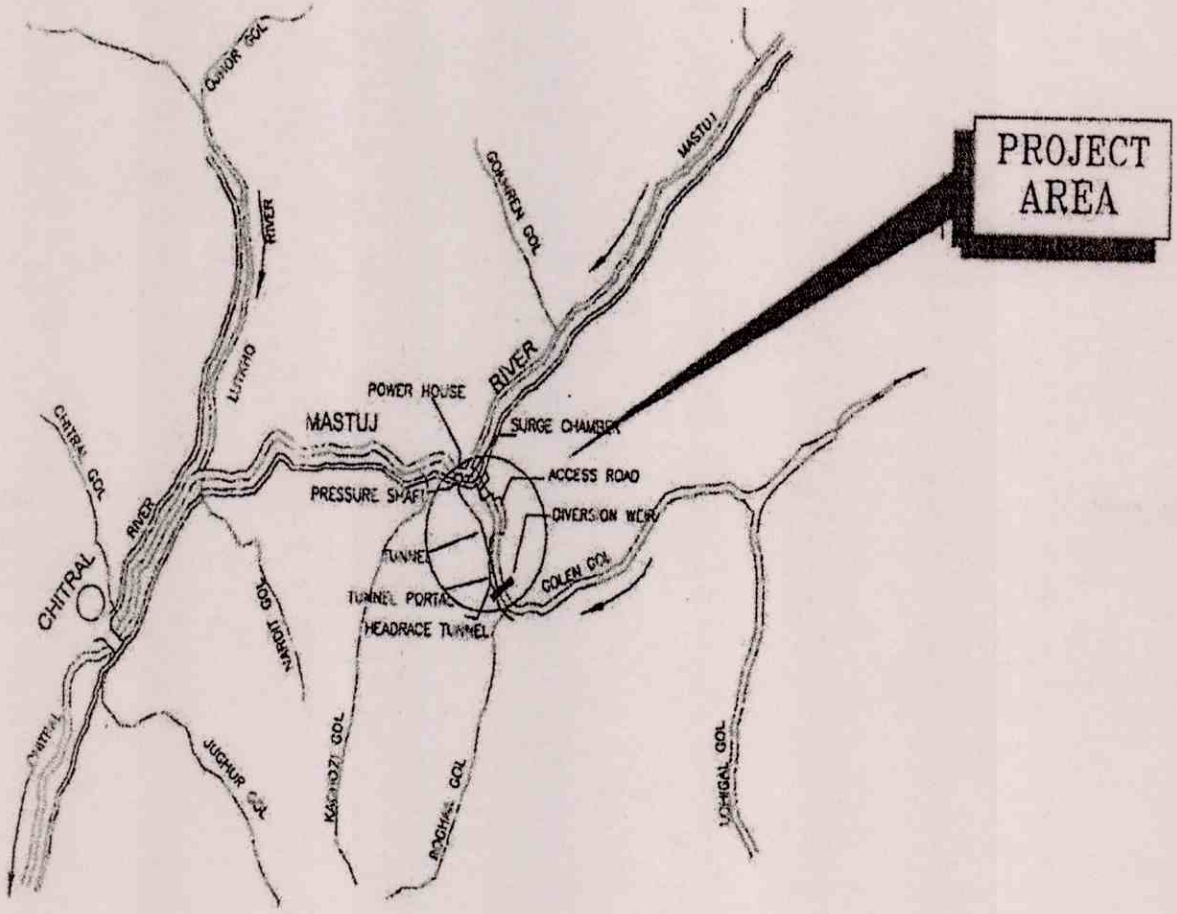

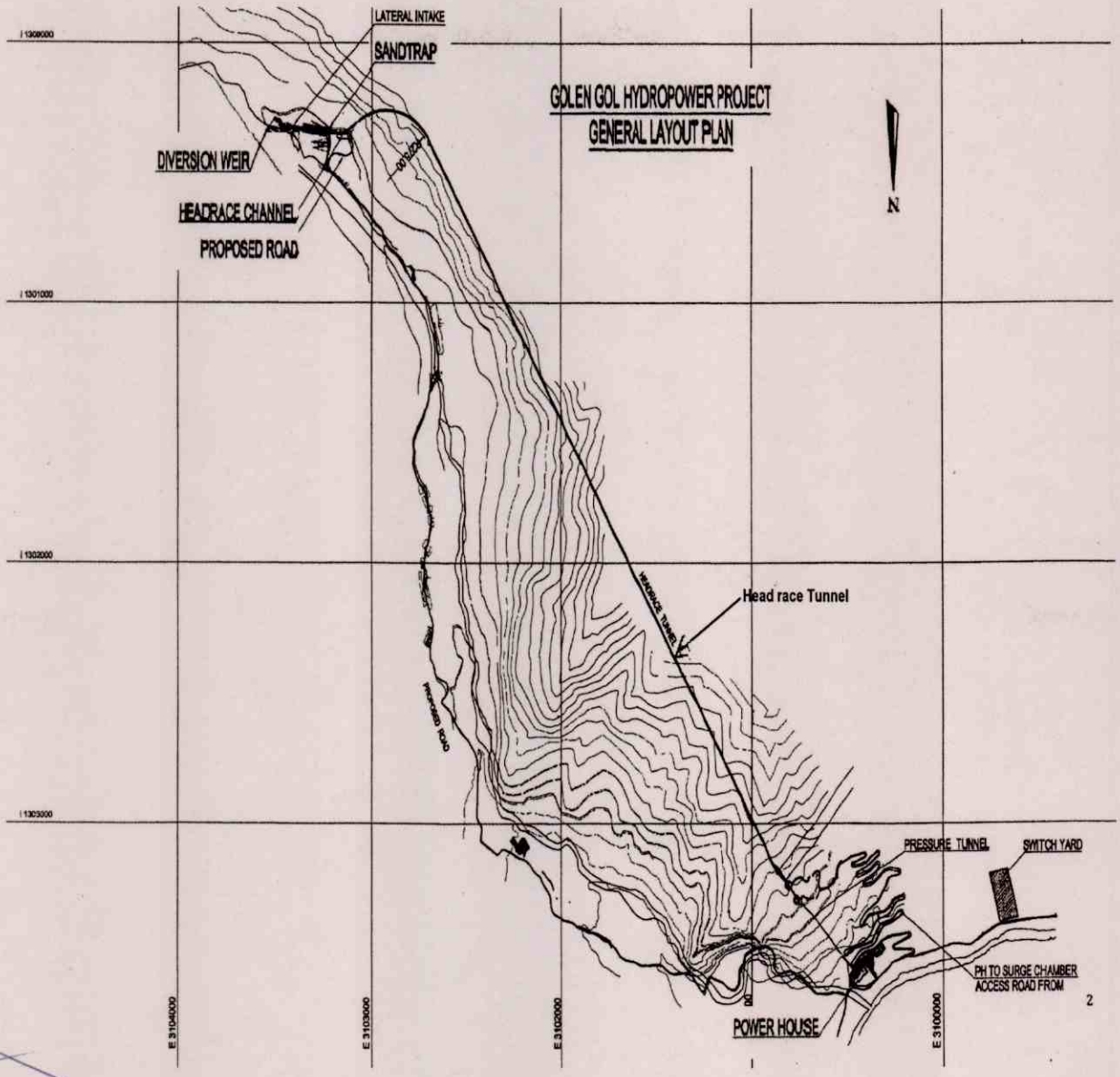

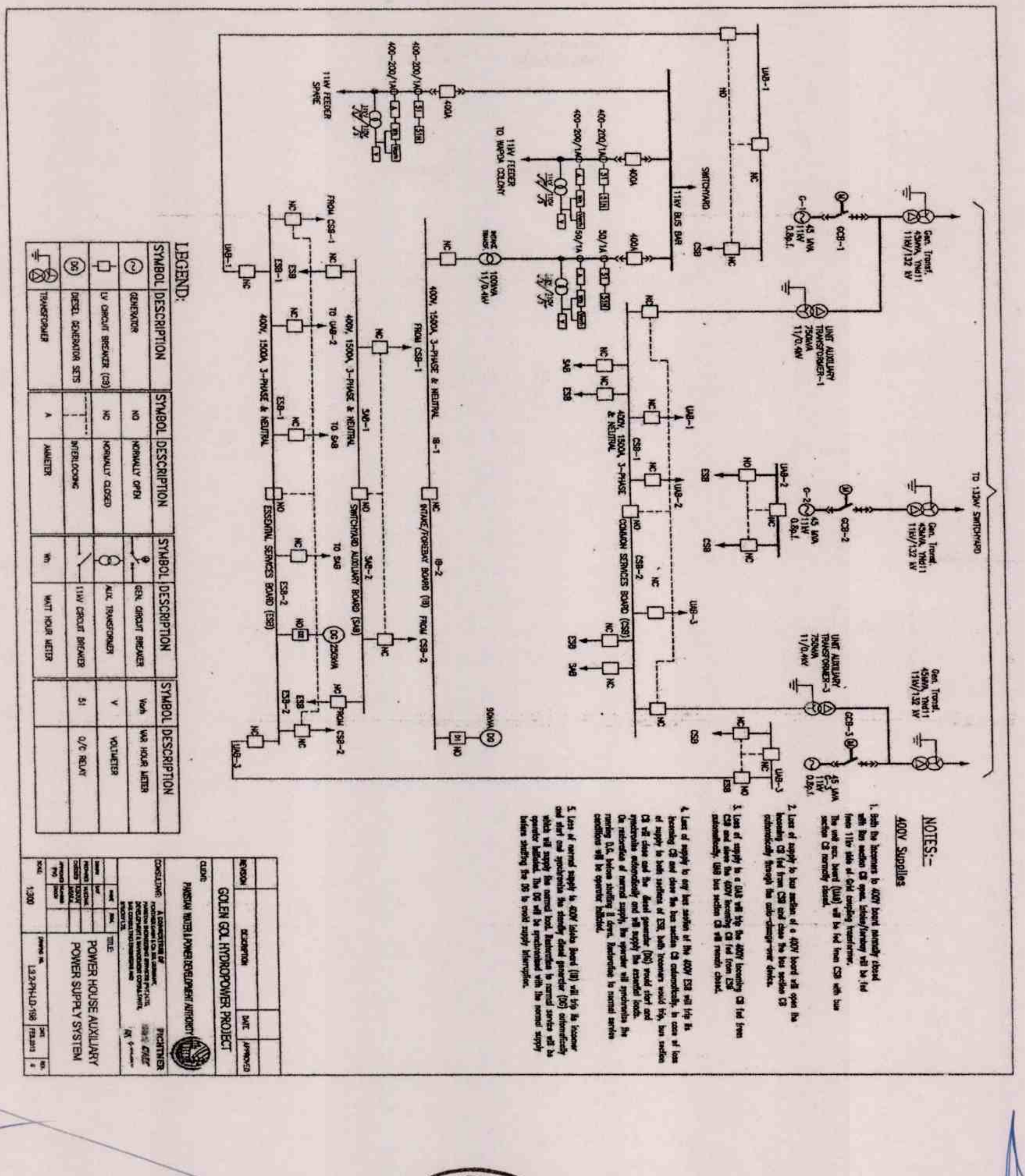

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Hydel Power Station, Golen Gol

PLANT DETAILS

1.	Location	On Golen Gol Nullah, 25 Km from Distt. Chitral in KHYBER PAKHTUNKHWA.				
2.	Plant	Type	Total Capacity	No. of Units		
		Run of River	106 MW	03		
3.	Head	Gross		Rated		
		439.3 m		423.3 m		
4.	Technology	Pelton Turbines				
5.	Tunnel	No.	Length	Diameter		
	Total No. of Tunnel	3	-	At Intake	Steel Liner	
	(i) No of Power Tunnel	3	3.81 Km	4.1m	3.2 m	
	(ii) No of Irrigation Tunnel	-	-	-	-	
6.	Peak/Base Load Operation	Base Load Operation Plant				
7.	Minimum Expected Useful Life of the Generation Facility	35 Years				
8.	Plant Characteristics	Generator Voltage	11 KV			
		Power Factor	0.80			
		Frequency	50 Hz			
		Automatic Generation Control	Yes			
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)		
		Golen Gol to Tmergara	132	145		
		Timergara to Chakdara	132	53		

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Hydel Power Station
Jabban

(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

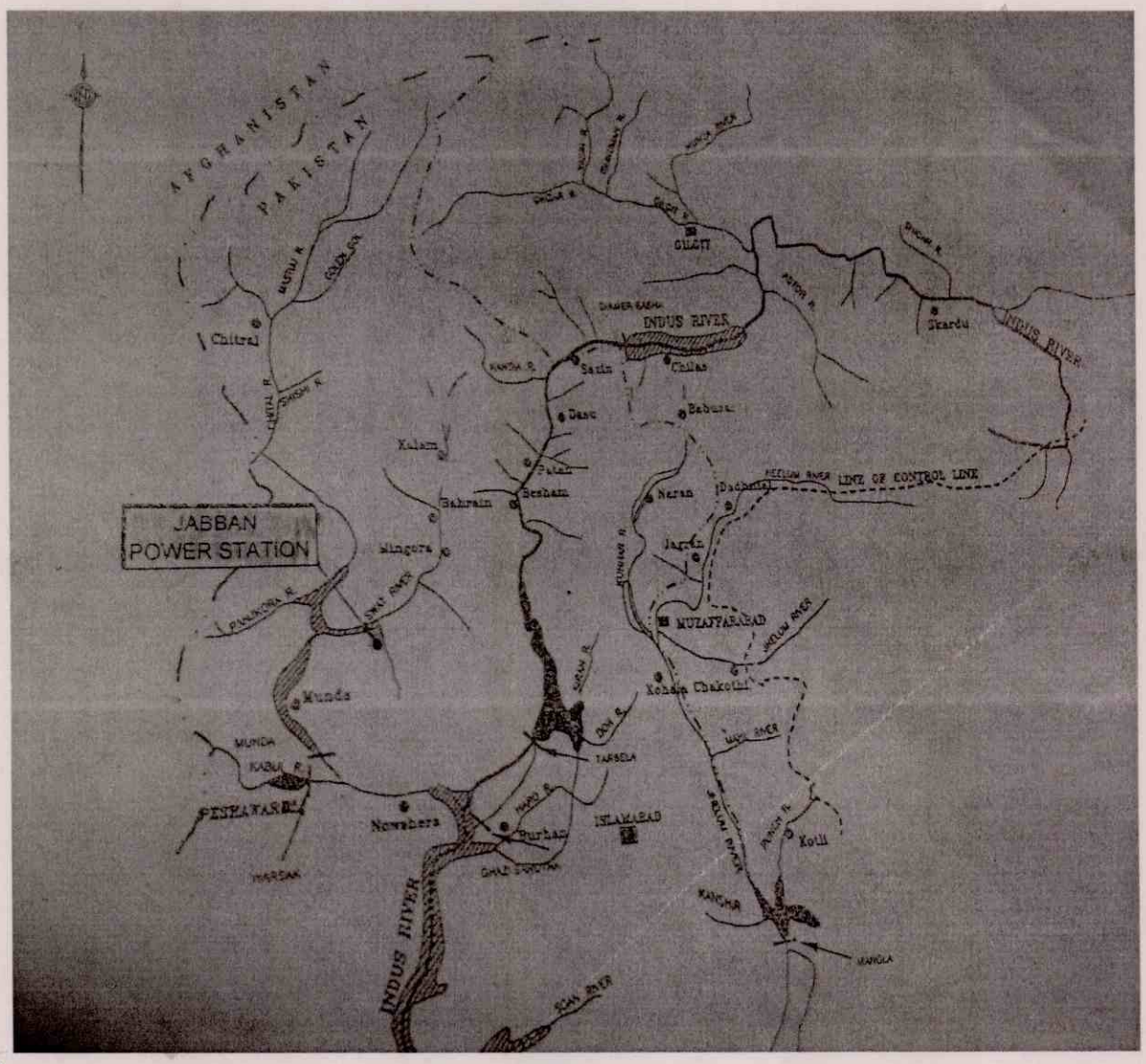
(e). Tunnel(s) if existing: length, diameter

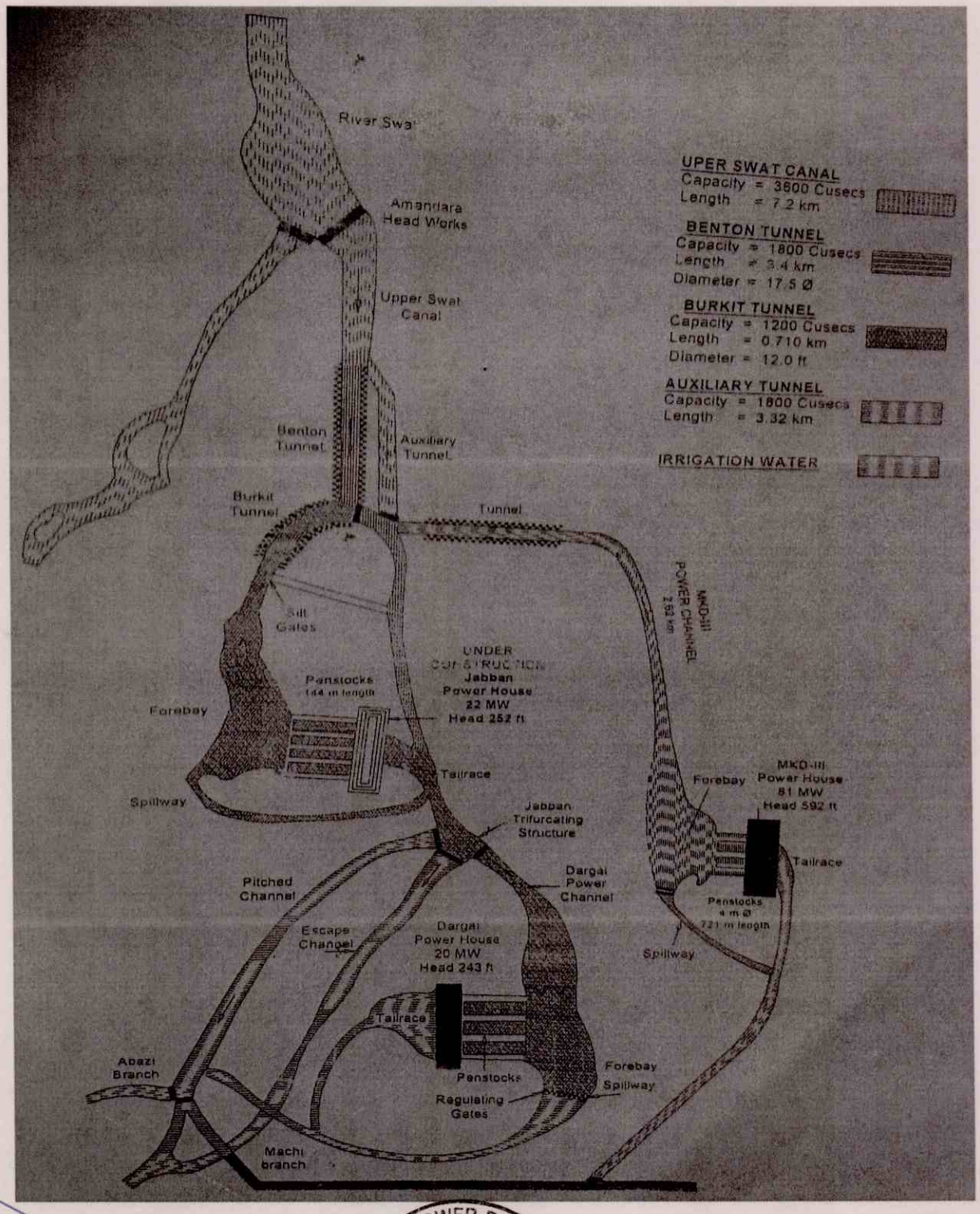
(f). expected life

(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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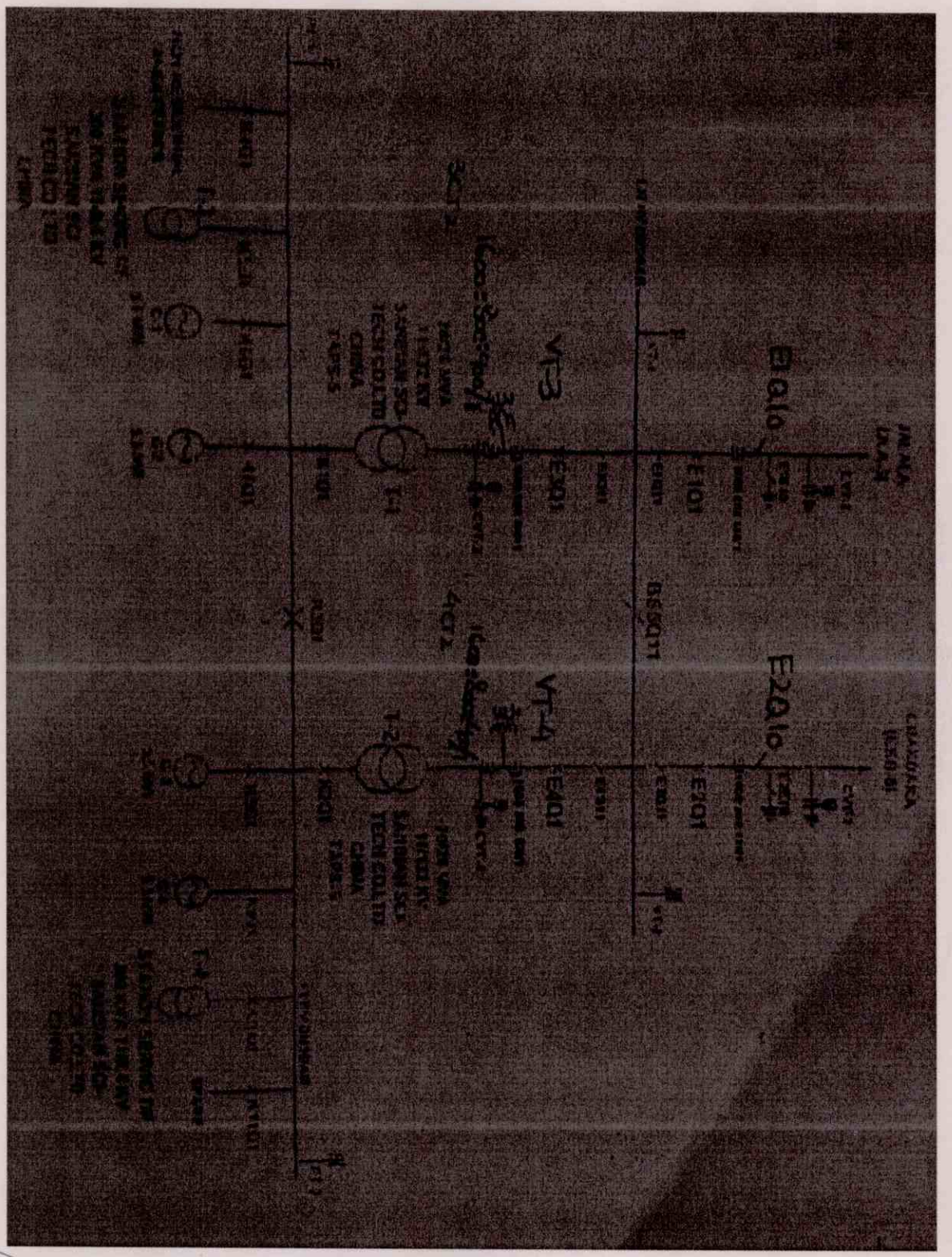

Hydel Power Station, Jabban

PLANT DETAILS

1.	Location	On Swat River in Distt. Malakand, in KHYBER PAKHTUNKHWA.			
2.	Plant	Type	Total Capacity	No. of Units	
		Run of River	22 MW	04	
3.	Head	Maximum		Minimum	
		614.48 m		537.08 m	
4.	Technology	Horizontal Francis Turbines			
5.	Tunnel	No.	Length	Diameter	
	Total No. of Tunnel		-	At Intake	At Penstock
	(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 Facility	50 Years			
8.	Plant Characteristics	Generator Voltage		11 KV	
		Power Factor		0.85 (Lagging)	
		Frequency		50 Hz	
		Automatic Generation Control		Yes	
9.	Interconnection Arrangements (CCT details, length of Transmission Line, voltage level details etc.)	CCT	Voltage (KV)	Length (KM)	
		Jabban to Chakdara	132	19.38	
		Jabban to Jalala/Mardan	132	26.62	

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Hydel Power Station
Diamer Basha

(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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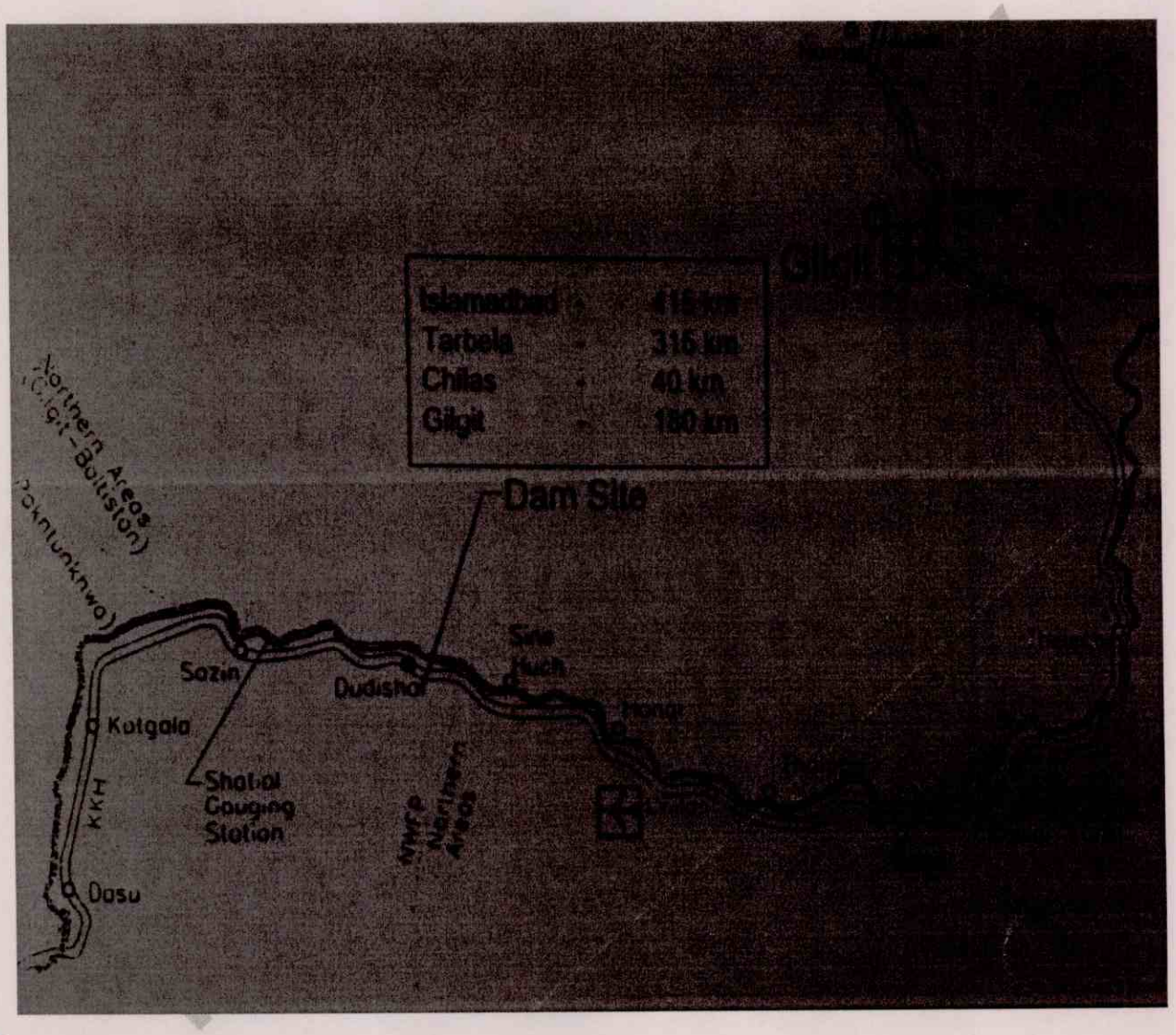

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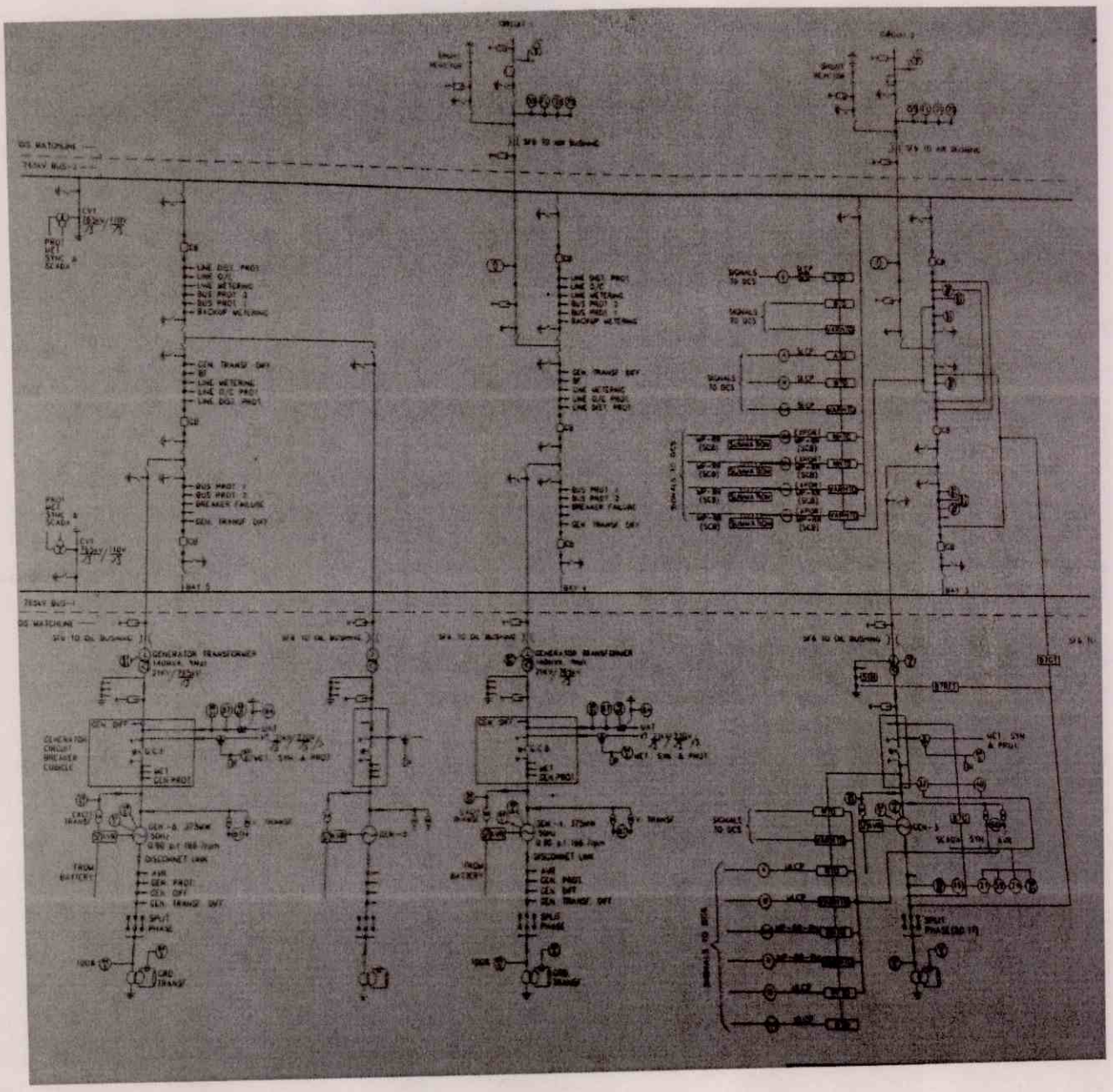

Hydel Power Station, Diamer Basha

PLANT DETAILS

1.	Location	Diamer Basha Dam, 40 km downstream of Chilas the district headquarter of Diamer in Gilgit-Baltistan				
2.	Plant	Type	Total Capacity	No. of Units		
		Storage	4500 MW	12 (375 MW Each)		
3.	Head	Maximum		Minimum		
		204.2 m		100.5 m		
4.	Technology	Francis Turbines				
5.	Tunnel (s)	No.	Length	Diameter		
	Total No. of Tunnels (Head Races L&R Bank)	04	3477 m (490.6+450.1+ 1165.5+ 1371.0)	At Intake	At Penstock	
	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	Base Load Operation				
7.	Minimum Expected Useful Life of the Generation Facility	50 Years				
9.	Plant Characteristics	Generator Voltage	-			
		Power Factor	-			
		Frequency	50 Hz			
		Automatic Generation Control	-			
10.	i. To be confirmed as per Feasibility Study of NTDC for Integrated Power	CCT	Voltage (KV)	Length (KM)		
		-	-	-		

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	Evacuation from North. ii. Reportedly, the Feasibility Study proposes 4 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 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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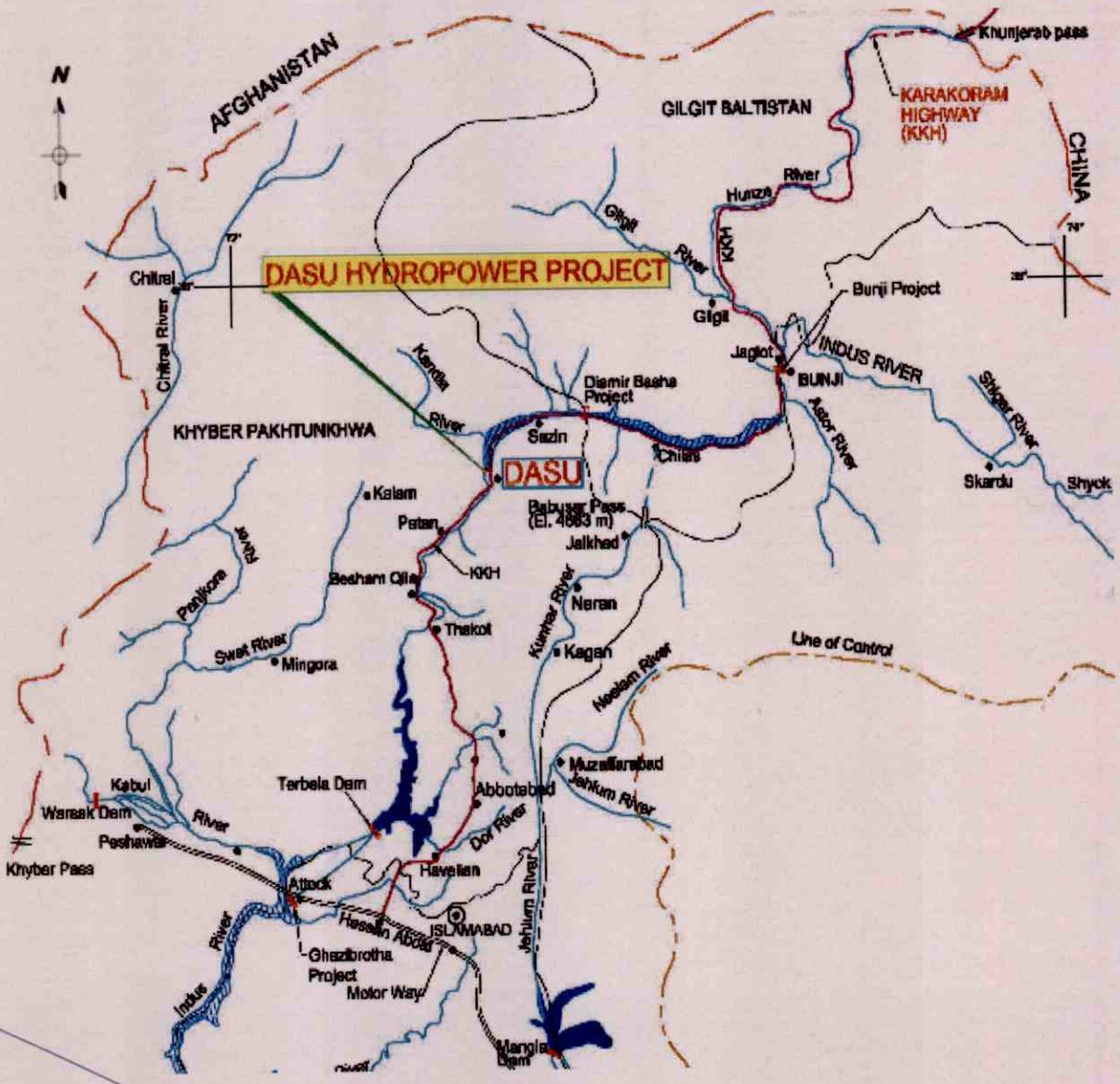

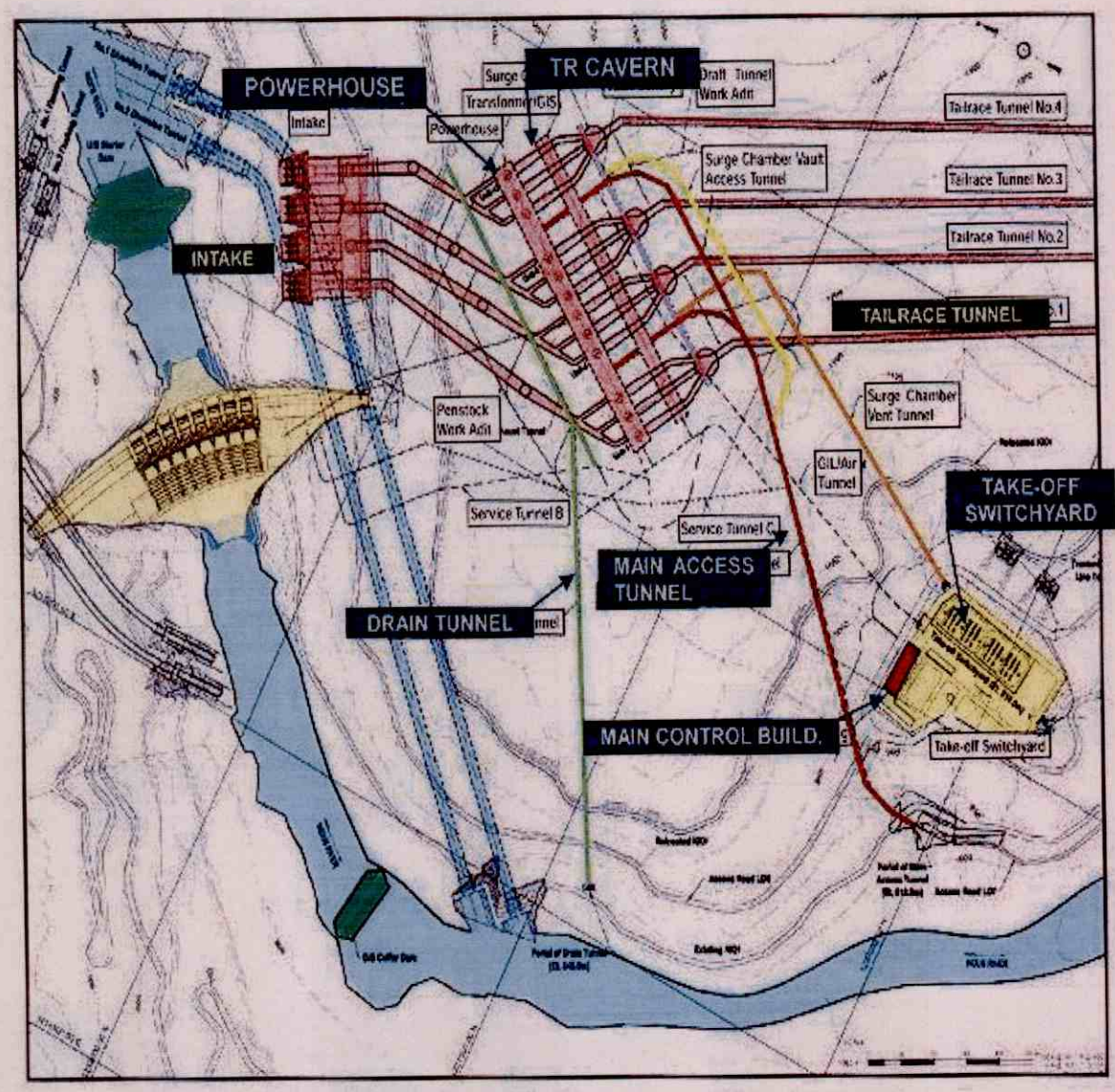

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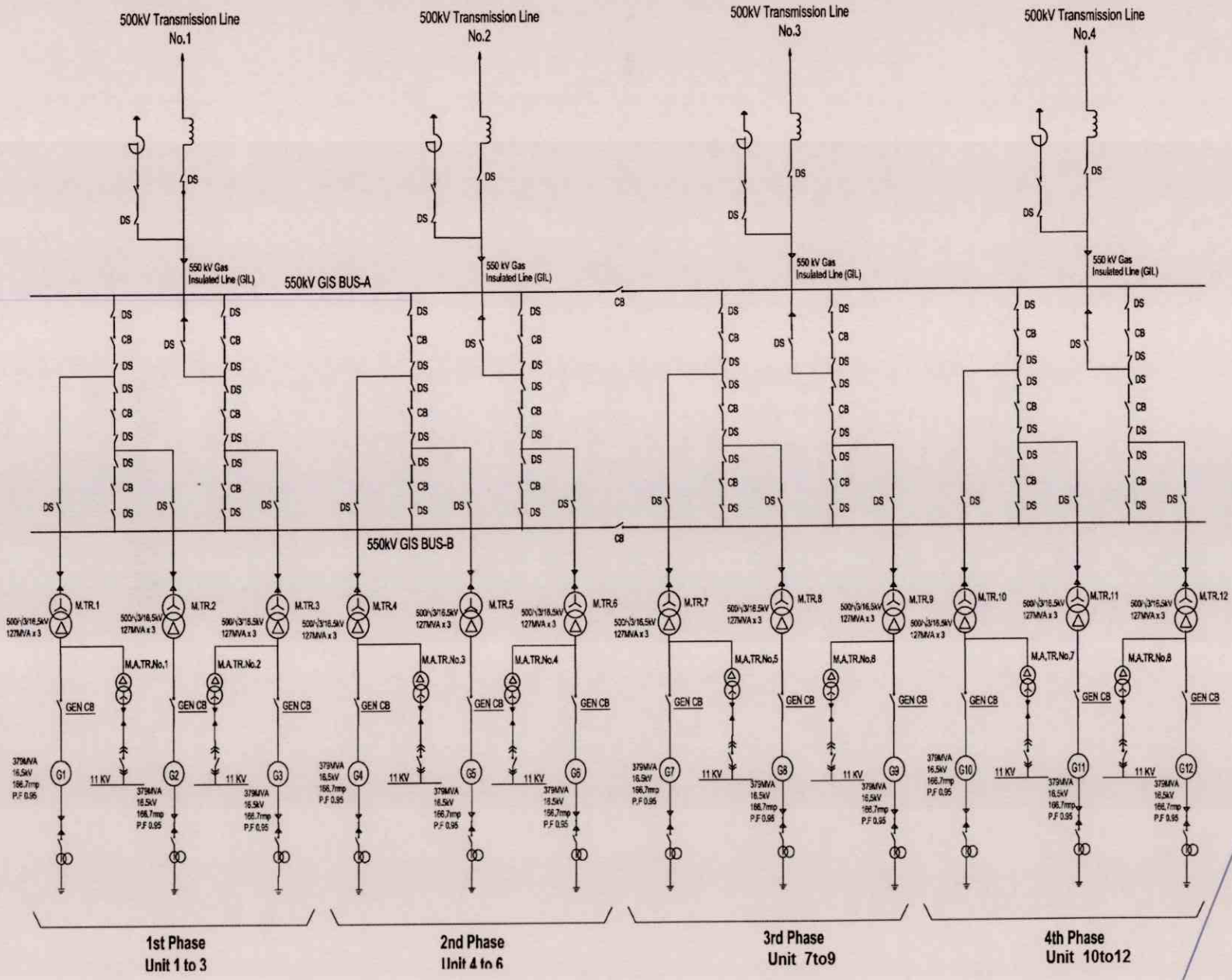

Hydel Power Station, Dasu

PLANT DETAILS

1.	Location	Left bank of Indus River, 7 KM upstream from Dasu Town, District Kohistan, Khyber Pakhtunkhwa				
2.	Plant	Type	Total Capacity	No. of Units		
		Run of River	4320 MW	12		
3.	Head	Maximum		Minimum		
		179.51 m		131.94 m		
4.	Technology	Francis Turbines				
5.	Tunnel(s)	No.	Length	Diameter		
		04	450 m (Each)	At Intake	At Penstock	
				12m	5.5m	
				12m	5.5m	
				12m	5.5m	
				12m	5.5m	
6.	Peak/Base Load Operation	Base Load Operation				
7.	Minimum Expected Useful Life of the Generation Facility	30 Years				
8.	Plant Characteristics	Generator Voltage	16.5 KV			
		Power Factor	0.9(Lagging)			
		Frequency	50 Hz			
		Automatic Generation Control	Yes			
9.	Two (02) Double Circuit 500KV Transmission Lines. From Dasu HPP Switchyard to Mansehra 140KM.	CCT	Voltage (KV)	Length (KM)		
		-	500	140		
		-	500	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, 4th 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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