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BEFORE

THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY (NEPRA)

TARIFF PETITION

FOR

DETERMINATION OF EPC STAGE GENERATION TARIFF

FOR

10.20 MW JABORI HYDROPOWER PROJECT

NOVEMBER 2019

PAKHTUNKHWA ENERGY DEVELOPMENT ORGANIZATION

(PEDO)

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Annex B: EPC Contract

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Glossary

BOOT	Build, Own, Operate and Transfer
COD	Commercial Operations Date
CPI	Consumer Price Index
CPP	Capacity Purchase Price
CPPA	Central Power Purchasing Agency
Cusec	Cubic Foot per second
DSRA	Debt Services Reserve Account
EPC	Engineering, Procurement and Construction
EPP	Energy Purchase Price
GOP	Government of Pakistan
GOPb	Government of Punjab
GST	General Sales Tax
GWh	Giga watt hours=1000,000 kWh
IA	Implementation Agreement
IDC	Interest During Construction
IPP	Independent Power Producer
IRR	Internal Rate of Return
ISO	International Organization for Standardization
JHPP	Jabori Hydropower Project
KIBOR	Karachi Interbank Offered Rate
Km	Kilometer=1000 meters
kV	Kilovolt =1000 volts
Kva	Kilovolt Ampere
Kw	Kilowatt=1000 watts
kWh	Kilowatt hours
LIBOR	London Interbank Offered Rate
LOI	Letter of Interest
LOS	Letter of Support
LV	Low Voltage
m³/s	Cubic meters per second or cumecs
MAF	Million Acre Feet
PESCO	Peshawar Electric Supply Company
MVA	Megavolt Ampere=1000kVA
MW	Megawatt=1000kW
MWh	Megawatt hours=1000kW h
NEPRA	National Electric Power Regulatory Authority
NPV	Net Present Value
NTDC	National Transmission and dispatch Company
O&M	Operation and Maintenance
PKR or Rs.	Pakistani Rupees
POE	Panel of Experts
PPA	Power Purchase Agreement

ROE
USC or ¢
USD or US\$

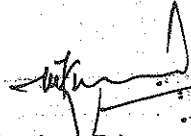
Return on Equity
United States Cent.
United States Dollar

BEFORE THE NATIONAL ELECTRIC POWER REGULATORY AUTHORITY (NEPRA)

1. PETITION

Under Rule 3 of the National Electric Power Regulatory Authority (Tariff Standards and Procedure) Rules, 1998, for determination of tariff for the 10.20 MW Jabori Hydropower Project In accordance with the NEPRA (Tariff Standards and Procedure) Rules 1998, read with Mechanism for Determination of Tariff for Hydropower Projects and SRO 763 (1)/2018 dated June 19, 2018 providing benchmarks for determination/approval of the EPC Stage Reference Tariff and its Adjustment/Indexation provisions and other terms and conditions for the Project.

Pakhtunkhwa Energy Development Organization (PEDO)


**Project Director
Jabori HPP
PEDO, Peshawar**

2. THE PETITIONER

The Petitioner is Pakhtunkhwa Energy Development Organization (PEDO) for its 10.20 MW Jabori Hydropower Project. Pakhtunkhwa Energy Development Organization (PEDO), since its inception in 1986, has been instrumental in identifying and exploiting hydel potential in Khyber Pakhtunkhwa. The organization is under the administrative control of Energy and Power Department of Provincial Government and is governed by the Board of Directors. PEDO has so far identified a number of promising hydel potential sites of more than 6000 MW capacity, which can be developed in a systematic manner either through Public sector or Private sector.

2.1 Objectives of the Organization

- Prepare comprehensive plan for development of the power and energy resources of the province.
- Frame schemes related to Generation, Transmission and Distribution of power, construction, maintenance and operation of powerhouses.
- Advisory body for the Government of KP in power sector matters regarding hydropower development.
- Conducting feasibility studies, surveys of hydel potential sites etc.
- Implementation of Provincial Hydel Power Policy to promote private sector investment in generation, transmission and distribution of power.

2.2 Role of PEDO

The Provincial Government has entrusted a dynamic role to PEDO, which mainly oriented towards private sponsors participation in power sector projects besides developing projects in

public sector. PEDO has established a dedicated Directorate to provide one window facility to private sponsors.

2.3 PEDO Organization

A Board of Directors, comprising Eleven (11) members under the chairmanship governs affairs of PEDO. Following are the members of the PEDO Board of Directors as of to date followed by organizational structure of the PEDO on the next page.

Chairman

Nisar Muhammad

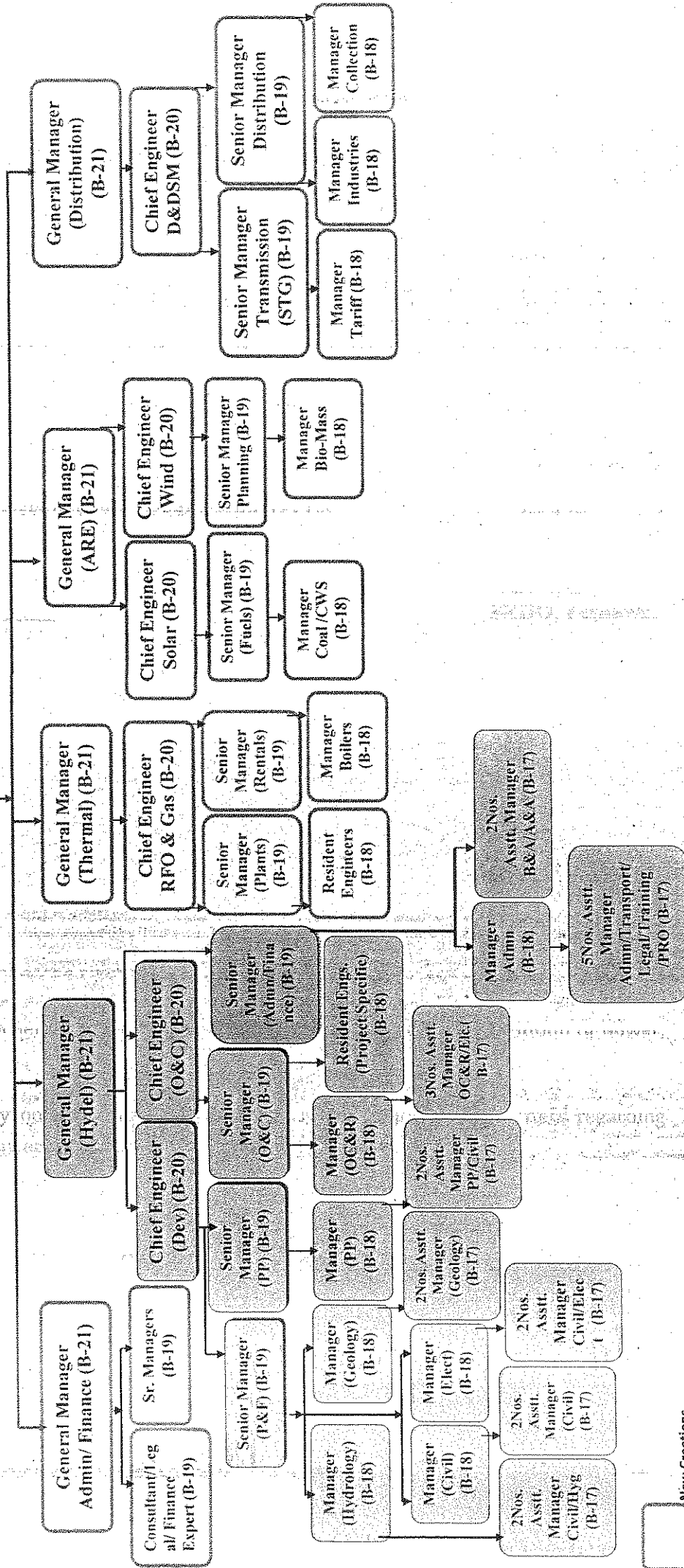
Members include

- | | |
|------------------------------|----------------------------------|
| 1- Secretary Energy & Power | 2- Secretary Finance Department |
| 3- Secretary Home Department | 4- Faiz Muhammad |
| 5- Muhammad Amjad | 6- Abdul Siddique |
| 7- Arbab Khudadad Khan | 8- Syed Mussawar Shah |
| 9- Hassan Nasir | 10- Chief Executive Officer PEDO |

PEDO ORGANOGRAM



CHIEF EXECUTIVE OFFICER (CEO)
(MP-1/Market Based Package)



New Creations

Existing Posts

- Note:**
- Organogram is showing posts up to Asstt. Managers only.
 - The PMUs/PDs under independent PC-1/PC-II will fall under respective General Managers.
 - The existing posts of Director Finance/Admin will continue as Sr. Manager Finance/Admin for the Hydel Wing of PEDO.
 - The Existing Ministerial Staff of the Hydel Wing of PEDO will also continue with same nomenclature.
 - The grades has been prepared according to the hierarchy of Posts.
 - Supporting staff with the new GMs is shown in the Budget Working Paper.

2.4 Achievements by PEDO

PEDO, with the assistance of GTZ (German Agency for Technical Cooperation), has compiled a Master Plan for rural electrification in the Northern mountainous areas of KP with particular emphasis on those areas which were not connected to the National Grid System. The Master Plan entails a total potential of more than 6000 MW that has been identified for public and private sector development. The hydropower potential sites are mainly located in the Northern districts of K.P i.e. Chitral, Dir, Swat, Indus Kohistan and Mansehra.

2.5 PEDO Projects

As tabulated, following are PEDO's projects at various stages.

Projects under Feasibility Studies

S/No	Name of Project	District	Capacity (MW)
1	Gabral Kalam HPP	Swat	88
2	Kari Muskhur HPP	Chitral	491
3	Torecamp- Goduber HPP	Chitral	409
4	356 MHPPs	All Districts of KPK	34.74
5	Access to Clean Energy Canal (10 MHPPs)	Charsadda / Mardan	81 KW

Projects with Completed Feasibility

S/No	Name of Project	District	Potential (MW)
1	Patrak-Shringal HPP	Dir	22.0
2	Nandihar HPP	Batagram	12.3
3	Arkari Gol HPP	Chitral	99.0
4	Istaro Boni HPP	Chitral	72.0
5	Mujigram-Shaghore HPP	Chitral	64.3
6	Naran Dam HPP	Mansehra	188.0
7	Balakot HPP	Mansehra	300.0
8	Sharmai HPP	Dir	150.0
9	Shushgai HPP	Chitral	144.0
10	Shogosin HPP	Chitral	132.0
11	Gahrait-Swir Lasht HPP	Chitral	377.0
12	Toren More Kari HPP	Chitral	350.0
13	Laspur Marigram HPP	Chitral	230.0
14	Barikot Patrak HPP	Dir	47.0
15	ShigoKach HPP	Dir	102.0
16	Ghor Band HPP	Shangla	20.8

S/No	Name of Project	District	Potential (MW)
17	Batakundi HPP	Mansehra	96.0
18	Jameshill More Lasht	Chitral	260.0

Under Construction Hydropower Projects

S/No	Name of Project	District	Capacity (MW)
1	Lawi HPP	Chitral	69
2	Kalkot- Barikot HPP	Swat	47
3	Patrak- Sheringal HPP	Dir	22
4	Koto HPP	Dir	40.8
5	Karora HPP	Shangla	11.8
6	Jabori HPP	Mansehra	10.2
7	Balakot HPP	Mansehra	300
8	Gorkin-Matilthan HPP	Swat	84

Solar and Other Under Construction Projects

S/No	Project Name	Capacity
1	Electrification of 100 Villages through Solar Alternate Energy, Phase-I	300 Watt each (2900 Solar Units)
2	Solarization of Chief Minister's Secretariat/Chief Minister's House	400 KWatt (Estimated)
3	Solarization of Civil Secretariat (Remaining Departments of Civil Secretariat)	400 KWatt (Estimated)
	Solarization Schools & Health Facilities	600 Watt per Class
5	Solar Electrification of 4000 Masajid in Khyber Pakhtunkhwa	2.6 KWatt (2000 Masajid)
		1.6 KWatt (2000 Masajid)
6	Solar Electrification of 440 in PK-10 & PK-11 in District Peshawar.	2.7 KWatt each (440 Masajid)
7	Electrification of Un-Electrified Villages through Solar/Alternate Energy, Phase-II (Additional 1000 SHS)	200 Watt each (1000 Solar Units)
8	Solarization of Administration Headquarters Offices in Charsadda (Feasibility)	N/A
9	356-Mini Micro HPP	34.74
10	Access to Clean Energy (Streams)	37.41
11	Access to Clean Energy (Canals)	15.72

Recently Completed Projects

S/No	Project Name	MW
1	Ranolia HPP Dubair District Kohistan	17
2	Daral Khwar Hydropower Project	36.6MW
3	Machai HPP	2.6
4	Electrification of Un-Electrified Villages through Solar/Alternate Energy, Phase-II.	200 Watt each (2750 Solar Units)

2.6 Petition Fee

The applicable fee for the tariff petition payable under NEPRA Rules adjusted for CPI is paid along with this Petition

3. PROJECT

3.1 Project Introduction

The project is located on Siran River, a tributary of Indus River near Jabori village, about 20 KM from Shinkhari and 40 KM from Mansehra city in District Mansehra, Khyber Pakhtunkhwa Province. Siran River flows next to Kaghan Valley in the East and crosses through rock sequences of Cambrian Mansehra Granite and Pre-Cambrian Tanawal formation, consisting of medium to coarse grained metaquartzites.

Mansehra District is located at 34° - 12' to 35° - 10' N Latitude and 72° 42' to 74° 12' E Longitudes. Mansehra city is 234 km from Peshawar and 143 km from Islamabad while the project area is about 40 km from Mansehra city. Geographically, Mansehra district is bordered to the North by Kohistan and Battagram districts, to the South by Abbotabad & Haripur districts, to the West by Buner and Shangla districts in Malakand Division, and to the East by Azad Kashmir (AJK). The project area is located almost in the central part of Mansehra District.

Project area is accessible from Mansehra city through the KKH up to Khanpur from where an off-taking road leads to the proposed project location. The road from Shinkhari is recently rehabilitated and now all-weather metalled road is available for access up to the diversion weir.

3.2 Project History

To explore and develop the hydropower potential on provincial level, the Government of the then NWFP (now Khyber Pakhtunkhwa Province) created Small Hydel Development Organization (SHYDO) in 1986-87 which was later on converted to Sarhad Hydel Development Organization (SHYDO), under the SHYDO Act 1993. After the change of province name, the name of SHYDO was changed to PHYDO i.e. Pakhtunkhwa Hydel Development Organization which further renamed to PEDO (Pakhtunkhwa Energy Development Organization) which could implement power project up to 50MW only. However, as result of 18th amendment in the constitution of Pakistan in year 2011, the provincial governments were allowed to develop electricity above 50 MW also in their jurisdictions.

The PEDO in collaboration with GTZ identified a number of small/medium size hydel schemes. The Jabori Hydropower Project was identified during the Identification of Hydropower Development Potential in Khyber Pakhtunkhwa by PEDO-GTZ IN 1998.

Later on the task of conducting Feasibility Study of Jabori Hydropower Project was awarded to Associated Consulting Engineers – ACE (Pvt.) Ltd. in August, 2008 who submitted the Feasibility Report in May 2011. After completing necessary formalities on 22nd October, 2013, the Management Consultancy of Jabori HPP was awarded to the Joint Venture of AGES (Pakistan), IDC (Pakistan) and HCE (Nepal) Consultants with AGES Consultants as the lead partner. The consortium started its activities on 23rd October, 2013. The feasibility of the project was re-assessed by Management Consultants (MC) which concluded the project being feasible with installed capacity of 10.20 MW and plant factor of 79.57% resulting into annual generation of 71.1 GWh with saleable energy of 62.70 GWh (after considering O&M period of 336.5 days per annum and auxiliary consumption of 2%)

3.3 PROJECT OBJECTIVE

Primary objective of the Project is to generate 10.20 MW hydropower with average annual energy production of 71.1GWh and saleable energy of 62.70 GWh providing 16% Equity based IRR

3.4 Project Components

The project components consist of, construction of diversion weir (Tyrolean type), a connecting channel leading the diverted discharge to sand trap from where the sediments free discharge will be collected by means of power channel which will ultimately enter into the power tunnel. A surge shaft has been provided at the end of power tunnel. The tunnel is connected with a steel penstock proposed on slope of the hill. A surface powerhouse is proposed which has two Francis units. Tailrace channel is provided at the downstream of powerhouse to carry the outflow back into the Siran River. Switchyard is being located at the right side of Siran River to evacuate the power to national grid located at Battal through 132 kv Double Circuit Transmission Line.

3.5 Environmental Aspect of the Project.

Electricity, generated from Jabori hydropower project will be quite useful in minimizing the energy crisis in Pakistan. This will also help in meeting the electricity requirement of the local population. The availability of alternative source to meet the energy requirement will reduce consumption of timber and other fossil fuels. JHPP will also provide job opportunities to the unskilled people of the locality at general during the construction phase and a limited number of jobs once it is operational.

The climate of the district is warm in summer and cold in winter. Since the district is at an elevation of 2000 to 4500 meters thus the winter season remains extremely cold in the upper half of the district while in the lower half it remains moderate. Snow fall generally starts by the

end of November on the high peaks of the mountains and descends downwards as the temperature falls further.

The Mansehra District is rich in natural vegetation. Besides the scattered vegetation in almost the entire area, the hills are covered with forests of broad leaf and pine trees in accordance with the altitude. Fruit trees are very rare. These are generally found in the courtyards of the farming communities.

Project area is home of a diverse group of people including different tribes and clans, amongst whom Swati are dominant with a percentage of 73.2. Remaining population belongs to Yousaf zai (15%), Tanoli (8.2%), Gujjar (3.1%), Awan (2.4%) and Quraishi (2.1%) tribes. Community, on the whole, is socially cohesive with minor conflicts which are resolved locally by the elders

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 (CO₂), particulate matter (PM), sulphur dioxide (SO₂), carbon monoxide (CO) and Oxides of Nitrogen (NO_x) etc. JHPP has almost no negative socio-economic and environmental impact on the locality. Similarly, there are no impacts on wildlife or sites of historic or archaeological importance. However, the main impact identified in the environmental examination is the consumption of land based resources. It is estimated that the Project will consume about 267 Kanals of agriculture land and one household. To neutralize the Project impact on the aquatic life in the Siran River, about 314 litter of water will be made available in the Siran River round the year. This Environmental residual flow will further be supplemented by the contributing perennial streams downstream of the weir. This provision will also allow the cleansing of the river bed and negation of any harmful effects of sewage and rubbish concentrating in the river system.

3.6 Executing And Financing Agencies

Executing Agency (EA) for implementation of the Project is Pakhtunkhwa Energy Development Organization (PEDO) of KP Province headed by Chief Executive Officer, PEDO. The Authorized Representative of EA is the Project Director, Jabori Hydropower Project (PEDO), assisted by the MC.

The project is being financed by the Government of Khyber Pakhtunkhwa from its own resources. The Project was included in ADP 2014-15 with ADP No. 203 and code 100174 (10% ADP) (local and (90% HDF).

3.7 Project Implementation Arrangements

Executing Agency : Pakhtunkhwa Energy Development Organization (PEDO)

Consultants : A Joint Venture of:

1. AGES Consultants Peshawar, Pakistan

(Lead Firm)

2. Infra-D Consultants Islamabad (Pakistan)
3. Hydro Consult Pvt. Ltd. (Nepal)

3.8 SALIENT FEATURES

Following are the key parameters of the Project.

Location

Jabori (District Mansehra333), Khyber

Pakhtunkhwa, Pakistan

UTM Co-ordinates

43 S, Easting = 338482.00 m

Northing = 3831554.0 m

River

Siran

Type

Run-of-River

Purpose of Project

Supply electricity to National Grid

Hydrology

Catchment Area

236 km²

Normal Reservoir Level

1413.75 masl

Design discharge for Power

8.00 m³/s

Selected design flood for Weir

100 years frequency

Flood Discharge (Q₁₀₀)

686 m³/s

Flood Discharge (Q₁₀₀₀)

1144 m³/sec

Diversion Weir / Dam

Type

Tyrolean

Crest level of Tyrolean section

1413.50 masl

Crest of flow section

1414.00 masl

Minimum Head on Crest

0.25 m

Length of Weir

45.0 m

Design Flood

100 years frequency

Flood discharge

686 m³/s

Surcharge due to design Flood

3.38 m

Total Height of Weir

3.00 m above river bed

Stilling Basin

USBR Type II

Size of Basin

45.0 x 18.0 m

Intake gate size

Vertical lift gate 2.3 x 2.2 m

Embedded Channel design

25% extra over discharge (8.00 m³/s)

Size of embedded Channel

2.35 x 2.0 m

Water level in embedded channel	El: 1412.58 masl
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Connecting Channel (Trapezoidal Section)

Design discharge	25% extra over discharge (10.00 m ³ /s)
Invert Level	El: 1410.82 masl
Water level at start	El: 1412.23 masl
Bed Width	2.00 m
Flow depth	1.41 m
Side slope	1.50:1.00 (V: H)
Bed slope	1.0 in 1000 m
Free board	0.3 m
Flow velocity in channel	1.7 m / sec
Total Length	150 m
Total friction losses	0.15 m

Sand Trap (Two Chambers)

Limit particle size	0.2 mm
Average velocity in chamber	0.216 m/ s
Length of chamber	65.0 m
Length of U/S transition	10.0 m
Length of D/S transition	10.0 m
Free board	0.40 m
Size of chamber at start	B = 4.5 m, D = 4.5 m
Size of chamber at end	B = 4.5 m, D = 5.8 m
Inlet gates	Two lift gate with hoisting (2.1m x 1.8m)
Outlet gates	Two lift gate with hoisting (2.0m x 1.3m)
Flushing arrangement	Two rectangular gates (0.8m x 0.55m)
Flushing discharge	2.0 m ³ /s i.e 25% of design discharge
Spillway Section	Overflow type
Crest level of spill section	EL: 1412.10 masl
Length of spill section	22.0 m
Surcharge due to overflow	0.2 m
Head losses in Sand trap	0.04 m

Headrace Channel (Rectangular Section)

Design discharge	8.0 m ³ / s
Invert Level	El: 1410.40 masl
Water level at start	El: 1412.07 masl
Size of Channel	3.0 x 1.9 m
Bed slope	1.0 in 1000 m
Free board	0.3 m

Flow velocity in channel	1.67 m / sec
Total Length	94 m
Total friction losses	0.15, including 10 m long Aqueduct

Aqueduct

Design discharge	8.0 m ³ / s
Length of throat	10.0 m
Dimensions of turf	3.0 x 1.90 m (B x D)
Free board	0.30 m
Head losses	0.046 m
Bed Slope	1.0 in 1000 m

Intake Portal

Invert elevation at start	EL: 1410.00 masl
Invert elevation at Tunnel inlet	EL: 1405.60 masl
Water level at intake	EL: 1411.74 masl
Freeboard	0.60 m
Min: submerged provided	3.25 m

Spillway section Overflow sharp crested at EL: 1411.85 masl

Length of spillway section	25.0 m
Surcharge due to design discharge	0.34 m

Power Tunnel

Type	Horseshoe shape concrete lined
Height and Width	2.50 m and 2.30 m
Invert elevation of tunnel	EL: 1405.90 masl
U/S Water level at design discharge	EL: 1411.50 masl
Flow area	5.51 m ²
Bed slope	1.0 in 1000 m
Average flow velocity	1.50 m / s
Equivalent diameter of Tunnel	2.65 m
Length of Tunnel up to Surge tank	2895 m
Bed level at Surge tank	EL: 1403.17 masl
Total loss in Tunnel	2.76 m

Surge Tank

Type	Simple orifice type
Maximum surge level	EL: 1421.1 masl
Minimum surge level	EL: 1401.6 masl

Head losses	0.05 m
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Diameter of surge tank	5.0 m
Height of surge tank	25.0 m

Penstock

Material	Steel
Invert level	EL: 1395.3 masl
Total length	548 m
Diameter	1.6 m
Thickness	14 ~16 mm
Average velocity	3.98 m/s
Gross Head	155.8 m
Head losses	3.81 m
Invert level at Powerhouse	EL: 1256 masl
Bifurcation length	Two pipes 50 m each
Dia of bifurcation	1.1 m

Power Facilities

Powerhouse	Surface Powerhouse
Size of Powerhouse	43 x 21 m
Turbine type	Horizontal Francis
Units	Two
Turbine Capacity	4.0 m ³ / s
Generator Capacity	6 MVA
Gross Head	156.75 m
Net Head	148.00 m
Net Head losses	8.75 m
Installed Capacity	10.2 MW
Average annual energy (365 days' basis)	71.10 GWh

Plant Factor	79.57 %
Annual saleable energy	62.7 GWh

Tailrace Channel

Type	Rectangular Concrete channel
Dimensions	3.5 x 1.7 m
Average velocity	1.7 m / s
Flow depth	1.38 m
Length of Channel	30.0 m
Freeboard	0.32 m

Switchyard

Size of Switchyard area 50 x 36 m

Transmission Line

Transmission Line 132 KV – 20 Km (From Jabori to Batal)

Other Components

Employer's Colony

Access Roads

RCC Bridge on Siran River. 01 No. Near Powerhouse Site

Protection Works for Structures

4. PROJECT FUNDING AND COST ESTIMATES

Financial analysis of the project has been carried out on the following basis:

- Total cost of the project is estimated to be USD35.501 Million.
- Debt equity ratio is taken as 70:30
- Project financed through local loan (Sponsors loan provided by PEDO)
- ROE is taken as 16%
- O&M annual amount considered 2.5% of Capital Cost minus IDC although budget calculations indicated it to be APPROX. 3.5 % of Capital Cost. This has been done to keep the tariff as low as possible
- Interest rate 8% (KIBOR)
- Spread over interest 2.5% over KIBOR (as per benchmarks SRO 2018)
- Construction time 30 months
- Levelized tariff Rs. 14.4579 per KWh (US cents 9.0362/kWh)
- Dispatch on Take & Pay basis. Provision of Must-Run arrangement in the Energy Purchase Agreement
- Agreement Year-Concludes when annual benchmark energy has been generated or 12 months whichever is later. Additional energy over and above benchmark to be sold at 10%

4.1 Project Capital Cost

The total project cost is given below

Project Budget- Jabori Hydropower Project
Contract Capacity -9996 kW

Description	Budgeted Amount-USD
EPC Contract (Comprises of provisional sum of USD 2,031,281.74 for transmission line, Rs, 1,848,456,420 or USD 18.77 million local cost and USD 9.54 million as foreign cost-Local cost converted TO USD @98.47 Rs=USD 1	28,298,334
Land	384,000
Customs Duties (adjustable as per actual-assumed at 7% of 70% foreign cost)	446,000.
Withholding Tax on local Services (included in EPC)	
Total Infrastructure Cost	29,128,334
Project Management Unit	900,112
Management Consultant	796,695
Insurance during Construction included in EPC	-
Spares (included in EPC)	
Total of Services	1,696,807
Total CAPEX without IDC	30,826,141
Financing Fee (Project financed by PEDO)-	-
Interest during Construction	3,135,396.9444
Contingency	1,541,257
Total Project Cost	35,501,795

PKR/USD = 160

4.2 Break Up of Capital Cost

Following are the breakup of cost estimates:

- EPC cost:** EPC Contract has been awarded to M/s GRC based on the competitive bidding carried out in accordance with the PPRA rules and the bids were evaluated by the Management Consultants and the team members of PEDO. Detailed EPC Contract along with the terms and conditions of implementation, payment terms etc. is attached. The EPC comprises of local cost of Rs. 1,848,456,420 or USD 18.77 million (USD1=Rs.98.46) and USD

9.54 million, total USD 28.298334 million. EPC has provisional sum of USD 2.03 million allocated for 132 KV transmission line (not included in EPC price used for budget). In case, Power Purchaser arranges for construction of transmission line from its own resources, the amount shall be paid to Power Purchaser and the EPC price, Project budget, CAPEX and tariff shall be adjusted accordingly. The EPC also covers spare parts, tests on completion insurance during construction, site security, port handling and inland transportation etc. The price covers all taxes imposed on the contractor on account of this contract

- b) **spare parts: Spare parts have been covered under the EPC Contract and the details are provided.** The sole purpose of this is to provide un-interrupted power supply to the utility in particular and consumers at large.

4.3 Customs Duties

An amount of USD 0.446 million (adjustable as per actual at COD based on documentary evidence has been considered). 7% of 70% of foreign cost has been considered for budgeting purposes

Land purchase and infrastructure development "Land purchase cost" covers the payment of the cost of land to the owner of the land/property along with stamp duty and registration fees, the fees of the lawyers, as well as the cost of fill to level the site for construction purposes and compensation to be paid for land, built up property, trees and agriculture/cultivation loss, an area of 267 Kanals has been acquired for an amount of Rs.61.50 million or USD 0.384 million

4.4 Project Management Unit (PMU)

This cost covers the project establishment for the preconstruction as well as employer's cost during construction. The amount considered under this head is USD 0.901 million. The details are provided in the annexures.

i. Insurance During Construction

This insurance is required for coverage of risks during construction period. This area is covered under EPC. This means a saving of USD 0.84 million (USD 0.28 Per annum) or 1% as per benchmarks 2018.

ii. Management Consultancy Cost

This cost covers, feasibility update/upgrade, bid level design, tender document, bid evaluation, contract negotiations as well as complete construction management and services during defect liability period. The amount considered is USD 0.7965 million (contract attached)

c) Financing Charges and Fees

No Financing fee has been considered as the entire loan amount has been provided by PEDO as Sponsors loan. This provides a saving of approx. USD 0.40 million (2% of the loan amount) as per benchmarks 2018.

d) **Interest during Construction (IDC)**

Interest during construction is calculated based on KIBOR (8%) Plus 2.5% for a period of 30 months. The estimated amount is USD 3.135 million. The drawing schedule is attached herewith. The amount of IDC shall be adjusted as per actual for the following variation

1. Percentage of drawdown of funds
2. Change in Construction period for any force majeure acknowledged by power purchaser and approved by Authority

4.5 Contingency

A provisional sum of USD 1.541 million or 5% CAPEX without IDC has been considered) This is needed to cover unforeseen expenses mainly resulting from delays etc.

5. FINANCIAL ASSUMPTIONS

Debt (Sponsor loan) forms 70% of the total project cost. Interest rate for debt is based on six months' average of KIBOR, with premium i.e. 2.5, which is in accordance with NEPRA benchmarks 2018. (KIBOR 8%, spread 2.5%). The Return on equity has been assumed as 16% which is very reasonable considering the size of project and the fact that financing is arranged by PEDO from its own resources and hence no financing cost has been incurred. Discount rate for the purpose of computation of levelized tariff is 10% has been applied. Details are given in Table below

Financial Assumptions for tariff computation

Description	Value
Plant Price EPC US\$ Million	2.76
Financial Assumptions	
Debt	70%
Equity	30%
Six Month KIBOR	8%
Premium for Rupee Loan	2.500%
ROE	16%
Withholding Tax on Dividends	7.5%
Discount Rate	10.00%
Financing Fee	0
Insurance (during construction)	0
Insurance ops	1%
Emergency parts	0
Customs Duties	7%
Variable O & M Rs./kWh	0.263

Description	Value
Fixed O & M . Rs/KWh	1.755
Plant Capacity MW (net)	9.996
Hours Run	24
Days Operated	328.50
Exchange Rates	
Rs/US\$	160

6. TECHNICAL ASSUMPTIONS

The plant operation is assumed round the clock for 328.50 days a year and the remaining 36.50 days cater for routine and emergency plant shutdowns. Annual energy output is computed based on these figures. Auxiliary consumption of 2% is considered. Forced outage hours are equivalent of 14.5 days or 348 hours in a year

6.1 Capital Structure

The debt and equity component is computed as 70:30 in the tariff model as provided in the policy. The capital structure is shown below in table below.

Project Capital Structure

Capital Structure	US\$ Million
Equity	10.6505
Debt	24.8513
Project Capital Cost	35.5018
Debt Equity Ratio	70:30

6.2 CAPEX Disbursement

The CAPEX disbursement is based on the assumption of 30 months COD period. The percentage disbursement of different components of CAPEX will change as per EPCC contracts.

6.3 Debt Servicing Schedule

Debt service schedule is spread over a period of 10 years with equal installments computed on six monthly basis. Mark-up is computed as per financial assumptions using declining balance method. The interest charges are also computed per kWh to be used as a fixed charge for tariff computation.

7. EQUITY REPAYMENT

Return on equity is computed @ 16% per annum

8. OPERATING COSTS

Operating costs include fixed and variable cost and are calculated based on financial and technical assumptions. The fixed costs include Operating Insurance, Fixed O&M and Cost of Working Capital. Variable costs include only Variable O&M Per unit costs (Rs/kWh) have been computed based on dependable capacity – the maximum possible energy the plant can deliver per annum.

Operating Costs

Item	Unit	Value
Plant Capacity net	MW	9.996
Plant Factor	%	79.57
Hours/Day		24
Days		328.50
Net Electrical Output 79.57 % plant factor	GWh	71
Saleable Energy	GWh	62.70
Water use charges	Rs	0
Variable O&M Cost	Rs/kWh	0.263
Fixed O&M Cost	Rs/kWh	1.755
Operating Insurance 11%	%	1%
Annual Insurance Cost	\$	282,983
	Rs	45277280
	Rs/kWh	0.722

9. PROJECT TARIFF

Tariff based on EPA is based on Take & Pay basis, with **Must Run** provision when the plant is available for dispatch barring any constraints on plant as well as grid. The tariff is calculated based on energy sold i.e. 62.70 GWh per annum and the Agreement year shall be construed accordingly.

The tariff comprises of

- Fixed O&M
- Operating Insurance
- Return on Equity
- Withholding Tax on Dividends
- Loan repayment
- Interest Charges
- Water Use Charges

viii. Variable O&M

Tariff computed based on the assumptions indicated above shows that the tariff will be high in the first ten years after COD thereafter, it reduces substantially. Initial high tariff allows enough cash for debt repayment during the first 10 years of the tariff period. The leveled tariff is computed using the discount rate as per financial assumptions. Average and levelized tariffs are also calculated at different periods i.e. 1-10 years, 11-30 years and 1-30 years for ready reference. Summarized position is given in Table below

Summary of Tariff

Period	Rs/ Kwh	¢/kWh
Average tariff for 1-10 years	18.0766	11.2979
Average tariff for 11-30 years	7.6837	4.8023
Average tariff for 1-30 years	11.1480	6.9675
Levelized tariff	14.4579	9.0362

Detailed tariff schedule is presented at Annexures

10. TARIFF ASSUMPTIONS

Project financing structure is based on 70:30 debt-equity ratio, although the project has been entirely funded from PEDOs resources. 70% of the project Capital cost is considered to be arranged through sponsor loan and 30% is considered as equity. The proposed Reference Tariff is based on the following assumptions. Any change in any of these assumptions will result in changes in the Reference.

- The exchange rates are assumed to be 160 for PKR/USD. Exchange rates variations as per standard EPA shall be accommodated.
- 100% of Debt has been assumed to be financed through Sponsor loan provided by PEDO.
- O&M has been considered as 2.5% of Capital cost minus IDC to keep the tariff as low as possible, although budget calculations indicate it should be approx. 3.5%.
- A constant ROE of 16% per annum is assumed over 30 years.
- Custom Duties on the import of plant and equipment (7% of 70% of foreign cost) have been assumed for reference purposes.
- No sales tax is assumed, General Sales Tax, and all other taxes and any new taxes shall be treated as pass through items.
- The construction period for the purpose of Reference Tariff calculations has been assumed as 30 months from the 'Notice to Proceed' to the EPC contractor. In case the completion of the project takes more than 30 months, IDC shall be adjusted based on the actual time taken for the completion of the project if caused by Force Majeure events acknowledged by Power Purchaser/Authority.

- h) Withholding Tax on dividend @7.5% as required under the Income Tax Ordinance, 2001 is assumed. Any change in the rate of the withholding tax would be pass-through to the Power Purchaser.
- i) No Debt Service Reserve Account (DSRA), Maintenance Reserve Account or Contingency Reserve Account or any other Reserve Account has been considered in the tariff model.
- j) During construction period, the timing of debt drawdown may vary from that estimated now; as such, the actual 'Interest during construction' (IDC) will be updated at COD and the Reference Tariff table will be adjusted accordingly. Similarly, the adjustments for variations in the assumed benchmark interest rates etc shall be applied.
- k) No hedging cost has been assumed for exchange rate fluctuations during construction
- l) Being a Public Sector project, no Water Usage Charges have been considered

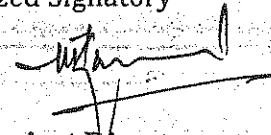
10.1 Summary

In view of the foregoing submissions and further submissions as may be made during hearing and giving of evidence or in rejoinder to a reply by the Petitioner, the Petitioner respectfully prays that in exercise of its statutory powers under the NEPRA Act read with the Tariff Rules, NEPRA may be pleased to allow the tariff with the calculations, amounts and assumptions set out in the Annexures.

Petitioner----

Through authorized Representative
Mr. MUSTAFA KAMMAL KHAN
Authorized Signatory

Dated: NOV-25-2019


Project Director
Jabori HPP
PEDO, Peshawar