No. PD. PPMU /1276 /2015

PUNJAB POWER MANAGEMENT UNIT (PPMU)
ENERGY, DEPARTMENT
GOVERNMENT OF THE PUNJAB
77 SHAH JAMAL COLONY, LAHORE

Dated February 16, 2015

The Registrar
National Electric Power Regulatory Authority (NEPRA)
NEPRA Tower, Ataturk Avenue (East)
G-5/1, Islamabad

Subject: **5.38 MW Chianwali Hydropower Project, Gujranwala- Application for Generation License**

Dear Sir,

1. I, Moeen-ud-Din Sheikh, Project Director , Punjab Power Management Unit (the "PPMU") being the authorized representative of the Punjab Power Development Company Limited (the "PPDCL) by virtue of the authority granted by Board of Directors of PPDCL' resolution dated 31-1-2014 (Copy attached hereto for reference) hereby apply to the National Electric Power Regulation Authority for the grand of a generation license for Chianwali Hydropower Project (CHP) to the PPDCL pursuant to Chapter III—License Regulation 15 of the Regulation of Generation , Transmission and Distribution of Electric Power Act, 1997.

2. I, certify that the documents–in-support attached with this application are prepared and submitted in conformity with the provisions of the National Electric Power Regulatory Authority Licensing (Application and Modification Procedure) Regulation 1999, and undertake to abide by the terms and provisions of the above-said Regulations. I, further undertake and confirm that the information provided in the attached documents-in-support is true and correct to the best of my knowledge and belief.

3. A Cheque No.167671 dated January 13,2015 in the sum of Rs.136,624/= (Rupees one hundred thirty six thousand, six hundred twenty four only) being license application fee calculated in accordance with Schedule II to the National Electric Power Regulatory Authority Licensing (Application and Modification Procedure) Regulations, 1999, as subsequently amended is attached in a separate sealed cover.

With best regards

Yours Truly,

16.2.2015

(Moeen-ud-Din Sheikh)
Project Director
Punjab Power Management Unit

Check List for Examination of
New Generation Facility (Hydel) – License Application

1. **Name of Company:** **Punjab Power Development Company Limited (PPDCL)**
2. **Capacity :** **5.38 MW Chianwali – Gujranwala-Punjab**
3. **Prepared/Updated on:** **16-02-2015**
4. **Application is being filed pursuant to NEPRA (Application and Modification Procedure) Regulations 1999**

Regulation #	Information/Documents Required	Compliance		Comments/Remarks
		Yes	No	
3(1)	An application for a license shall be made in the form specified in Schedule 1 to these rules. Authorization from Board of Directors Resolution/Power of Attorney	Yes	-	Format given in Schedule 1 has been used. Authorization from Board of Directors (BOD) of Punjab Power Development Company Limited (PPDCL) attached with application.
3(3)	The Registrar shall not receive the application unless it is accompanied with the correct amount of application fee. (including indexation)	Yes	-	A cheque drawn on National Bank of Pakistan (NBP), Lahore bearing number 167671 amounting to Rs.136, 624/= is attached with application for Chianwali Hydropower Project (CHP).
3(4)	The application for a license shall be submitted in triplicate	Yes	-	Three Copies attached. One original & two certified copies
3(5)(a)(i)	Certified copy of *Certificate of incorporation* shall be filed as documents-in-support along with application for license.	Yes	-	Certificate of Incorporation of Punjab Power Development Company Limited (PPDCL) is attached with this application.
3(5)(a)(ii)	Certified copy of *Memorandum and Articles of Association* shall be filed as documents-in-support along with application for license.	Yes	-	Copy of *Memorandum and Articles of Association* attached. However, it may be mentioned that Punjab Power Development Company Limited (PPDCL) is a public sector company fully owned by the Punjab

				Government. **Flag A.**
3(5)(a)(iii)	Certified copy of *Annual Return in case of applicant required to be submitted to the Registrar of companies pursuant to Section 156 of the Ordinance,* shall be filed as documents -in-support along with application for license.	-	No	Not Applicable as Punjab Power Development Company Limited (PPDCL) is a public sector company fully owned by the Punjab Government.
3(5)(a)(iv)	In case of an applicant to whom sub-clause (a)(iii) of Sub-clause (5) is not applicable , a return comprising all such information, in as close a form and content as possible, laid down in the third schedule to the Ordinance	-	No	Not Applicable
3(5)(b)	A reasonably detailed profile of the experience of the applicant , its management staff and its members in the electricity industry	Yes	-	Details are attached along with Organogram **Flag B**. Brief on PPDCL is enclosed. **Flag B-1**
3(5)(c)	The curriculum vitae of the applicant's senior management, technical and professional staff	Yes	-	The requisite CV's are attached. **Flag C.**
3(5)(d)(i)	Evidence , satisfactory to the Authority, of the availability of adequate financial and technical resources to the applicant for the purpose of the generation, transmission or distribution business, as the case may be, and such evidence may consist of : *Cash balances held in reserve along with the bank certificates;*	Yes	-	Government of the Punjab provides requisite funds through budget for revenue and development expenditure to Punjab Power Management Unit (PPMU) and Punjab Power Development Company Limited (PPDCL), implementing the ADB--funded Project. Copies of Release Order of Finance Department to PPDCL are attached **Flag D.** Details of assignment accounts and releases to PPMU can also

				be provided if required. Cash balances held in reserve along with bank certificates details-hence Not Applicable.
3(5)(d)(ii)	Evidence , satisfactory to the Authority, of the availability of adequate financial and technical resources to the applicant for the purpose of the generation, transmission or distribution business, as the case may be, and such evidence may consist of : *expression of interest to provide credit or financing along with sources and details thereof;*	Yes	-	Renewable Energy Development Sector Investment Program (REDSIP) is financed through a soft loan by Asian Development Bank (ADB). As per funding modalities of the ADB Loan Agreement, the Punjab Government would provide 20% of the total Project Cost as Equity through Annual Development Program. Recently the Punjab Government has committed to provide additional funds beyond 20% agreed Equity if loan proceeds fall short of financial requirements to complete the REDSIP Projects. Loan Agreement & requisite Commitment Letter and Punjab Finance Department's funds Release order for PPDCL / PPMU being a purely government-owned company / entity are attached. **Flag E.**
3(5)(d)(iii)	Evidence , satisfactory to the Authority, of the availability of adequate financial and technical resources to the applicant for the purpose of the generation, transmission or distribution business, as the case may be, and such evidence may consist of : *latest financial statements of*	Yes	-	Loan Agreement with Asian Development Bank (ADB) is attached herewith. **Flag F.** Copies of relevant pages of Annual Development Program (ADP) circulated by Punjab Finance Department as an Annual Budget Documents are

	the applicant;			placed at **Flag G**.
3(5)(d)(iv)	Evidence , satisfactory to the Authority, of the availability of adequate financial and technical resources to the applicant for the purpose of the generation, transmission or distribution business, as the case may be, and such evidence may consist of: *employment records of engineering and technical staff of the applicant proposed to be employed;*	Yes	-	Requisite employment records are given in CV's of the staff attached with the application. **Flag C-1** EPC/Turnkey Contract **(Flag H)** with Chinese Contractor M/s. SINOTEC-SHPE (JV) is attached. The EPC/Turnkey Contract has been awarded through International Competitive Process (ICB) as per procurement guidelines of ADB i.e. Single Stage two-envelopes after being the lowest bid and technical qualification of the Contractors;
3(5)(d)(v)	Evidence , satisfactory to the Authority, of the availability of adequate financial and technical resources to the applicant for the purpose of the generation, transmission or distribution business, as the case may be, and such evidence may consist of: *profile of sub-contractors, if any, along with expressions of interest of sub-contractors; and ;*	-	No	Not Applicable
3(5)(d)(vi)	Evidence , satisfactory to the Authority, of the availability of adequate financial and technical resources to the applicant for the purpose of the generation, transmission or distribution business, as the case may be, and such evidence may consist of: *verifiable references in respect*	Yes	-	The EPC/Turnkey Contract has been awarded through ICB process after technical qualification of the Contractors; -Previously Power Wing of the Punjab's Irrigation and Power Department was dealing with power issues of the Province. Its domain

	of experience of the applicant and its proposed sub-contractor;			was limited and primarily meant for regulation and administration. But with REDSIP initiative, the required expanded role was needed. Hence PPDCL and PPMU were established as required by ADB. These entities are now attached with a newly created Energy Department, Punjab to provide required focused and concentrated efforts for the development of energy sector.
3(5)(e)	In respect of a going concern, details of any charges or encumbrances attached to the company's assets;	-	No	-Asian Development Bank has provided loan through Economic Affairs Division, Government of the Pakistan; -Not Applicable as the development initiative currently on the table is a new public sector foreign-aided project.
3(5)(f)	In case of a first application for a license by a going concern, technical and financial proposals in reasonable detail for the operation, maintenance, planning and development of the generation, transmission, or distribution facility or system in respect of which the license is sought;	-	No	-The project is being executed as EPC/Turnkey Contract, signed with Chinese firms SINOTEC-SHPE (JV). -Not Applicable as the project is new. However, the project being implemented by Punjab Power Management Unit (PPMU) and will be handed over to PPDCL for operation & maintenance i.e. commercial operation through their technical staff and revenue generated through sale of

				electricity.
3(5)(g)(a)	In case of ; *generation license applications, the type, technology, model, technical details and design of the facilities proposed to be acquired, constructed, developed or installed;*	Yes	-	The required details are provided in the Project Description.
3(5)(g)(b)(i)	Distribution and transmission license applications: *the type, technology , model, technical details and design of the facilities proposed to be acquired, constructed, developed or installed;*	-	No	Not Applicable
3(5)(g)(b)(ii)	Distribution and transmission license applications: *a territorial map of the service area proposed to be covered;*	-	No	Not Applicable
3(5)(g)(b)(iii)	Distribution and transmission license applications: *particulars in respect of the availability , sources, rates and evidence of commitments from the sources of electric power;*	-	No	Not Applicable
3(5)(h)(i)	In case of a license for a new facility or system, a feasibility report in respect of the project, specifying in details: *the type, technology, model, technical details and design of the facilities proposed to be constructed, developed or installed;*	Yes	-	The Feasibility Study of the sub-projects was initially carried out by ADB under Technical Assistance (TA) grant. Theses Feasibility Studies were carried out by ADB appointed consultants prior to offering loan to Government of Pakistan (Borrower) for on-lending to the concerned provinces i.e. the Punjab & Khyber Pakhtoon Khawa for harnessing the renewable energy potential. As required by ADB, review of these Feasibility Studies

				was made by Management Consultants under the Loan and Tender Level Designs. Project now being implemented through EPC/Turnkey Contractor, who is responsible for detailed designs. The approved copy of detail design report by EPC/Turnkey Contractor, attached. **Flag I**
3(5)(h)(ii)	In case of a license for a new facility or system, a feasibility report in respect of the project, specifying in details: *the expected life of the facility or the system;*	Yes	-	Thirty Three (33) years as per Government Standards i.e. 30 years of PPA (Power Purchase Agreement) including 3 years of construction phase.
3(5)(h)(iii)	In case of a license for a new facility or system, a feasibility report in respect of the project, specifying in details: *the location of the facility or the system, or the territory with outer boundaries within which the facilities or the system is proposed to be installed and operated by the licensee , along with maps and plans; and*	Yes	-	The Project shall be built on Upper Chenab Canal (UCC), which is located in Gujranwala District of the Punjab Province. The Project site (Latitude $32^0$39'44" and Longitude 74^0 20' 26") is approximately 55 km from Lahore. The Project is a very low head hydropower Project to be placed in the permanently constructed diversion channel at right side of Upper Chenab Canal (UCC). Chianwali Hydropower Project on main canal; Upper Chenab Canal (Main Line Lower) is located in Gujranwala District of Punjab. The Chianwali Hydropower Project (CHPP) will be constructed at RD 129+000 to RD 133+000. The

				powerhouse will be constructed at RD 131+250. This proposed run-of-canal hydropower project site is situated between Kamoke and Gujranwala towns, near Chianwali village and the Irrigation Rest House. It is about 55 km from Lahore and 8 km from Gujranwala at UCC RD 131+250 and the project area is running parallel to the Grand Trunk Road at distance of two and a half kilometer. The project area is linked with Gujranwala city by an 8 km service road along the right bank of canal. It is accessible from main road from Lahore –Gujranwala G.T Road at the town of Kamoke by Qila Deedar Singh Road, crossing the D.R Bridge at R.D 139+165 of U.C.C and then along the inspection track of U.C.C up to the Powerhouse location. Punjab Province. The requisite Map is attached. **Flag J.**
3(5)(I)	A Prospectus	Yes	-	Attached
SCHEDULE III [Regulation 3(6)]				
(C) NEW GENERATION FACILITIES (HYDEL)				
1.	Location (location maps, site map)	Yes	-	Details have been provided in Project Description/Details and requisite Map attached
2.	Plant: Run of the River, storage, veir	Yes	-	Run of River (ROR). The project will be built on Upper Chenab Canal (UCC)

3.	Head: Minimum, Maximum	Yes	-	Max: Net Head 5.52 m Min: Net Head 3.05 m
4.	Technology: Francis, Pelton, etc size, number of units	Yes	-	Turbine: Pit Type Horizontal Shaft Kaplan (Double Regulated) Units: 2
5.	Tunnel (if proposed): length, diameter	Yes	-	Tunnel is not required
6.	ESSA (Environmental & Social Soundness Assessment)	Yes	-	Copy attached. Approval letter attached. **Flag K.**
7.	Detailed Feasibility Report	Yes	-	Copy provided. **Flag I.**
8.	Resettlement Issues	Yes	-	No such issues have been confronted
9.	Consents	Yes	-	EIA (Environmental Initial Assessment) already approved. Customs and other duties at concessionary rates will be applicable as per GOP/GOPb Policy. **Flag K.**
10.	Infrastructure development	Yes	-	Included in EPC/T Contract
11.	Interconnection with National Grid Company. Distance and name of the nearest grid, voltage level (single line diagram)	-	-	Requisite studies already underway by contractor. These studies would be provided when completed and validated by GEPCO (Gujranwala Electric Power Company). Grid Station: Chianwali, 11 KV Bus Bar, located at the distance of 12--km from the Power House.
12.	Project Cost , information regarding sources and amounts of equity and debt	Yes	-	Local Financial Cost (Rs. M) =616.12 Eqvi Foreign Financial Cost (Rs. M) =2273.48 (US$ 21.14 M) Total = 2889.61 (Rs. M) -Debt Equity Ratio= 80:20 -Debt: Asian Development Bank (Eqvi Rs. 2311.69 M) -Equity: Punjab Government (Rs. 577.92 M)

13.	Project Schedule, expected life	Yes	-	Construction period is 1080 days with DLP of 12 months. Project life is assumed as 30 years for the purpose of financial and economic calculations and tariff
14.	Peaking /Base load operation	Yes	-	Base Load
15.	Plant characteristics: generation voltage, power factor, frequency, automatic generation control, ramping rate, control metering and instrumentation	Yes	-	Transmission Voltage 11 KV Power Factor: 0.8 Frequency: 50 Hz Facility.
16.	System studies load flow short circuit, stability studies	Yes	-	Studies i.e. Load Flow, Short Circuiting & Dynamic Stability already underway through Consultant by the Contractor M/S SINOTEC. These studies would be provided later on after validation by GEPCO. **Flag L.**
17.	Training and Development	-	No	Not Applicable

Plant Details & Other Details

1. General Information

- Name of Applicant ..... Punjab Power Development Company Limited (the "PPDCL")
- Address of the registered office ..... 77-Shah Jamal Colony, Lahore
- Plant Location ..... District Gujranwala-Punjab
- Type of Facility ..... Very Low Head Hydropower Project

2. Plant Configuration

- Low Head Hydropower turbines
- Gross Capacity of the Power Plant 5.38 MW
- Type of Technology ..... Very Low head hydropower generation
- Number of Units / Capacity 02
- Power Plant Make and Model ..... Low Head Kaplan Pit Type Turbines
- Commissioning Date ..... February 2016

3. Fuel Details

- Type of Fuel ..... Hydropower Generation
- Fuel (Imported / Indigenous) ..... Indigenous
- Fuel Supplier ..... N.A
- Water Use Agreement ..... With Irrigation Department GOPb

4. Emission values

- SO_x ..... NA
- NO_x ..... NA
- CO ..... NA
- PM10 ..... NA

5. Gross Installed Capacity ..... 5.38 MW
6. De-rated Capacity ..... to be provided later
7. Expected Life of the Facility ..... 30 years
8. Operation Record ..... New Plant to be commissioned by Feb 2016

9. Plant Characteristics

- Generating Voltage ..... 11 KV
- Frequency..... 50 Hz
- Power Factor ..... Leading 0.95 at Lagging 0.8
- Automatic Generation Control ..... No
- Ramping Rate..... to be provided later
- Alternative Fuel..... No
- Auxiliary Consumption ..... 54 kW
- Time required to Synchronize ..... to be provided later

Schedule H

The Net Capacity of the Licensee's Generation Facility

- Gross Installed Capacity of the Plant (ISO).....5.38 MW
- Derated Capacity of the Plant .....
- Auxiliary Consumption of the Plant .....54 kW
- Net Capacity of the Plant .....5326 kW
- Construction Period .....1080 days
- Expected date of Commercial Operation of the Plant — February 07, 2016

Note: These are indicative figures provided by the Licensee.

The Net Capacity of the Plant available for dispatch to Power Purchaser will be determined through procedures contained in the EPC Agreements or Grid Code.

Interconnection Arrangement with National Grid for Power Dispersal of the Plant

The project is proposed to be connected with the GEPCO's nearest 66 KV Grid Station Chianwali for evacuation of energy generated by the Project. For this purpose the contractor being EPC Contractor has engaged a consultant to conduct Load Flow Study, Short Circuiting Study and Dynamic Stability Study besides studying the route and length of transmission line from the power house to grid station. The consultant would also study the assessment/requirements of additional equipments needed for proper inter-facing. These studies would be submitted to GEPCO for validation & appraisal as per WAPDA specifications so that the contractor could construct the transmission line as part of EPC contract. These arrangements have been incorporated in the Project's physical scope to ensure the energy dispersal and inter-connectivity on the immediate basis after the commissioning of the Power House. Traditional arrangements about transmission line are likely to cause delay the energy evacuation /dispersal.

5.38 MW Chianwali Hydropower Project

Upper Chenab Canal - District Gujranwala

Punjab - Pakistan

Prospectus

5.38 CHIANWALI HYDROPOWER PROJECT

PROJECT DESCRIPTION

Asian Development Bank (ADB) offered a multi-tranche loan of US$ 500 Million to the Govt. of Pakistan for development of renewable energy resources under Renewable Energy Development Sector Investment Programme (REDSIP). The first tranche of J¥ 5599 million for Punjab, was negotiated in Oct. 2006, however loan was signed on October 5, 2007, upon approval of PC-Is by ECNEC. Govt. of Pakistan is the "BORROWER" for on- lending to the Govt. of Punjab (GOPb). The GOPb is responsible to share 20% equity in addition to the ADB Loan. The revised allocation of the ADB Loan No. 2286 (OCR) for construction of projects is J¥ 7882 million based on actual bidding.

The Feasibility Reports and the original PC-1s were framed by ADB Consultants under PPTA (Project Preparation Technical Assistance) in 2005-06. Management Consultants for REDSIP, Punjab were appointed under ADB Loan conditions in 2009 and the Feasibility Studies were reviewed by the Management Consultants under their TORs approved by ADB. During review of the Feasibility Studies, the proposed Layouts and Designs of Civil as well as Electro Mechanical Plants (E&M) were thoroughly examined and limitations of the Irrigation Canal System, over looked in the Feasibility Studies, were also considered. The siltation problem in the canal system and its impact on capacity of the canals, in view of some existing hydropower plants on canals since 1960s was also focused. Accordingly workable "Tender Level Designs" for Layouts and appropriate E&M Plant, suitable to the conditions was made, having basic changes in the Feasibility Designs and Layouts. The Tender Documents, based on the Tender Level Designs were framed, and cleared by ADB. Accordingly, International Competitive Bidding (ICB) for EPC/Turnkey Contracts was made as per ADB's Procurement Rules & Guidelines under single stage - two envelopes procedures. Being first experience of EPC/Turnkey Contracts in Punjab, the Chief Minister constituted a Steering Committee (SC), under the Chair of Chainman P&D Board, Punjab with its TORs, as attachment. The major TORs of the SC are monitoring the transparency of bidding process and approval of the lowest bids. All the bids have been approved by SC, after clearance / NOC by ADB. The latest revision of the PC-Is has been approved by ECNEC on Oct. 27, 2013 on the basis of actual approved bids as result of ICB.

As defined in ADB Loan Agreement, the mode of implementation of the REDSIP is EPC /Turnkey, which in the terms of ADB is "Procurement of Plant, Design, Supply and Install" on Turnkey basis. In EPC mode, the Contractor takes full responsibility of detailed designs, engineering, procurement and construction / commissioning of Plant and carries the associated risks against the offered bid price in view of time schedule as per requirements of sponsors of the Project.

PROJECT LOCATION

The Project shall be built on Upper Chenab Canal (UCC), which is located in Gujranwala District of the Punjab Province. The Project site (Latitude $32^0 39'44"$ and Longitude 74^0 20' 26") is approximately 55 km from Lahore. The Project is a very low head hydropower scheme to be placed in the permanently constructed diversion channel at right side of Upper Chenab Canal (UCC). Chianwali Hydropower Project

on main canal; Upper Chenab Canal (Main Line Lower) is located in Gujranwala District of Punjab Province.

The Chianwali Hydro Power Project (CHPP) will be constructed at RD 129+000 to RD 133+000. The powerhouse will be constructed at RD 131+250. This proposed run-of-canal hydropower project site is situated between Kamoke and Gujranwala towns, near Chianwali village and the Irrigation Rest House. It is about 55 km from Lahore and 8 km from Gujranwala at UCC RD 131+250 and the project area is running parallel to the Grand Trunk Road at distance of two and a half kilometer. The project area is linked with Gujranwala city by an 8 km service road along the right bank of canal. It is accessible from main road from Lahore –Gujranwala G.T Road at the town of Kamoke by Qila Deedar Singh Road, crossing the D.R Bridge at R.D 139+165 of U.C.C and then along the inspection track of U.C.C up to the Powerhouse location. The project area is accessible from Karachi Port through a good road network of National Highways. The road distance between Lahore and Karachi is about 1,292 km

Upper Chenab Canal (Main Line Lower) is controlled from Bombanwala head regulator. The designed discharge of the head regulator is 315 m^3/sec. A number of fall structures exist along this canal where hydropower projects can be developed. The falls at RD 129+000 and RD 133+000 have been selected for hydropower development. Internet access is available with high speed through the telephone network Telephone and telegraph facilities are available in Gujranwala and Chianwali which is connected with other main towns of the country through the nationwide dialing system. International Direct Dialing (IDD) exists, too. Internet access is available with high speed through the telephone network.

Sialkot Airport is the nearest airport. However, Lahore International Airport is also close to the project area.

Upper Chenab Canal

The Upper Chenab Canal (UCC) is fed from the Marala Barrage, leading water from the Chenab River into a number of tributaries of the Punjab irrigation system in Gujranwala, Sheikhupura, Depalpur, Sahiwal and Okara districts of the Punjab Province. The Upper Chenab Canal Main has a design capacity of 477 m^3/sec. The canal aims primarily as a link canal and to supply water to Upper Chenab Canal Lower, Bambanwala Ravi Badian Depalpur Canal and Nokhar Branch off-taking at its tail RD 133+296. The canal is a perennial link and closed for about one month only every year during December and January for annual maintenance purposes.

Salient Features

Background

Pakistan has been facing energy shortage for quite some time now as the gap between demand and effective power supply has widened enough that the country is under huge power outages these days. Pakistan does not have enough proven resources of fossil fuels and being a developing country does not have enough resources to import fuels for power generation purposes. The only viable alternative is to depend on less costly and clean hydroelectric potential available along rivers, streams and canals constructed for irrigation.

In Punjab, the hydropower potential exists on canal falls of irrigation system only. Preliminary studies ware made by WAPDA, indicating 317 sites with a total potential of more than 600 MW on canal falls and barrages, out of which 48 sites are preferred sites having hydropower potential of 2 MW and more. The falls on canals and barrages range from 0.5 m to 5 m, most of which cannot be developed as a single fall hydropower project therefore combination of falls to avail minimum water head of 2 m and above (preferably 3 m and more) for VLH is essential in most of the cases which involves additional costs as compared to high and medium head.

Salient Features of the Project.

The very Low Head Chianwali Hydropower Project has been designed for a maximum design discharge of 150 cumecs, available in Kharif and will be reduced in Rabi, with a variable head of 3.20 m to 5.67 m. The design capacity is 5.38 MW with estimated annual generation of 28.82 GWh. The technology is 2 units of pit type horizontal Kaplan Turbines with double regulation arrangements. Other details and the salient features are narrated below.

Salient Design Features

Sr. No.	Features	Details / Description	
1.	Location	District Gujranwala, Punjab	
2.	River System	Upper Chenab Canal System Near Fall Structure at RD 128+000	
3.	Discharge	Mean Monthly: Total Annual Average:	101.50 m^3/s 3,200 10^6 m^3/y
4.	Main Structures	Design Discharge: Maximum Discharge:	150 m^3/s 271 m^3/s
5.	Spillway	Units: Type: Sill Level: Design Pressure at Sill: Height: Width:	7 Radial Gates 221.40 masl 2.29 m 2.89 m 7.00 m
6.	Trash Racks	Width: Height: Inclination: Bar Distance:	8.434 m 11.258 m 80° 100 mm
7.	Stop Logs	*Intake* Width: Height: *Spillway* Width: Height:	 8.434 m 8.456 m 7.00 m 2.70 m

ENVIRONMENTAL & SOCIAL ASPECTS OF THE PROJECT

Environmental Impacts

There are no significant Environmental impacts of the project neither on archaeological sites nor on the wildlife or fisheries. Owing to the existing falls in the canals system and annual closure regime, there are no significant fisheries. The impacts identified in the Land Acquisition & Resettlement Plan (LARP) and Environment Management Plan (EMP) is mostly due to construction related activities. The loss of land is restricted to the least possible minimum level, for which compensation and mitigation measures have been proposed. For Environmental Clearance, 'NOC' has been acquired from Environment Protection Authority (EPA).

Environmental Mitigation

Mitigation measured included in the EMP are as indicated below:

Summary of Mitigation

Potential Impact	Mitigation
Construction impacts – loss of temporary water quality, loss of trees and access	Implementation through detailed EMP attached to the IEE including provision of stand pipes for drinking water, bridge access across the existing canal.
Permanent loss of small amount of agricultural land and some trees	Compensation package for permanent loss of land & for trees. Implement tree planting program.

Land Acquisition and Resettlement

This project, because of its relatively small size, less than 50 MW, is classified as a category "B" project, in accordance with Asian Development Bank (ADB) Guidelines for Environmental Assessment, 2003. An Initial Environmental Examination (IEE) has been approved by Environmental Protection Department for the Project. The detail environmental examination and Land Acquisition & Resettlement Plan (LARP) including impacts and mitigation measures for Deg-Outfall HPP has been prepared in accordance with the ADB guidelines.

According to the ADB's handbook on Involuntary Resettlement, project is categorized based on the following benchmarks:

- Significant impact: if > 200 people are resettled or will lose > 10% or more of their income generating assets are classified as category "A" requiring a full LARP.
- Insignificant Impact: if < 200 people will be resettled or experience a loss of <10% of income generating assets are classified category "B" requiring a short LARP.

A total of 11 households (49 persons) as in June 2010 having ownership of 73.08 Acres (Private & Evacuee Trust Land) are affected by CHPP. None of these Affected Households (AHs) is losing more than 10% of their productive assets. According to project ADB guidelines on project categorization, the impacts are considered insignificant as less than 200 people are losing their income generating assets. The CHPP is classified as category "B" and a Short LARP for CHPP has been prepared accordingly. The

Sr. No.	Features	Details / Description	
8.	Draft Tube	Units: Type: Head on Sill: Height: Width:	2 Roller Gates 7.50 m 5.67 m 7.20 m
9.	Headrace Channel	Water Level at Entrance: Canal Width: Flow Depth: Bed Slope:	223.69 masl 75.00 m 3.20 m 0.15
10.	Power House	Powerhouse Level: Machine Hall Length: Machine Hall Width: Machine Hall Height:	220.8 masl 29.50 m 20.10 m 13.4 m
11.	Tailrace Channel	Bed Level: Canal Width: Bed Slope:	217.31 masl 75.0 m 0.15
12.	Nominal Head at Maximum Power Output	Headrace Water Level: Max. Tailrace Water Level: Min. Tailrace Water Level: Maximum Gross Head: Minimum Gross Head: Head Loss:	223.69 masl 220.49 masl 218.02 masl 5.67 m 3.20 m 0.15 m
13.	Hydro-mechanical Equipment	Type of Turbine: Units: Rated Flow for each Unit: Capacity: Rotational Speed: Rated Head:	Hor. Shaft Kaplan 2 75 m^3/s 2.837 MW 120 rpm 4.20 m
14.	Electrical Equipment	*Generator* Unit: Speed: Capacity: *Transformer:* *Switchgear:*	 2 600 rpm 3.3625 MVA *6.3/11 kV* *11 kV*
15.	Power and Energy	Power: Mean Annual Energy [On contract capacity basis (Not Yet Finalized)]	2 x 2.69 MW 28.82 GWh

LARP for CHPP has been approved by ADB for its implementation.

The objective of this Short Land Acquisition and Resettlement Plan (SLARP) is to describe the impacts of CHPP, compensation entitlements, and resettlement principles. The Short LARP sets out provisions for compensation of land, structures, crops and trees under the Land Acquisition Act, 1894, and ADB's policy on involuntary resettlement (1995) and Handbook on Resettlement- A Guide to Good Practices.

None of the AHs resides in the project location therefore, no households will be displaced. Most of the AHs also have other sufficient source of incomes for their livelihoods. As the AHs are losing their productive assets, they have been compensated at replacement cost for their losses under ADB guidelines and Land Acquisition Act 1894.

A total of 73.08 Acres (Private & Evacuee Trust Land) has been acquired for the construction of the Power Channel including powerhouse, headrace channel, tailrace channel, sub-station, Offices and (O & M) staff residencies etc. The total No. of Affected Households (AHs) is 11 which are cultivating the 73.08 Acres (Private & Evacuee Trust Land). The CHPP also affected and 3874 trees of different species (non-fruit) belonging to Forest Department standing in the right of way of UCC canal acquired land and replenishment cost has been paid to the Forest Department.

All the households are Muslim and ethnically Punjabi. There is neither tribal nor minority people amongst these AHs. The ADB's Policy on Indigenous People, as specified in the Indigenous Peoples Development Framework (IPDF) prepared for this program is not triggered; therefore neither an Indigenous Peoples Development Plan (IPDP) nor special action is required for CHPP.

The budget for this Short LARP has been calculated using the rates derived through consultation with the APs, Revenue, Agriculture, Building, Irrigation, Forest Department and with the local markets at replacement cost. Assessment of compensation rates are in line with ADB's requirement regarding land and other assets to be compensated at replacement costs. The total compensation cost including compulsory acquisition charge @ 15% for the losses of the 11 AHs and external monitoring is estimated at Rs. 107 Million and provided in the Short LARP.

Resettlement Budget

The total compensation cost for resettlement including land acquisition and land based assets that are crops, trees, building infrastructure, Irrigation Facilities, Monitoring & Evaluation and the contingencies is estimated Rs. 107 Million. The Punjab Power Management Unit (PPMU), Energy Department is responsible for financing to implement this Land Acquisition and Resettlement Plan (LARP) on Chianwali Hydro Power project. The break-up of the resettlement activities and budgeting is as under:-

Summary of Land Acquisition and Resettlement Cost CHAINWALI HPP
CHIANWALI HYDROPOWER PROJECT

Sr. No.	Type of Asset	Unit	Quantity	Cost/Unit (Rs)	Cost (Million Rs)	Remarks
1	Land	Acre	73.08	1,200,000	87.696	15 % compulsory land acquisition charges included.
2	Crop Compensation	Acre	73.08	• Fodder = 2400 • Rice+ wheat = 63000 • Vegetables =34000	4.567	Wheat in Winter and Rice in Summer. Compensation for 1 year.
Affected Buildings/Structures						
	(a) Semi Pacca	Sq.ft	**442**	**600**	**0.265**	
	(b) Tube-well Room	Sq.ft	**180**	**600**	**0.108**	
	(c) Boundary wall	Rft	**2506**	**400**	**1.002**	
Infrastructures						
	(a) Removal of Hand Pumps	No	1	5000	0.005	
	(b)Removal of Tube wells	No	1	120,000	0.120	
Forest Tree Compensation						
5	Trees Re-plantation	Avenue Mile	46.52	59300	2.177	500 trees per avenue mile will be planted
6	Livelihood Allowance for Agri. Workers	No	2	7,000	0.042	Allowance for three months
	Add one severity allowance for households who have lost more than 10% of their productive land	-	-	-	-	-
7	Livelihood Allowance for vulnerable PAP	No	2	10,000	0.020	One time
8	Third Party/ External Monitoring & Evaluation of Resettlement Plan (LARP)	LS		1,000,000	1.0	
	Sub Total				**96.885**	
9	Special Security Measures	LS			9.70	
	Total				**106.702**	
	Total Rs. (Million)				**Say 107 million**	

Social Benefits: The project will save an amount of substantial amount of precious foreign exchange annually that would otherwise be required for import of oil needed for an equivalent thermal plant. The revenues of the government would increase due to direct and indirect taxation, duties and levies on the production of goods and services that will result from the power generation benefits within the project area as well as from the electricity duty collected by the Federal Government, Government of Punjab or any other agency. Sale of electricity is the direct revenue which will be collected by Energy Department, Punjab.

Indirect or the secondary benefits would include creation of employment opportunities and improved standard of living of the people of the area and vicinity. There will be multiple effects on socio-economic development of the region as well. Communication, infrastructures, livestock, forestry, cottage industry, livestock development and other opportunities would open up with construction of the proposed project. Most of the indirect benefits are difficult to quantify in monetary terms but should not be ignored while making the decision for the implementation of the Project.

CHIANWALI

HYDROPOWER PROJECT WILL PLAY ITS DUE ROLE IN THE SOCIO-ECONOMIC UPLIFT OF THE PEOPLE OF THE ADJOINING AREAS IN PARTICULAR, THE PUNJAB PROVINCE AND THE COUNTRY IN GENERAL. SINCE IT IS AN INDIGENOUS RESOURCE BASED PROJECT WITHOUT ANY FUEL ELEMENT BEING CONSIDERED AS PASS THROUGH, THE PROJECT WILL CONTRIBUTE IN BRIDGING THE GAP OF PRICE DIFFERENTIAL, WHICH CURRENTLY POWER PURCHASER IS FORCED TO PAY. THIS WILL HELP IN EASING OUT THE ISSUE OF CIRCULAR DEBT ETC.

Project Cost and Tariff

Total financial cost of the project at present on the basis of EPC Contract Equivalent Rs.2889.61 million with foreign exchange component (FEC) 21.71 million US$. The currently envisaged financing structure is based on a debt equity ratio of 80:20 %. Project life for the purpose of the tariff is estimated to be 30 years. The Project tariff is within the acceptable range considering that it is a small project based on very low head technology i.e. **Rs.12.3206/kWh or US Cent 11.9695/kWh.** (Annex A). The real benefits of the project will be available when the debt is retired in 20 years from COD stage and the Project becomes debt free. At that time, electricity from the project will be available at a very nominal price.

Project Director
Punjab Power Management Unit
Government of the Punjab
Energy Department

Project Director
Punjab Power Management Unit
Government of the Punjab
Energy Department

A

SECURITIES AND EXCHANGE COMMISSION OF PAKISTAN
COMPANY REGISTRATION OFFICE

LAHORE

CERTIFICATE OF INCORPORATION

[Under section 32 of the Companies Ordinance, 1984 (XLVII of 1984)]

Company Registration No.0064048

I hereby certify that **PUNJAB POWER DEVELOPMENT COMPANY LIMITED** is this day incorporated under the Companies Ordinance, 1984 (XLVII of 1984) and that the company is limited by shares.

Given under my hand at **LAHORE** this **15th Day of January, 2008** (Two Thousand and Eight).

Fee Rs.52,000/=

(MAHBOOB AHMAD)
JOINT REGISTRAR OF COMPANIES
LAHORE.

No. ARL/ 11861

DATED:- 16-01-08

CERTIFIED TO BE TRUE COPY
01/01/2015
DEPUTY REGISTRAR OF COMPANIES
COMPANY REGISTRATION OFFICE
LAHORE.

THE COMPANIES ORDINANCE, 1984

(PUBLIC COMPANY LIMITED BY SHARES)

Memorandum of Association

of

PUNJAB POWER DEVELOPMENT COMPANY LIMITED

I. The name of the Company is "PUNJAB POWER DEVELOPMENT COMPANY LIMITED".

II. The Registered Office of the Company will be situated in the Province of the Punjab.

III. The objects for which the Company is established are all or any of the following:-

1. To carry on the business of setting up of all types of Power Projects, construction of Grid Station, transmission lines and other works incidental there to.

2. To carry on all or any of the businesses of generating, purchasing, importing, transforming, converting, distributing, supplying, exporting and dealing in electricity and all other forms of energy and products or services associated therewith and of promoting the conservation and efficient use of electricity and to perform all other acts which are necessary or incidental to the business of electricity generation, transmission, distribution and supply.

3. To locate, establish, construct, equip, operate, use, manage and maintain hydro power plants, thermal power plants and coal fired power plants, geothermal power plants, solar power plants, wind power plants, biomass based power plants, power grid station, transforming, switching, conversion, and transmission facilities, grid stations, cables, overhead lines, sub-stations, switching stations, tunnels, cable bridges, link boxes, heat pumps, plant and equipment for combined heat and power schemes, offices, computer centres, shops, dispensing machines for pre-payment cards and other devices, showrooms, depots, factories, workshops, plants, printing facilities, warehouses and other storage facilities.

4. To carry on all or any of the businesses of wholesalers, retailers, traders, importers, exporters, suppliers, distributors, designers, developers, manufacturers, installer, filters, testers, repairers, maintainers, contractors, constructors, operators, users, inspectors, reconditioners, improvers, alterers, protectors, removers, hirers, replacers, importers and exporters of and dealers in, electrical appliances, systems, products and services used for energy conservation, equipments, machinery, materials and installations, including but not limited to cables, wires, meters, pylons, tracks, rails, pipelines and any other plant, apparatus equipment, systems and things incidental to the efficient generation, procurement, transformation, supply and distribution of electricity.

5. To ascertain the tariff for bulk supply that will secure recovery of operating costs, interest charges and depreciation of assets, redemption at due time of loans other than those covered by depreciation, expansion projects, payment of taxes, and reasonable return on investment, to quote the tariff to bulk purchasers of electrical power, and to prefer petition to the appropriate authority for approval of the schedule of tariff and of adjustments or increases in its bulk supply tariff, where desirable or necessary.

6. For the purposes of achieving the above objects, the company is authorized:-

   (1) to purchase/import raw materials and allied items required in connection thereto in any manner the company may think fit;

   (2) to do and perform all other acts and things as are incidental or conducive to the attainment of the objects of the company;

   (3) to own, establish or have and maintain shops, branches and agencies all over Pakistan or elsewhere for sale and distribution of cables, wires, meters, pylons, tracks, rails, pipelines and any other plant, apparatus equipment, systems and things incidental to the efficient generation, procurement, transformation, supply and distribution of electricity;

   (4) to make known and give publicity to the business and products of the company by such means as the company may think fit;

   (5) to purchase, acquire, protect, renew, improve, use and sell, whether in Pakistan or elsewhere any patent, right, invention, license, protection or concession which may appear advantageous or useful to the company for running the business;

(6) To enter into partnership, to amalgamate, or merge movable with immovable and/or to buy on all interests, assets, liabilities, stocks, or to make any arrangement for sharing profits, union of interests, co-operation, joint-venture, reciprocal concession or otherwise with any person, firm or company carrying on or proposing to carry on any business which this Company is authorised to carry on or which is capable of being conducted so as directly or indirectly to benefit this Company and to have foreign collaborations and to pay royalties/technical fees to collaborators subject to the provisions of the Companies Ordinance, 1984.

(7) to pay all costs, charges and expenses, if any, incidental to the promotion, formation, registration and establishment of the company;

(8) to borrow and arrange the repayment of money from Asian Development Bank, World Bank or other national or international developmental financial institution, banks/financial institutions or any lawful sources whether in Pakistan or elsewhere and in such manner as the company may think fit, including the issue of debentures, preference shares, bonds, perpetual or otherwise charged upon the whole or any part of the company's property or assets, whether present or future, and to purchase, redeem or payoff such securities;

(9) to purchase, hold and get redeemed shares, debentures, bonds of any business, company, financial institution or any Government institutions;

(10) to guarantee the performance of contracts, agreements, obligations or discharge of any debt of the company or on behalf of any company or person in relation to the payment of any financial facility including but not limited to loans, advances, letters of credit or other obligations through creation of any or all types of mortgages, charges, pledges, hypothecations, on execution of the usual banking documents or instruments or otherwise encumbrance on any or all of the movable and immovable properties of the company, either present or future or both and issuance of any other securities or sureties by any other means in favour of banks, Asian Development Bank, World Bank or other national or international developmental financial institution, Non-Banking Finance Companies (NBFCs) or any financial institutions and to borrow money for purpose of the company on such terms and conditions as may be considered proper.

(11) to acquire, sell or dispose off part or all of the assets of the company to another company with similar objects.

(12) to guarantee the performance of a financial obligation of another company having similar or different objects and in this respect issue guarantees, promissory notes, instruments and undertakings.

7. It is, hereby, undertaken that the Company shall not engage in banking business or any business of investment company or non-banking finance company or insurance or leasing or business of managing agency or in any unlawful business and that nothing contained in the object clauses shall be so construed to entitle it to engage in such business directly or indirectly and the Company shall not launch multi-level marketing (MLM), P*yramid* and *Ponzi* schemes. Notwithstanding anything stated in any object clause, the Company shall obtain such NOC approval or license from the competent authority as may be required under any law.

IV. The liability of the members is limited.

V. The authorized capital of the company is Rs. 15,000,000/- (Rupees Fifteen Million only) divided into 1,500,000 ordinary shares of Rs. 10/- each with power to enhance, reduce or consolidate the share capital and to divide the shares of the company into different classes and kinds subject to the provisions of the Companies Ordinance, 1984.

We, the several persons whose names and addresses are subscribed below, are desirous of being formed into a Company, in pursuance of this Memorandum of Association, and we respectively agree to take the number of shares in the Capital of the Company as set opposite to our respective names.

Name and Surname (Present & Former) in Full (in Block Letters)	Father's Name in Full	Nationality with any former Nationality	Occupation	Residential Address (in Full)	Number of shares taken by each sub-scriber	Signature
1. GOVERNMENT OF THE PUNJAB, IRRIGATION & POWER DEPARTMENT, PUNJAB	Under the Federation of Pakistan	Pakistani	An Autonomous Body of the Provincial Government	Govt. of the Punjab, Irrigation & Power Department, Old Anarkali, Lahore	94	
Nommiee Members of the Above Provincial body						
2. MR. ARIF NADEEM *N.I.C. No.* 35202-7817681-9	Muhammad Ashraf	Pakistani	Secretary Govt. of the Punjab, Irrigation & Power Department, Lahore	Govt. of the Punjab, Irrigation & Power Department, Old Anarkali, Lahore	1	
3. MR. IMDAD ULLAH BOSAL *N.I.C. No.* 34401-0645271-7	Muhammad Iqbal Bosal	Pakistani	Additional Secretary (Economic Services) Govt. of Punjab Finance Department, Lahore	Govt. of the Punjab, Finance Department, Civil Secretariat, Lahore	1	
Nominee member of Govt of Punjab Finance Department, Punjab						
4. DR. MUHAMMAD ABID BODLA *N.I.C. No.* 35202-3013538-5	Muhammad Sana Ullah Bodla	Pakistani	Member Engineering Govt. of the Punjab, P & D Department, Lahore	Govt. of the Punjab, Planning & Development Department, Lahore	1	
Nominee member of Govt of Punjab Planning & Development Dept, Punjab						
5. MR. MUHAMMAD YAQOOB *N.I.C. No.* 34101-2727731-1	Muhammad Shafi	Pakistani	Chief Engineer (Power) Irrigation & Power Department, Lahore	Govt. of the Punjab, Irrigation & Power Department, Old Anarkali, Lahore	1	
6. MR. SIKANDER KHAN *N.I.C. No.* 35200-1424373-1	Agha Jahangir Ali Khan	Pakistani	Electrical Engineer, CEO of JJ Petroleum (Pvt.) Ltd. Lahore	JJ Petroleum (Pvt.) Ltd. 43 - L, MM Alam Road, Lahore	1	
7. MR. LIAQAT ALI *N.I.C. No.* 35201-2984182-1	Mian Ali Muhammad	Pakistani	Project Director Govt. of the Punjab, Irrigation & Power Department, Lahore	209 - C, 1st Floor, Tech Housing Society, Canal Bank, Lahore	1	
				Total Number of Shares Taken	100	

Dated this 8th day of January 2008.

Witness to the above Signatures :

Full Name : M. MASUD QURESHI

N.I.C. No: 35202-2462926-5

Father's/Husband's Full Name : M. SHAFI QURESHI

Signature :

Nationality : Pakistani

Occupation : Manager Accounts

Full Address : YUSAF SAEED & CO. CHARTERED ACCOUNTANTS 6-A, BLOCK-S, GULBERG-II, LAHORE. PHONES: 5764717-8 FAX NO. 5764719

CERTIFIED TO BE TRUE COPY — REGISTRAR OF COMPANIES — REGISTRATION OFFICE — LAHORE — 01/01/15

1. COMPANY REGISTRATION NO: 64548
2. SERIAL NO OF DOCUMENT.
3. NAME OF THE COMPANY
4. BRIEF DESCRIPTION OF THE DOCUMENT
   NUMBER OF PAGES.
5. DATE FOR WHICH THE DOCUMENT
   REGISTERED OR RECORDED. 19/1/18

JOINT REGISTRAR OF COMPANIES
LAHORE REGION

THE COMPANIES ORDINANCE, 1984

(PUBLIC COMPANY LIMITED BY SHARES)

Articles of Association

of

PUNJAB POWER DEVELOPMENT COMPANY LIMITED

PRELIMINARY

1. The regulations in Table "A" in the First Schedule to the Companies Ordinance, 1984 shall not apply to the Company except as reproduced herein : Table 'A' Not to apply.

2. In these Articles, unless the context or the subject matter otherwise requires : Interpretation

(a) "Articles" means these Articles as originally framed or as from time to time altered in accordance with law.

(b) "Board" means a meeting of the Directors duly called and constituted or as the case may be, the Directors assembled at a Board.

(c) "Company" means "**PUNJAB POWER DEVELOPMENT COMPANY LIMITED**".

(d) "Directors" means the Directors for the time being of the Company or as the case may be, the Directors assembled at a Board.

(e) "Month" means calendar month according to the English Calendar.

(f) "Office" means the Registered Office for the time being of the Company.

(g) "Ordinance" means the Companies Ordinance, 1984 or any modification or re-enactment thereof for the time being in force.

(h) "Register" means, unless the context otherwise requires, the register of members to be kept pursuant to Section 147 of the Ordinance.

(i) "Seal" means the common or official Seal of the Company.

(j) "Section" means Section of the Ordinance.

(k) "Special Resolution" means the special resolution of the Company as defined in Section (2)(1)(36) of the Ordinance.

(l) Words importing masculine gender include the feminine gender.

(m) Words importing singular number include the plural number and vice versa.

(n) Expression referring to writing shall, unless the contrary intention appears, be construed as including references to printing, lithography, photography and other modes of representing or reproducing words in a visible form.

(o) Words importing persons shall include bodies corporate.

(p) The head notes are inserted for convenience and shall not affect the construction of these Articles.

(q) Unless the context otherwise requires words or expressions contained in these Articles shall bear the same meaning as in the Ordinance.

PUBLIC COMPANY

olic Company

3. The Company is a Public Company within the meanings of Section 2(1)(30) of the Companies Ordinance, 1984.

CAPITAL

ital

4. The Authorised Capital of the Company is Rs. 15,000,000/- (Rupee Fifteen Million only) divided into 1,500,000 ordinary shares of Rs. 10/- (Rupees Ten only) each. The Company shall have the powers to increase, reduce or alter the capital in accordance with law.

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5. The Directors shall, as regards any allotment of shares duly comply with such of the Provisions of Section 68 to 73 as may be applicable to the Company. The minimum subscription upon which the Directors may proceed to make the first allotment has been fixed as ~~Rs. 15,000,000/- (Rupees Fifteen Million only)~~ Nil.
Rs. 15,000/- (Rupees one lac fifty thousand only) Nil

es ficates

6. Every person whose name is entered as a member in the Register shall, without payment, be entitled to receive within ninety days after allotment or within forty-five days of the application for registration of transfer, a certificate under the Seal specifying the share or shares held by him and the amount paid up thereon. Provided that, in respect of a share or shares held jointly by several persons, the Company shall not be bound to issue more than one certificate, and delivery of a certificate for a share to one of several joint holders shall be sufficient delivery to all.

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7. If a Share Certificate is defaced, lost or destroyed, it may be renewed on payment of such fee, if any, not exceeding one rupee, and on such terms, if any, as to evidence and indemnity any payment of expenses incurred by the Company in investigating title as the Directors think fit.

n use of any Funds

8. Except to the extent and in the manner allowed by Section 95, no part of the funds of the Company shall be employed in the purchase of, or in loans upon the security of, the Company's shares.

TRANSFER OF SHARES

Transfer

9. The instrument of transfer of any share in the Company shall be executed both by the transferor and transferee and the transferor shall be deemed to remain holder of the share until the name of the transferee is entered in the Register in respect thereof.

Form of Transfer

10. Shares in the Company shall be transferred, without fee, in the following form, or in any usual or common form which the Directors shall approve ;

I.....of..... in consideration of the sum of Rs.....Paid to me by..... of.....(hereinafter called the "Transferee") do hereby transfer to the Transferee.....the share(s) numbered..... to .....inclusive, in **PUNJAB POWER DEVELOPMENT COMPANY LIMITED** to hold into the transferee, his executors, Administrators and assigns, subject to the several conditions on which I held the same at the time of the execution hereof, and I, the Transferee, do hereby agree to take the said share (or shares) subject to the conditions aforesaid.

As witness our hands this.....day of.....20

Transferor

Signature

Transferee

Signature

WITNESSES :

1. _____
(Signature)

2. _____
(Signature)

Full Address : _____

_____

_____

Full Address of _____

_____

_____

Non-refusal of Transfer of Shares

11. The Directors shall not refuse to transfer any fully paid shares unless the transfer deed is defective or invalid. The Directors may also suspend the registration of transfer prior to the determination of entitlement or rights of the shareholders by giving seven days previous notice in the manner provided in the Ordinance. The Directors may decline to recognize any instrument of transfer unless the duly stamped instrument of transfer is accompanied by the certificate of the shares to which it relates, and such other evidence as the Directors may reasonably require to show the right of the transferor to make the transfer.

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12. If the Directors refuse to register a transfer of shares, they shall within thirty (30) days after the date on which the transfer deed was lodged with the Company send to the transferee and the transferor notice of the refusal indicating the defect or invalidity to the transferee, who, shall, after removal of such defect or invalidity be entitled to re-lodge the transfer deed with the Company. The transferor or transferee or the person who gave intimation of the transmission by operation of law, as the case may be, may appeal to the commission against any refusal of the Company to register the transfer or transmission or against any failure on its parts within period as specified in Section 78 for which Section 78/A will be applicable.

TRANSMISSION OF SHARES

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13. The executors, administrators, heirs, or nominees as the case may be, of a deceased sole holder of a share shall be the only persons recognized by the Company as having any title to the shares. In the case of a share registered in the names of two or more holders, the survivor or survivors, or executors or administrators of the deceased survivor shall be the only persons recognized by the Company as having any title to the share.

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14. Any person becoming entitled to a share in consequence of the death or insolvency of a member shall, upon such evidence being produced as may from time to time be required by the Directors, have the right, either to be registered as a member in respect of the share or, instead of being registered himself, to make such transfer of the share as the deceased or insolvent person could have made ; but the Directors shall, in either case have the same right to decline or suspend registration as they would have had in the case of a transfer of the share by the deceased or insolvent person before the death or insolvency.

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15. A person becoming entitled to a share by reason of the death or insolvency of the holder shall be entitled to the same dividends and other advantages to which he would be entitled if he were the registered holder of the share, except that he shall not, before being registered as a member in respect of the share be entitled in respect of it to exercise any right conferred by membership in relation to meetings by the Company.

ALTERATION OF CAPITAL

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16. The Company may from time to time, by special resolution increase the share capital by such sum, to be divided into shares of such amount, as the resolution shall prescribe.

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17. Subject to the Provisions of the Ordinance, all new shares shall, before issue be offered to such persons as at the date of the offer are entitled to receive notices from the Company of General Meetings in proportion, as nearly as the circumstances admit, to the amount of the existing shares to which they are entitled. The offer shall be made by notice specifying the number of shares offered, and limiting a time within which the offer if not accepted, will be deemed to be declined and after the expiration of that time, or on the receipt of an intimation from the person to whom the offer is made that he declines to accept the shares offered, the Directors may dispose of the same in such manner as they think most beneficial to the Company. The Directors may likewise so dispose of any new shares which (by reason of the ratio which the new shares bear to shares held by persons entitled to an offer of new shares) cannot, in the opinion of the Directors, be conveniently offered under this regulation.

Conversion of Loan to Ordinary shares

18. Subject to the provisions of Section 87 of the Ordinance, the Company may issue ordinary shares or grant option to convert into ordinary shares the outstanding balance of any loans advances or credit or other non-interest bearing securities and obligations or having a term of not less than three years in the manner provided in any contract with any scheduled bank or financial institution to the extent of twenty per cent (20%) of such balance.

Provisions applicable to new Shares

19. The new shares shall be subject to the same provisions with reference to transfer, transmission and otherwise as the shares in the original share capital.

Consolidation and Subdivision

20. The Company may, by ordinary resolution :

(a) Consolidate and divide its share capital into shares of larger amount than its existing shares ;

(b) Sub-divide its existing shares or any of them into shares of smaller amount than is fixed by the Company's Memorandum of Association, subject, nevertheless, to the provisions to clause (d) of sub-section (1) of Section (92).

(c) Cancel any shares which at the date of passing of the resolution have not been taken or agreed to be taken by any person.

Reduction of Share Capital

21. The Company may, by Special Resolution, reduce its share capital in any manner and with, and subject to any incident authorized and consent required by law.

GENERAL MEETINGS

Statutory Meeting

22. The Statutory General Meeting of the Company shall be held within the period required by Section 157.

Annual General Meeting

23. A General Meeting to be called Annual General Meeting, shall be held in accordance with provisions of Section 158, within a period of four months following the close of its financial year and not more than fifteen months after the holding of its last preceding Annual General Meeting as may be determined by the Directors.

Other Meetings

24. All General Meetings of the Company other than the Annual General Meeting shall be called Extraordinary General Meetings.

Extraordinary Meeting

25. The Directors may whenever they think fit, call an Extraordinary General Meeting, and Extraordinary General Meetings shall also be called on such requisition, or in default, may be called by such requisitionists, as is provided by Section 159. If at any time there are not within Pakistan sufficient Directors capable of acting to form a quorum, any Director of the Company may call an Extraordinary General Meeting in the same manner as nearly as possible as that in which Meetings may be called by the Directors.

NOTICE AND PROCEEDINGS OF GENERAL MEETINGS

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26. Twenty one days notice at least (exclusive of the day on which the notice is served or deemed to be served, but inclusive of the day for which notice is given) specifying the place, the day and the hour of Meeting and, in case of special business, the general nature of that business, shall be given in the manner provided by the Ordinance for the General Meeting, to such persons as are, under the Ordinance or the regulations of the Company, entitled to receive such notices from the Company ; but the accidental omission to give notice to, or the non-receipt of notice by, any member shall not invalidate the proceedings at any General Meeting.

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ɜiness

27. All business shall be deemed special that is transacted at an Extraordinary General Meeting, and also all that is transacted at an Annual General Meeting, with the exception of declaring a dividend, the consideration of the accounts, balance sheet and the reports of the Directors and auditors, the election of Directors, the appointment of and the fixing, of the remuneration of the auditors.

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28. No business shall be transacted at any General Meeting unless a Quorum of members is present at that time when the meeting proceeds to business. Two members present personally who represent not less than twenty five per cent of the total voting power, either on their own account or as proxies shall be a quorum.

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ŋ present

29. If within half an hour from the time appointed for the meeting a quorum is not present, the meeting, if called upon the requisition of members, shall be dissolved; in any other case, it shall stand adjourned to the same day in the next week at the same time and place, and, if at the adjourned meeting a quorum is not present within half an hour from the time appointed for the meeting, the members present, being not less than two, shall be a quorum.

ɜirman of
ɛting

30. The Chairman of the Board of Directors, if any, shall preside as Chairman at every General Meeting of the Company, but if there is no such Chairman, or if at any meeting he is not present within fifteen minutes after the time appointed for the meeting, or is unwilling to act as Chairman, any one of the Directors present may be elected to be Chairman, and if none of the Directors is present, or willing to act as Chairman, the members present shall choose one of their member to be Chairman.

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31. The Chairman may, with the consent of any meeting at which a Quorum is present (and shall if so directed by the meeting), adjourn the meeting from time to time but no business shall be transacted at any adjourned meeting other than the business left unfinished at the meeting.

ing

32. At any General Meeting a resolution put to the vote of the meeting shall be decided on a show of hands unless a poll is (before or on the declaration of the result of the show of hands) demanded. Unless a poll is so demanded, a declaration by the Chairman that a resolution has, on a show of hands, been carried, or carried unanimously, or by a particular majority, or lost, and an entry to that effect in the book of the proceedings of the Company shall be conclusive evidence of the fact, without proof of the number or proportion or the votes recorded in favour of, or against, that resolution.

33. A Poll may be demanded only in accordance with the provisions of Section 167. — Demand for Poll

34. If a Poll is duly demanded it shall be taken in accordance with the manner laid down in Section 168 and the result of the Poll shall be deemed to be the resolution of the meeting at which the Poll was demanded. — Manner of taking Poll

35. A Poll demanded on the election of Chairman or on a question of adjournment shall be taken at once. — Time of taking Poll

36. In the case of an equality of Votes, whether on a show of hands or on a poll, the Chairman of the meeting at which the show of hands takes place, or at which the Poll is demanded, shall have and exercise a second or Casting Vote. — Casting Vote

VOTES OF MEMBERS

37. On a show of hands every member present in person shall have one Vote except for election of Directors in which case the provisions of Section 178 shall apply. On a Poll every member shall have voting rights as laid down in Section 160. — Right to Vote

38. In case of Jointholders, the Vote of the senior who tenders a Vote, whether in person or by proxy, shall be accepted to the exclusion of the Votes of the other Jointholders ; and for this purpose seniority shall be determined by the order in which the names stand in the register. — Voting by Joint Holders

39. A member of unsound mind, or in respect of whom an order has been made by any Court having jurisdiction in lunacy, may vote, whether on show of hands or on a poll, by his committee or other legal guardian, and any such committee or guardian, on a poll vote by proxy. — Member of Unsound Mind

40. On a poll vote may be given either personally or by proxy. Provided that nobody corporate shall vote by proxy as long as a resolution of its Directors in accordance with the provisions of Section 162 is in force. — Voting by Corporation Representations

41. The instrument appointing a Proxy shall be in writing under the hand of the appointer or of his attorney duly authorized in writing. A Proxy must be a member of the Company. — Proxy to be in Writing

42. The Instrument appointing a Proxy and the power of attorney or other authority (if any) under which it is signed, or a notarially certified copy of that power or authority, shall be deposited at the Registered Office not less than forty eight hours before the time for holding the meeting at which the person named in the instrument proposes to vote and in default the instrument of proxy shall not be treated as valid. — Instrument appointing Proxy to be deposited

43. An instrument appointing a proxy may be in the following form, or a form as near thereto as may be.

PUNJAB POWER DEVELOPMENT COMPANY LIMITED

n of Proxy

44 I/We ..... of .....(full address) being the member(s) of **PUNJAB POWER DEVELOPMENT COMPANY LIMITED** hereby appoint Mr. / Mrs. / Miss ..... of ..... (who is also member of the Company vide Registered Folio No. ..... (being member of Company) as my / our Proxy to attend at and vote for my / us and on my / our behalf at the ..... Annual / Extra Ordinary General Meeting of the Company to be held at ..... on ..... at ..... and at any adjournment thereof.

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45. A vote given in accordance with the terms of an instrument of proxy shall be valid notwithstanding the previous death or insanity of the principal or revocation of the proxy or of the authority under which the proxy was executed, or the transfer of the share in respect of which the proxy is given, provided that no intimation in writing of such death, insanity, revocation or transfer as aforesaid shall have been received by the Company at the office before the commencement of the meeting or adjourned meeting at which the proxy is used.

DIRECTORS

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46. Unless otherwise determined by the Company in General Meeting the number of Directors shall not be less than three and if the Company applies for listing on Stock Exchanges, then the number of Directors shall not be less than Seven.

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47. The following are the present Directors of the Company who shall hold office uptil first Annual General Meeting and thereafter shall be eligible for re-election.

1. **MR. ARIF NADEEM**
   (Nominee Director of the Govt. of the Punjab, Irrigation & Power Department, Punjab)
2. **MR. IMDAD ULLAH BOSAL**
   (Nominee Director of the Govt. of the Punjab, Finance Department, Punjab)
3. **DR. MUHAMMAD ABID BODLA**
   (Nominee Director of the Govt. of the Punjab, Planning & Development Department, Punjab)
4. **MR. MUHAMMAD YAQOOB**
   (Nominee Director of the Govt. of the Punjab, Irrigation & Power Department, Punjab)
5. **MR. SIKANDER KHAN**
   (Nominee Director of the Govt. of the Punjab, from Private Sector
6. **MR. LIAQAT ALI**
   (Nominee Director of the Govt. of the Punjab, Irrigation & Power Department, Punjab)

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48. Save as provided in Section 187, no person shall be appointed as a Director unless he is a member of the Company and holds shares of the minimum value of Rs. 1,000/- in his own name relaxable in the case of Directors representing interest holding shares.

49. The remuneration of a Director for performing extra services, including holding of the office of Chairman, and the remuneration to be paid to any Director for attending the meetings of the Directors or a committee of Directors shall from time to time be determined by the Board of Directors in accordance with law. Remuneration of Directors

CHAIRMAN

50. The Directors may from time to time appoint one of their members to be the Chairman of the Company for a period not exceeding three years on such terms and conditions as they deem fit. The Chairman shall preside over the meetings of the Board of Directors and members of the Company. In his absence, the Directors may elect one of them to preside over the Board Meeting. The questions arising at the meeting of the Directors shall be decided by a majority of votes. In the case of equality of votes, the Chairman, or the Director presiding over the meeting, as the case may be, shall have a casting vote. Chairman

CHIEF EXECUTIVE

51. The first Chief Executive of the Company will be appointed by the Board of Directors within fifteen days from the date of incorporation of the Company who shall hold office till the first Annual General Meeting. Chief Executive

POWERS AND DUTIES OF DIRECTORS

52. The business of the Company shall be managed by the Directors, who may pay all expenses incurred in promoting and registering the Company, and may exercise all such powers of the Company as are not by the Ordinance or any statutory modification thereof for the time being in force, or by these regulations, required to be exercised by the Company in General Meeting, subject nevertheless to the provisions of the Ordinance or to any of these regulations, and such regulations being not inconsistent with the aforesaid provisions, as may be prescribed by the Company in General Meeting but no regulation made by the Company in General Meeting shall invalidate any prior act of the Directors which would have been valid if that regulation had not been made. General Management Powers

BORROWING POWERS

53. The Board may from time to time borrow any money for the purposes of the Company from its members or from any other person, firms, companies, corporations, Government Agencies, institutions or the Directors may themselves lend moneys to the Company. Borrowing Powers and giving of Securities

54. The Board may raise and secure payment of such sums of money in such manner and upon such terms and conditions in all respects as it may think fit, and in particular by the issue of TFC's bonds, perpetual or redeemable debentures or by mortgage or charge or other security on the whole or any part of the property, assets and rights of the Company (both present and future), of the Company. Raising Moneys

55. Any TFC's, bonds, debentures or other securities issued or to be issued by the Company shall be under the control of the Board which may issue them upon such terms and conditions and in such manner and for such consideration as shall be considered to be for the benefit of the Company. Condition of Bond/Securities

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56. Any TFC's, bonds, debentures or other securities may be issued with any special privileges as to redemption, surrender, drawing, convertibility into shares, attending and voting at General Meetings of the Company, appointment of Directors, and otherwise, provided that debentures with the right to vote or to be converted into shares shall be issued with the consent of the Company in General Meeting in terms of Section 114 of the Ordinance.

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oint Attorney

57. The Directors may from time to time, by Power of Attorney under the Company's seal, appoint any person or persons to be the Attorneys of the Company for such purposes and with such powers, authorities, and discretions (not exceeding those vested in, or exercisable by, the Directors under these presents) and for such period and subject to such conditions as the Directors may from time to time think fit. Any such attorney(s) may, if authorised by the Directors, delegate all or any of the powers vested in him/them.

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58. The Directors shall duly comply with the provisions of the Ordinance and in particular with the provisions in regard to the registration of the particulars of mortgages and charges affecting the property of the Company or created by it, to the keeping of a register of the Directors, and to the sending to the Registrar of an annual list of members and a summary of particulars relating thereto and notice of any consolidation or increase of share capital, or sub-division of shares, and copies of Special Resolutions and a copy of the register of Directors and notifications of any changes therein.

tes Books

59. The Director shall cause minutes to be made in books provided for the purpose of :

(a) all appointments of officers made by the Directors ;

(b) the names of the Directors present at each meeting of the Directors and of any Committee of the Directors ;

(c) all resolutions and proceedings at all meetings of the Company and of the Directors and of Committees of Directors ;

(d) and every Director present at any meeting or Directors of Committee of Directors shall sign his name in a book to be kept for that purpose.

DISQUALIFICATION OF DIRECTORS

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60. No person shall become a Director of the Company if he suffers from any of the disabilities or disqualifications mentioned in Section 187 and, if already a Director, shall cease to hold such office from the date he so becomes disqualified or disabled or provided, however, that no Director shall vacate his office by reason only of his being a member of any company which has entered into contracts with, or done any work for the Company but such Director shall not vote in respect of any such contract or work, and if he does so his vote shall not be counted.

PROCEEDINGS OF DIRECTORS

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61. The Directors may meet together for the despatch of business, adjourn and otherwise regulate their meetings, as they think fit. The quorum for a meeting of Directors shall not be less than **two-third or four** whichever is greater. Questions arising at any meeting shall be decided by a majority of votes. In case of an equality of votes, the Chairman shall have and exercise a second or casting vote. A Director may, and the secretary on the requisition of a Director shall, at any time, summon a meeting of Directors. It shall not be necessary to give notice of a meeting of Directors to any Director for the time being absent from Pakistan.

Chairman of Directors Meetings

62. The Directors may elect a Chairman of their meetings and determine the period for which he is to hold office but, if no such Chairman is elected, or if at any meeting the Chairman is not present within ten minutes after the time appointed for holding the same or is unwilling to act as Chairman, the Directors present may choose one of their number to be Chairman of the meeting.

Committee

63. The Directors may delegate any of their powers not required to be exercised in their meeting to Committees consisting of such member or members of their body as they think fit. Any Committee so formed shall, in the exercise of the powers so delegated, conform to any restrictions that may be imposed on them by the Directors.

Chairman of Committee Members

64. A Committee may elect a Chairman of its meetings, but, if no such Chairman is elected, or if at any meeting the Chairman is not present within ten minutes after the time appointed for holding the same or is unwilling to act as Chairman, the members present may choose one of their number to be Chairman of the meeting.

Proceedings of Committee Members

65. A Committee may meet and adjourn as it thinks proper. Questions arising at any meetings shall be determined by a majority of votes of the members present. In case of an equality of votes, the Chairman shall have and exercise a second or casting vote.

Validity of Directors Acts

66. All acts done by any meeting of the Directors or of a committee of Directors, or by any person acting as a Director, shall, notwithstanding that it be afterwards discovered that there was some defect in the appointment of such Directors or persons acting as aforesaid, or that they or any of them were disqualified, be as valid as if every such person had been duly appointed and was qualified to be a Director.

Resolution in Writing

67. A resolution in writing circulated to all the Directors signed by all the Directors or affirmed by them through telex or telegram shall be as valid and effectual as if it had been passed at a meeting of the Directors duly convened and held.

ELECTION AND REMOVAL OF DIRECTORS

Election & Term of Directors

68. At the first Annual General Meeting of the Company, all the Directors shall stand retired from office, and thereafter shall be re-elected in their place in accordance with Section 178 for a term of three years.

Eligibility for Re-election

69. A retiring Director shall be eligible for re-election.

Mode of Election

70. The Directors of the Company, unless the number of persons who offer themselves to be elected is not more than the number of Directors fixed by the Board of Directors, shall be elected to office by the members in General Meeting in the following manner :

(a) A member shall have such number of votes as is equal to the product of the number of voting shares or securities held by him and the number of Directors to be elected.

(b) A member may give all his votes to a single candidate or divide them between more than one of the candidates in such manner as he may choose.

(c) The candidate who gets the highest number of votes shall be declared elected as Director and then the candidate who gets the next highest number of votes shall be so declared and so on until the total number of Directors to be elected has been so elected.

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71. Subject to the provisions of the Ordinance, the Company may from time to time in General Meeting increase or decrease the number of Directors.

ıg of Casual ıncy

72. Any Casual vacancy occurring on the Board of Directors may be filled up by the Directors, but the person so chosen shall be subject to retirement at the same time as if he had become a Director on the day on which the Director in whose place he is chosen was last elected as Director.

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73. The Company may remove a Director but only in accordance with the provisions of the Ordinance.

NOMINEE DIRECTOR

74. In addition to the elected Directors, the Financial Institutions, shall be entitled, during the currency of their respective loan(s) to the Company, to appoint one person on the Board of Directors of the Company to be called Nominee Director and to recall and/or replace such a person from time to time. Such Nominee Director on the Board of Directors of the Company may not be holder of Share(s) in the Capital of the Company and the Articles 67 to 72 and other regulations and or rules pertaining to the election, retirement, qualification and/or disqualification of the Director shall not apply to him.

THE SEAL

non Seal

75. The Directors shall provide a Common Seal of the Company which shall not be affixed to any instrument except by the authority of a resolution of the Board or by a committee of Directors authorised in that behalf by the Directors, and two Directors of one Director and the secretary of the Company shall sign every instrument to which the Common Seal is affixed.

al Seal

76. The Directors may provide for the use in any territory, district or place not situated in Pakistan, of an Official Seal which shall be a facsimile of the Common Seal of the Company, with the addition on its face of the name of every territory, district or place where it is to be used. The provisions of Section 213 shall apply to the use of the Official Seal.

DIVIDENDS AND RESERVES

77. The Company in General Meeting may declare dividends but no dividend shall exceed the amount recommended by the Directors. — Declaration of Dividends

78. The Directors may from time to time pay to the members such interim dividends as appear to the Directors to be justified by the profits of the Company. — Interim Dividends

79. No dividend shall be paid otherwise than out of profits of the year or any other undistributed profits. — Dividends Payable out of Profits

80. Subject to the rights of persons (if any) entitled to shares, all dividends shall be declared and paid according to the amounts paid on the shares, but if and so long as nothing is paid upon any of the shares in the Company, dividends may be declared and paid according to the amounts of the shares. — Dividends Payable on Amount Paid on Shares

81. The Directors may, before recommending any dividend set aside out of the profits of the Company such sums as they think proper as a reserve or reserves which shall, at the discretion of the Directors, be applicable for meeting contingencies, or for equalizing dividends, or for any other purpose to which the profits of the Company may be properly applied, and pending such application may, at the like discretion, either be employed in the business of the Company or be invested in such investments (other than shares of the Company) as the Directors may, subject to the provisions of the Ordinance, from time to time think fit. — Reserve Fund

82. The Directors may carry forward any profits which they may think prudent not to distribute, without setting them aside as a reserve. — Profit carried Forward

83. Any General Meeting may resolve that any moneys, investments, or other assets forming part of the undivided profits of the Company standing to the credit of any reserve or other fund or in the hands of the Company and available for dividend (or representing premiums received on the issue of shares and standing to the credit of the shares premium account) be capitalized and distributed amongst such of the shareholders as would be entitled to receive the same if distributed by way of dividend and in the same proportions on the footing that they become entitled thereto as capital and that all or any part of such capitalized fund be applied on behalf of such shareholders in paying up in full, any unissued shares, debentures or debenture-stock of the Company which shall be distributed accordingly and that such distribution or payment shall be accepted by such shareholders in full satisfaction of their interest in the said capitalized sum. — Capitalization of Reserve

84. A transfer of shares shall not pass the right to any dividend declared thereon before the registration of the transfer. — Effect of Transfer

85. If several persons are registered as jointholders of any share, any one of them may give effectual receipt for any dividend payable on the shares. — Dividends to Joint Holders

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86. Notice of any dividend that may have been declared shall be given in the manner hereinafter mentioned to the persons entitled to share therein.

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87. The dividend shall be paid within the period laid down in Section 251.

claimed idends

88. All dividends unclaimed for six years after having been declared shall be kept in trust by the Company but may be invested or otherwise made use of by the Directors for the benefit of the Company until claimed.

ACCOUNTS

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89. The Directors shall cause to be kept proper Books of Account as required under Section 230.

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90. The Books of Account shall be kept at the Registered Office of the Company or at such other place as the Directors shall think fit and shall be open to inspection by the Directors during business hours.

ection by nbers

91. The Directors shall from time to time determine whether and to what extent and at what time and places and under what conditions or regulations the accounts and books or papers of the Company or any of them shall be open to the inspection of members not being Directors, and no member (not being a Director) shall have any right of inspecting any Account and Book or papers of the Company except as conferred by law or authorised by the Directors or by the Company in General Meeting.

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92. The Directors shall as required by Sections 233 and 236 cause to be prepared and to be laid before the Company in General Meeting such Profit and Loss Accounts and Balance Sheets and reports as are referred to in those sections.

nce Sheet Profit and Account

93. A Balance Sheet, Profit and Loss Account, and other reports referred to in the preceding Article shall be made out in every year and laid before the Company in the Annual General Meeting made up to a date not more than six months before such meeting. The Balance Sheet and Profit and Loss Account shall be accompanied by a report of the auditors of the Company and the report of Directors.

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94. A copy of the Balance Sheet and Profit and Loss Account and reports of Directors and auditors shall, at least twenty one days preceding the meeting, be sent to the persons entitled to receive notices of General Meetings in the manner in which notices are to be given as hereinafter provided.

Accounts d

95. Every Account of the Directors when audited and approved by a General Meeting shall be conclusive except as regards any errors discovered therein within three months next after the approval thereof. Whenever any such error is discovered within that period the account shall forthwith be corrected and thenceforth shall be conclusive.

96. The Directors shall in all respect comply with the provisions of Sections 230 to 236. Compliance with Ordinance

AUDIT

97. Once at least every year the accounts of the Company shall be audited and the correctness of Profit and Loss Account and Balance Sheet ascertained by one or more Auditors. The Auditors shall be appointed and their duties regulated in accordance with Sections 252 to 255 of the Companies Ordinance 1984. Audits

SECRETARY

98. The Board may appoint a Secretary of the Company who shall perform such functions and duties as are required in these Articles, or as may be directed by the Board. Secretary

NOTICES

99. Notices shall be given by the Company to Members and Auditors of the Company and other persons entitled to receive notices in accordance with Section 50. Notice to Members etc.

SECRECY

100. Every Director, Manager, Adviser, Auditor, Trustee, Member of a Committee, Officer, Servant, Agent, Accountant or other person employed in the business of the Company shall, if so, required by the Directors, before entering upon his duties, sign a declaration pledging himself to observe a strict secrecy respecting all transactions of the Company with its customers and the state of accounts with individuals and in matters relating thereto, and shall by such declaration pledge himself not to reveal any of the matters which may come to his knowledge in the discharge of his duties except when required to do so by the Directors or by any General Meeting or by any Court of Law and except so far as may be necessary in order to comply with any of the provisions in these presents. Secrecy

101. No member or other person (not being a Director) shall be entitled to enter upon the property of the Company or examine the Company's premises or properties without the permission of the Directors, and to require discovery of or any information respecting any detail of the Company's trading or any matter which is or may be in the nature of a trade secret, mystery of trade, or secret process or of any matter whatsoever which may relate to the conduct of the business of the Company and which in the opinion of the Directors will be inexpedient, in the interest of the members of the Company to communicate. Members access to Company premises

RECONSTRUCTION

102. On any sale of the undertakings of the Company the Directors or the liquidators on a winding up may, if authorised by a Special Resolution, accept fully paid shares, debentures or securities of any other company, either then existing or to be formed for the purchase in whole or in part of the property of the Company, and the Directors (if the profits of the Company permit), or the liquidators (in a winding up), may distribute such shares or securities, or any other properties of the Company Reconstruction

amongst the members without realization, or vest the same in trustees for them and any Special Resolution may provide for the distribution or appropriation of the cash, shares or other securities, benefits or property, otherwise than in accordance with the strict legal rights of the members or contributories of the Company for the valuation of any such securities or property at such price and in such manner as the meeting may approve and all holders of shares shall be bound to accept and shall be bound by any valuation or distribution so authorised and waive all rights in relation thereto save only such statutory rights (if any) as are, in case the Company is proposed to be or in the course of being wound up, incapable of being varied or excluded by these presents.

WINDING UP

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103. If the Company is wound up, the liquidator may, with the sanction of a Special Resolution of the Company and any other sanction required by Ordinance, divide amongst the members in specie or kind the whole or any part of the assets of the Company (whether they consist of property of same kind or not) and may, for such purpose, set such value as he deems fair upon any property to be divided as aforesaid and may determine how such division shall be carried out as between the members or different classes of members. The liquidator may, with the like sanction, vest the whole or any part of such assets in trustees upon such trust for the benefit of the contributories, as the liquidator with the like sanction, shall think fit, but so that no member shall be compelled to accept any shares or other securities whereon there is any liability.

INDEMNITY

nnification

104. Every officer or agent for the time being of the Company may be indemnified out of the assets of the Company against any liability incurred by him indefending any proceedings, whether civil or criminal, arising out of his dealings in relation to the affairs of the Company, except those brought by the Company against him, in which judgement is given in his favour or in which he is acquitted, or in connection with any application under Section 488 in which relief is granted to him by the Court.

ARBITRATION

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105. Whenever any difference arises between the Company on the one hand and any of the members, their executors, administrators or assignees on the other hand, touching the true intent or construction, or the incident or consequences of these Articles or of the statutes or touching anything there or thereafter done, executed, omitted or suffered in pursuance of these Articles or of the statutes or touching any breach or alleged breach of these Articles, or any claim on account of any such breach or alleged breach, or otherwise relating to the premises, or to these Articles or to any statute affecting the Company or to any of the affairs of the Company, every such difference shall, as a condition precedent to any other action at law be referred in conformity with the Arbitration Act, 1940, or any statutory modification thereof and any rules made thereunder, to the decision of an Arbitrator to be appointed by the parties in difference or if they cannot agree upon a single Arbitrator to the decision of two Arbitrators of whom one shall be appointed by each of the parties in difference, or in the event of the two Arbitrators not agreeing, then of an umpire to be appointed by the two Arbitrators, in writing, before proceeding on the reference, and such decision shall be final and binding on the parties.

We, the several persons whose names and addresses are subscribed below, are desirous of being formed into a Company, in pursuance of these Articles of Association, and we respectively agree to take the number of shares in the Capital of the Company as set opposite to our respective names.

Name and Surname (Present & Former) in Full (in Block Letters)	Father's Name in Full	Nationality with any former Nationality	Occupation	Residential Address (In Full)	Number of shares taken by each sub-scriber	Signature
1. GOVERNMENT OF THE PUNJAB, IRRIGATION & POWER DEPARTMENT, PUNJAB	Under the Federation of Pakistan	Pakistani	An Autonomous Body of the Provincial Government	Govt. of the Punjab, Irrigation & Power Department, Old Anarkali, Lahore	94	
Nommiee Members of the Above Provincial body						
2. MR. ARIF NADEEM *N.I.C. No.* 35202-7817681-9	Muhammad Ashraf	Pakistani	Secretary Govt. of the Punjab, Irrigation & Power Department, Lahore	Govt. of the Punjab, Irrigation & Power Department, Old Anarkali, Lahore	1	
3. MR. IMDAD ULLAH BOSAL *N.I.C. No.* 34401-0645271-7 Nominee member of Govt of Punjab Finance Dept. Punjab	Muhammad Iqbal Bosal	Pakistani	Additional Secretary (Economic Services) Govt. of Punjab Finance Department, Lahore	Govt. of the Punjab, Finance Department, Civil Secretariat, Lahore	1	
4. DR. MUHAMMAD ABID BODLA *N.I.C. No.* 35202-3013538-5 Nominee member of Govt of Punjab Planning & Development Dept, Punjab	Muhammad Sana Ullah Bodla	Pakistani	Member Engineering Govt. of the Punjab, P & D Department, Lahore	Govt. of the Punjab, Planning & Development Department, Lahore	1	
5. MR. MUHAMMAD YAQOOB *N.I.C. No.* 34101-2727731-1	Muhammad Shafi	Pakistani	Chief Engineer (Power) Irrigation & Power Department, Lahore	Govt. of the Punjab, Irrigation & Power Department, Old Anarkali, Lahore	1	
6. MR. SIKANDER KHAN *N.I.C. No.* 35200-1424373-1	Agha Jahangir Ali Khan	Pakistani	Electrical Engineer, CEO of JJ Petroleum (Pvt.) Ltd. Lahore	JJ Petroleum (Pvt.) Ltd. 43 - L, MM Alam Road, Lahore	1	
7. MR. LIAQAT ALI *N.I.C. No.* 35201-2984182-1	Mian Ali Muhammad	Pakistani	Project Director Govt. of the Punjab, Irrigation & Power Department, Lahore	209 - C, 1st Floor, Tech Housing Society, Canal Bank, Lahore	1	
				Total Number of Shares Taken	100	

Dated this 8th day of January 2008.

Witness to the above Signatures :

Full Name : H. MASUD QURESHI

N.I.C No: 35202 - 2462926 - 5

Father's/Husband's Full Name : M. SHAFI QURESHI

Signature .....

Nationality : Pakistani

Occupation : Manager Accounts

Full Address : YUSAF SAEED & CO. CHARTERED ACCOUNTANTS 6-A, BLOCK-S, GULBERG-II, LAHORE. PHONES: 5764717-8 FAX NO. 5764719 C/O

COMPANY REGISTRATION OFFICE LAHORE 01/01/15

1. COMPANY REGISTRATION NO: 64548
2. SERIAL [illegible]
3. NAME OF THE COMPANY
4. BRIEF DESCRIPTION OF THE DOCUMENT INCLUDING PAGES.
5. THE DATE OF EXECUTION OF DOCUMENT REGISTERED/RECORDED. 8/5/05

JOINT REGISTRAR OF COMPANIES
LAHORE REGION

B-I

Flag B-1

PUNJAB POWER DEVELOPMENT COMPANY LTD

(PPDCL)

Introduction

Punjab Power Development Company Limited (PPDCL) is a Government of the Punjab owned, corporate entity duly incorporated under section 32 of Companies Ordinance 1984. The company was established in January, 2008. The company is aimed at developing power generation projects based on different technologies for sale to National Grid (National Transmission and Dispatch Company-NTDC) or Distribution Companies. PPDCL also looks forward for supplying quality electric supply in bulk to Industrial Estates or retail electric supply to industrial units in Industrial Estates in a commercially viable manner.

Objectives of the Company:

- Development of power projects in public sector or development of power projects in Joint Venture (JV) mode with private sector;
- Arrange funding through local banks or International donor agencies or public subscription;
- Operation and management of power projects in commercial viable manner;
- Sale of power to National Transmission and Dispatch Company (NTDC-WAPDA) or Distribution Company;
- Sale of power to Industrial Estates in Bulk;
- Sale of un-interrupted power to Industrial units within specified areas (Ordinarily in Industrial Estates)
- Development of pilot projects for innovative technologies

Vision

To utilize all available sources in province to provide affordable electric supply to all segments of provincial economy through increase in generation

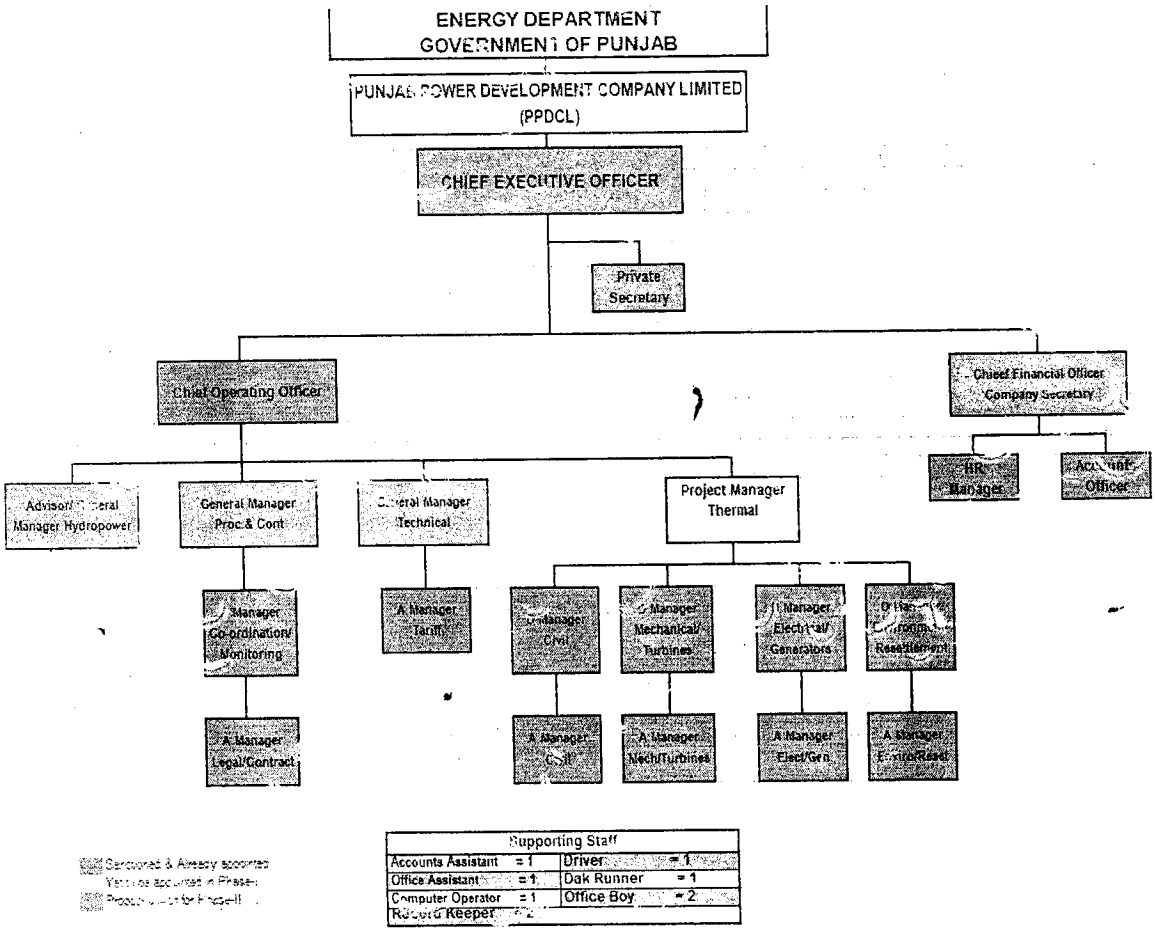
Mission statement:

Assure sustainable electric supply in the province through responsible development of energy generation projects and to supplement the Federal Government in electricity generation.

Company Profile/Board of Directors

Sr. #	NAME	STATUS
1	Mr. Arif Saeed, Servis Group	Chairman
2	Mr. Muhammad Jehanzeb Khan, Secretary, Finance Department, Government of the Punjab	Member
3	Mr. Muhammad Jehanzeb Khan, Additional Chief Secretary (Energy), Government of the Punjab	Member
4	Dr. Muhammad Abid Bodla, Member Infrastructure, Planning and Development Department Government of the Punjab	Member
5	Syed Yawar Ali, Chairman Nestle Pak Ltd	Member
6	Mr. Fazai Ahmed Khan Ex-Member (Power) WAPDA Lahore	member
7	Dr. Javed Younas Uppal, Chairman, Institute of Engineers (Pak) Lahore	Member
8	Mr. Nauman Khan, Managing Director, M/s Almoiz Industries Ltd. Lahore	Member
9	Mr. Asad Ali, ABACUS Consultant, Lahore	Member
10	Syed Mohammad Feisal Hussain Naqvi, Bhindar and Naqvi Law Associates Lahore	Member
11	Syed Farrukh Ali, Chief Executive Officer, Punjab Power Development Company Ltd.	Member

Organogram of the Company



Power Projects

Hydropower Projects under ADB Loan

Asian Development Bank extended a multi-tranche facility of US$ 525 Million in year 2006 under " Renewable Energy Development Sector Investment Program " (REDSIP) for the development of renewable energy projects in the country. Punjab Government availed 1st tranche of US$ 65 Million including 20% equity share for the construction of hydropower projects at Marala (Sialkot), Chianwali (Gujranwala), Dep Out Fall (Sheikhupura), Pakpattan and Okara.

A Power Project Management Unit (PPMU) has been established for the implementation of the projects financed by ADB. The projects are being implemented on EPC mode by inviting International Competitive Bidding (ICB) under the procedures of ADB where contractor is responsible for "Engineering, Procurement

and Construction". Four (4) Hydropower projects has awarded through International Competitive Bidding process as per the guidelines of ADB. A Steering Committee constituted by Punjab Government is empowered to approve the bid price as well as monitoring the progress of implementation. The projects details are given below.

Project Name	Capacity (MW)	Date of Award of Contract	Effective Date of contract	Completion Period (days)	COD
Marala HPP	7.64	24-09-2011	28-05- 2012	900	14-11-2014
Pakpattan HPP	2.82	24-09-2011	28-05-2012	885	30-10-2014
Deg Out Fall HPP	5.38	17-12-2012	23-02-2013	885	27-08-2015
Chianwali HPP	4.04	17-12-2012	23-02-2013	1080	06-02-2016

PPDCL will be responsible for O&M of the hydropower projects in a commercial viable manner.

Coal Fired Power Projects

a) **2x55 MW Coal Projects at Sundar Lahore and M-3 Industrial City Faisalabad**

In order to mitigate load shedding, Government of Punjab took policy decision to install dedicated coal fired power projects near industrial estates in Punjab for supplying un-interrupted electric supply to industrial units. PPDCL has been assigned the tasks to install two (2) 2x55 MW Coal Fired Power Project near i) Sunder Lahore ii) M-3 Industrial City Faisalabad in public sector. As a first step, the feasibility studies of the projects have been completed by hiring consultants. The projects will be implemented in public mode.

The projects are expected to be commissioned in year 2016-17

b) **2x660 MW Coal Projects in District Sahiwal on EPC plus finance mode.**

Punjab Government has decided to undertake installation of 2x660MW Coal Power Projects in EPC plus finance mode in District Sahiwal. As a first step the feasibility studies of the projects are being prepared by hiring consultants. The projects will be implemented in public mode.

The projects are expected to be commissioned in FY 2018-19

CFO for further Procedure

No. SO(Admn)/ED-13-37/2014
GOVERNMENT OF THE PUNJAB
ENERGY DEPARTMENT

Dated Lahore, the 21st March, 2014

To

The Chief Executive Officer,
Punjab Power Development Company Limited,
Lahore.

Subject:- **SUBMISSION OF REVISED SNE FOR FY 2013-14 AND PROPOSED SNE FOR FY 2014-15.**

I am directed to refer to the subject cited above and to enclose here-with a copy of U.O No. FD.SO(I&P)1-8/2007 Vol-I, dated 12th March, 2014, received from Section Officer (I&P), Government of the Punjab, Finance Department.

2. It is, therefore, requested to furnish the audit copy for authentication from Finance Department.

3. This may be treated on **Top Priority.**

SECTION OFFICER (ADMN)

Punjab Power Development Company Ltd.
Energy Department
Diary No: 1037S
Date 26/3/2014

GOVERNMENT OF THE PUNJAB
FINANCE DEPARTMENT

SUBJECT:- **SUBMISSION OF REVISED SNE FOR FY 2013-14 AND PROPOSED SNE FOR FY 2014-15.**

Will the Section Officer (Admn), Government of the Punjab, Energy Department, Lahore kindly refer to his letter No. SO (Admn) (ED)13-37/2014 dated 17-02-2014 on the subject cited above?

2. Finance Department agrees to the continuation of **17 temporary posts** for **Punjab Power Management Unit (PPMU) Irrigation and Power Department already established for Establishment of Punjab Power Development Company Limited (PPDCL)** through SNE 2014-15 at a total cost of **Rs.34.726 million (Rupees thirty four million seven hundred twenty six thousand only)** under Grant No.PC-21008(008)-Others Taxes & Duties, 011205-Tax Management, LQ5320. The detail of posts / allocation is as under:-

Sr. No.	Name of Post	Number of Posts	Pay (In Rs.)
1.	Chief Executive Officer (MP-1/20)	1	5787000
2.	General Manager (Technical)	1	2400000
3.	General Manager (Hydropower)	1	2400000
4.	General Manager (Procurement & Contract)	1	2400000
5.	Project Manager (Thermal)	1	2400000
6.	Chief Finance Officer (MP-2/BS-19)	1	3537000
7.	Advisor	1	1800000
8.	Company Secretary (MP-3/BS-18)	1	1914000
9.	PS to Chief Executive Officer	1	960000
10.	Accounts Assistant (BS-14)	1	480000
11.	Office Assistant (BS-14)	1	480000
12.	Record Keeper/Junior Clerk (BS7)	2	480000
13.	Driver (BS-5)	1	192000
14.	Dak Runner (BS-1)	1	144000
15.	Office Boy / Naib Qasid (BS-1)	2	144000
	G- Total:-	**17**	**25518000**

Codes	Object / Classification	Amount (Rs.)
A011-1	**PAY OF OFFICERS**	
A01101	Pay of officer	23,598,000
A011-2	**Pay of other staff**	
A01151	Pay of other staff	1,920,000
A012-1	**Regular Allowance**	
A01202	House Rent Allowance	1,781,000
A01203	Conveyance Allowance	100,000
A01217	Medical Allowance	50,000

A01240	Utilities (MP-I)	201,000
A0120X	Adhoc Allowance 2010	86,000
A0121-A	Adhoc Allowance 2011	35,000
A0121M	Adhoc Allowance 2012	70,000
A01270	Others	150,000
A012-2	**OTHER ALLOWANCES**	
A01273	Honorarium	10,000
A01274	Medical Charges	80,000
A032	**Communications**	
A03201	Postage and Telegraph	70,000
A03202	Telephone and Trunk Calls	175,000
A033	**Utilities**	
A03301	Gas	30,000
A03303	Electricity	400,000
A03304	Hot & Cold Weather Charges	30,000
A038	**Travel & Transport**	
A03805	T.A / D.A	225,000
A03807	P.O.L. Charges	400,000
A039	**General Charges**	
A03901	Stationery	200,000
A03902	Printing & Publication	200,000
A03905	Newspapers Periodicals & Books	25,000
A03907	Advertising & Publicity	225,000
A03933	Service Charges	400,000
A03942	Cost of Other Store	100,000
A03970	Others	100,000
A034	**Occupancy Costs**	
A03402	Rent of Office Building	1,025,000
A03407	Rate & Taxes	125,000
A09	**Physical Assets**	
A09202	Software	25,000
A097501	Purchase of Transport (3Nos Cars 1300CC – 1 MC	2,100,000
A09601	Purchase of Plant & Machinery Desk Top Computer (Nos), Laptop (3Nos), Laser PrinterA4(2Nos), Laser Printer A3(1No) Laser Printer Color A3 (1No0, Scanr (1No), Photocopier (1No)	500,000
A09701	Purchase of Furniture	100,000
A13	**REPAIR AND MAINTENANCE**	
A13001	Repair of Transport	70,000
A13101	Repair of Machinery and Equipment	70,000
A13201	Repair of Furniture and Fixture	50,000
	GRAND TOTAL:	**34,726,000**

12/3/14

3. The above said SNE is subject to the condition that Salary Packages in respect of contract employees would be got cleared from the Committee formulated by S&GAD dated 28-06-2010 and for Public Sector Officers in accordance with Finance Department's letter No.SR-I/9-20/2006 dated 11-11-2011.

3. The expenditure will be incurred after completion of all the codal / legal / procedural formalities.

4. The expenditures involved will be debitable to under Grant No.PC-21008(008)-Others Taxes & Duties, 01-Gerneral Public Service, 011-Executive & Legislative Organs, Financial, 0112-Financial and Fiscal Affairs, 011205-Tax Management (Custom, Income Tax, Excise) and Taxation Department, LQ5320-Charges under Electricity Act, during the financial year 2014-15.

SECTION OFFICER (I&P)
12/3/14

To
The Section Officer (Admn),
Government of the Punjab,
Energy Department,
Lahore.

U.O. No. FD.SO (I&P) 1-8/2007 Vol-I Dated Lahore the 12th March, 2014

No. & Date Even.

A copy is forwarded for information and necessary action to the Budget Officers (VI), Government of the Punjab, Finance Department.

SECTION OFFICER (I&P)

E

No.4(12)ECA/P&D/04
GOVERNMENT OF THE PUNJAB
PLANNING & DEVELOPMENT DEPARTMI

Dated Lahore, the 8th March, 2013

To

The Section Officer (ADB-II),
Government of Pakistan,
Economic Affair Division (EAD),
Islamabad.

Subject: - **RENEWABLE ENERGY DEVELOPMENT SECTOR INVESTMENT PROGRAMME [redacted] ADB FUNDS..**

The Renewable Energy Development Sector Investment Programme (REDSIP), financed by ADB envisages the construction of Marala, Chianwali, Deg-Out Fall, Okara and Pakpattan Hydro power Projects (HPPs) on Canal Falls of Punjab. The projects are being implemented under "International Competitive Bidding" (ICB) on Turnkey basis.

ADB funds (80%) and equity by Government of the Punjab (20%) for REDSIP Loan #2286(Tranche-I) was assessed on the basis of revised PC-Is in June 2011 and available loan was considered insufficient.

ADB was approached to re-allocate non-committed loan /saving with KPK under Tranche-I. Accordingly ADB re-allocated KPK saving and confirmed the re-allocated loan of Japanese ¥ 7882.62 million against the original allocation of 5599.11 million for Punjab under loan # 2286/PAK (OCR).

At present re-allocated loan for Punjab is ¥ 7882.62 million which is Eq US$ 86.20 million. Out of five HPPs, four sub-projects have been awarded and loan amount committed by ADB for these four projects is US $ 81.11 million.

Okara sub-project requires approximately US$ 19.40 million as 80% share of ADB, whereas available un- Committed loan is US$ 5.09 million.

It is confirmed that the Govt of the Punjab is committed to take up the additional financing in addition to its 20% counter part share to cover the financing gap, so that all five-projects under REDSIP may be implemented successfully.

ADB may be informed accordingly.

8/8/17

(JABRAN AZIZ)
PLANNING OFFICER (ECA-I)

CC:

1. The Country Director Asian Development Bank Pakistan Resident Mission, Islamabad.
2. The Secretary Energy, Govt of the Punjab Lahore.

PA
F Office Copy

LOAN NUMBER 2266-PAK

LOAN AGREEMENT
(Ordinary Operations)

(Renewable Energy Development Sector Investment Program—Project 1)

between

ISLAMIC REPUBLIC OF PAKISTAN

and

ASIAN DEVELOPMENT BANK

DATED 5 October 2007

LAL:PAK 34339

LOAN AGREEMENT
(Ordinary Operations)

LOAN AGREEMENT dated 5 October 2007 between ISLAMIC REPUBLIC OF PAKISTAN (hereinafter called the Borrower) and ASIAN DEVELOPMENT BANK (hereinafter called ADB).

WHEREAS

(A) The Borrower has entered into the Framework Financing Agreement (hereinafter called the FFA) with ADB to seek ADB financing for a roadmap and an investment program for renewable energy development (the Investment Program);

(B) The Borrower has applied to ADB for (i) a loan from its ordinary capital resources for the purposes of Part A and Part B of the Project described in Schedule 1 to this Loan Agreement; and (ii) a loan from its Special Funds resources for the purposes of Part C of the Project;

(C) By an agreement of even date herewith between the Borrower and ADB (hereinafter called the Special Operations Loan Agreement), ADB has agreed to lend to the Borrower, from its Special Funds resources, an amount in various currencies equivalent to six million seven hundred ninety three thousand Special Drawing Rights (SDR 6,793,000), for the purposes of Part C of the Project (hereinafter called the Special Operations Loan, and together with this Loan, the Loans);

(D) The Borrower has also applied for a technical assistance grant up to eight hundred thousand Dollars ($800,000) for the purposes of facilitating the process of the development of the renewable energy policy of the Borrower and capacity development of the Alternative Energy Development Board under the Ministry of Water and Power of the Borrower (hereinafter called AEDB), and ADB has agreed to provide a grant to the Borrower for such purpose;

(E) The Project will be carried out by (i) AEDB, (ii) North West Frontier Province (hereinafter called NWFP) through Sarhad Hydel Development Organization (hereinafter called SHYDO), and (iii) Province of Punjab (hereinafter called Punjab), and for this purpose the Borrower will make available to NWFP and Punjab the proceeds of the Loan provided for herein upon terms and conditions satisfactory to ADB; and

(F) ADB has agreed to make a loan to the Borrower from ADB's ordinary capital resources upon the terms and conditions set forth herein and in the Project Agreements of even date herewith between (i) ADB on the one part and NWFP and SHYDO on the other part; and (ii) ADB and Punjab.

NOW THEREFORE the parties hereto agree as follows:

ARTICLE I

Loan Regulations; Definitions

Section 1.01. All the provisions of the Ordinary Operations Loan Regulations Applicable to LIBOR-Based Loans Made from ADB's Ordinary Capital Resources, dated 1 July 2001, are hereby made applicable to this Loan Agreement with the same force and effect as if they were fully set forth herein.

Section 1.02. Wherever used in this Loan Agreement, unless the context otherwise requires, the several terms defined in the Loan Regulations have the respective meanings therein set forth, and the following additional terms have the following meanings:

(a) "AEDB" has the meaning given in Recital (D) of this Loan Agreement;

(b) "Consulting Guidelines" means ADB's Guidelines on the Use of Consultants by Asian Development Bank and its Borrowers dated April 2006, as amended from time to time;

(c) "FFA" means the Framework Financing Agreement dated 31 October 2006 between ADB and the Borrower;

(d) "Goods" means equipment and materials to be financed out of the proceeds of the Loans, including related services such as transportation, insurance, installation, commissioning, training, and initial maintenance, but excluding consulting services;

(e) "Implementing Agency" means any of the agencies, responsible for the day-to-day implementation of the Project, as described in paragraph 2 of Schedule 5 to this Loan Agreement;

(f) "IPD" means the Irrigation and Power Department, and includes its successor entities;

(g) "NWFP" has the meaning given in Recital (E) of this Loan Agreement;

(h) "NWFP component" means each component to be implemented by NWFP as more fully described in Schedule 1 to this Loan Agreement;

(i) "PPA" means a power purchase agreement;

(j) "Procurement Guidelines" means ADB's Procurement Guidelines dated April 2006, as amended from time to time;

(k) "Procurement Plan" means the procurement plan for the Project dated 31 October 2006 and agreed between the Borrower and ADB, as updated from time to time in accordance with the Consulting Guidelines, the Procurement Guidelines, and other arrangements agreed with ADB;

(l) "Project" means, for the purposes of this Loan Agreement, Part A and Part B of the Project described in Schedule 1 to this Loan Agreement;

(m) "Project Executing Agency" for the purposes of, and within the meaning of, the Loan Regulations and Special Operations Loan Regulations (as defined herein) means (i) AEDB at the federal level, and (ii) IPD of NWFP and IPD of Punjab at the provincial level, all being responsible for the carrying out of the Project;

(n) "Punjab" has the meaning given in Recital (E) of this Loan Agreement;

(o) "Punjab component" means each component to be implemented by Punjab as more fully described in Schedule 1 to this Loan Agreement;

(p) "SHYDO" has the meaning given in Recital (E) of this Loan Agreement;

(q) "Special Operations Loan Agreement" has the meaning given in Recital (C) of this Loan Agreement;

(r) "Special Operations Loan Regulations" means the Loan Regulations referred to in Section 1.01 of the Special Operations Loan Agreement;

(s) "Subprojects" means subprojects under the Project that have been selected and approved as described in paragraph 4 of Schedule 5 to this Loan Agreement; and

(t) "Works" means construction or civil works to be financed out of the proceeds of the Loans, including services such as drilling or mapping, and project related services that are provided as part of a single responsibility or turnkey contract, but excluding consulting services.

ARTICLE II

The Loan

Section 2.01. (a) ADB agrees to lend to the Borrower from ADB's ordinary capital resources an amount of twelve billion five hundred eight million six hundred fifty thousand Japanese Yen (¥12,508,650,000), as such amount may be converted from time to time through a Currency Conversion in accordance with the provisions of Section 2.06 of this Loan Agreement.

(b) The Loan has a term of twenty-five (25) years, including a grace period of five (5) years, as provided in Schedule 2 to this Loan Agreement.

Section 2.02. The Borrower shall pay to ADB interest on the principal amount of the Loan withdrawn and outstanding from time to time at a rate for each Interest

Period, equal to the sum of LIBOR and 0.60% as provided by Section 3.02 of the Loan Regulations.

Section 2.03. (a) The Borrower shall pay a commitment charge at the rate of three-fourths of one percent (0.75%) per annum. Such charge shall accrue on amounts of the Loan (less amounts withdrawn from time to time), during successive periods commencing sixty (60) days after the date of this Loan Agreement, as follows:

during the first twelve-month period, on ¥ 1,876,297,500;
during the second twelve-month period, on ¥ 5,628,892,500;
during the third twelve-month period, on ¥ 10,632,352,500; and
thereafter, on the full amount of the Loan.

$= \frac{1.87}{12.51} \times 100 = 15\%$
$= 45\%$
$= 85\%$

(b) If any amount of the Loan is cancelled, the amount of each portion of the Loan stated in paragraph (a) of this Section shall be reduced in the same proportion as the cancellation bears to the full amount of the Loan before such cancellation.

Section 2.04. Interest and other charges on the Loan shall be payable semiannually on 15 June and 15 December in each year.

Section 2.05. The Borrower shall repay the principal amount of the Loan withdrawn from the Loan Account in accordance with the provisions of Schedule 2 to this Loan Agreement.

Section 2.06. (a) The Borrower may at any time request any of the following Conversions of the terms of the Loan in order to facilitate prudent debt management:

(i) a change of the Loan Currency of all or any portion of the principal amount of the Loan, whether withdrawn and outstanding or unwithdrawn, to an Approved Currency;

(ii) a change of the interest rate basis applicable to all or any portion of the principal amount of the Loan from a Floating Rate to a Fixed Rate, or vice versa; and

(iii) the setting of limits on the Floating Rate applicable to all or any portion of the principal amount of the Loan withdrawn and outstanding by the establishment of an Interest Rate Cap or Interest Rate Collar on said Floating Rate.

(b) Any conversion requested pursuant to paragraph (a) of this Section that is accepted by ADB shall be considered a "Conversion", as defined in Section 2.01(6) of the Loan Regulations, and shall be effected in accordance with the provisions of Article V of the Loan Regulations and the Conversion Guidelines.

ARTICLE III

Use of Proceeds of the Loan

Section 3.01. (a) The Borrower shall make the proceeds of the Loan available to NWFP and Punjab, upon terms and conditions satisfactory to ADB as provided herein. The foreign exchange risk shall be borne by the Borrower in accordance with the applicable policy of the Borrower. The Borrower shall cause each of NWFP and Punjab to apply such proceeds to the financing of expenditures on the Project in accordance with the provisions of this Loan Agreement and the respective Project Agreement.

(b) Except as ADB may otherwise agree, the Borrower shall make the proceeds of the Loan available to NWFP in amount of six billion nine hundred nine million five hundred forty thousand Japanese Yen (¥6,909,540,000) on the same terms and conditions, as those of the Loan. NWFP shall make the proceeds of the Loan available to SHYDO on terms and conditions satisfactory to ADB.

(c) Except as ADB may otherwise agree, the Borrower shall make the proceeds of the Loan available to Punjab in amount of five billion five hundred ninety nine million one hundred ten thousand Japanese Yen (¥5,599,110,000) on the same terms and conditions as those of the Loan.

Section 3.02. The goods and services and other items of expenditure to be financed out of the proceeds of the Loan and the allocation of amounts of the Loan among different categories of such Goods, Works and consulting services and other items of expenditure shall be in accordance with the provisions of Schedule 3 to this Loan Agreement, as such Schedule may be amended from time to time by agreement between the Borrower and ADB.

Section 3.03. Except as ADB may otherwise agree, all Goods, Works and consulting services to be financed out of the proceeds of the Loan shall be procured in accordance with the provisions of Schedule 4 to this Loan Agreement. ADB may refuse to finance a contract where Goods, Works or consulting services have not been procured under procedures substantially in accordance with those agreed between the Borrower and ADB or where the terms and conditions of the contract are not satisfactory to ADB.

Section 3.04. Except as ADB may otherwise agree, the Borrower shall cause all Goods, Works and consulting services financed out of the proceeds of the Loan to be used exclusively in the carrying out of the Project.

Section 3.05. The closing date for withdrawals from the Loan Account for the purposes of Section 9.02 of the Loan Regulations shall be 30 June 2012 or such other date as may from time to time be agreed between the Borrower and ADB.

ARTICLE IV

Particular Covenants

Section 4.01. (a) The Borrower shall cause each Project Executing Agency and each Implementing Agency to carry out the Project with due diligence and efficiency and in conformity with sound administrative, financial, engineering, environmental and social practices.

(b) In the carrying out of the Project and operation of the Project facilities, the Borrower shall perform, or cause to be performed, all obligations set forth in Schedule 5 to this Loan Agreement and the Schedules to the Project Agreements.

Section 4.02. The Borrower shall make available to the Project Executing Agencies and the Implementing Agencies, promptly as needed and on terms and conditions acceptable to ADB, the funds, facilities, services and other resources which are required for the carrying out of the Project.

Section 4.03. The Borrower shall ensure that the activities of its departments and agencies with respect to the carrying out of the Project and operation of the Project facilities are conducted and coordinated in accordance with sound administrative policies and procedures.

Section 4.04. The Borrower shall take all action which shall be necessary on its part to enable the Project Executing Agencies and the Implementing Agencies to perform their obligations under the respective Project Agreements and shall not take or permit any action which would interfere with the performance of such obligations.

ARTICLE V

Suspension; Cancellation; Acceleration of Maturity

Section 5.01. The following is specified as an additional event for suspension of the right of the Borrower to make withdrawals from the Loan Account for the purposes of Section 9.01(l) of the Loan Regulations: the Borrower shall have, in the opinion of ADB, failed to perform any of its obligations under the Special Operations Loan Agreement.

Section 5.02. The following is specified as an additional event for acceleration of maturity for the purposes of Section 9.07(a)(iv) of the Loan Regulations: the event specified in Section 5.01 of this Loan Agreement shall have occurred.

ARTICLE VI

Effectiveness

Section 6.01. The following is specified as an additional condition to the effectiveness of this Loan Agreement for the purposes of Section 10.01(f) of the Loan Regulations: the Special Operations Loan Agreement shall have been duly executed and delivered on behalf of the Borrower, and all conditions precedent to its effectiveness (other than a condition requiring the effectiveness of this Loan Agreement) shall have been fulfilled.

Section 6.02. The following is specified as an additional matter, for the purposes of Section 10.02(d) of the Loan Regulations, to be included in the opinion or opinions to be furnished to ADB: that the Special Operations Loan Agreement has been duly executed and delivered on behalf of the Borrower and is legally binding upon the Borrower in accordance with its terms.

Section 6.03. A date ninety (90) days after the date of this Loan Agreement is specified for the effectiveness of the Loan Agreement for the purposes of Section 10.04 of the Loan Regulations.

ARTICLE VII

Delegation of Authority

Section 7.01. The Borrower hereby designates (i) NWFP for the NWFP components; and (ii) Punjab for the Punjab components, its agents for the purposes of taking any action or entering into any agreement required or permitted under Sections 3.02, 3.03 and 3.05 of this Loan Agreement and under Sections 6.01, 6.02, 6.03 and 6.04 of the Loan Regulations.

Section 7.02. Any action taken or any agreement entered into by NWFP or Punjab pursuant to the authority conferred under Section 7.01 of this Loan Agreement shall be fully binding on the Borrower and shall have the same force and effect as if taken by the Borrower.

Section 7.03. The authority conferred on NWFP and Punjab under Section 7.01 of this Loan Agreement may be revoked or modified by agreement between the Borrower and ADB.

ARTICLE VIII

Miscellaneous

Section 8.01. The Secretary, Economic Affairs Division, Ministry of Economic Affairs and Statistics of the Borrower is designated as representative of the Borrower for the purposes of Section 12.02 of the Loan Regulations.

Section 8.02. The following addresses are specified for the purposes of Section 12.01 of the Loan Regulations:

For the Borrower

Secretary
Economic Affairs Division
Ministry of Economic Affairs and Statistics
Islamabad, Pakistan

Cable Address:

ECONOMIC
ISLAMABAD

Telex Number:

5634 ECDIV PK

Facsimile Numbers:

(9251) 920-5971
(9251) 921-0734.

For ADB

Asian Development Bank
P.O. Box 789
0980 Manila, Philippines

Cable Address:

ASIANBANK
MANILA

Telex Numbers:

29066 ADB PH (RCA)
42205 ADB PM (ITT)
63587 ADB PN (ETPI)

Facsimile Numbers:

(632) 636-2444
(632) 636-2428.

IN WITNESS WHEREOF the parties hereto, acting through their representatives thereunto duly authorized, have caused this Loan Agreement to be signed in their respective names and to be delivered at the principal office of ADB, as of the day and year first above written.

ISLAMIC REPUBLIC OF PAKISTAN

By _____
Authorized Representative

ASIAN DEVELOPMENT BANK

By _____
PETER L. FEDON
Country Director
Pakistan Resident Mission

ENERGY DEPARTMENT
GOVERNMENT OF THE PUNJAB

CONTRACT AGREEMENT

FOR

PROCUREMENT OF PLANT, DESIGN, SUPPLY AND INSTALL
OF CHIANWALI HYDROPOWER PROJECT (CHP)
ICB NO. Pb - 002

BETWEEN

ENERGY DEPARTMENT, GOVERNMENT OF THE PUNJAB

AND

SINOTEC – SHPE JV

VOLUME – I

DECEMBER – 2012

Letter of Acceptance
Contract Agreement and Appendices hereto
General Conditions of Contract (GCC)
Special Conditions of Contract (SCC)
Letter of Price Bid and Price Schedules submitted by the Contractor

PUNJAB POWER MANAGEMENT UNIT

PROCUREMENT OF PLANT, DESIGN, SUPPLY AND INSTALL OF CHIANWALI HYDROPOWER PROJECT (CHP)

CONTRACT DOCUMENTS

INDEX

Volume I	Letter of Acceptance
	Contract Agreement and Appendices hereto
	General Conditions of Contract (GCC)
	Special Conditions of Contract (SCC)
	Letter of Price Bid and Price Schedules submitted by the Contractor
VOLUME II	Specifications / Employer's Requirements.
	Drawings
VOLUME III	
A	Letter of Technical Bid and Technical Proposal Submitted by the Contractor
B	Post Bid Clarifications
VOLUME IV	Other completed Bidding Forms submitted with the Letters of Technical and Price Bids.
	Minutes of meeting of the final negotiation before Award of Contract, endorsed by steering Committee of the project and ADB.

SINOTEC - SHPE JOINT VENTURE

CONTRACT AGREEMENT AND APPENDICES

Contract Agreement

For

PROCUREMENT OF PLANT, DESIGN, SUPPLY AND INSTALL OF CHIANWALI HYDROPOWER PROJECT (CHP)

ICB No. Pb - 002

THIS AGREEMENT made the 17th day of December, 2012,

BETWEEN

Government of the Punjab, Energy Department through **Project Director, Punjab Power Management Unit (PPMU)** and having its principal place of business at **77-Shah Jamal Colony, Lahore – Pakistan**, (herein after called "the Employer").

AND

SINOTEC-SHPE JV , Joint Venture of **Sinotec Co. Ltd.** and **Hunan Sunny Hydropower Equipment Corporation,** corporations incorporated under the laws of **P.R. CHINA** and having its principal place of business at **House No. 33 – A, Block G, Gulberg III, Lahore, Pakistan** (hereinafter called "the Contractor").

WHEREAS the Employer desires to engage the Contractor to design and construct civil works and design, manufacture, test, deliver, install, complete and commission certain plant & equipment (the Facilities) and the Contractor have agreed to such engagement upon and subject to the terms and condition hereinafter appearing.

NOW IT IS HEREBY AGREED as follows:

Article 1 Contract Documents

1.1 **Contract Documents** (Reference GCC Clause 2) The following documents shall constitute the Contract between the Employer and the Contractor, and each shall be read and construed as an integral part of the Contract:

(a) This Contract Agreement and the Appendices hereto
(b) Letter of Price Bid and Price Schedules submitted by the Contractor and Post Bid Clarifications
(c) Letter of Technical Bid and Technical Proposal submitted by the Contractor.
(d) Special Conditions of Contract.
(e) General Conditions of Contract.
(f) Specifications / Employer's Requirements.
(g) Drawings
(h) Other completed Bidding Forms submitted with the Letters of Technical and Price Bids
(i) Minutes of meeting of the final negotiation, before award of contract, endorsed by steering committee of the project and ADB.

JOINT VENTURE

1.2 **Order of Precedence** (Reference GCC Clause 2)
In the event of any ambiguity or conflict between the Contract Documents listed above, the order of precedence shall be the order in which the Contract Documents are listed in Article 1.1 (Contract Documents) above.

1.3 **Definitions** (Reference GCC Clause 1)
Capitalized words and phrases used herein shall have the same meanings as are ascribed to them in the General Conditions.

Article 2
Contract Price and Terms of Payment

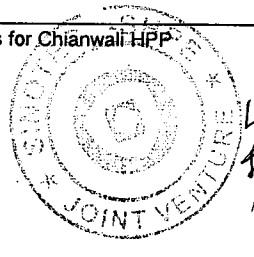
2.1 **Contract Price** (Reference GCC Clause 11)
The Employer hereby agrees to pay to the Contractor the Contract Price in consideration of the performance by the Contractor of its obligations hereunder. The Contract Price, applying "Discount (14%-Fourteen Percent of Grand Total Price)" offered in the Letter of Price Bid, shall be the aggregate of: **US$21,142,519 i.e. Twenty One Million, One Hundred Forty Two Thousands, Five Hundred and Nineteen US Dollars** and **Rs339,239,552 i.e. Three Hundred Thirty Nine Million, Two Hundred Thirty Nine Thousand, Five Hundred and Fifty Two PAK Rupees only** as specified in the Grand Summary of Price Schedule No. 5, or such other sums as may be determined in accordance with the terms and conditions of the Contract.

2.2 **Terms of Payment** (Reference GCC Clause 12)
The terms and procedures of payment according to which the Employer will reimburse the Contractor are given in the Appendix (Terms and Procedures of Payment) hereto.

The Employer shall instruct its bank to issue an irrevocable confirmed documentary credit made available to the Contractor in a bank in the country of the Contractor. The credit shall be for an amount of US$3,687,525 Three Million, Six Hundred Eighty Seven Thousand, Five hundred and Twenty Five US Dollars and shall be subject to the Uniform Customs and Practice for Documentary Credits 1993 Revision, ICC Publication No. 500.

Article 3
Effective Date

3.1 **Effective Date** (Reference GCC Clause 1)
The Effective Date upon which the period until the Time for Completion of the Facilities shall be counted from is the date when all of the following conditions have been fulfilled:



(a) This Contract Agreement has been duly executed for and on behalf of the Employer and the Contractor;

(b) The Contractor has submitted to the Employer the performance security and the advance payment guarantee;

(c) The Employer has paid the Contractor the advance payment

(d) The Contractor has been advised that the documentary credit referred to in Article 2.2 above has been issued in its favor

Each party shall use its best efforts to fulfill the above conditions for which it is responsible as soon as practicable.

3.2 If the conditions listed under 3.1 are not fulfilled within two (2) months from the date of this Contract notification because of reasons not attributable to the Contractor, the parties shall discuss and agree on an equitable adjustment to the Contract Price and the Time for Completion and/or other relevant conditions of the Contract.

Article 4 Communications

4.1 The address of the Employer for notice purposes:

Project Director,

Punjab Power Management Unit
Energy Department
77 - Shah Jamal Colony
Lahore, Pakistan

4.2 The address of the Contractor for notice purposes, pursuant to GCC 4.1 is:

House No. 33 – A, Block G, Gulberg III, Lahore Pakistan.

Article 5. Appendices

5.1 The Appendices listed in the attached List of Appendices shall be deemed to form an integral part of this Contract Agreement.

5.2 Reference in the Contract to any Appendix shall mean the Appendices attached hereto, and the Contract shall be read and construed accordingly.

IN WITNESS WHEREOF the Employer and the Contractor have caused this Agreement to be duly executed by their duly authorized representatives the day and year first above written.

Signed by, for and on behalf of the Employer

Project Director,
Punjab Power Management Unit (PPMU),
Energy Department,
Government of the Punjab,
Lahore, Pakistan. 17/12/12

in the presence of

[Signature]

[Title]

SECRETARY
GOVERNMENT OF THE PUNJAB
ENERGY DEPARTMENT

Signed by, for and on behalf of the Contractor

Song Shuangping
Chief Representative
SINOTEC-SHPE Joint Venture

in the presence of

[Signature]

[Title]

SINOTEC -SHPE JOINT VENTURE

SINOTEC -SHPE JOINT VENTURE

Appendices

Appendix 1 - Terms and Procedures of Payment 2
Appendix 2 - Price Adjustment 5
Appendix 3 - Insurance Requirements 6
Appendix 4 - Time Schedule 9
Appendix 5 - List of Major Items of Plant and services and List of Approved Subcontractors 10
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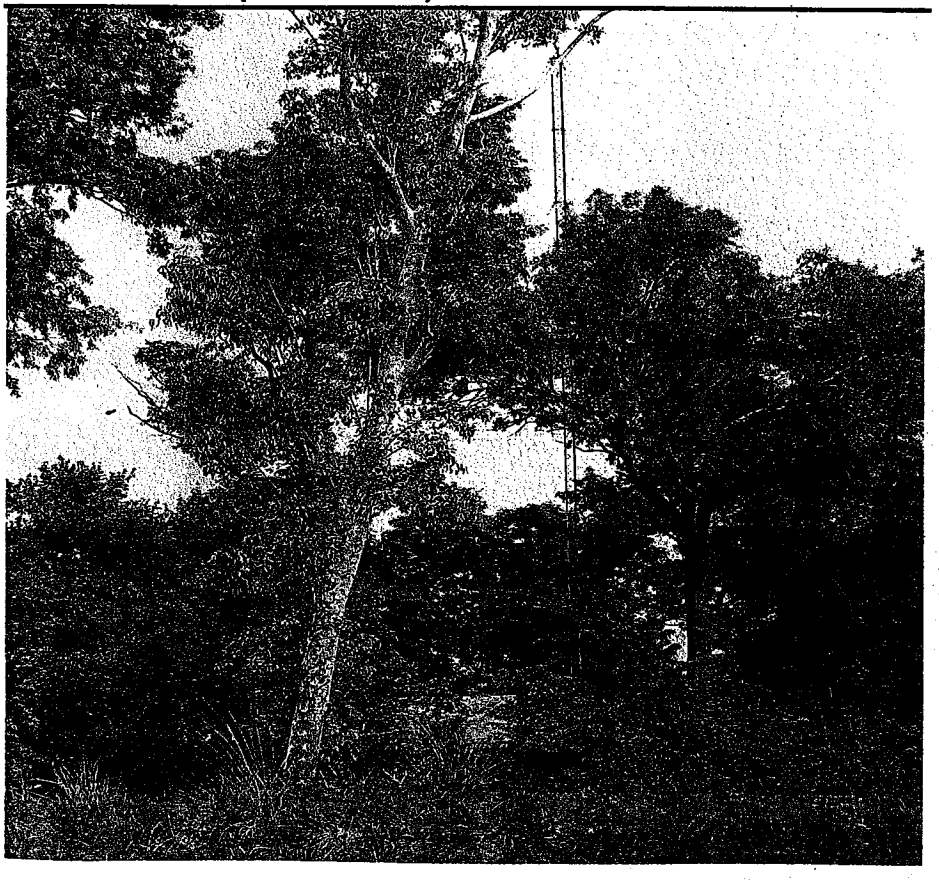
IRRIGATION & POWER DEPARTMENT
GOVERNMENT OF PUNJAB

ADB TA No. 4425-PAK

Renewable Energy Development Project (TAR 34339-01)

CHIANWALI (UCCL 128) HPP FEASIBILITY STUDY



Integration Environment & Energy Ltd

In association with

ENTEC AG

ABBREVIATIONS

ADB	Asian Development Bank
AD/LAR	Assistant Director/ Land Acquisition and Resettlement
AEDB	Alternative Energy Development Board
am	ante meridiem (before noon)
AP	Affected person
BKHP	Batal Khwar Hydropower Project
CAS	Compulsory Acquisition Surcharge
CBO	Community Based Organisation
D	Distance
DD	Deputy Director
DFO	Divisional Forest Officer
DRO	District Revenue Officer
D/S	Down Stream
Drwg.	Drawing
E	Energy
EA	Executing Agency
e.g.	For example
El.	Elevation
E&M	Electrical and Mechanical
EM	Electro Mechanical
EPC	Engineering Procurement and Construction
ESDC	Environmental and Social Development Cell
Fig.	Figure
FSL	Full Supply Level
FWD	Forest and Wildlife Department
g	Acceleration due to Gravity
GOP	Government of Pakistan
GSP	Geological Survey of Pakistan
GRC	Grievance Redress Committee
GTZ	Gesellschaft für Technische Zusammenarbeit (German Agency for Technical Cooperation)
GWh	Giga Watt Hour
h	hour
H	Head
ha	Hectare
HEPO	Hydro Electric Planning Organization
HH	household
IA	Implementing Agency
ICCP	Information and Community Consultation Program
IDD	International Direct Dialing
IDPD	Indigenous People Development Plan
I&P	Irrigation and Power
km	Kilometer
kW	Kilowatt
LAA	Land Acquisition Act
LAC	Land Acquisition Collector
L.L.	Liquid Limit
L-Section	Longitudinal Section

MACP	Mountain Area Conservation Program
masl	metres above sea level
Max	Maximum
Mill	Million
Min	Minimum
mm	Millimeter
MoU	Memorandum of Understanding
MW	Mega Watt
MWh	Mega Watt hour
m^3/sec	Cubic Meter Per Second
m/sec^2	Meter Per Square Second
NEPRA	National Electric Power Regulatory Authority
NGO	Non-Governmental Organisation
NSL	Natural Surface Level
NTDC	National Transmission and Despatch Company
NWFP	North-western Frontier Province
P	Power
PC	Planning Commission
PD	Project Director
P.I.	Plasticity Index
P.L.	Plastic Limit
pm	post meridiem (after noon)
PPA	Power Purchase Agreement
ppm	Parts Per Million
PSB	Primary School for Boys
PSG	Primary School for Girls
Q	Discharge
RAC	Resettlement Advisory Committee
RD	Running Distance
RP	Resettlement Plan
Rs.	Pakistani Rupee
sec	Second
SHYDO	Sarhad Hydropower Development Organization
SPT	Standard Penetration Test
T	Time
TA	Technical Assistant
TDS	Total Dissolved Solids
U/S	Up Stream
WASID	Water and Soil Investigation Department
WAPDA	Water and Power Development Authority
η	Efficiency coefficient
%	Percentage
°C	Degree Centigrade

Exchange Rate: 1 US$ = 60 Rs.

MAIN DESIGN FEATURES

Location	
Punjab	
Gujranwala District	
River System	
Upper Chenab Canal System	
Upstream of fall structure RD 128+000	
Mean monthly discharge:	101.5 m^3/s
Total annual average discharge:	3,200.10^6 m^3/y
Main Structures	
Design discharge:	150 m^3/s
Maximum discharge:	254 m^3/s
Gated Spillway	
Units:	4
Type:	Radial gate
Sill level:	221.2 masl
Design pressure at sill:	2.7 m
Height:	2.64 m
Width:	6.5 m
Trash racks	
Width:	9.78 m
Height:	7.87 m
Inclination:	78°
Bar distance:	40 mm
Stop logs	
• Intake:	
- Width:	10.0 m
- Height:	9.1 m
• Draft tube:	
- Width:	10.0 m
- Height:	45.5 m
• Spillway gates:	
- Width:	7.0 m
- Height:	25.84 m
Headrace Canal	
Water level at entrance:	223.75 masl
Canal width	64.0 m
Water head	3.24 m
Bed slope	0.15 ‰

Powerhouse	
Powerhouse level:	222.67 masl
Machine hall length:	21.15 m
Machine hall width:	11.22 m
Machine hall height:	7.74 m
Tailrace Canal	
Bed level:	217.4 masl
Canal width	64.0 m
Bed slope	0.15 ‰
Nominal Head at maximum power output	
Headrace water level:	223.75 masl
Tailrace water level at max. power:	219.32 masl
Gross head:	4.43 m
Head Loss	0.2 m
Net Head	4.23 m
Hydro Mechanical Equipment	
Kaplan Turbines	
Units:	2
Rated flow:	75 m^3/s
Capacity:	2.69 MW
Vertical shaft speed:	120 rpm
Rated head:	4.3 m
Runner diameter:	3.6 m
Electrical Equipment	
Generator	
Units:	2
Speed:	1,200 rpm
Capacity:	3.4 MVA
Transformer:	6.3/11 kV
Switchgear:	11 kV
Energy Output	
Per unit:	2.7 MW
Total:	5.4 MW
Mean annual energy (1983-2004):	32.7 GWh
Investment	
Total investment:	11.8 mil. US$
Specific investment	2,185 US$/kW
EIRR:	15.7 %
FIRR:	9.1%
Levelized tariff:	4.02 cent/kWh

I INTRODUCTION

A General

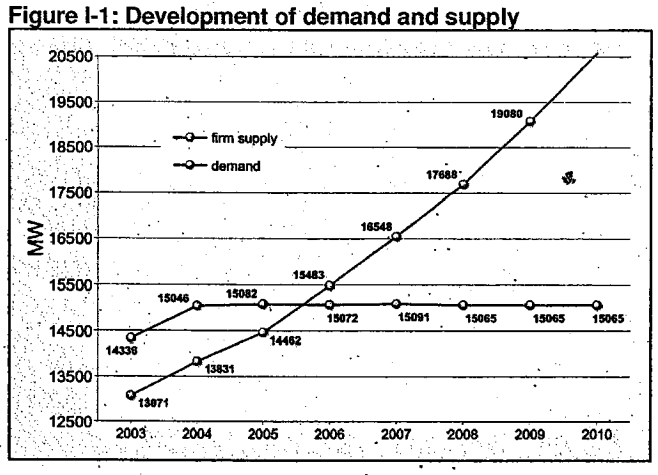
1. Pakistan's domestic energy resources are characterized by sizeable reserves of natural gas, substantial hydropower potential and modest recoverable reserves of crude oil and coal (Table I-1).

Table I-1: Pakistan's Energy Resources

Oil	Recoverable reserves	38,860,000
	Crude oil production	3,035,275
	Consumption**	15,727,409
Natural Gas	Total reserves*	541,190,000
	Production	25,261,972
	Consumption**	23,303,630
Coal	Total reserves (mill t)	185.173
	Production	1,465,452
	Consumption	3,300,491
Electricity	Gross generation	6,582,513
Total Energy	**Net supply**	**31,278,578**
	Net consumption	**28,983,968**

***: gas fields and associated gas resources**
****: gross supply**
all figures in TOE if not otherwise stated
Source: Pakistan Energy Yearbook, 2004

Figure I-1: Development of demand and supply



2. The country also has a large base of traditional fuels such as fuelwood and agricultural and animal wastes that mainly meet the energy needs of rural consumers. However, the exploitation of these energy resources has been slow, because of funding constraints and inadequate implementation capability.

3. As a result, Pakistan's dependence on energy imports remains high. Development of the energy sector is crucial to support continued growth of Pakistan's economy. Power shortage is to be expected already for 2006 (Fig. I-1).

4. Recognizing this, a number of efforts have been made during the last century to overcome the shortages:

- 2005: A long-term integrated "Energy Security Plan (ESP)", covering the period up to 2030; approved by the GoP in March 2005
- 2002: "Policy for Power Generation Projects Year 2002"; approved by the GoP in October 2002
- 2002: Hydro Power Development Plan (Vision 2025) by WAPDA
- 1998: "Policy for New Private Independent Power Projects"
- 1997: Nepra Act: Establishing of National Electric Power Regulatory Authority
- 1995: "Policy Framework and Package of Incentives for Private Sector Hydropower Power Generation Projects in Pakistan" an on the

"Transmission Line Policy"

- 1994: "Policy Framework and Package of Incentives for Private Sector Power Generation Projects in Pakistan".

5. All policies put emphasis on the development of the national hydropower resources as an alternative to costly and environmentally critical thermal plants[1].

B The Project

6. The Government of Pakistan (GoP) has requested the Asian Development Bank (ADB) to provide project preparatory technical assistance (TA) to prepare an ensuing loan project for developing renewable energy (RE). A TA Fact-Finding Mission visited Pakistan from 21–30 July 2004 to formulate the proposed TA and reached an understanding with GoP on the purpose, scope, implementation arrangements, cost estimates, financing arrangements, and terms of reference for consultants.

7. International tendering was conducted at the beginning of 2005 and concluded by contract negotiations and approval in May 2005. Works have been commissioned by the selected Consultant in May 2005. The total duration of the PPTA was estimated at being 8 months. The following time schedule was agreed upon:

- Commissioning of work: 13th May
- Inception phase: 13.05. – 12.06.2005
- Interim Phase: 13.06. – 12.09.2005
- Final Phase: 13.09. – 12.12.2005
- Final Report: 13.12. – 12.01.2006.

[1] For more details please refer to chapter X.

1 Purpose and Outputs

8. The TA will prepare a project to develop indigenous, nonpolluting, and renewable sources of energy to help meet Pakistan's power shortage and improve the quality and reliability of the power system, especially in rural areas. The TA prepares financing of RE projects through the ensuing loan.

2 Methodology and Key Activities

9. The TA will have two components.

(i) **Component 1-Review of renewable energy potential in each province**. A broad review of the potential for various RE technologies in each province will be conducted to determine the most appropriate (i.e., technically and economically viable) sub-projects suitable for funding by the ensuing loan. The TA will focus on specific RE technologies in each province:
   (a) Balochistan: wind, solar, and hybrid systems;
   (b) North-West Frontier Province (NWFP): small hydropower from perennial high-head rivers that are abundant in the province;
   (c) Punjab: low-head, high-volume small hydropower stations that can be installed in the extensive irrigation canal system in perennial flow in the province; and
   (d) Sindh: small hydro, wind, solar, as well as hybrid systems.

(ii) **Component 2-Feasibility studies**. Based on the reviews, the TA consultants will work with the implementing agencies (IAs) to prioritize subprojects in each province. The subprojects will be selected by least-cost analysis for power system expansion, consistent with ADB's energy policy (2000), and will include analysis of alternatives, as well as conventional energy sources. The TA consultants will then conduct feasibility studies for sample projects in each province (about 2 per province) to be financed by the ensuing loan. The feasibility studies will include technical, economic, financial, environmental, and social analyses. The ensuing loan is expected to be a sector loan. The feasibility studies will develop model technical, economic, and financial analyses that can be used by the executing agencies (EAs) in selecting subprojects for loan financing as well as framework for environmental and social assessments.

10. The original plan to include all 4 provinces and wind and solar resources besides hydropower has been dropped because:

- there were no suitable projects made available by the Government of Sindh Province
- no projects in wind or solar were available which suit the requirements of a commercial loan.

11. Therefore it was finally agreed that the TA will concentrate on hydropower projects in 2 Provinces, namely Punjab and NWFP.

12. Additionally, the TA supports Balochistan Province in the elaboration of a strategy for remote village electrification and to strengthen the provincial know-how in these aspects.

13. In addition, it has been agreed upon that the TA will concentrate on the preparation of project loans rather than sector loans for which further requisites have to be prepared first.

3 Organization and Tasks

14. The AEDB has been nominated as the Executing Agency (EA) and the provincial Irrigation and Power Departments as Implementing Agencies (IA) for the PPTA.

15. The role of AEDB as EA for the TA will be to facilitate TA implementation, coordinate its activities, and disseminate the information learned. The TA will be implemented at the provincial level.

16. The IAs will be the Department of Irrigation and Power of each province. The departments will work closely with the TA consultants and will provide them with the necessary information and guidance in carrying out the studies. A project manager of senior standing in the IA will be appointed by the IAs, and a project management unit (PMU), consisting of two or three engineers, will be established in each province to oversee the day-to-day activities and work with the project consultants. The project manager will be appointed and PMU established before the TA begins.

4 Selection of Hydropower Project

17. The two Provinces offered a number of projects to be revised under the ensuing loan (Table I-1) from which 10 have been mutually selected in the Inception meeting.

Table I-2: Projects agreed for review under the PPTA

No.	Province	Site Name	RD No.	Capacity (MW)	Discharge (m^3/s)	Net head (m)
1	Punjab	UCC (Bambanwala)	133+296	[illegible]	175	2.4
2		UCC Main Lower near Gujranwala	128+000	3.50 - 4.82	135	3.30
3		Deg Fall Sheikhupura	164+400	3.60 - 5.44	100	[illegible]
4		Upper Gogera Sheikhupura	214+000	1.90	90	[illegible]
5		Pakpattan Canal	112+350	2.43 - 3.30	84	[illegible]
6		LBDC	235+454	1.90 - 5.07	175	[illegible]
7		UCCM Marala	000+000	11.50	336	3.75
8	NWFP	Daral Khwar		35.0	15	308
9		Batal Khwar		8.1	5.78	[illegible]
10		Ranolia		11.5	3.5	424
11		Summar Gah		28.0	9	390
12		Machai Canal	68+798	3.5	58	8

18. All projects have been discussed during the Inception phase and the Inception meeting. Finally the following projects have been selected as being of first priority (Table I-2). Main reasons for withdrawal from the list have been too little head (below 3 m) and low overall capacity (i.e. 1.9 MW).

Table I-3: Selected Projects to be reviewed under the PPTA

No.	Province	Site Name	RD No.	Capacity (MW)	Discharge (m^3/s)	Net head (m)
1	Punjab	UCC (Bambanwala)	133+296	3.50	175	2.4
2		UCC Main Lower near Gujranwala	128+000	3.50 - 4.82	135	3.30
3		Deg Fall Sheikhupura	283+100	3.60 - 6.44	100	4.32
4		Upper Degera Sheikhupura	214+000	1.00	90	2.52
5		Pakpattan Canal	112+350	2.45 - 3.30	84	3.51
6		LBDC	295+454	1.00	175	1.98
7			196+954	5.07	144	4.5
8		UCC/M Marala	000+000	11.30	386	3.75
9	NWFP	Barai Khwar		3.0	1.5	308
10		Barai Khwar		6.1	5.78	171
11		Ranolia		1.5	3.5	394
12		Gumrai Gah		2.0	9	390
13		Machai Canal	68+708	2.5	58	3

5 Execution of Work

19. The review of the feasibility studies started in June 2005 and included

- Collection and analyses of basic data
- Review of the power market
- Technical redesign of the systems if necessary and performance of layout studies
- Up-dating of unit cost and Bills of Quantities
- Economic and financial analyses
- Field surveys with respect to involuntary resettlement and environmental aspects
- Establishing of environmental and resettlement impact mitigation concepts for each of the projects.

20. Seminars and workshops were conducted in order to support the IAs in improving existing know-how in the field of environment and resettlement aspects and with respect to economic and financial analysis.

21. The Consultant team would like to thank the AEDB and the IAs in the Provinces for their support, the close and fruitful cooperation and a lot of open discussions on various issues. We would like to express our special thanks to the focal person of AEDB, Air Comdr (R) Mujahid Sadiq, Engr. Bahadur Shah, Director (P&F) SHYDO and focal person of NWFP to the PPTA and Engr. M. Yaqoob, Director Technical (Power) - I&P Punjab and focal person to this PPTA.

C Background Information on CHIANWALI Hydropower Project

22. CHIANWALI hydropower project was first mentioned in the early 80's when studies were conducted by WAPDA to make use of the head available at barrages and canal falls of the country's irrigation network. The following studies were carried out:

- **Ranking study:** In 1985 a Ranking study of 10 identified sites with a total potential of about 630 MW was completed which was followed by feasibility studies detailed design/detailed engineering of the identified schemes.
- **Inventory of low head potential along existing barrages and canal falls; 1992:** During the course of studies for low head potential at barrages and canal falls, need was felt to prepare a comprehensive inventory of all the available low head potential sites on the irrigation system of the country. Accordingly, a draft inventory report on the basis of data /information collected from the Provincial Irrigation Departments was prepared in June 1992 covering 21 barrages/headworks/dams and 586 sites on canals with an aggregated potential of about 649 MW. The results of the report were only up to identification level and no detailed calculations were made.
- **Feasibility Study; 2003:** In WAPDA Authority meeting held on 17-02-2001, it was decided that WAPDA will update the already prepared inventory report including ranking of the projects and prepare feasibility studies of these projects. Accordingly a PC-II was approved by the Govt. of Pakistan amounting to Rs. 108.282 million on 18-10-2001. The study was then conducted in 2002/2003.

II TOPOGRAPHY

1. The project is located in the District Gujranwala in Punjab Province. The scheme was identified by WAPDA/HEPO.

2. The area belongs to the Indo-Gangetian plains and is predominantly flat. The elevation at project site is around 223 masl.

3. Topographic maps were elaborated in the course of the WAPDA feasibility study in 2003. The plane table survey (scale 1:1,000) covers an area of about 0.460 km² around RD 128+000 with contour interval of 0.25 m. These maps have been transferred manually and through photocopying to scale 1:2,500 and were used for the feasibility design.

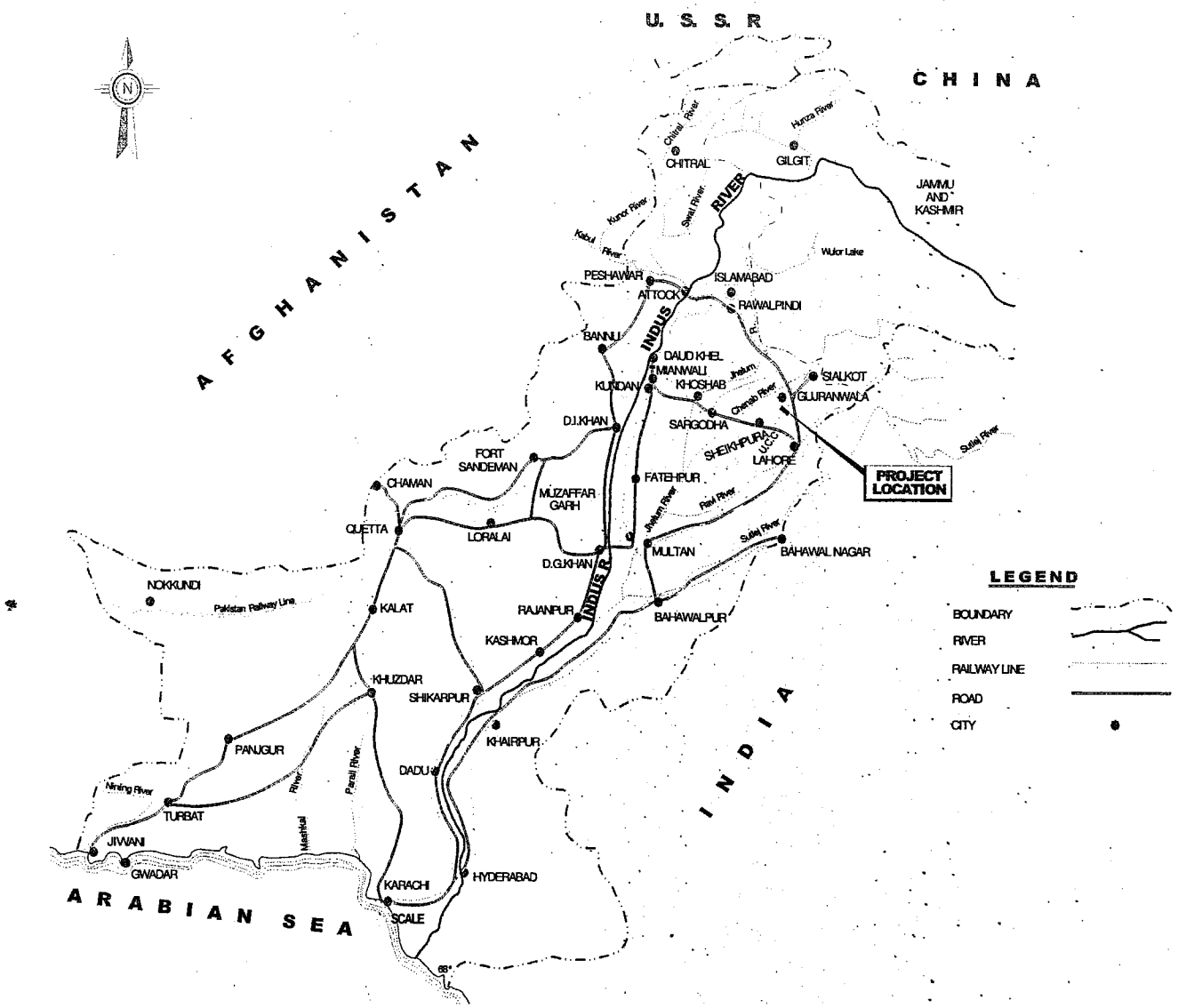
4. In addition, canal cross sections at RD 126+000, 127+900, 128+311, 133+000, 149+000, 164+500 and 165+050 were taken during canal closure through sounding.

5. The following instruments have been used for survey:
- Total Station Topcon # ET-2 at an accuracy rating of ± (5 mm +3 ppm x D)
- Topcon Level # TL-20DT.

6. For horizontal checking, traversing was carried out in a closed loop form in the area of interest. The orientation is based on Sun Azimuth determination. The traverse distances were measured in two directions (forward & back) and averaged, provided the two measurements agree to within 1:10,000 or better. The measured distances were corrected for various geodetic corrections.

7. For vertical checking, leveling and check leveling was carried out by using an automatic leveling instrument and leveling staves of quality.

Map II-1: Project Location



III HYDROLOGY AND POWER POTENTIAL

A The Upper Chenab Canal System

1. The Upper Chenab main canal is fed from the Marala Barrage, leading water from the Chenab River into a number of tributaries for irrigation purposes.

1 Marala Barrage

2. The Marala barrage was constructed during 1968 across the Chenab River to divert water to the river Ravi and to irrigate fertile agricultural land along the left banks of the river through the Upper Chenab Canal Main (UCCM; design discharge: 492.5 m³/s) and Marala Ravi (M-R) Link (design discharge: 623 m³/s). Marala Ravi link and Upper Chenab Canal divert also water from Chenab River to the Ravi River. The barrage is located at latitude 32° 40' North and longitude 74° 23', about 48 km upstream of Khanki headworks and about 25 km north of Sialkot City.

3. Its designed discharge capacity is 33,994.50 m³/sec. The total width is 1363.50 m (clear water way is 1207.1 m) with 46 bays of 18.3 m each and two under sluices consisting of 20 bays of 18.3 m (7 bays on the right side and 13 bays on the left).

2 Bambanwala Headworks

4. The Bambanwala headworks was constructed as a trifurcator structure at the tail RD 133+296 of the Upper Chenab Canal Main (UCCM) near Daska Town which is about 19 km from Gujranwala city. From here the Upper Chenab Canal (UCC) Lower (maximum design discharge: 315 m³/s), Bambanwala Ravi Badian Depalpur (BRBD) Canal (design discharge: 153 m³/s) and the Nokhar Branch (design discharge: 24.5 m³/s) branch off.

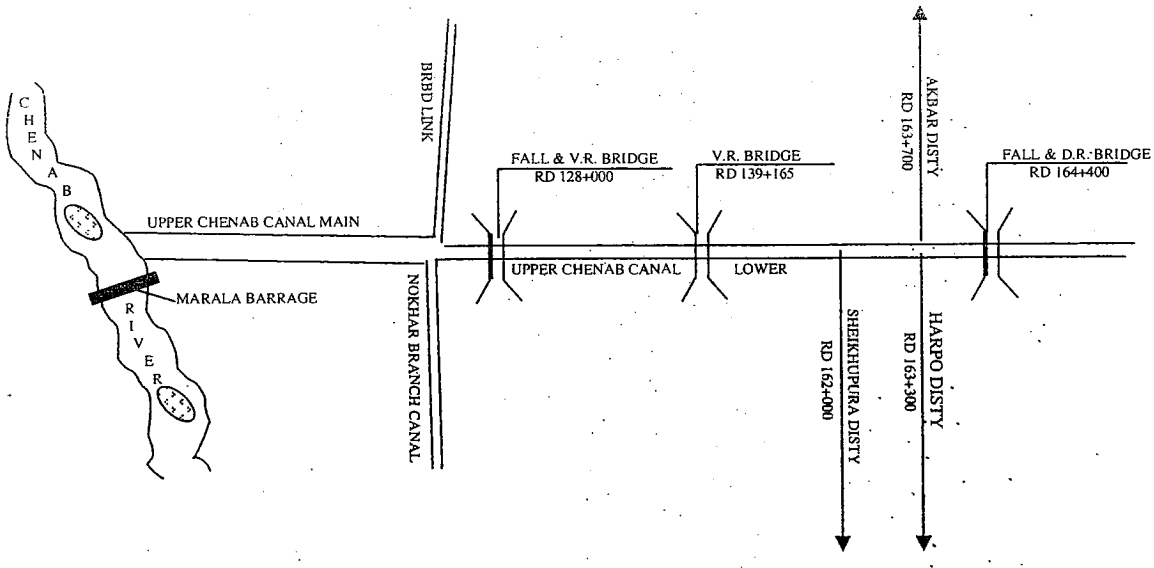
3 Upper Chenab Canal Lower

5. The Upper Chenab Canal forms part of the Punjab irrigation system in the Gujranwala, Sheikhupura and Okara districts of Punjab Province. The Upper Chenab Canal Lower head regulator has a maximum design capacity of 315 m³/sec. The canal was primarily designed as a link canal and supplies water to the Balloki headworks canal system.

6. The canal system and its distributaries are shown in Fig. III-1, the designed L-section between RD 120+000 and RD 170+000[2] in Drwg. AIII-1 (Annex III). The canal is perennial and closed for about one month a year during December and January for annual maintenance purposes.

[2] provided by the Punjab Irrigation and Power Department

Fig. III-1: Distributary System of Upper Chenab Canal Lower



7. For the proposed hydro power station, the fall structures of RD 128+000 and RD 164+400 are used.

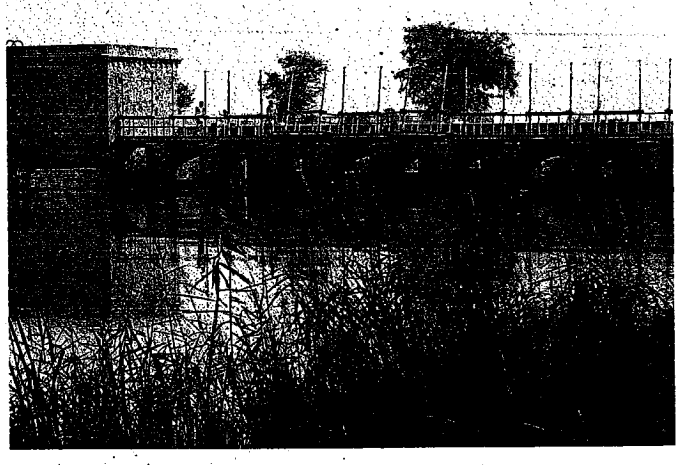
a Fall structure RD 128+000

8. The regulated fall structure at RD 128+000 has a width of 62.68 m with 19 manually operated gates. The total fall head available is about 1.59 m. A village road crosses the structure on 7 bays. The basic hydraulic data of RD 128+000 are summarized in Table III-1.

Table III-1: RD 128+000; Basic Hydraulic Data

Description	Unit	Designed (Previous)
U/S Bed level	masl	220.64
U/S FSL	masl	223.84
D/S Bed level	masl	219.08
D/S FSL	masl	222.25
Fall FSL	m	1.59
D/S Bed width	m	64.08
D/S Full supply depth	m	3.27
D/S Discharge	m³/s	255
Bed slope	‰	0.15
U/S discharge	m³/s	270

Fig. III-2: Fall Structure at RD 128+000



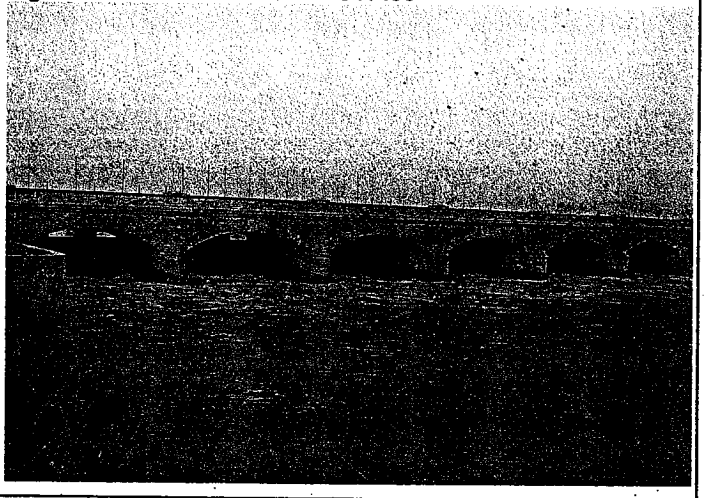
b Fall structure RD 164+400

9. The fall structure at RD 164+400 has a width of about 62.68 m and consists of 21 gates (each of 2.13 span). A village road also crosses this structure. The total head available is 1.65 m. Sheikhupura distributary and Akbar off-takes are on the right while Harpoki is on the left side. A flow gauge is installed upstream and downstream of the fall structure. The basic hydraulic data are compiled in Table III-2.

Table III-2: RD 164+400; Basic Hydraulic Data

Description	Unit	Designed (Previous)
U/S Bed level	masl	217.41
U/S FSL	masl	220.57
D/S Bed level	masl	215.82
D/S FSL	masl	218.92
D/S Discharge	m^3/s	254
Fall head	m	1.65
Bed slope	‰	0.15

Fig. III-3: Fall Structure at RD 164+400



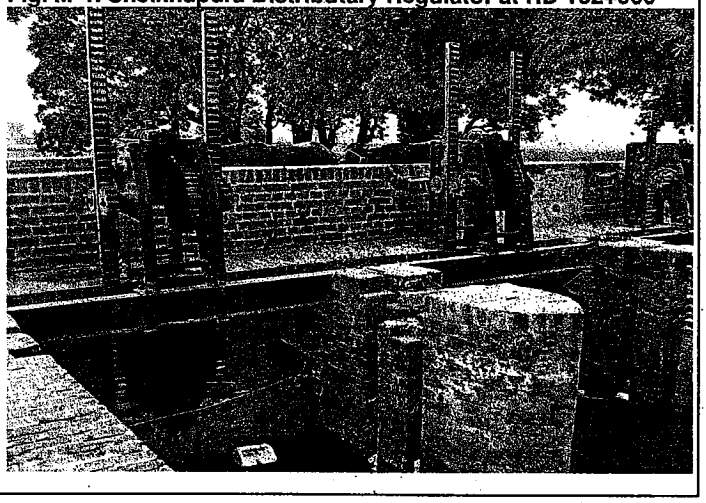
c Head regulator Sheikhupura Distributary

10. The 7.70 m wide head regulator of Sheikhupura distributary is located at RD 162+000 on the right side of canal supporting a village road bridge of 3.65 m width. The regulator is equipped with 3 manually operated gates. Its design capacity is 10.30 m^3/s.

Table III-3: Sheikhupura Distributary at RD 162+900; Basic Hydraulic Data

Description	Unit	Designed (Previous)
U/S Bed level	Masl	217.52
U/S FSL	Masl	220.68

Fig. III-4: Sheikhupura Distributary Regulator at RD 162+900



d Harpoki Distributor

11. Harpoki distributary off-takes at RD 163+300 at the left side of canal. It is equipped with a single manually operated gate of 1.52 m width and has a discharge capacity 1.2 m^3/s. It supports a village road bridge of 3.05 m width. The full supply level of the distributary is 219.32 masl.

e Akbar Distributor

12. The head regulator (discharge capacity 1.2 m^3/s) of the Akbar distributary is located at RD 163+700 and off-takes from the right left side of UCCL. It is equipped with a single manually operated gate of 2.44 m width and constructed out of brick masonry with a village road bridge of 3.05 m width passing over. The full supply level of the distributary is 218.82 masl.

B Climate

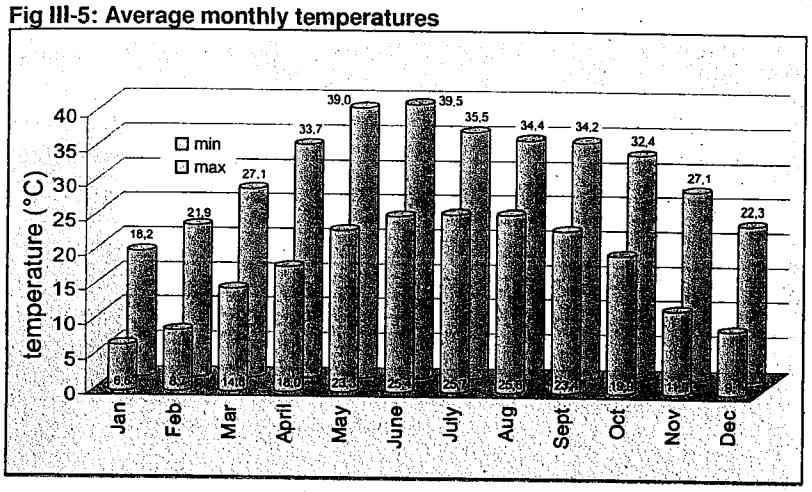
13. Meteorological data have been collected from the Hydrology and Research Directorate WAPDA, for the Gujranwala meteorological station.

14. The climate of the project area is generally hot and dry in summer and moderately cold in winter. Summer starts in April and continues until September. July and August

are the months of summer monsoon. Winter begins in mid October and lasts until mid March.

1 Temperature

Fig III-5: Average monthly temperatures

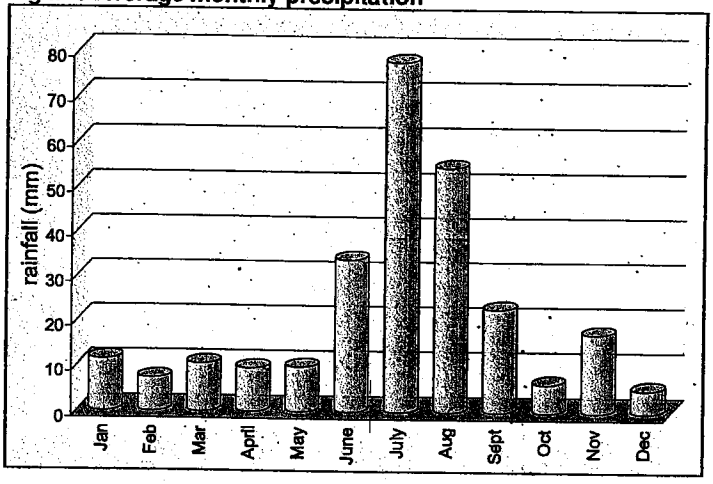


15. The hottest months are May, June and July while December, January and February are the coldest. Based on data from Gujranwala for the period 1991 until 2002, the lowest and the highest values of the monthly mean maximum temperature are 18.2° C and 39.5° C during the month of January and June, respectively. The minimum mean monthly temperature varies between 6.6° C and 25.7° C, whereas the average mean monthly temperature varies between 12.4° C and 32.5° C (compare Fig. III-5).

2 Rainfall

16. Average annual total rainfall at Gujranwala during the period 1991 until 2002 was 266.3 mm. Most of the rainfall occurs during the summer monsoon period (July to August) amounting to 66.0 % of the total average annual rainfall. October is the month of minimum rainfall (0.50 mm) and July the month of maximum rainfall (average: 373.1 mm). The maximum annual rainfall recorded so far (1991 to 2002) was 813.1 mm in 2001.

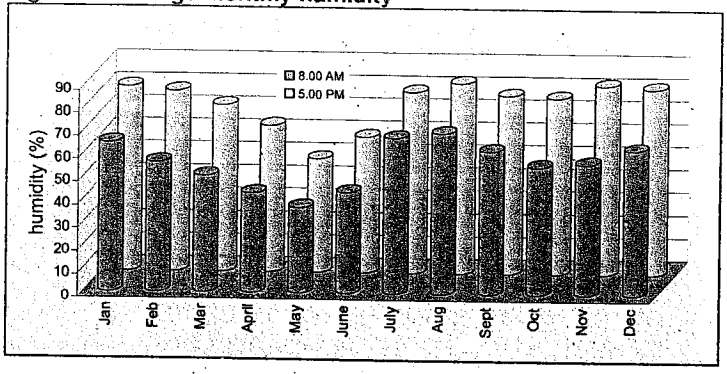
Fig III-6 Average monthly precipitation



3 Humidity

17. Humidity is measured at 08:00 am and 05:00 pm. Average relative humidity for the years 1991 to 2002 are compiled in Fig. III-7 indicating a variation in humidity ranging from 49.1% in May to 82.9% in August.

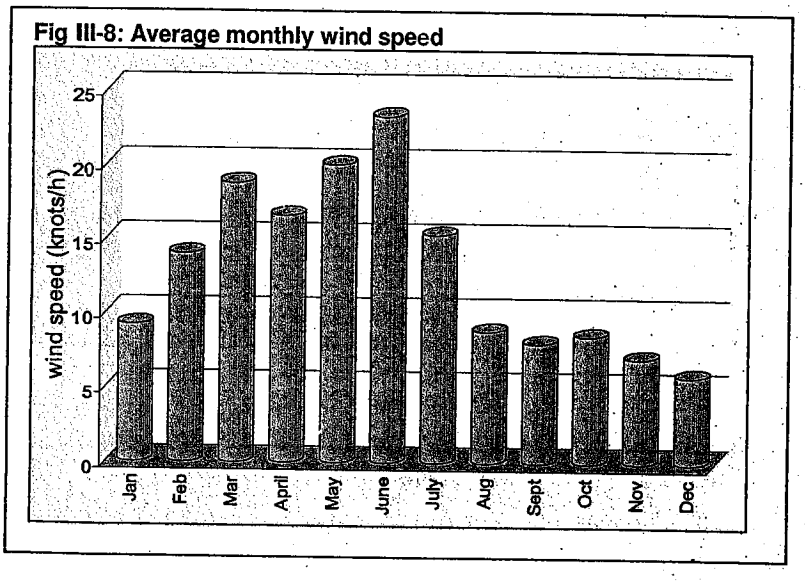
Fig. III-7: Average monthly humidity



4 Wind Speed

18. Average monthly wind speed is calculated using daily data measured at Gujranwala Meteorological Station (Fig. III-8). The minimum and maximum values of wind speed are 5.8 knots per hour in December and 23.3 knots per hour in June, respectively (1991 – 2002).

Fig III-8: Average monthly wind speed



C Hydrology

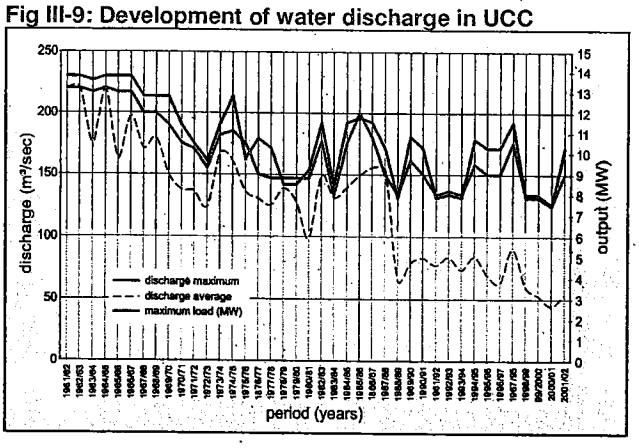
19. The proposed Chianwali Hydropower Project is a run-of-river scheme with powerhouse near RD 130+000. Hydrological and power potential estimations are based on canal flow and head data.

1 Data Sources

20. As all canal water flow is artificially regulated, it does not depend on precipitation or river flow. Therefore, the hydrological calculations are based on the discharge measurements in the canal itself only. Discharge and water level data and related discharge rating tables were collected from the office of the Executive Engineer, Irrigation and Power Department, Government of Punjab at Sheikhupura.

21. All data have been checked for accuracy and quality and have been found to be of sufficient quality to be used in this study. Consequently, the present discharge measurements at fall RD 128+000 and RD 164+400 which are officially sanctioned were used as the main data source. Data from the head regulator were used for quality control. Water levels data at RD 128+000 and RD 164+400 were used for head calculation. All data are compiled in Annex III.

Fig III-9: Development of water discharge in UCC



22. The discharge data series indicate that until the 90s, the water flow reaches approximately the design discharge of 492.5 m³/s, e.g. 439.9 m³/s in July 1990 and 457 m³/s in September 1967. During recent years, discharge decreased remarkably showing a maximum value of about 199.5 m³/s only (May 1992). As can be taken from Fig. III-10 (data are from Chichoki hydropower station located at the same canal) the discharge is approximately constant at a lower level. Reasons for this have been analysed in the WAPDA/HEPO feasibility study. It was found that irrigation water was led through other link canals (e.g. Qadrabad Balloki Link) instead of using the UCCM.

23. Thus, no water shortage but water management are the reasons for the lower discharge in UCCM. However, it seems to be a difficult and time consuming exercise to change the complex irrigation system again only due to power generation aspects which is anyhow not of utmost importance for the Irrigation department. It was therefore decided to design the power station at the average discharge flow since 1991. Consequently, the data series from 1991 until 2004 have been used for further analyses.

2 Flow Duration

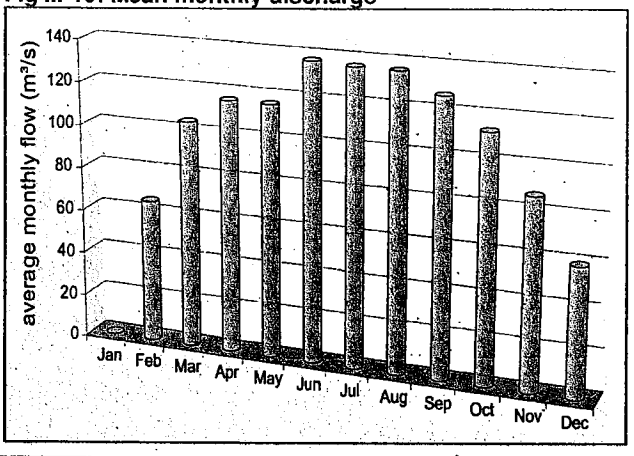
24. Daily stream flows (morning and evening) are available for more than 40 years. As mentioned above, the data series for the period of 1991 – 2004 (14 years) were collected and processed. The data have been summarized as daily, 10 daily mean, mean monthly and annual flows and are compiled in Annex III. The mean monthly and annual flows are presented in Table: III-4 below.

Table: III-4: Monthly and Annual average discharge

Months	Discharge (m^3/s)
January	0
February	65.4
March	104.3
April	116.0
May	136.6
June	137.3
July	136.2
August	136.1
September	126.8
October	112.8
November	87
December	59.1
Average Annual	**101.5**

Flow in January in some years above 0

Fig III-10: Mean monthly discharge

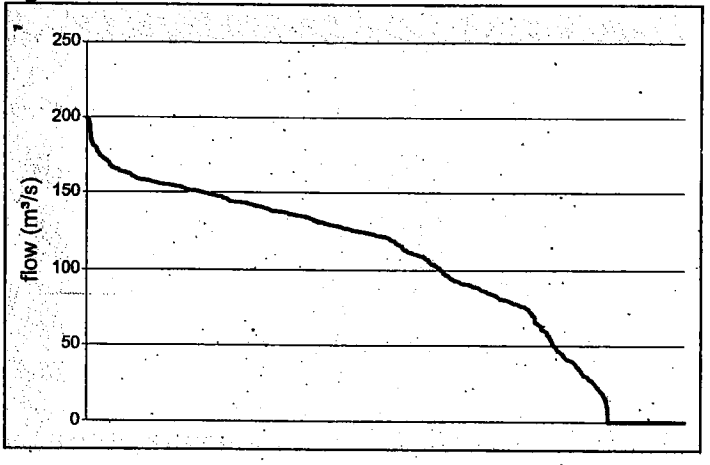


25. The annual availability of discharge expressed in % of time is compiled in Table III-5 and presented as flow-duration curve in in Fig. III-11.

Table III-5: Annual discharge Availability

% of Time	Discharge (m^3/s)
10	151.7
20	143.0
30	137.6
40	129.0
50	118.2
60	105.6
70	80.8
80	65.0
90	26.6
100	0

Fig III-11: Flow duration



26. The canal usually remains closed in the month of January due to the annual closure period for maintenance. Nonetheless, during some years flows were also recorded during January. However, for the following calculations, flow in January has been considered to be zero. The minimum and maximum discharges recorded in the above mentioned period were 5.1 m^3/s and 199.5 m^3/s, respectively.

3 Discharge

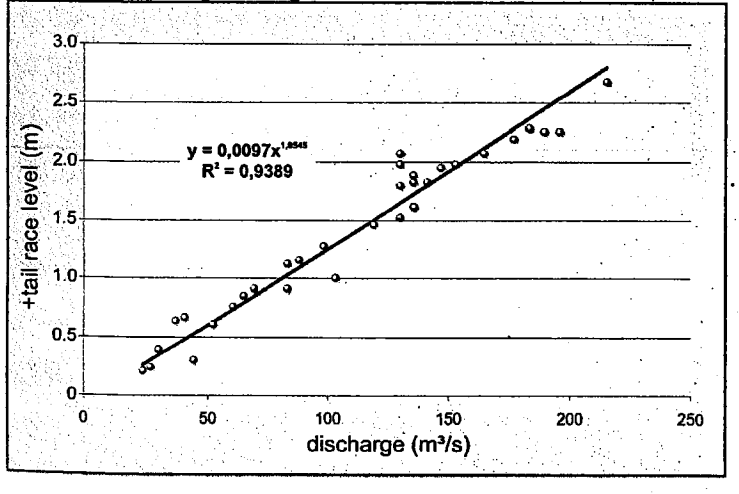
27. The discharge rating table (Table III-6) at RD 128+000 was collected from the Irrigation and Power Department, Government of Punjab. The resulting function is presented in Fig. III-12.

Table III-6: Discharge Rating Table

Head (m)	Discharge (m³/s)	Head (m)	Discharge (m³/s)
0,67	40,14	0,76	60,34
1,16	87,99	0,30	43,97
0,85	64,70	0,61	51,93
0,91	69,18	0,24	26,06
1,13	83,14	0,21	22,89
1,28	98,22	0,91	83,14
1,52	129,83	1,01	103,03
1,98	152,72	1,98	129,86
2,20	176,83	0,64	36,43
2,29	183,03	0,40	29,41
2,07	164,62	2,68	215,10
1,95	146,88	2,26	189,29
1,80	129,86	2,26	195,64
1,83	135,44	1,83	141,13
2,29	183,06	2,07	129,86
1,46	118,87	1,62	135,72
1,62	135,44	1,89	135,44

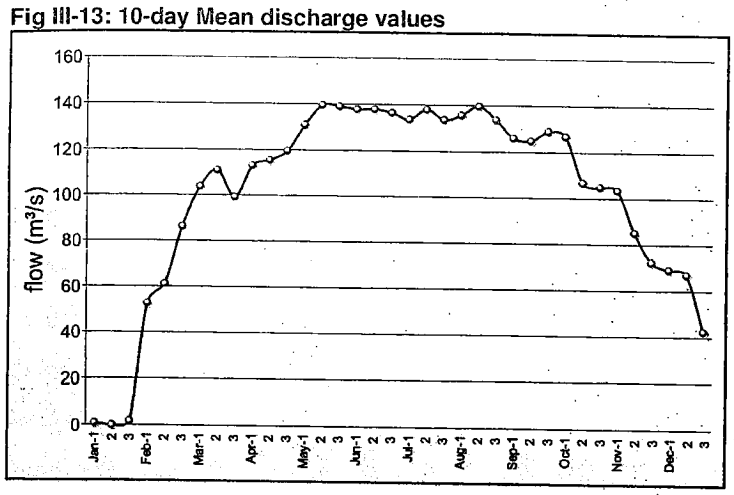
28. Head calculation (Annex. III) was conducted by using a constant upstream water level at 223.81 masl at the power house location and variable downstream water levels calculated by applying the results of the rating curve (Fig.III-12). The results are presented in Fig. III-11.

Fig III-12: Discharge Rating Curve



29. The 10-day mean discharge values are presented in Fig. III-13.

Fig III-13: 10-day Mean discharge values



30. The basic hydrological data at the power house location (RD 130+000) are compiled in Table III-7

Table III-7: RD 130+000; Basic Hydraulic Data

Description	Unit	Designed
U/S FSL	masl	223.75
U/S Bed level	masl	220.55
D/S FSL	masl	220.51
D/S Bed level	masl	217.40
D/S max. design Discharge	m³/s	253
D/S minimum water level for operation	masl	217.81
Fall head F/S	m	3.20
Fall head zero supply	m	6.44
Bed slope	‰	0.15

4 Sediment Analyses

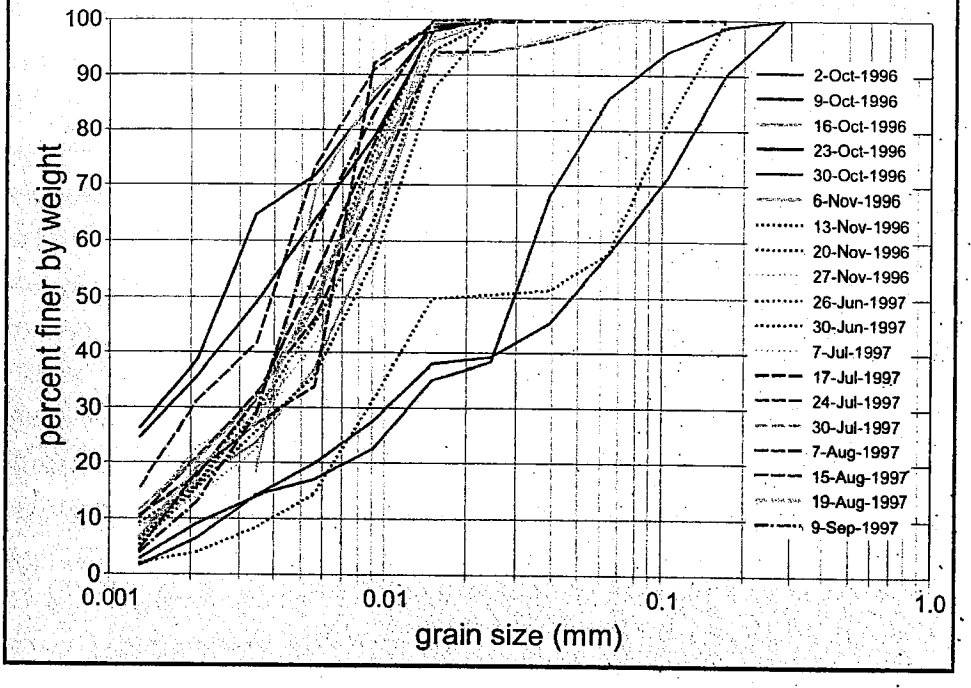
31. Sediment sampling and analyses have been performed by ISP, WAPDA in 1996 and 1997 at RD 0+000[3]. Because no other water flows into the canal in between RD 000 and RD 128 the values are representative for the situation at RD 128, too.

32. The results are compiled in Annex IIII and presented in Figure III-14. They indicate that there will be no negative impact on the power station especially due to sediment load. Anyhow, due to the very low head power generation, system abrasion effects at the turbine runner caused by suspended load are not likely to occur. The maximum tolerable concentration and values are to be provided by the turbine manufacturer.

[3] ISRIP, WAPDA, 1998: Bathymetric and Sedimentation Survey, Publication No. 187, March 1998.

33. Bed load does due to the ponding system in front of the headregulator at RD 000, the controlled inflow into the canal which is regulated by gates, the little slope (0.15‰), and the resulting low velocity, not occur.

Fig III-14: Sediment analyses



D Power and Energy Calculations

34. The power and energy calculations are based on the following formulae:

- **POWER**

$$P = Q \times H \times g \times \eta / 1000$$

with:

P	=	Power (MW)
Q	=	Discharge (m^3/s)
H	=	Available gross head (m)
g	=	Acceleration due to gravity (9.81 m/sec^2)
η	=	Efficiency coefficient (%)

- **ENERGY**

$$E = P \times T$$

with:

E	=	Energy (MWh)
P	=	Power (MW)
T	=	Time (h)

35. Considering the only small fluctuations in water discharge, total design discharges of 150 and 140 m³/s have been analysed. In case of a 150 m³/s design discharge, the

full load time is about 70 days or 19% respectively. 140 m³/s are available during about 100 days or 29% of the year. The bigger set must run a much longer time in part load and already has to switch off at an earlier stage (minimum discharge required is about 20% of design load).

36. The difference in power generation finally amounts to about 715,000 kWh per year (about US$25,000) which justifies the higher investment cost for E&M and civil construction.

37. Consequently, the design discharge was set at 150 m³/s (2 sets of turbines with 75 m³/s each). Full load efficiency was conservatively estimated at being 85%. For part load operation, respective part load efficiencies (resulting from decreasing efficiencies of turbines) have been adopted. The resulting power and energy estimations are presented in Table III-8 and Fig. III-15.

IRRIGATION & POWER DEPARTMENT
GOVERNMENT OF PUNJAB

ADB TA No. 4425-PAK

Renewable Energy Development Project

(TAR 34339-01)

CHIANWALI HPP FEASIBILITY STUDY

Volume 3: Environment Assessment

ADB TA No. 4425-PAK

Renewable Energy Development Project
(TAR 34339-01)

CHIANWALI HPP FEASIBILITY STUDY

Volume 1 of 4	Technical Report
Volume 2 of 4	Economic and Financial Analysis
Volume 3 of 4	**Environment Assessment**
Volume 4 of 4	Resettlement Plan

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Photos from
MR Marlene Richter
DR Derek Ratcliff

LIST OF ACRONYMS

CURRENCY EQUIVALENTS

Currency Unit Pak Rupee (Rs)
US$1.00 = Rs.60.00

ABBREVIATIONS

ADB	Asian Development Bank
AEDB	Alternative Energy Development Board
DD	Deputy Director
EA	Environmental Assessment
ERO	Environmental and Resettlement Officer
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
FD	Forest Department
GCHP	Gujranwala Canal Hydropower Project
GoP	Government of Pakistan
GTZ	Deutsche Gesellshaft fur Technische Zusammenarbeit (German Agency for Technical Cooperation)
GWh	Giga Watt hour
HEPO	Hydro Electric Planning Organization
HHs	House Holds
IA	Implementing Agency
IEE	Initial Environmental Examination
IUCN	International Union for Conservation of Nature
I&PD	Irrigation and Power Department of Punjab
LBDC	Lower Bari Doab Canal
MW	Mega Watt
NO_X	Oxides of Nitrogen
NWFP	North Western Frontier Province
O&M	Operation and Maintenance
PHED	Public Health Engineering Department
PMU	Project Management Unit
RoW	Right of Way
SIEE	Summary Initial Environmental Examination
SO_X	Oxides of Sulfur
TA	Technical Assistance
UCCL	Upper Chenab Canal Lower
WAPDA	Water and Power Development Authority

WEIGHTS AND MEASURES

ac	acre
ft	Feet/Foot
ha	hectare
km	kilometre
m	meter
m^3	cubic meter
m^2	square meter
s	seconds

EXECUTIVE SUMMARY

Objectives and Approach

The potential of Gujranwala Canal Hydropower Project (GCHP) was first identified in studies undertaken by Water and Power Development Authority (WAPDA) in 1988 and 1992. A Feasibility Study of GCHP was undertaken in 2004 by Hydro Electricity Planning Organisation (HEPO), of WAPDA and this included an Environmental Assessment (EA) of the project. The Irrigation and Power Department of Punjab (I&PD) has been trying to obtain Provincial and Federal Governments' approval and funding, but the project remained pending because of non-availability of reliable funding.

The Government of Pakistan has requested loan funding from the ADB for a number of renewable energy projects. ADB is making loan preparations and a PPTA is being conducted in cooperation with the provincial power cells in Punjab and NWFP with AEDB as Executing Agency (EA). GCHP is one of the locations to be reviewed by the project team for the preparation of the ensuing loan. The other canal sites reviewed in Punjab under this same TA are close to the settlements of Okara, Sheikhupura, Pakpattan, and Marala. I&PD as the Implementing Agency (IA) will be responsible for all the sites.

GCHP (also known as Chianwali Hydropower Project) is a small (4.82 MW) hydropower scheme, which is placed in an existing irrigation canal. Under ADB guidelines GCHP is a Category B project, and, as such is subject to an Initial Environmental Examination (IEE). The project also requires an IEE under the Environmental Assessment requirements of the Government of Pakistan. A resettlement plan was also undertaken as part of the TA.

The project consists of a temporary diversion canal on the right bank of the Upper Chenab Canal Lower. Upstream and downstream cofferdams are constructed immediately upstream and downstream of an existing fall in the Canal to allow the demolition of the existing fall in the river and for the powerhouse to be built directly in the Canal. When the powerhouse is completed, the cofferdams are removed and the diversion canal is filled in and returned to its original land use. The project uses the fall at this canal to produce an instantaneous power output of 4.82 MW, and electricity production of 23.52 GWh/year.

Environmental impacts

The WAPDA and HEPO feasibility studies investigated a similar location for a permanent diversion canal on the right bank. Alternative alignments and designs have been examined in this TA for the project. The right bank permanent diversion alternative in the HEPO study is superseded by a temporary diversion, which involves no permanent loss of land. No resettlement is involved and the environmental impacts of the project, as now proposed, are minimal. There is a requirement only for the temporary acquisition of 0.6 hectares of irrigated farmland and three trees.

As the powerhouse will be placed inside an existing canal, with no impact on the existing canal regime, no impacts are expected during the operation phase of the

project. The powerhouse site will have a new road bridge crossing the canal and the existing road along the right bank of the existing canal will be renovated and improved.

During construction there will be limited impacts as a result of the construction of the diversion canal, cofferdams and a colony for permanent staff. There will also be a temporary camp for construction labour which can be accommodated inside the existing land owned by I&PD.

Environmental mitigation

There will be limited impacts from construction of the diversion canal, cofferdams, a camp for permanent staff and a temporary camp for construction labour. All these facilities can be accommodated in the extensive I&PD owned Right of Way (RoW) areas.

Mitigation measured included in the EMP are as indicated below:

Table 1 Summary of Mitigation

#	Mitigation Measure	Total (Rs)	Total $US
1	Compensation for 0.6 hectares of temporary land acquisition, crop loss and affected trees	199,500	3,325
2	Environment & Resettlement Expertise	175,000	2,917
3	Plantation of endemic tree species along canal road and the rehabilitated temporary diversion canal	10,728	178
4	***Sub-Total***	***374,500***	***6,242***
5	Contingencies (15%)	56,175	936
6	**Total Estimated Costs**	430,675	7,178

Exchange Rate: US $ 1.00 = Rs. 60.00

Conclusions

The Project has very little environmental impact and the impacts identified are only during the construction phase. These limited impacts can be successfully mitigated by implementing the EMP attached to the IEE. The IEE and EMP are adequate to ensure compliance with ADB and GOP environmental safeguards. On the basis of this IEE, there is no need for a full environmental impact assessment. However, I&PD, the Implementing Agency, (IE) will need to strengthen its capabilities to implement and monitor the measures in the EMP. This has been designed into the project by requiring the employment of an Environment and Resettlement Officer (ERO) in I&PD and the appointment of an environmental & resettlement specialist.

I INTRODUCTION

A. Purpose and Scope of Environmental Report

1. This environment examination is undertaken as part of the overall feasibility study for the Gujranwala Canal Hydropower Project (GCHP) and is designed to meet the requirements for environmental assessment (EA) under the guidelines of ADB. I&PD (Irrigation and Power Department) Punjab will also submit this report for review and approval by the Pakistan Environmental Protection Agency (EPA) under the Environmental Assessment (EA) laws of Pakistan. This project is also known as Chianwali Hydropower Project.

2. The GCHP is one of a number of small low head projects, which have been examined by WAPDA in the past. GCHP is intended to augment the national power supply and distribution systems in Punjab. At the same time the project will help supply Pakistan's overall energy needs.

3. Large power projects are implemented by WAPDA, and smaller projects up to 50 MW, are generally undertaken at Provincial level. In this case the I&PD of Punjab Province will be responsible. I&PD will be the Implementing Agency (IA) for the project and is also the proponent as specified under the environmental requirements of ADB and the Pakistan Environment Protection Agency (EPA).

4. The project makes use of the existing water flow and fall in an established irrigation canal system. It will not change the water flow characteristics and hydrological regime of the area. This study looks at the potential impacts of construction and operation of the project on the Upper Chenab Lower Canal and the adjoining area of its influence.

5. Six km of 11 kV overhead transmission lines is required to link GCHP to the national grid and the corridor for the lines is inside the I&PD RoW.

6. This Initial Environment Examination (IEE), along with a resettlement plan, is part of an ADB-TA to examine a number of small hydropower projects in Punjab and NWFP. The work was completed with approximately three weeks of input from international and local consultants.

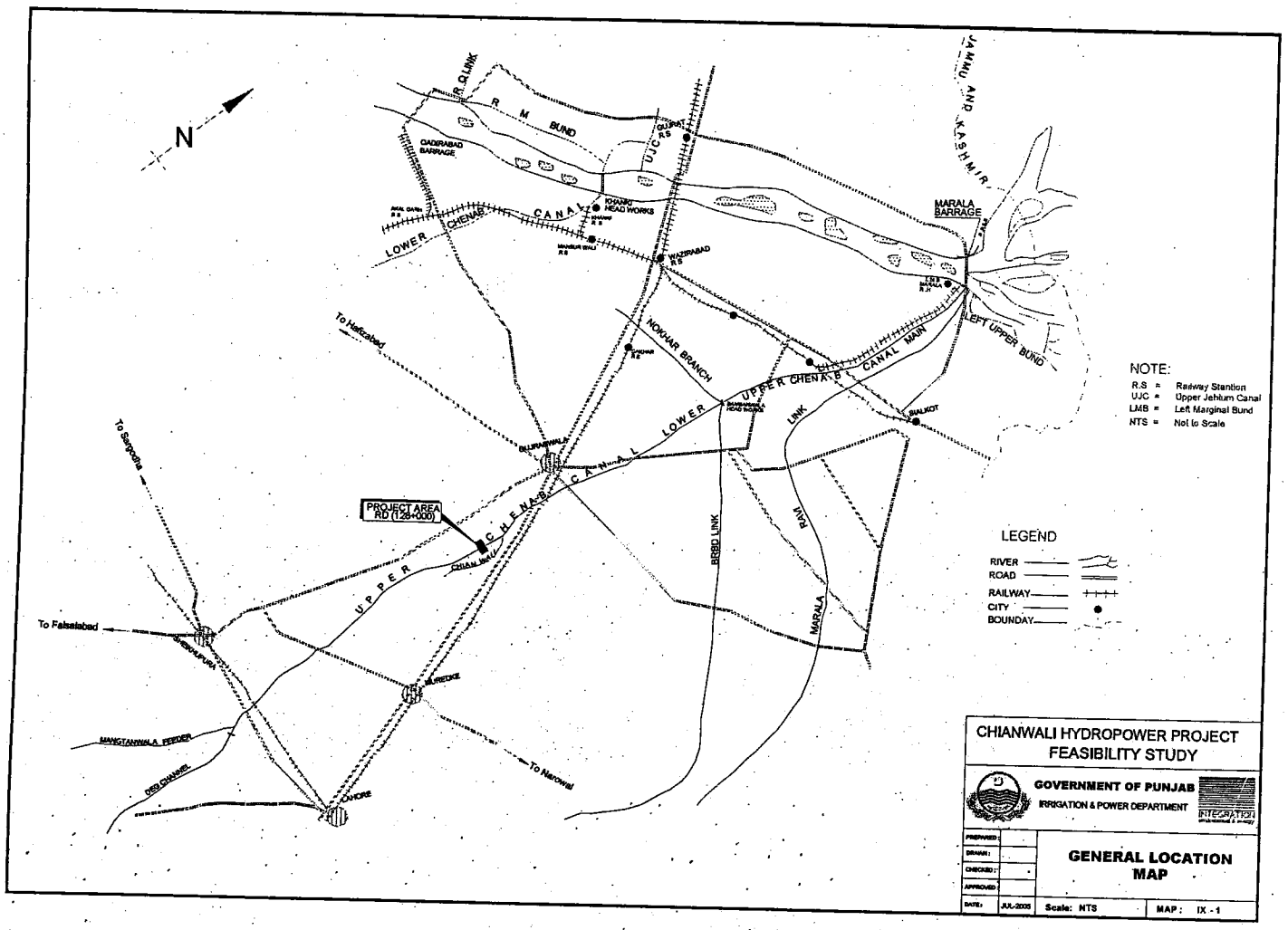
7. An IEE was conducted as part of the overall feasibility report for GCHP in March 2004 by Hydro Electric Planning Organization (HEPO) a subsidiary of WAPDA. The information contained therein has been incorporated in this report, where appropriate. Information was also gathered during short field visits by I&PD staff and the consultants. Stakeholders meetings were held with local community leaders, affected individuals and with government agencies at Islamabad, Lahore and at site specific locations. Specifically, consultation group meetings were held on 25th July and 18th September 2005 in Chiyanwala village close to the site of GCHP. Field staff working in the area were also interviewed. A full list of those persons and organizations contacted is provided in Annex 1.

8. On 29th September 2005 a Workshop was held in Lahore to familiarize the IA and other concerned Government Departments with the ADB policy and guidelines with

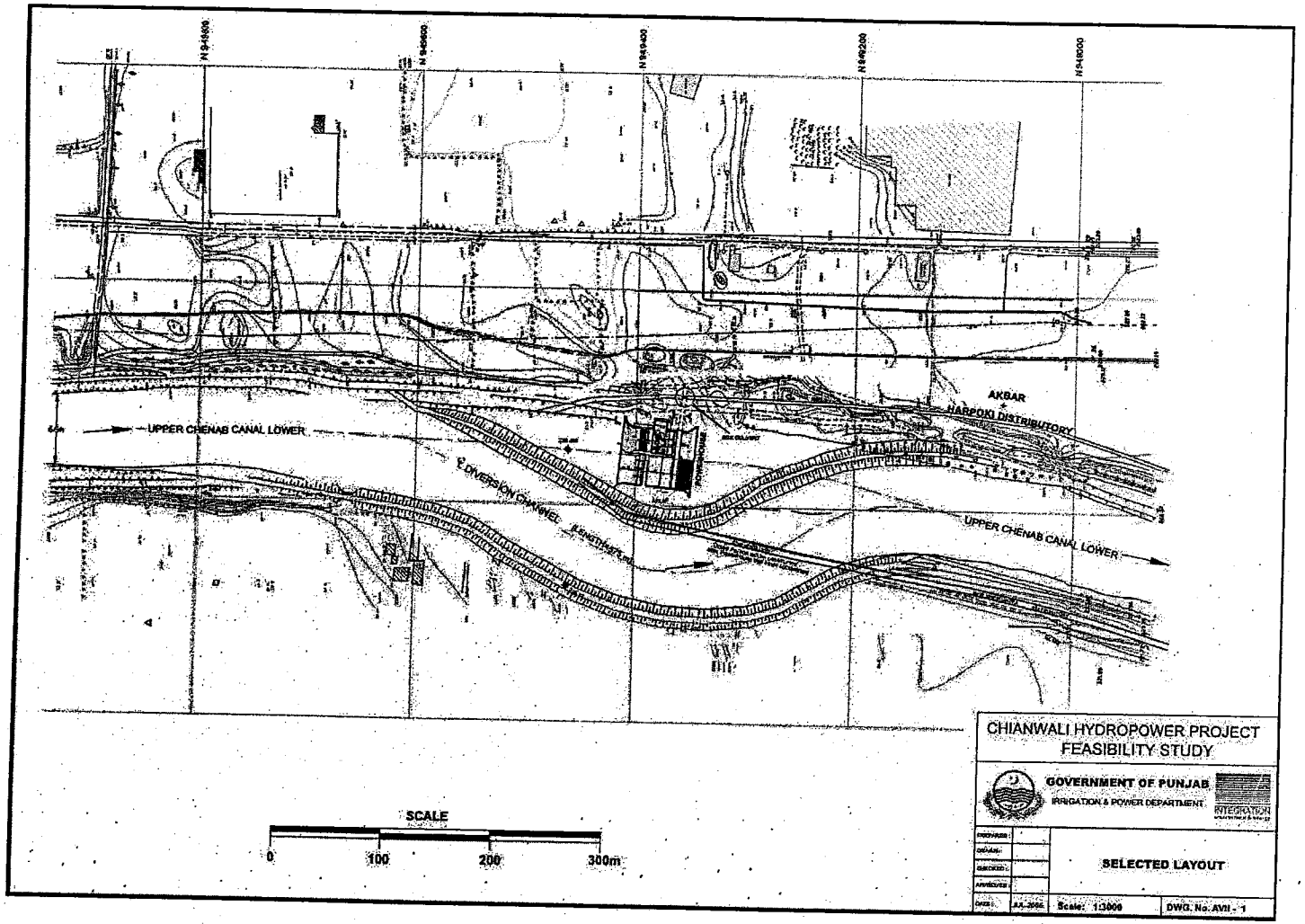
respect to EA and Involuntary Resettlement Policy. Altogether 35 participants from I&PD, WAPDA and HEPO joined the Workshop in order to share information.

9. The adverse impacts of these low head hydropower projects investigated in the TA will be relatively few. The preferred design for all the projects is similar with a powerhouse constructed directly in the existing canal bed. A temporary diversion canal maintains the flow of water in the Canal system for general irrigation purposes during project construction. Additionally an extensive Right of Way exists along all the main canal systems, having been acquired for the original construction of the Irrigation Canals many years ago. Therefore, the impacts of the above mentioned Hydropower Projects reviewed under this TA are very similar with only temporary land acquisition and a very small number of affected households, if any. In addition the Implementing Agency (I&PD) is the same and institutional requirements will not change from project to project. For these reasons several chapters of the IEE reports for these hydropower projects in Punjab will be similar or the same.

Map 1 Gujranwala Location Plan



Map 2 Gujranwala Project Layout



II DESCRIPTION OF THE PROJECT

A Type of and Category of the Project

10. This project, because of its relatively small size of 4.82 MW, is classified as a Category "B" project, in accordance with ADB *Guidelines for environmental assessment, 2003*. An Initial Environmental Assessment (IEE) is required to determine if there are significant impacts and if a more detailed impact assessment is necessary.

B Government Approval Requirements

11. The Government of Pakistan has exactly the same environmental assessment requirement as ADB for hydro projects of less than 50 MW. An IEE submission is required to the Punjab Provincial EPA by I&PD. A full scale Environmental Impact Assessment (EIA) is mandatory only for projects bigger than 50 MW.

C Location and General Description

12. GCHP will be constructed on the Upper Chenab Canal Lower (UCCL) near Chiyanwali village. The site is situated between Kamoke and Gjranwalla towns, near a I&PD resthouse, about 55 km from Lahore and about five km from the bridge crossing of Gujranwala Bypass over UCCL near WAPDA Town Gujranwala.

13. The powerhouse replaces an existing fall in the canal system (see Map 1).

14. The main elements of the project and project construction are as follows:

- Construction of a temporary diversion canal 70 m wide and 400 m long on the right bank of the canal (see Map 1),
- Construction of temporary cofferdams upstream and down stream of the existing fall and the proposed dam location,
- Removal of the old road bridge and fall,
- Construction of the powerhouse in parallel with a spillway in the area between the cofferdams,
- Removal of the cofferdams once the powerhouse is complete to allow water to flow back again into the bed of the existing canal and through the new powerhouse and spillway. Sealing off and filling of the diversion canal and renovation of the land,
- The existing right bank unsealed road will be temporarily moved to the bank of the new diversion canal and later rebuilt on its existing alignment once construction work on the powerhouse is complete,
- I&PD colony for offices and residences and the construction camp will be constructed in the existing I&PD RoW,
- An 11 kV transmission line (6km) to link the project to the Kamoke grid station and the national grid.

15. The upstream canal banks are remodelled, raised and protected with stone plastering and geo-textile and a 4 m wide road is constructed at the crest of both of the temporary diversion canal banks. The design discharge of the powerhouse is 45 m^3/s. Roads will be sealed prior to completion of the project. Throughout the construction stages unhampered canal flow for irrigation purposes will be ensured in the canal.

16. The existing road bridge is in need of replacement – it has cracks in the arch structure. The existing fall structure is also very dilapidated and in need of repair. A new bridge will be constructed at the same time and location as the powerhouse.

D. Construction Schedule

17. From the beginning of construction to the commissioning of the project is estimated to take approximately 48 months. The various construction phases of the project are discussed in relation to mitigation measures (see B.2. Construction Activities). Construction scheduling is dependent on the one month closure of the canal system in January/February. It is vital that the diversion canal work is finished well in advance of the closure so that cofferdams can be constructed in the dry period. Only once the diversion canal is completed will work on the powerhouse commence.

III. DESCRIPTION OF THE ENVIRONMENT

A. Provincial Context

18. Punjab forms part of Indus Basin Watershed System. The landscape of the whole Province has been so changed by human activity that hardly any of the original habitat of thorn forests, swamps and riverine plantations remain. The irrigated plains of Punjab today constitute the largest canal system in the world and with the conversion of habitat to agriculture, a number of highly distinctive agro-ecosystems exist and the Forestry Master Plan of 1992 identifies nine such zones.

19. Various protected areas are spread across the Punjab province but none are close to the project area.

B Physical Environment

20. The project is located in a plain area, which is irrigated through a network of canals and which has extensive crop cultivation. The UCCL on which the project stands is a frontal off-take of the Bumbanwala Headwork on the tail of the Upper Chenab Canal, which in turn comes from the Marala Barrage constructed in 1968. The average elevation of the project district is barely 150 m above sea level.

21. The area falls in the moist temperate zone and receives rains in the summer monsoon. Some residual precipitation is also received in the winter months through western Mediterranean winds. The area gets nearly 205.5 mm[1] precipitation/annum, with maximum in July of 87.7 and minimum in November of 2.6 mm. The lowest and highest values of mean monthly maximum temperature are 5.9 C and 42° C during the months of January and June respectively.

[1] Bahawainaga rainfall records between 1963 & 2001

22. The soils of the project are characterised as alluvium deposits of sandy-loam and sandy-silt. These soils are generally well drained and exhibit no signs of water logging and salinity.

23. The UCCL delivers a uniform irrigation water flow for 11 months of the year. The local population of the project area uses water from the canal for a number of purposes like washing, bathing and drinking. Canal water for drinking purposes has been reported in the lower reaches of the system where soils are not well drained and considerable problems of water logging and salinity persist. Most of the households (HH) in the immediate project area have local hand pumps for their everyday needs. The proposed project will neither bring any changes to the existing hydrological regime nor will it affect the local communities' day-to-day canal water usage other than some potential reduction in water quality during the construction phase. A significant load of suspended solids is carried by canal water in the shape of silt for which no sampling data is available[2].

24. According to "Seismo-Tectonic Map of Pakistan", the project area belongs to one of the least active earthquake zones of the country, Zone "0". According to seismic history of the region, deep earthquakes have been reported with negligible damages.

25. This is an alluvial area and aggregate and sand has to be imported from external sources.

C. Ecological Resources

1. Wildlife

26. Because of extensive cultivations, high population and human activities, there is little wildlife in the project area. However, the local population as well as the Wildlife Department have reported some fauna. The following is a general wildlife profile of the area:

- **Mammals:** Common mammals reported from the project area wild-bore, hyaena (*Hyaena striata*), red Indian foxes (*Vulpes bengalensis*), porcupines and jackals (*Canis aureus*). Until a few years ago the wolf (*Canis palfies*) was also found in riverain forests, but the species has almost become extinct due to loss of forests.

- **Birds:** The commonly found birds of the area are hawk (*Accipiter badius cenchroides*), kite (*Milvus migrans govinda*), parrot (*Paleornis torquata*), partridge (*Fvancolinus pondoceraianus mecrranesis*) and common crow (*Corvidae splendens*). A large variety of waterfowls and migratory birds also visit the region because of wetlands associated with barrages along the river systems of the area.

- **Reptiles:** Because of hot and humid climate of the region, some population of reptiles have also been reported from the project area. Reptilian and amphibian fauna is not well documented. However, local people have reported that snakes and lizards are common in the region.

[2] Ibid, Sediments, paragraph 7.2.1.7.

27. Wild-bore are reported to be inflicting serious crop damages, mainly to sugarcane and potatoe crops. Some degree of illegal hunting, poaching and trapping has been reported from the project area.

2 Forest Resources

28. The entire Gujranwala District has no natural forests, mainly due to vast agricultural activities. However, according to an old provincial notification, the trees along canals, provincial highways and rural roads are the responsibility of the forest department, which fall in the category of reserved forests.

29. Along the canal segment of the project there is some significant plantation of trees – nearly all eucalypts, which have been cultivated by the Forestry and I&PD. There is also some rosewood, *Sheesham* (*Dilbergia sisoo*) which are mostly diseased due to some fungal attack[3]. Species in the area also include *Sheesham* (*Dilbergia sisoo*), *Keekar* (*Acacia arabica*), *Peeloo* (*Salvadora persica*), *Bohar* (*Ficus religiosa*), *Gaz* (*Tamarix indica*), *Nim* (*Azadrichta indica*), and Mesquite (*Prosopis juliflora*). Eucalypts and Mesquite are exotic species and mesquite has suppressed endemic species to a great extent. The endemic species of *Peeloo* and *Bohar* are reported to be endangered, as the forest department is not propagating the same, and similarly the wild berry (*Zizyphus numularia*) has almost become extinct.

30. Local farmers are practicing a small degree of farm-forestry in the project area to meet their fuel-wood and other day-to-day needs. The common species in such plantations are Poplar (*Populus alba*), Eucalyptus, *Keekar* (*Acacia arabica*), mulberry (*Morus alba*) and *Jamun* (*Syzygium cumini*).

3. Cropping Patterns

31. Ever since the irrigation canal system was developed, cotton, rice, sugarcane and wheat have been the main crops. During more recent times cropping patterns in the region have witnessed further major changes. Cotton had always been the major cash crop earning foreign exchange for the country. Due to some serious pest/viral attack, farmers have sustained major losses, and over the last decade, cotton cultivation has almost been replaced by maize. Currently, as many as three maize crops per annum are being cultivated.

32. Similarly, sugarcane cultivation has also displayed considerable decrease, mainly due to pest infection and delayed payments to the growers by the sugar industry. Maize has equally replaced the sugarcane crop. Also large areas of land vacated by cotton and sugarcane have also been brought under potato cultivation.

33. Because of hot and humid weather, Gujranwala District is also famous for its fruit production, which includes mango, guava, banana, oranges and water-melons.

[3] This viral attack is found throughout South Asia, commonly known as "Sheesham Die Back". A considerable amount of research work is underway to find the causes of this infection and its remedial measures, with no coordination amongst other countries of the region.

4 Fish Resources

34. It is reported by the Fisheries Department that the main fish species found in Canal are *Gulfam (Cyprinus carpio)*, *Rahoo (Lebeorohita* sp) and *Mohri (Crhinus miragata)*. It has also been stated that no methodical fish surveys have been conducted by the Department of fresh water streams and canals, in the recent past. Because of the construction of several barrages on the river network, migratory species like *Khagga, Bam* and *Pamphlait* have almost become extinct in Punjab waters and *Soal* and *Shangri* are considered to be highly endangered.

35. In the month of January the canal is closed down for annual repair, maintenance and de-silting purposes. In this period fishing contracts are awarded and the contractors take the fish before the canal dries out. In this way the entire fish population in the canal is destroyed annually.

36. Currently, the main concentration of the Fisheries Department is upon development of private fish farms. It has been reported that there are approximately 400 – 500 acres of such farms, which meet the growing demand for fish.

D. Socio-Economical and Cultural Environment

37. The project area has a reasonably well developed communication infrastructure. An unsealed 3 km road links the area to the main road system and Gujranwala and Lahore are a further 3km and 55km away on sealed roads.

38. Chiyanwali is the closest village to the site. It is a large compact village, reportedly consisting of about 1,250 households with an estimated population of 9,000 persons and an average household size of 7.2. It is a fairly modern village by Pakistani standards, being situated on the main N-5 road to Lahore. It has 100% domestic electrification, drinking water supply and a basic health unit. There are three private maternity homes and clinics, and five schools, separate for boys and girls, including a private English Medium Primary School for boys. In addition, the village has two Women's Training Centres (embroidery and sewing).

39. The main Chiyanwali village has a small market consisting of 46 shops selling groceries, clothing, vegetables, fruit, candies, milk, meat, stationary, medicines, etc., and providing various traditional and technical services, like tailoring, shoe-mending, hair-cutting, etc. Moreover, there are three major industrial establishments, two producing chipboard and one a Ghee cooking oil factory.

40. Chiyanwali village has a total land area of 1,000 ha, approximately 950 ha of which are irrigated by canal and tube well water. The remaining 50 ha are covered by village housing and industries. The predominant cropping pattern is of wheat and rice rotation, while some farmers also grow sugarcane, fodder and vegetables for sale in Gujranwala and Lahore.

41. The village has a large population of livestock for milk and meat production. Water buffaloes are very common for producing milk and milk products. Approximately 60% of village households keep 6 to 20 buffaloes and 25% households have 10 to 30 goats for meat production, marketed in the towns of Punjab province. Poultry

production and business is quite common in the village, where almost every household keeps five to ten hens for egg and meat production.

42. The average farm-size is small and for many households it is below the minimum economic unit of 5.0 ha. Thus, most of the villagers whether landowners, tenants or the landless, depend on various off-farm income sources for their living, i.e., industrial labour, government jobs and small entrepreneurship.

43. The adult population of Chiyanwali village is highly educated, where the men's literacy rate is 63% and the women's is 48%. The children's literacy rate is far higher, as 95% of the boys and 75% of the girls are reportedly enrolled in the schools and colleges.

44. Women participate equally in farming and small business activities. Over 200 women are working as village school teachers, as paramedical staff at the private maternity home and in the nearby industries. Over 100 women are enrolled at the two women's skills training centres and 300 who have completed training work at their homes, producing embroidery and garments for sale in the towns.

45. Income levels for the people of Chiyanwali village are shown in the Table below:

Table 2: Household Income Distribution of Chiyanwali Village by Tenure Status

No.	Poverty Status	Average Monthly Income (Rs)	Percentage of Households (%)		
			Landowners	Tenants	Others
1	Poor / Very Poor	Up to 5000	-	60	5
2	Average Type	5,000 - 10,000	85	35	85
3	Better Off / Rich	Above 10,000	15	10	10
			100	100	100

Source: Fieldwork – Key Informant Interviews and Group Discussions.

IV CONSIDERATION OF ALTERNATIVES

46. This TA Feasibility studied alternative solutions for the project. These alternatives consisted of the examination of:

- different right bank diversions,
- one fall and two fall schemes,
- different designs for the powerhouse,
- placing the powerhouse in the existing canal or inside a diversion canal.

47. The design investigated in the 2004 HEPO study was for the powerhouse to be constructed inside a 500 m. permanent right bank diversion of the main canal. The present proposal is for a 400 m long temporary diversion with less requirement for land acquisition. Placing the powerhouse inside the existing canal, as now proposed, rather than a diversion canal also reduces the amount of permanent land required for the project as the diversion canal can be returned to its original state at completion of the powerhouse construction. See comparison table below.

Table 3 Comparison of Impacts of HEPO and New Design

No.	Resettlement Item	Unit	HEPO Design	New Proposal	Net Saving
1	Private Poultry Farm (2000 Chicken)	Number	1		1
2	Private Dairy Farm (30 Buffaloes)	Number	1		1
3	Private Tubewell (Electric)	Number	1		1
4	Katcha Farm Houses for Tenants	Number	3		3
5	Road Bridge Across UCC (RD 128)	Number	1	1	0
6	Katcha Road on Right Bank of UCC	Meters	400	300	100
7	UCC's Seepage Collection Tank	Number	1		1
8	Affected Land (Irrigated Farmland)	Hectare	2.10	0.60	1.50
9	Affected Private Land Owners	Number	7	2	5
10	Affected Lease Tenants	Number	2	1	1
11	Affected Person (O+T)	Number	9	4	5
12	Affected Land per Land Owner	Hectare	0.30	0.20	0.10
13	Affected Land per Lease Tenant	Hectare	0.50	0.40	0.10
14	Affected Private Trees (Wood)	Number	6	3	3
15	Affected Government Trees (Wood)	Number	240	200	40

Note: Table and figures from Resettlement Plan

V SCREENING OF ENVIRONMENTAL IMPACTS

48. The ADB checklist for hydropower projects was used to screen for any potential impact. The checklist is attached in the Annex 1 of this document. Impacts, which were determined as having environmental implications, are considered further and where significant impacts occur mitigation has been provided for.

A. Project Impacts and Mitigation Measures

1 Positive Impacts

49. The project will provide electrical power to the wider population. The electricity generated will supply the national grid along with other hydropower projects in the region and will benefit the people of Punjab and the country as a whole. Mains power will mean cooking and domestic heating for those who can afford it and will reduce the pressure on the use of timber and other fossil fuels for heating, cooking and other purposes.

50. The project will also provide unskilled jobs during the construction phase and a limited number of jobs in operations. This will be a bonus for the men of the area, many of who are used to having to travel down country for employment.

51. Hydropower is a clean and renewable source of energy and avoids contributions to pollution loads, which would result from the alternative use of thermal electricity generation. Hence, it is environment friendly. Thermal power generation plants are known for a large variety of toxic emissions i.e. carbon dioxide (CO_2), particulate matter (PM), sulphur dioxide (SO_2), carbon monoxide (CO) and Oxides of Nitrogen (NO_x) etc. The following table provides a comparative analysis of estimated emissions of CO_2 from a power station generating the same amount of energy as the

Gujranwala project over a 30-year period using oil, gas & coal as a fuel source. Between 0.21 and 0.29 tons of carbon dioxide is saved over the 30 years of the project by using hydropower rather than fossil fuels.

Table 4 Comparative Analysis of CO_2 Emission using Oil, Gas and Coal for Generation

Fuel Source	Oil	Gas	Coal
Grams CO_2/kwh	297	232	410
Total Saving (million tons CO_2)	0.21	0.16	0.29

Note: Assumes generation 23.52 GWh per year over a 30 year project life = 681.00 GWh.

2 Loss of Land and Compensation

52. With a 400 metre long diversion canal only a small amount of irrigated farmland will need to be temporarily acquired. Most of the project can be constructed inside the existing Irrigation and Power Department (I&PD) RoW.

53. An additional strip of land adjacent to the right bank of the canal will be required where the temporary diversion canal will intrude into private agricultural land. The total land area to be acquired temporarily will be only 0.6 ha. The land is canal-irrigated land cultivated with wheat and rice (see Table 3 Comparison of Impacts of HEPO and New Design). The land belongs to two persons and one sharecropper tenant cultivates the land. Resettlement impacts will, therefore, be insignificant as per the ADB criteria. The current average lease rate for the irrigated lands in the village is Rs. 8,000 ha per year. Compensation is required for a maximum time period of three years and will amount to Rs. 67,000 (1,125 US$). One-off compensation for crop damage is estimated, with the assistance of the local farmers group, at Rs. 54,000 (US$ 900). Total compensation to be paid for land will be Rs. 121,500 (US$ 2,025).

Table 5: Estimated Cost of Compensation and Resettlement Implementation for GCHP, Punjab

No	Description of Expense	Unit	Quantity	Avg Rate	Total Amount	
				(Rs.)	(Rs.)	$(US$)
1	Temporary Land Acquisition (3 yrs)	ha	0.60	112,500	67,500	1,125
2	Compensation for Crop Damage	ha	0.60	90,000	54,000	900
3	Compensation for Affected Trees	Number	3	14,000	42,000	700
4	Rehabilitation of affected farmland	ha	0.6	60,000	36,000	600
Sub-Total (a) Compensations					*199,500*	*3,325*
5	Resettlement Specialist (Package)	Man Days	20	5,000	100,000	1,667
6	Resettlement Monitoring Evaluation	Man Days	5	6,000	30,000	500
7	Training of staff, material and brochure (lump sum)				45,000	750
Sub-Total (b) Resettlement Expertise					*175,000*	*2,917*
				Total Direct Costs (a+b)	374,500	6,242
8	Contingencies (10%)				56,175	936
	TOTAL ESTIMATED COSTS				430,675	7,178

3 Loss of Trees and Tree Planting Programme

54. Only three mature trees are affected by the project and these are costed in

Table 5: Estimated Cost of Compensation and Resettlement Implementation for GCHP, Punjab. The loss of trees is estimated at Rs 30,000 (US$ 500).

55. There are also 200 trees lost in the I&PD RoW and these are mainly eucalypts of various sizes. A tree-planting programme will also be implemented by I&PD using its own resources or through the Forestry Department, or a private consultant. Planting will take place in the I&PD RoW and along the canal banks. Allowance is made for two acres of plantation for re-afforestation. The costs of planting and raising of trees for a one-acre plantation is estimated at Rs. 5,364.00 as indicated in the Table below. The cost of two acres plantation is included in the Table 7 Proposed Mitigation Costs.

Table 6 Table Cost Estimates for Raising One Acre Tree Plantations

#	Particulars	Work Days	Amount (Rs)
1	Digging of 435 pits, 10x10 ft spacing, 1.5 ft deep @ Rs.100/cft for 625.50/cft.	6.5	650.00
2	Planting of 435 saplings, including carriage and wing walls around pits, @ 50 plants/day	8.70	870.00
3	Procurement of 435 plants, @ Rs 5/plant		2,175.00
	i. Sub-Total		**3,695.00**
4	Beating up of 30 % failures in the 2nd year, 131 plants	52	
a	Re-opening of 131 pits, 1.5 ft deep, 196.5 cft. @ Rs.100/cft	1.96	196.00
b	Planting of 131 saplings, including carriage and wing walls around pits, @ 50 plants/day	2.62	262.00
c	Procurement of 131 plants, @ Rs 5/plant		655.00
	ii. Sub-Total		**1,113.00**
5	Beating up of 15 % failures in the 3rd year, 65 plants		
a	Re-opening of 65 pits, 1.5 ft deep, 98 cft, @ Rs.100/cft	1	100.00
b	Planting of 65 saplings, including carriage and wing walls around pits, @ 50 plants/day	1.31	131.00
c	Procurement of 65 plants, @ Rs 5/plant		325.00
	iii. Sub-Total		**556.00**
	Total		**5,364.00**

B. Construction Impacts

1 Materials

56. The project will require various materials for construction with potential for destruction and damage of quarry and sand extraction areas. This is an alluvial area and the project must import stone, sand and aggregate from quarries at some distance. The source for riprap or coarse aggregate is 130km in the Kirana Hills and at Taxila 300km. Fine aggregates are available in river bed deposits at Sutlej river and sand from the Chenab (close by) and Lawrence pur. Cement, steel and bricks are available at local markets near the site. Materials will be sourced from these already established quarries.

2 Construction Activities

57. Construction of the project involves the excavation and movement of materials for:

- Excavation of the temporary diversion canal with temporary road on the right bank and the raising of the banks of the temporary canal and the upstream headrace portion of the existing canal,
- Construction of temporary cofferdams up and down stream of the proposed powerhouse site in the bed of the existing canal,
- Removal of the existing bridge and fall,
- Removal of the cofferdams when the powerhouse and spill way are complete,
- Filling and renovation of the temporary diversion canal and rebuilding of right bank road,

58. To minimise environmental impacts and avoid any need for disposal of earthwork materials or the importation and unnecessary storage of earth, the project will maximise the reuse of excavated materials. Excavated spoil from the diversion canal will be used for raising of embankments in the existing canal and will in part be stored for use in the construction of the upstream and downstream cofferdams. The material from the cofferdams will then be re-used to back fill the diversion canal when the powerhouse is completed. In this way there will be negligible waste material and minimal need to dispose of materials. Most of the construction activity will be contained inside the outer embankment of the temporary diversion canal. Any residual spoil can easily be placed inside the RoW where it will be leveled and landscaped.

59. The 1.0 m deep topsoil of the 0.6 ha farmlands to be affected by the project will be removed and stockpiled prior to excavation proper. At the end of the construction phase the topsoil will be re-used for topping before returning the land to its respective landowners.

60. The land in the I&PD RoW is approximately 50m wide on the right bank and 60m on the left bank of the existing canal. This land is unused and available for construction activities such as aggregate processing and batching plant (see Map).

61. Full mitigation for all identified potential impacts during the construction phase of the project is included in the Table 8 Environmental Management Plan (EMP).

3. Access and Traffic

62. There are existing unsealed roads either side of the existing canal and an existing road bridge over the canal at the weir (see photograph). The embankment top on either side will be used for access and upstream embankments will be heightened and reinforced. A temporary access road will be constructed on the right bank of the temporary diversion canal. The existing bridge will be demolished to build the powerhouse but a new road bridge is constructed with the powerhouse. There is a district road bridge just over 3 km downstream of the project and a village road 6 upstream from which local access can be obtained during the short period of the powerhouse construction.

63. Existing temporary roads for the project will be sealed on completion of the project and there will be a new road access across the canal at the new powerhouse location.

4. Construction Site and Camp Impacts

64. The construction camp has the potential for environmental impacts in terms of solid and wastewater emissions. With batching plant and material storage there will be associated dust problems. Conditions requiring the contractor to suppress any dust hazards by the use of water spraying of roads during dry periods will be included in contracts.

65. The contractor will require a temporary work-force camp for up to 50 labourers. There will be some degree of negative social impact from the labour camp. Maximum use of local labour will be encouraged with contractors required to give preference to local people.

66. The construction camp and the residential land for the I&PD staff can be located on vacant land in the existing RoW on the right bank and the land on the left bank inside the 60m RoW is also vacant and available for this purpose.

67. Clauses will be included by I&PD in sub-contracts to ensure dedicated water supply, solid waste and sewage disposal facilities are provided for construction labour camps and for the I&PD residential colony.

5. Impacts of Water Quality

68. Various activities of the population along the canal rely on canal water (washing, bathing, and livestock). Drinking water is mainly obtained from tube wells and the local village of Chiyanwali has drinking water supply. Irrigation water for crops is required throughout the year. The project will not change irrigation flows during operations, and similarly, during construction, the project is designed to ensure that irrigation flows in the main canal are maintained. However, local population may have some difficulties during the limited period of construction work when the existing river embankments are opened to allow water to flow into the diversion canal and when cofferdams are constructed and removed. There is a possibility of increased sediment and turbidity during these times if such work is undertaken while the canal is flowing.

69. Maximum use will be made of the one month down time in the canal system to build the cofferdams and undertake any work in existing canal bed. This will minimise the need to work in the water to construct dams and remove material to deepen the canal bed.

70. Nevertheless, measures will be taken if necessary for the local population to have access to water during the temporary project construction phase. Ground water wells are required for dewatering inside the construction pit for the powerhouse and potable water will be available. Temporary standpipes can be provided to supply drinking water during the construction period to villagers if necessary.

6 Fish Impacts

71. As there are a number of existing falls on the canal and because water flow in the canal system is completely closed off for a minimum of one month each year there are no significant fish populations in the river and there are no significant impacts to fish either in the construction or operation phase of the project.

C Impacts and Mitigation of Transmission Lines

72. Upon its commissioning, the powerhouse will be connected to the national grid by 6km of 11 kVA overhead transmission line at the existing Kamoke Grid Station.

73. The transmission line required does not pass through any sensitive areas and is completely in the canal system RoW. Approximately 120 poles will be required. No private land is affected and the environmental impacts of the transmission line will be minimal.

VI. ENVIRONMENTAL MANAGEMENT AND MONITORING PLAN AND INSTITUTIONAL REQUIREMENTS

74. Project mitigation measures and costing are indicated in Table 7 Proposed Mitigation Costs.

Table 7 Proposed Mitigation Costs

#	Mitigation Measure	Total (Rs)	Total $US
1	Compensation for temporary land acquisition crop damage and affected trees	199,500	3,325
2	Environment & Resettlement Expertise	175,000	2,917
3	Plantation of endemic tree species along canal road and the rehabilitated temporary diversion canal	10,728	178
4	*Sub-Total*	348,228	6,420
5	Contingencies (10%)	34,823	642
6	**Total Estimated Costs**	383,051	7,062

Exchange Rate: US $ 1.00 = Rs. 60.00

75. The EMP is developed in Table 8 Environmental Management Plan. Supervision and implementation of the EMP will be undertaken by I&PD.

76. The I&PD will obtain approvals from EPA Punjab and will also monitor the project and forward monitoring reports on a regular basis to the Provincial EPA as per the requirements of the Federal EPA regulations. This IEE and the EMP can form the basis of a submission for environmental approval to the EPA Punjab.

77. I&PD will ensure that conditions are included in project construction contract documents. It will also ensure that during the construction phase, environmental mitigation measures, as per the EMP, are effective and are implemented. The EMP implementation will be coordinated with concerned Government Agencies.

78. I&PD has engineering and support staff, but has no specific capacity or qualified personnel in the environment and resettlement fields. To handle its general environmental and land compensation responsibilities, I&PD will develop the necessary capacity and allocate manpower to specifically implement the Gujranwala environmental management plan, monitoring requirements and Resettlement Plan.

79. To adequately address the requirements for environmental and any resettlement planning and implementation the I&PD, as the IA for the project, will set up a Project Management Unit (PMU) for the project at I&PD Headquarters in Lahore. It will also appoint an Environment and Resettlement Officer (ERO) in the PMU. This person will work in close cooperation with the respective field-based office on the day-to-day activities of EMP and the Short Resettlement Plan implementation. ToR for this position is attached in Annex 3.

80. As I&PD does not yet have the expertise and capacity required for implementing the IEE and Short Resettlement Plan, it will have to depend in the short

term on additional external technical assistance. It will, therefore, hire additional expertise in the form of:

- a part time Implementation Consultant (Environmental and Resettlement Specialist) who will be hired directly by I&PD, to provide technical assistance in implementation of the environment and resettlement plans and the EMP,
- Another part-time Consultant (External Monitoring) who will be hired to conduct the external monitoring and evaluation of the effectiveness of implementation of the EMP and resettlement activities.

81. The Implementation Consultant (ToR in Annex 3) will carry out internal on-the-job training and institutional capacity building for I&PD in general and for the officer appointed as ERO. In this way I&PD will acquire the necessary expertise to carry out the implementation of EMPs and resettlement plans by itself in future. The cost of the Implementation Consultant is included in Table 5: Estimated Cost of Compensation and Resettlement Implementation for GCHP, Punjab.

VII. CONCLUSION, FINDINGS AND RECOMMENDATIONS

82. The GCHP site is on an existing canal system in Punjab, which has been in operation for more than eighty years. The proposed hydropower project uses the existing fall in the canal to produce an instantaneous power output of 4.82 MW and electricity production of 23.52 GWh/year. The project uses a temporary diversion canal (400 m long and 70m wide) on the right bank of the canal to divert the existing waters of the canal, while a powerhouse is constructed in the middle of the existing canal. Upstream and downstream cofferdams are built to allow the powerhouse to be constructed. The diversion canal is filled in and returned to its original land use when construction work on the powerhouse is complete and the water again flows in the original canal.

83. The IEE indicates that there are no resettlement issues following the adoption of a right bank temporary diversion rather than the original scheme on the left side. Most of the project construction activity takes place within the existing way-leave reserve in Government ownership (I&PD). There are no identified impacts affecting either archaeological sites or wildlife. Because of the existing falls in the canal system and, because of the annual closure regime of the canal system, there are no significant fisheries and the project will have no impact on fish. The impacts identified in this IEE are construction related activities, some temporary loss of land, and trees, (for which compensation is proposed) and a temporary loss of water quality during construction.

84. This project has very little environmental impact; those impacts identified will be adequately addressed by the mitigation and environmental management plan, which I&PD is committed to implement. Therefore, a full EIA is not required for the Gujranwala project.

85. It is important, however, that I&PD as the Implementing Agency develops its internal capacity to implement and monitor the measures in the EMP. This has been designed into the project by requiring the appointment of an Environmental and Resettlement Officer in I&PD and the appointment of an environmental & resettlement external specialist and the hiring of an independent monitor.

Table 8 Environmental Management Plan

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
Design /Pre-construction Components				
Project construction & potential loss of property, agricultural & other land uses	- Examination of alternative layouts and technology and choice of canal alignment with least land take and minimum loss of existing land use - Design for maximise use of excavated material at various stages of the construction process, I) cut from the diversion canal to make embankments for the diversion ii) to construct upstream and downstream cofferdams iii) reuse material to fill in the diversion canal and renovate the of the diversion canal - Compensation at market rates for any small amount of land required by the project prior to work commencement	Proper planning. Measures to be added in relevant parts of contract documents	Design consultants & I&PD.	I&PD
Excavation of construction materials and development of quarries & borrow areas & loss of alternative land use	- Maximum use of existing quarry & borrow areas already in operation for sand, aggregate etc.	Proper planning and measures to be added in the relevant parts of contract documents	Design consultants & I&PD.	I&PD
Disruption of roads & canal crossing by construction	- Design for least disruption of road communications on right bank and bridge crossings. Build temporary road along temporary diversion canal and new bridge at powerhouse site	Proper planning & Measures in contracts	Design consultants & I&PD	I&PD
Construction Stage				
Earth Works for construction of diversion canal, powerhouse causing loss of land use and trees	- Maximise re-use of material in different construction phase and avoid or reduce the need to find areas for the deposition of excavated materials. - Tree planting programme on canal banks and within the I&PD RoW and on the reclaimed temporary diversion. - Store top agricultural topsoil and reuse when the diversion canal is renovated	Careful planning and monitoring	Contractor's Environment Engineer	SC, I&PD EPA,
Disruption of access for local people across and along the river	- Ensure existing road access is maintained with roads along the canal banks & provide bridge access across the existing canal either upstream or downstream of the new powerhouse and coffer dams	Proper planning, implementation & monitoring	Contractor's Environment Engineer	SC, I&PD EPA,
Taking of Quarry Materials with loss/degradation of land	- Quarry materials will be obtained from existing operating sites in the area with proper licenses & environmental clearances	Careful monitoring	Environment Engineer	SC, I&PD, EPA
Operation of construction equipment and construction	- Fuel storage & refuelling will have adequate containment away from the canal. - Equipment to be properly maintained & any waste petroleum products will be	Careful planning and monitoring of	Contractor's Environment	SC, I&PD, EPA

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
activities and contamination of soils, loss of water quality & water pollution	collected, stored, & disposed of at approved sites as per Hazardous Waste Management Act. - Planning of construction phases to minimise the amount of time for work in water and avoid loss of water quality and turbidity in the canal. Maximum effort for building the coffer dams, opening the diversion canal and work in deepening the existing canal the existing downstream fall during the closure time of the canal system.	conditions included in contracts	Engineer	
Construction activities causing disruption of existing canal system and the supply of irrigation water	- Appropriate rain-storm-water channels will be constructed. - Planning of the diversion canal and coffer dam system to ensure that water flows for irrigation are maintained at all times when the canal system is in operation.	Proper planning and implementation	Design consultants I&PD. Contractor's Environment Engineer	I&PD
Construction Camp & Residential colony, Social impacts & pollution from wastewater & solid waste	- The construction camp can be located in the existing I&PD RoW on either side of the existing canal. Both locations are away from houses in Chiyanwali village. - Camps & residential colony will have properly designed sewage system for wastewater effluent and solid waste collection.	Careful design and planning by I&PD & design consultants	Contractor's Environment Engineer	SC, I&PD, EPA
Emission from Construction Vehicles & Equipments causing air pollution	- Emission levels of all construction vehicles & equipment will conform to the Pakistan emission standards. - Pollutant parameters will be monitored during construction. - Crushing, & concrete plants will at defined construction areas within the right of way but away from the water system.	Careful monitoring	Contractor's Environment Engineer	SC, I&PD, EPA
Dust particulate carrying health impacts for workers and villagers	- All precautions to be taken to reduce dust level emissions from batching plants & portable crushers. - Regular water spraying at all mixing sites & temporary service roads will be undertaken. - All delivery vehicles will be covered with tarpaulin. Mixing equipment will be sealed & equipped as per existing standards.	Careful monitoring	Contractor's Environment Engineer	SC, I&PD, EPA
Construction activity Vehicles & Plant & Equipment noise pollution	- All construction equipment & plants will conform to EPA NEQS noise standards. - All vehicles & equipment to be fitted with noise abatement devices. - Construction workers provided with earplugs in high noise environments.	Careful monitoring	Contractor's Environment Engineer	SC, I&PD, EPA,
Construction in RoW with loss of vegetation & tree cover	- Plantation Programme implemented along the canal banks. Indigenous tree species being accorded priority over exotic species.	Forestry Department or private contractor. Careful monitoring	Contractor's Environment Engineer	SC, I&PD, EPA,
Construction Activities &	- Safety signals will be installed on all routes affected by construction work particularly	Inclusion of	Contractor's	SC, I&PD,

Environmental Aspect & Potential Impact	Remedial Measure	Means of Implementation	Institutional Responsibility	
			Implementation	Supervision
Accident Risks	during work from the existing road on the left bank. - Workers will be provided helmets, masks & safety goggles etc. - A readily available first aid unit with dressing materials etc. - Road safety education will be given to construction vehicle drivers. - Traffic management will be ensured during road construction periods. - Information dissemination through banners & local announcement at mosques about project time frame, activities causing disruption & any temporary arrangements for public relief will take place.	measures in contracts and follow up monitoring	Environment Engineer	EPA
Construction Activities causing disruption to Public Utilities	- Any public utilities impacted, such as water wells, power/phone lines etc must be relocated to suitable places, in consultations with local beneficianes.	Added in the relevant parts of contract documents	Design consultants & I&PD	I&PD
Operational Stage				
Soil erosion, land degradation & vegetation loss	- Maintenance of trees and vegetative cover over initial five year of the project along the renovated temporary diversion canal, access roads and canal embankments.	Using sub-contractor or Forestry & Department	I&PD's Environment Engr.	I&PD

ANNEX 1 List Of Organizations/Persons Contacted/Visited

NAME	ADDRESS	TELEPHONE	FAX	E-MAIL
IRRIGATION & POWER DEPARTMENT, PUNJAB				
Dr. Bagh Ali Shahid, Chief Engineer (Power Zone)	1st Floor, Central Design Building, Old Anarkali, Lahore.	+92-42-9212794	+92-42-9212795	
Engr: Mohammad Yaqub, Director Technical (Power)	1st Floor, Central Design Building, Old Anarkali, Lahore.	+92-42-9212799	+92-42-9212795	
Mr. Liaqat Iqbal, Executive Engineer (Barrage)	Marala Headwork, Sialkot.	+92-432-502102 +92-432-502121		
Mr. Syed Sajed Hussain Rizvi, SDO (Barrage)	Marala Headwork, Sialkot.	+92-432-502102		
Engr: Muhammad Shafi Chaudhary, Consultant	PIDA Headquarters, Irrigation Secretariat, Old Anarkali, Lahore.	+92-42-9212771		pidahq@lhr.comsats.net.pk
Mr. Muhammad Latif, Sub-engineer	Arifwala Sub-division, Pakpattan.	+92-457-373878		
Mr. Arshad Saeed, Sub-inspector	Power Wing, Irrigation Colony, Sahiwal.	+92-300-6920369		
Mr. Masood Gujar, Sub-inspector	Power Wing, Irrigation Colony, Sahiwal.	+92-300-6909927		
AGRICULTURE DEPARTMENT, PUNJAB				
Mr. Zafar Iqbal Mirza, EDO Agriculture	Agriculture Office, Pakpattan.	+92-457-3765678	+92-457-352310	
WAPDA, HYRDO ELECTRIC POWER ORGANIZATION				
Mr. Syed Wali Waheed, Director	WAPDA Environmental Cell, # 3 Canal Bank, Mughalpura, Lahore.	+92-42-6849506 +92-303-6457569		
Mr. Atta-ur-Rehman, PD	Khan Khwar Hydropower Project, Besham, Shangla, Swat.	+92-996-400890 +92-996-401023		
MINISTRY OF ENVIRONMENT				
Mr. Chaudhary Ahmad Naeem, Director, EIA	# 4, Lyton Road, Lahore.	+92-42-9212599		
FOREST DEPARTMENT				
Mr. Rana Liaqat Ali Sulehri, DFO	Forest Colony, near Irrigation Colony, Sahiwal.	+92-40-4465097		
Mr. Mian Zahir Bashir, SDFO	Forest Colony, near Irrigation Colony,	+92-40-4465097		

NAME	ADDRESS	TELEPHONE	FAX	E-MAIL
	Sahiwal.			
Mr. Allah Ditta, Block Officer	Pakpattan Forest Range, Pakpattan.	+92-40-371789		
Mr. Muhammad Farooq, DFO	Forest Colony, Band Road, Ravi Bridge, Lahore.	+92-42-7448139		
Mr. Shahid Pervaiz Khan, DFO	Forest Office Complex, Old Bazaar, Sialkote.	+93-52-3253883		
WILDLIFE DEPARTMENT				
Mr. Baqar Abbas, District Wildlife Officer	District Office Complex, Pakpattan.	+92-40-4224200		
Mr. Agha Ezaz Ibrahim, DD Research & Publicity	Directorate of Wildlife, Sandha Road, Lahore.	+92-42-9212378		
Mr. Asim Bashir Cheema, District Wildlife Officer	Bano Bazaar, Zailghar Building, Sialkote.	+92-52-4264766		
FISHERIES DEPARTMENT				
Dr. Muhammad Ayub, DG	Directorate of Fisheries, Sandha Road, Lahore.	+92-42-9212379		
Mr. Rana Muhammad Khalid, AD	# 228, Fateh Sher Colony, Sahiwal.	+92-40-4227255		
Ch: Muhammad Nawaz, Assistant Director	Mission Hospital Road, Sialkote.	+92-52-4267963		
Mr. Rana Abbas, District Fishery Officer	Mission Hospital Road, Sialkote.	+92-52-4267963		
Mr. Asim Raza, Assistant District Fishery Officer	Mission Hospital Road, Sialkote.	+92-52-4267963		
NGOs & CBOs, & DEVELOPMENT PROJECTS				
Mr. Shahzad Ashraf, Scientific Committee Coordinator	WWF, PO Box - 5189, Ferozepur Road, Lahore.	+92-42-5862360 +92-42-5869429	+92-42-5862358	sdashraf@wwf.org.pk
Mr. Aamir Nzeer, Agriculture Economist	International Water Management Institute (IWMI), 12-KM, Multan Road, Thokar Niaz Beg, Lahore 53700.	+92-42-5410050-53	+92-42-5410054	a.nazeer@cgiar.org
Mr. Ilyas Masih, Hydrologist	International Water Management Institute (IWMI), 12-KM, Multan Road, Thokar Niaz Beg, Lahore 53700.	+92-42-5410050-53	+92-42-5410054	i.masih@cgiar.org

HYDROPOWER

ANNEX 2 Rapid Environmental Assessment (REA) Checklist

Instructions:

- This checklist is to be prepared to support the environmental classification of a project. It is to be attached to the environmental categorization form that is to be prepared and submitted to the Chief Compliance Officer of the Regional and Sustainable Development Department.
- This checklist is to be completed with the assistance of an Environment Specialist in a Regional Department.
- This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB checklists and handbooks on (i) involuntary resettlement, (ii) indigenous peoples planning, (iii) poverty reduction, (iv) participation, and (v) gender and development.
- Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country/Project Title: Pakistan (Punjab Province) Small Hydel Power Development Project (Gujranwala)

Sector Division: South Asian Infrastructure Division

SCREENING QUESTIONS	Yes	No	REMARKS
A. Project Siting Is the Project area adjacent to or within any of the following environmentally sensitive areas?			
Cultural heritage site		☒	There are no known archaeological, cultural or religious heritage site located within close proximity of the project area.
Protected Area		☒	No protected areas have been reported within the project area of environmental influence.
Wetland		☒	NA no wetlands affected
Mangrove	☐	☐	Not applicable.
Estuarine	☐	☐	Not applicable.
Buffer zone of protected area	☐	☐	Not applicable.
Special area for protecting biodiversity		☒	No special areas for biodiversity protection are close to project site.
B. Potential Environmental Impacts Will the Project cause...			
Loss of precious ecological values due to flooding of agricultural/forest areas, and wild lands and wildlife habitat; destruction of fish spawning/breeding and nursery		☒	There are no chances of encroachment on ecological, agricultural or forest areas.

SCREENING QUESTIONS	Yes	No	REMARKS
grounds, and disruption of fish migration routes?			
Loss of archaeological, historical or cultural monuments?		X	No archaeological, historical or cultural sites/monuments have been reported in the project area.
Dislocation or involuntary resettlement of people?		X	There are no chances of dislocation or involuntary resettlement if the right bank alternative is adopted for the project.
Disruption of tribal/indigenous people?		X	Homogeneity of tribal or indigenous people will not be affected due to this project.
Environmental degradation from increased pressure on land?	X		Minor temporary environmental degradation may occur during construction, mainly due to workers camps, fuel spillage , water contamination.
Conflicts on water supply rights and related social conflicts?		X	
Decreased production from capture fisheries due to submersion of river stretches and associated flood channels, and resultant destruction of fish breeding and nursery grounds?		X	There is no dam and no submersion of river stretches.
Proliferation of aquatic weeds in reservoir and downstream impairing dam discharge, irrigation systems, navigation and fisheries, and increasing water loss through transpiration?			N/A as there is no dam and reservoir to the project
Scouring of riverbed below the dam?			N/A as no dam is constructed in this project
Increased incidence of waterborne or water related diseases?		X	
Depletion of dissolved oxygen by large quantities of decaying plant material, fish mortality due to reduced dissolved oxygen content in water, algal blooms causing successive and temporary eutrophication, growth and proliferation of aquatic weeds?			N/A as there is no dam or significant water storage capacity in the project design.
Deterioration of water quality in the reservoir?			N/A there is no large reservoir or water retention for longer than a day.
Decline or change in the fisheries below dams due to reduced peak flows and floods and water quality changes?			N/A no dam involved
Loss of migratory fish species due to the impediment posed by the dam?			N/A no dam involved
Formation of sediment deposits at reservoir entrance, creating backwater effect and flooding and water-logging upstream?			N/A There is no major reservoir involved.
Sedimentation of reservoir and loss of storage capacity?			NA no large dam or storage facility included in the project
Alteration of water quality due to			NA no large dam or reservoir with this project

SCREENING QUESTIONS	Yes	No	REMARKS
evaporation in reservoir, lowered temperatures during low flow periods, silt concentration in density currents, low dissolved oxygen, and high levels of iron and manganese?			
☐ Salinization of floodplain lands and saltwater intrusion in estuary and upstream?			Not applicable.
☐ Decrease in floodplain agriculture?			Not applicable.
☐ Introduction or increase in incidence of waterborne or water-related diseases?		☒	
☐ Environmental problems arising from uncontrolled human migration into the area, made possible by access roads and transmission lines?		☒	

ANNEX 3 Terms of Reference for I&PD Staff and External Specialist

A. Terms of Reference for Environment and Resettlement Officer

Specific Job Description

- Responsible on behalf of I&PD for ensuring the implementation of the IEE and EMP.
- Conduct monitoring of the implementation of the Resettlement Plans and Land Compensation activities so that project affected persons and communities are paid their correct share of compensation in a timely manner prior to the commencement of any construction work
- Facilitate PMU/I&PD and the design/supervision consultants in site-specific environmental issues to ensure the least damages and disturbances to the natural environment and social values of the local residents.
- Check and vet design/specification, tender, and contract documents, to ensure social and environmental objectives are met and included. Ensure environmental conditions are included in contracts let for the project.
- Recommend revision of Environmental Management and Monitoring Plans to PMU so that the proposed mitigation measures are properly implemented in a cost effective manner.
- Provide information as necessary to external consultant.
- Establish regular contacts and on-going liaison with Government as necessary EPA, Forest, Wildlife and Fisheries Departments, local/regional NGOs, local officials, and all other stakeholders connected with the project related environmental and resettlement issues.
- Collect environment related ecological/social data/information, make computer data entries, carry out the analysis and apply the results.
- Liaison between I&PD and the Government of Punjab, particularly the Environmental Protection Agency who must receive 6 monthly reports in compliance with the EMP.

Qualifications

The PMU Environment & Resettlement Specialist is required to have at least a Bachelor's or Master's degree with five years work experience as an environmental engineer or in implementation of development projects

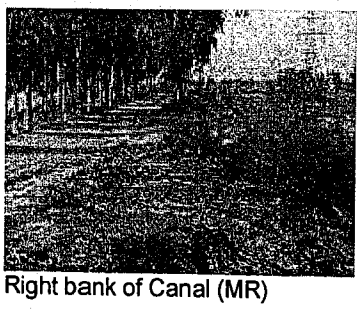
B Terms of Reference for External Environment and Resettlement Specialist

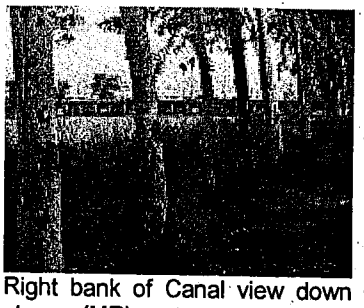
Tasks of the external consultant

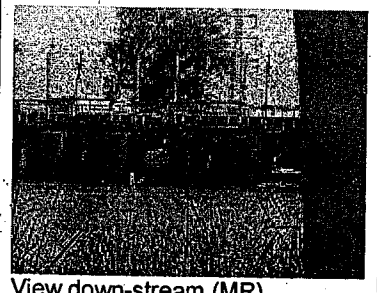
The external Consultant for Environment and Resettlement has to support I&PD/PMU and ERO in implementing the Environmental Management Plan and Resettlement Plan. The person is an advisor to I&PD/PMU/ and controls the implementation of the EMP and Resettlement Plan. This covers the following activities:

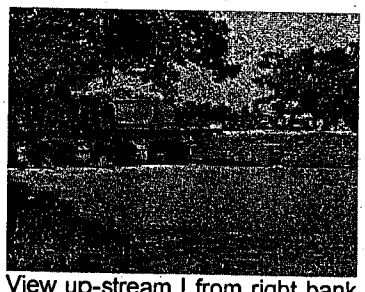
- Ensure that EMP mitigation is incorporated in contracts for the project.
- Support I&PD/ERO in final measurement of the permanently and temporarily required land at the project site. Ensure that the necessary request for land acquisition to DoR, FMU is followed up by I&PD/PMU.
- Undertake review of the EMP with the ESDC staff regularly. Specifically responsible for updating the plan immediately prior to construction in the light of any changes in design and construction contract entered into for the project.
- Ensure the EMP is updated at the beginning of project operations.
- Supervise the integration of the different agreed upon alterations in the project design to mitigate impacts including resettlement effects.
- Ensure consultation meetings take place regularly with any Affected People with regard to resettlement matters.
- Monitor all construction activities and EMP implementation including land acquisition and resettlement related activities and prepare progress reports on behalf of I&PD/PMU highlighting monthly progress highlighting issues/constraints that require decisions by I&PD/PMU and other involved agencies e.g Sub-Government Departments such as Fisheries, Wild Life, Forestry, Health.
- Ensure I&PD inform any concerned parties regularly about the RP implementation progress and determine bottlenecks in order to avoid time delay.
- Ensure that the project makes the necessary 6 monthly reports to the GoNWFP EPA under the EPA IEE approval.
- Conduct workshops and on the job training and raise the capacity of I&PD/PMU staff including a workshop on ADB policies and guidelines concerning Involuntary Resettlement and the implementation procedures of a RP.
- Act as an advisor to I&PD/PMU in all environment and resettlement associated questions.

ANNEX 4 Photos of Project Site (Gujranwala)

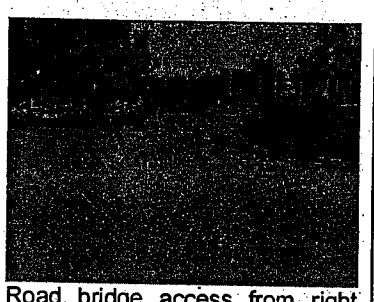

Right bank of Canal (MR)

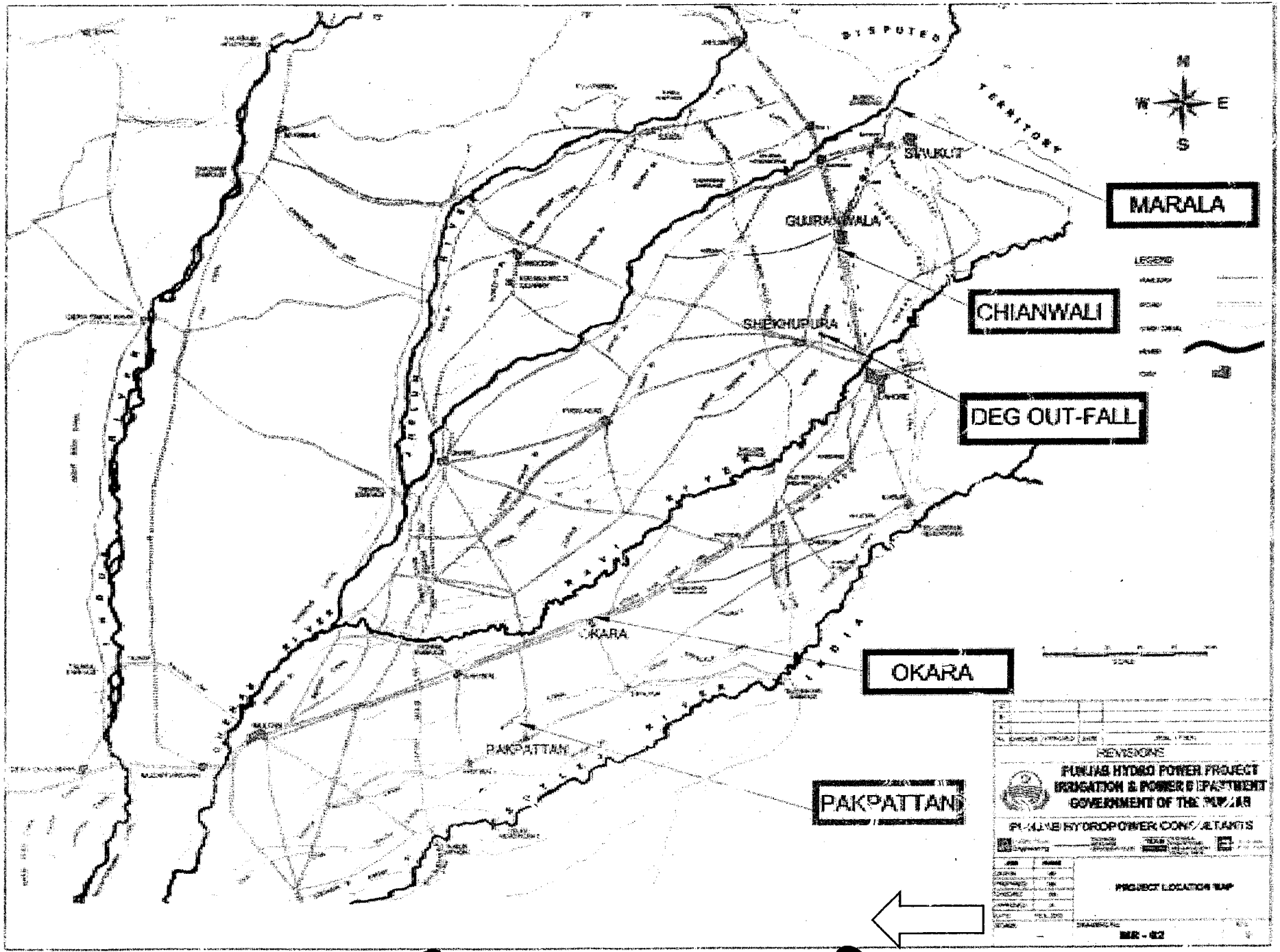

Right bank of Canal view down stream (MR)


View down-stream (MR)


View up-stream I from right bank Canal (MR)


View up-stream from left bank (DR)


Road bridge access from right bank (DR)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PAKPATTAN
PAKPATTAN
REVISIONS
PUNJAB HYDRO POWER PROJECT
IRRIGATION & POWER DEPARTMENT
GOVERNMENT OF THE PUNJAB
PROJECT LOCATION MAP
MR - 02

Attachment (14)
K

ENVIRONMENT PROTECTION DEPARTMENT

Government of the Punjab
National Hocky Stadium, Lahore

NO. DD (EIA)/EPA/F-430(IEE)/2006/Cir/ 30
Dated: 07 / 05 / 2011

To

The Chief Engineer (Power),
Marala Hydro Power Project,
Irrigation and Power Department,
First Floor Central Design Building,
Irrigation Secretariat, Near Old Anarkali,
Lahore.

Subject: **ENVIRONMENTAL APPROVAL**
Reference: your letter No. PD-PPMU/446/2011 dated 26-03-2011.

1. Description of Project: 5.4 MW Chianwali Hydro Power Project(CHPP).
2. Location of Project: The site is located at RD 130.000 on Upper Chenab Canal (UCC) near Chianwali Bungla, Eiman Abad, and District Gujranwala.

3. After review of Initial Environmental Examination (IEE) Report, SIR by DOE and other relevant record, the Environmental Protection Agency, Punjab accorded approval for construction phase of the above mentioned project at the aforementioned site vide letter No. DD (EIA)/EPA/F-430/2507/2K6/320 dated 30-07-2008.

4. Environment Protection Department, Punjab extends this period under Regulation 16 of IEE/EIA Regulations, 2000 read with Section 12 of Pakistan Environmental Protection Act, 1997 for further three years subject to the following conditions:

i. The proponent shall ensure compliance of National Environmental Quality Standards (NEQS).
ii. Mitigation Measures suggested in the IEE report and Environmental Management and Monitoring Plan shall be strictly adhered to minimize any negative impacts on soil, ground water, air and biological resources of the project area.
iii. Monitoring shall be carried out during the entire period of the project activities. Monitoring reports shall be submitted to EPA, Punjab on monthly basis.
iv. Camping sites shall be located at suitable distance from any settlement to avoid disturbance to the local people. Sewerage generated from camping sites shall be treated in septic tanks and soak pits or by other appropriate methods. The septic tanks and soak pits shall be constructed at a suitable distance from any permanent or seasonal water source. Septic tanks and soak pits shall not be located in the areas where high ground water table exists.
v. At least 90% unskilled and to the extent possible skilled jobs shall be give to the locals after providing them proper training.
vi. Proponent will submit a community development plan for the benefit of communities of the project area to Punjab, EPA within two months of the start of the project construction phase.
vii. The proponent shall not discharge treated or untreated wastewater in a surface or sub-surface water body that may be used for drinking purposes.
viii. The proponent shall ensure that strict and efficient health and safety measures are in place for protection of workers backed by a comprehensive emergency response system.
ix. The proponent shall carry out extensive tree plantation especially of indigenous species in and around the project area i.e. at least 15,000 trees of minimum height 6-7 feet may be planted on available space in consultation with District Forest Officer and District Officer (Environment), Sialkot within six months. The proponent will also make necessary arrangement for the maintenance and protection of these trees.
x. The proponent will provide a copy of this letter and Environmental Assessment report to the contractor for his information and compliance.
xi. The proponent shall obtain NOCs / clearance of all other concerned departments before commencement of work and provide copies to this office.

P.T.O

The proponent shall be liable for correctness and validity of information supplied to this Department by the consultant.

6. The proponent shall be liable for compliance of Sections 13, 14, 17 and 18 of IEE/EIA Regulations, 2000, regarding approval, conformation of compliance, entry, and inspection and monitoring.

7. This approval is accorded only for the installation /construction phase of the project. The proponent will obtain approval for operation of the above mentioned project in accordance with Section 13(2)(b) and Section 18 of the IEE/EIA Regulations, 2000.

8. Any change in the approved project shall be communicated to EPA, Punjab and shall be commenced after obtaining the approval.

9. This approval does not absolve the proponent of the duty to obtain any other approval or consent that may be required under any law in force. The approval shall be treated as null and void if all or any of the conditions, mentioned above, is / are not complied with and is subjudice to the legal proceedings in any court of competent jurisdiction / legal fora.

10. This approval shall be valid (for commencement of construction) for a period of three years from the date of issue under Section 16 of IEE / EIA Regulations, 2000.

11. This approval can be withdrawn at anytime without any prior notice if deem necessary in public/national interest.

Zjavaid

ASSISTANT DIRECTOR (EIA)
for Director General, EPA, Punjab
Ph: # 042-99232228

NO. & DATE EVEN.

A copy is forwarded for information to:

1. The District Officer (Environment), Gujranwala w.r.t his letter No. 1138/DOE/GRW dated 22-08-2006. He is requested to ensure compliance of the above mentioned conditions / measures under intimation to this office.

Zjavaid

ASSISTANT DIRECTOR (EIA)
for Director General, EPA, Punjab

Technical Specifications for Chianwali Hydropower Project (CHP)

Technical Specification for T/G Unit at Chianwali Hydropower Project (CHP), required by "NEPRA" is given as under:

Type of Turbine	Double Regulated Horizontal Shaft, Pit Type Kaplan Turbine
Rated Output of Turbine	2 820 MW
Rated Net Head	4.2 m
Turbine Manufacturer	SHPE
Generator Manufacturer	SHPE
Transformer Manufacturer	Changde Guoli Transformer Co, Ltd.

Generator Data:

Two horizontal shaft Generators of 3.37 MVA, each connected via 6.3 kV cables to 6.3/ 11kV step –up generator transformers.

Main characteristics of each generator are to be as under:

Description	Unit	Value
Type of Generator		SFW2690-10/1730
Rated Power	MW	2.69
Maximum Continuous Rating(mcr)	MVA	3.3625
Rated Current	Amp	309.3
Nominal Speed	RPM	600
Nominal Voltage	kV	6.3
GD^2 of Generator rotor	$T\text{-}m^2$	8
GD^2 of Generator flywheel	$T\text{-}m^2$	2
Generator Efficiency	%	96.5
Power Factor cos θ		0.8

Transformer Data

Four main step-up transformers and two auxiliary transformers will be installed.

Main characteristics of each Transformer are to be as under:

Description	Unit	Main Transformer	Auxiliary Transformer
Function		Step-Up	Step Down
Rated Output	MVA	3.37	0.300
Rated Voltage			
Primary	kV	6.3	11
Secondary	kV	11	0.4
Frequency	Hz	50	50
Tap Charger		Off Load	Off Load
Vector Group		YN d11	Dyn 11
Tap Range		+10%-5% in steps of 2.5%	± 5% in steps of 1.25%