



Feasibility Stage Tariff Proposal

640 MW Capacity Mahl Hydropower Project



SPONSORS:

China Three Gorges South Asia Investments Limited

List of Abbreviations:

ACE	Associated Consultancy Engineer
BOQs	Bill of Quantities
COD	Commercial Operations Date
CPP	Capacity Purchase Price
CPPA	Central Power Purchasing Agency (Guarantee) Limited
CSAIL	China South Asia Investments Limited
CTGHG	China Three Gorges Hong Kong Investment Company Ltd.
CTG	China Three Gorges Corporation
CTGI	China Three Gorges International Corporation
EPC	Engineering, Procurement & Construction Contract
EPP	Energy Purchase Price
GOAJK	Government of Azad State of Jammu and Kashmir
GOP	Government of Pakistan
GW	Gigawatt
GWh	Gigawatt hours
HPP	Hydro Power Project
Hrs.	Hours
IA	Implementation Agreement
IDC	Interest During Construction (Capitalized)
IFC	International Finance Corporation
IPR	NEPRA (Import of Electric Power) Regulations, 2017
IRR	Internal Rate of Return
KW	Kilowatt (kWh: Kilowatt hours)
kWh	Kilowatt hours
m	meter(s)
MPCL	Mahl Power Company (Pvt) Limited
MW	Megawatt (MWh: Megawatt hours)
MWh	Megawatt hours
NEPRA	National Electric Power Regulatory Authority
No.	Number
PKR	Pakistan Rupee
POE	Panel of Experts
PPA	Power Purchase Agreement
PPIB	Private Power Infrastructure Board
ROE	Return on Equity
SIDRI	Shanghai Investigation, Design & Research Institute, Co. Ltd.
SRF	Silk Road Fund
US¢	United States cent
USD	United States Dollar
WHT	Withholding Tax



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1. DETAILS OF THE APPLICANT

In order to implement the proposed 640 MW (Gross) Capacity Mahl Hydroelectric Power Project, a new Special Purpose Vehicle Company ("SPVC") by the name of Mahl Power Company (Private) Limited (hereinafter referred to as "MPCL", the "Company" or the "Project Company") was incorporated in Pakistan and registered with the SECP on May 25, 2015. The Project Company will build, own and operate the Complex till the expiry of the stipulated thirty (30) year Term of the Power Purchase Agreement ("PPA"). Thereafter the Complex will be handed over to the representative of the Government of Azad Jammu & Kashmir ("GOAJK") in accordance with the provisions of the Implementation Agreement(s) ("IA") to be entered into between MPCL and various counter parts, in due course.

Name and address of the authorized representative:

Syed Hasnain Haider

Chief Executive Officer

Mahl Power Company (Private) Limited ("MPCL")

Address: Level 6, Serena Business Complex,
Khayaban-e-Suhrawardy, G-5/1, Islamabad.

Tel: +92518439616

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2. EXECUTIVE SUMMARY

Mahl Power Company (Pvt.) Limited hereby requests Central Power Purchasing Agency (Guarantee) Limited ("CPPA", or the "CPPA-G") to process Company's proposed Feasibility stage tariff proposal for submission to NEPRA for 640 MW Mahl Hydropower Project ("Project"), located in the State of Azad Jammu & Kashmir ("AJ&K"); in accordance with NEPRA Import of Electric Power Regulations, 2017 and Policy for Power Generation Projects 2002.

MPCL is an ultimate subsidiary of China Three Gorges Corporation ("CTG"), which is a State Owned Entity of the Government of China. CTG is one of the largest power companies in the World with an asset base of USD 94.90 Billion. Apart from this Project, CTG is also developing two other mega hydro power projects on Jhelum River, namely, the 720 MW Karot Hydropower Project and the 1,124 MW Kohala Hydropower Project. CTG also has in operation a 50MW wind power project in Jhimpir, Sindh and is setting up additional two 50MW wind farms also in Jhimpir, Sindh. The aforementioned projects are primarily owned by an intermediate subsidiary of CTG, that is, China Three Gorges South Asia Investments Limited ("CSAIL" and "Sponsors") in which the International Finance Corporation ("IFC"; part of the World Bank Group) and China Silk Road Fund ("SRF"; owned by Government of China) each have 15% shares. The remaining 70% shareholding in CSAIL remains with CTG.

The Mahl Power Project was identified in a Ranking Study conducted by MONENCO (1983) which identified the Project on river Jhelum about 5 kilometers upstream of river Mahl confluence with river Jhelum. The Project was subsequently advertised by the Government of Pakistan ("GOP"). The Sponsors were issued the Letter of Interest ("LOI") for the Project on October 21, 2014. A detailed feasibility study was carried out and submitted to the Private Power & Infrastructure Board's ("PPIB") Panel of Experts ("POE") for approval on August 15, 2016. The POE approved the Feasibility Study on January 24, 2017.

Following deliberations and discussions with CPPAG, the Company is pleased to propose a Project Cost of USD 1,281.46 Million. The Sponsors are committed to setting up the Mahl HPP and other energy projects in Pakistan at most competitive rates for the long term sustainability and good relations between the Government of People's Republic of China and the Government of Pakistan, and we hope that the CPPAG and the Authority will recognize this gesture.

The Feasibility Stage envisages a Debt: Equity ratio of 80:20 to undertake the Project, with the size of Debt and Equity being USD 1,025.18 Million and USD 256.28 Million respectively.

This proposed Project will add an additional 640 MW generation capacity to the National Grid during the 30 year term of the Power Purchase Agreement ("PPA"). The Project will have a useful life beyond its proposed concession period, or, the "PPA Term". After the expiry of the Term, the project will be transferred to the Government of AJ&K("GOAJK") at a notional cost of Rupee 1.

The Project will also provide low cost power and will have consequential long term benefits for the national economy. In addition to electricity generation and foreign exchange savings through eliminating the need for fuel imports (as in the case of an alternative option) this project will also create employment opportunities for the local population and will promote development of ancillary business activity.

The Project will have a construction period of 72 months. Key factors which are contributing to construction period include: challenging geological conditions, narrow river valley at Project site necessitating the need for greater excavation works and requirements for substantial site related infrastructure including access roads and compensating roads.

Amongst the many challenges foreseen in the Project's construction and operations, some formidable ones include: project will be located in AJK & two provinces, regional security, political situation and circular debt scenario

The Grid Interconnection Facility for the Project will be built by National Transmission and Dispatch Company Limited ("NTDC"). In this regard, an interconnection study was conducted and submitted to the CPPA/NTDC for approval and has been approved by NTDC on December 29 ,2017

Sponsors are actively pursuing the development of this project of national importance for the two countries involved i.e. Pakistan and People's Republic of China and have so far invested US \$ 16 million in its development, and looks forward to the continuing support from all the Stakeholders.

The brief summary of the Project's technical parameters, project components and tariff proposal is as under:

Table 1: Project Information

	BASIC INFORMATION		
	PROJECT COMPANY		Mahl Power Company (Pvt.) Ltd.
	SPONSORS		CSAIL, Trans Tech
	GOOGLE COORDINATES		Longitude 73° 32' 37" East
			Latitude 33° 56' 49" North
	CONCESSION PERIOD	Years	30
1	ENGINEERING PERFORMANCE INDICATORS		



MAHL POWER COMPANY LIMITED

	INSTALLED CAPACITY	MW	3 x 213.33 = 640
	GUARANTEED OUTPUT	MW	96.33
	AVERAGE ANNUAL ENERGY OUTPUT (GROSS)	GWh	2,934
	AVERAGE ANNUAL ENERGY OUTPUT (NET)	GWh	2,904
	ANNUAL UTILIZATION HOURS	Hrs.	4,584
	PLANT FACTOR		52.33%
2	MAIN STRUCTURES AND EQUIPMENT		
2.1	DAM STRUCTURE		
	DAM TYPE		Roller-compacted concrete gravity dam
	CREST ELEVATION	m	592.4
	MAXIMUM DAM HEIGHT	m	88.4
	CREST LENGTH	m	372.5
2.2	SPILLWAY AND LOW LEVEL OUTLETS		
	TYPES OF RELEASE STRUCTURE		Overflow Spillway + Low Level Outlet
	SPILLWAY:		
	CREST ELEVATION	m	563
	NO. OF BAYS	No.	5
	SIZE OF BAY (WIDTH × HEIGHT)	m	15 x 22
	LOW LEVEL OUTLET:		
	NO. OF OUTLETS	No.	4
	ORIFICE SIZE (WIDTH × HEIGHT)	m	5.5 x 8
2.3	POWER WATER WAYS		
	DESIGN DISCHARGE	m ³ /s	1,305
	POWER INTAKE TYPE		Integrated with the dam
	PENSTOCK:		
	NO. OF PENSTOCKS	No.	3
	INNER DIAMETER	m	9.9
	TOTAL LENGTH	m	84.06 x 3 = 252.18
	FLUSHING OUTLETS:		
	NO. OF OUTLETS	No.	3
	INNER DIAMETER	m	3.2
	TOTAL LENGTH	m	147.27 x 3 = 441.81
	TAILRACE PLATFORM:		
	HEIGHT	m	548.5
	WIDTH	m	26
	LENGTH	m	97.5
2.4	POWERHOUSE		
	POWERHOUSE TYPE		Surface powerhouse at dam toe
	SIZE (LENGTH× WIDTH × HEIGHT)	m	166.5×34.0×82.7



MAHL POWER COMPANY LIMITED

	TOP ELEVATION	m	571.3
	SETTING ELEVATION OF WATER TURBINE	m	515.1
	<u>SUBSTATION:</u>		
	AREA (L × W) / NO. OF LAYERS (N)	m ² /n	97.5×17.00/2
2.5	MAIN ELECTROMECHANICAL EQUIPMENT		
	<u>WATER TURBINE:</u>		
	WATER TURBINE TYPE, SET	Set	Francis, 3
	RATED OUTPUT	MW	216.58
	RATED SPEED	r/min	83.3
	SUCTION HEAD	m	-4.5
	RUNNER DIAMETER	m	7.3
	RATED HEAD	m	55
	WEIGHTED AVERAGE HEAD	m	57.26
	RATED DISCHARGE	m ³ /s	434.8
	<u>GENERATOR:</u>		
	GENERATOR SETS	Set	3
	RATED CAPACITY	MW/MVA	213.33 / 237.03
	POWER FACTOR		0.9
	RATED VOLTAGE	kV	15.75
	<u>POWER TRANSMISSION LINE:</u>		
	TRANSMISSION VOLTAGE	kV	500
	NUMBER OF CIRCUITS	Circuit	2
3	PROJECT COST & TARIFF		
	PROJECT COST		USD 1,281.46 Million
	DEBT / EQUITY		80:20
	DEBT TENURE	Years	18 (Inc. 6 year Const.)
	DEBT PRICING FOREIGN	%	LIBOR: 0.91% + Spread 4.50%
	CONSTRUCTION PERIOD	Months	72 months
	LEVELIZED TARIFF	US¢	7.1030/kWh
		PKR	7.4404/kWh

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3. BASIS FOR TARIFF PROPOSAL

In order to cater to the unique nature of hydropower plants, wherein cost uncertainty due to a long gestation period is neither in the control of the Company nor the Power Purchaser, NEPRA has developed its Mechanism for Determination of Tariff for Hydropower Projects. The Hydropower Tariff Mechanism provides for determination of tariff and subsequent adjustments at different stages of development of hydropower projects. In this respect three distinct stages have been identified in the Mechanism for Determination of Tariff for Hydropower Projects:

- Feasibility stage;
- EPC stage; and
- COD stage (after achievement of Commercial Operation Date (“COD”)).

This proposal pertains to Feasibility stage tariff and is filed in accordance with the NEPRA (Import of Electric Power) Regulations, 2017 (“IPR”). The Company requests the CPPA to process MPCL’s Feasibility stage tariff proposal under the said Regulations for submission to NEPRA.

* * * * *

4. PROJECT BACKGROUND

The 640 MW Mahl Hydroelectric Power Project is located 5 km upstream of the confluence of Mahl River with Jhelum River, on the boundary between the State of Azad Jammu & Kashmir (AJ&K) and the province of Punjab with some portion of dam in province of Khyber Pakhtunkhwa at Longitude 73° 32' 37" East and Latitude 33° 56' 49" North. The Project is located 27 km downstream of 1,124 MW Kohala Hydro Project and 22 km upstream of 640 MW Azad Pattan Hydropower Project.

The Project was identified in a Ranking Study conducted by MONENCO (1983) which identified the Project on river Jhelum about 5 kilometers upstream of river Mahl confluence with river Jhelum. The normal water level of the proposed Mahl project was 557 m and the gross head was 53 m with installed capacity was 93 MW.

The 2nd study related to the Project was carried out by Hydroelectric Planning Organization (HEPO) of WAPDA in collaboration with German Agency for Technical Cooperation (GTZ). The report titled "Comprehensive Planning of Hydropower Resources in River Jhelum Basin" was prepared in December, 1994. According to the report, 245 MW capacity scheme downstream of the confluence of Mahl River and Jhelum River was proposed. The normal water level was 557m with gross head of 53m.

In 2008, on the basis of the previous planning reports and cascading hydropower designs, PPIB checked the cascade development plans for the reaches upstream of Mangla dam and prepared the report titled: "Study for Hydropower Cascading Projects on Jhelum River". As per the conclusion of the PPIB report, the dam axis for Mahl HPP was the same as identified in MONENCO study and its reservoir was to be extended up to Kohala Hydro Power project's tail water level of 585m. The tail water level for Mahl HPP was maintained at 526m. The gross head for Mahl HPP was revised to 59m instead of 53m as identified in MONENCO study with a design discharge of 1,200 m³/sec and installed capacity of 590 MW.

Based on aforementioned reports, studies and site visits; the Feasibility Report for Mahl Hydro Power project has subsequently been prepared by Shanghai Investigation, Design & Research Institute, Co. Ltd. ("SIDRI") in association with local Consultants: Associated Consultancy Engineer ("ACE") (collectively, "Feasibility Consultant"). With normal water level of 585m and the tail water level of 526 m (leaving a gross head of 59m), the Feasibility Consultant subsequently conceived the Project with an installed capacity of 640 MW.

After thorough deliberations, the submitted Feasibility Study was subsequently approved by the PPIB's designated Panel of Experts. A chronology of the Project till Approval of Feasibility Study by Panel of the Experts vide their letter No. 1(101) PPIB-2044-02/17/PRJ/O-48230 dated January 24, 2017 is provided below:



Table 2: Chronology till Feasibility approval

Date	Detail
AUGUST 26, 2013	Submission of Bidding Documents for the Project invited by PPIB
APRIL 15, 2014	Notification of Qualification by PPIB
OCTOBER 21, 2014	Letter of Interest (LOI) issued by PPIB
JANUARY 29, 2015	1 st Panel of Expert Meeting
JUNE 17, 2015	2 nd POE Meeting
SEPTEMBER 22, 2015	3 rd POE Meeting
MARCH 28, 2016	Submission of Interim Report
APRIL 8, 2016	4 th POE Meeting
AUGUST 15, 2016	Submission of Feasibility Study Report to PPIB/POE and concluded that it is technically feasible and economically viable to develop a 640 MW hydropower scheme at Mahl Project
SEPTEMBER 8, 2016	5 th POE Meeting (comments by POE responded on Sep 16, 2016)
SEPTEMBER 27, 2016	6 th POE Meeting (comments by POE responded on Oct 20, 2016)
NOVEMBER 24, 2016	7 th POE Meeting
JANUARY 2, 2017	8 th POE Meeting

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5. PROJECT BENEFITS TO PAKISTAN AND AJK

Apart from being a large-scale power generation project based on indigenous resources, the Project has various additional advantages:

- Project would provide economical and reliable electricity to the national grid.
- After completion of 30 year term, the Project, having substantial residual technical and economic life, shall be transferred to representative of the GOAJK at a notional value of Rupee 1.
- Project will generate employment for local population.
- Economic opportunities will be generated in the local area and in Pakistan for subcontracts, suppliers etc.
- After COD of the Project, GOAJK will receive around:
 - **Rs. 1.23 Billion** annually for 30 years on account of Water Usage Charges (the “WUC”) (which translates to per day income of around Rs. 3.38 Million for AJK) – Rs. 37.03 Billion over 30 years.
 - **Rs. 4.34Billion** on account of various taxes during six (6) years of construction of the Project.
- Project will prepare and implement a Community Investment Plan (the “CIP”) for betterment of the communities in the Project area through interventions in areas of health, education, community physical infrastructure, etc.

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6. ABOUT THE APPLICANT & PROJECT SPONSORS

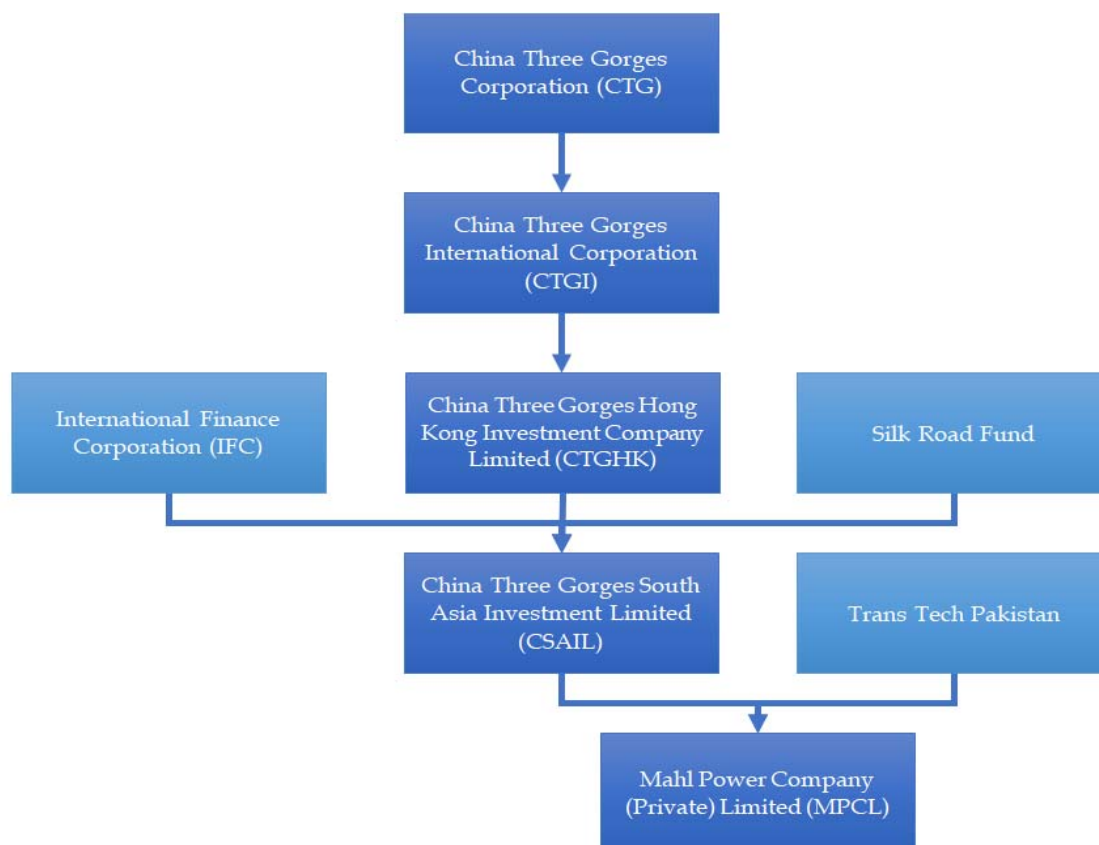
6.1 The Applicant

In order to implement the proposed 640 MW Mahl Hydro Power Project, a new Special Purpose Vehicle Company ("SPVC") with the name of Mahl Power Company (Private) Limited, was incorporated in Pakistan and registered with SECP on May 25, 2015. The Project Company will build, own and operate the Complex till the expiry of the stipulated thirty (30) year Term of the Power Purchase Agreement ("PPA"). Thereafter the Complex will be handed over to the representative of the Government of Azad Jammu & Kashmir ("GOAJK") in accordance with the provisions of the Implementation Agreement(s) ("IA") to be entered into between MPCL and various counter parties, in due course.

6.2 The Project Sponsors

6.2.1 Ownership Structure

China Three Gorges South Asia Investment Company Limited ("CSAIL") is the Main Sponsor in the Project Company. Ownership structure of CSAIL leading up to ultimate parent company i.e. CTG is explained through the hierarchical diagram below:



6.2.2 China Three Gorges South Asia Investment Limited (“CSAIL”)

CSAIL is incorporated for the purpose of acquiring, investing, developing, building, owning and operating renewable power generation projects in Pakistan and other territories. CSAIL’s current multi-stage project pipeline is USD 5.5 billion (approx.), comprising of hydro and wind power projects with a cumulative capacity of over 2,634 MW, including three hydropower projects with planned total installed capacity of 2,484 MW. CSAIL aims to become the largest renewable power company in Pakistan. The 640 MW Mahl Power Project reaffirms CTG’s commitment to Pakistan’s electricity market requiring a significant investment of around USD15-20 Billion to develop 10,000 MW of additional generation capacity in the next 5-6 years to overcome the supply shortfall in Pakistan. CTG, through its intermediate subsidiaries, owns 70% shares in CSAIL.

6.2.3 Trans Tech Pakistan

Trans Tech Pakistan is a partnership firm with its office at Suite 8, Ground Floor, Evacuee Trust Complex, Sector F-5/1. Trans Tech Pakistan owns 3% shareholding in MPCL.

6.3 China Three Gorges Corporation (“CTG”)

CTG is a wholly state-owned enterprise with a registered capital of RMB 149.54 Billion (USD 21.70 Billion). CTG is strategically positioned as a clean energy conglomerate specializing in development and operation of large-scaled hydropower projects. CTG’s principal operations include engineering, construction, management, electricity production and provision of related technical services for hydropower projects. With experience in the construction, management and operation of the 22,500 MW Three Gorges Project (world’s largest hydropower project), CTG has developed “four core abilities”:

- Construct and manage large-scale hydropower projects,
- Raise and manage funds for large-scale hydropower projects,
- Operate and market large-scale hydropower projects and
- Manage unified dispatching of cascade hydropower projects.

6.4 International Finance Corporation (IFC)

The International Financial Corporation, a member of World Bank Group with total assets of USD 90 Billion. IFC is committed to developing hydroelectric and alternative energy projects in Pakistan and has committed more than USD 500 Million so far towards this sector. IFC owns 15% shares in CSAIL.



6.5 Silk Road Fund – owned by Government of China (“SRF”)

The SRF has a total capital of USD 40 Billion, of which USD 10 Billion has been subscribed. The SRF is a medium to long-term development and investment fund. Through a variety of forms of investments and financings primarily equity investment, the fund is dedicated to supporting infrastructure, resources and energy development, industrial capacity cooperation and financial cooperation in countries and regions involved in Silk Road Economic Belt and the 21st Century Maritime Silk Road Initiative. Like IFC, SRF also owns 15% shares in CSAIL.

* * * * *



7. PROJECT DESCRIPTION

The Project envisages development, design, engineering, financing, construction, testing & commissioning, ownership, operations, maintenance and transfer of 640 MW Hydropower Plant on Build-Own-Operate-Transfer ("BOOT") basis in accordance with the GOP's Policy for Power Generation Projects 2002, as amended from time to time.

7.1 Project Location

The Project is located 5 km upstream of the confluence of Mahl River with the Jhelum River on the boundary between the State of Azad Jammu & Kashmir (AJ&K) and the province of Punjab with some portion of dam in Khyber Pakhtunkhwa (KPK). Mahl Hydropower Project is located between 1,124 MW Kohala and 640 MW Azad Pattan Hydropower Projects. The Project is about 140 km from Islamabad and 70 km from Muzaffarabad; capital of AJ&K. The Project area lies on the Jhelum river at Longitude 73°32'37" East and Latitude 33°56'49" North. The Project location and the Jhelum River are shown as below.

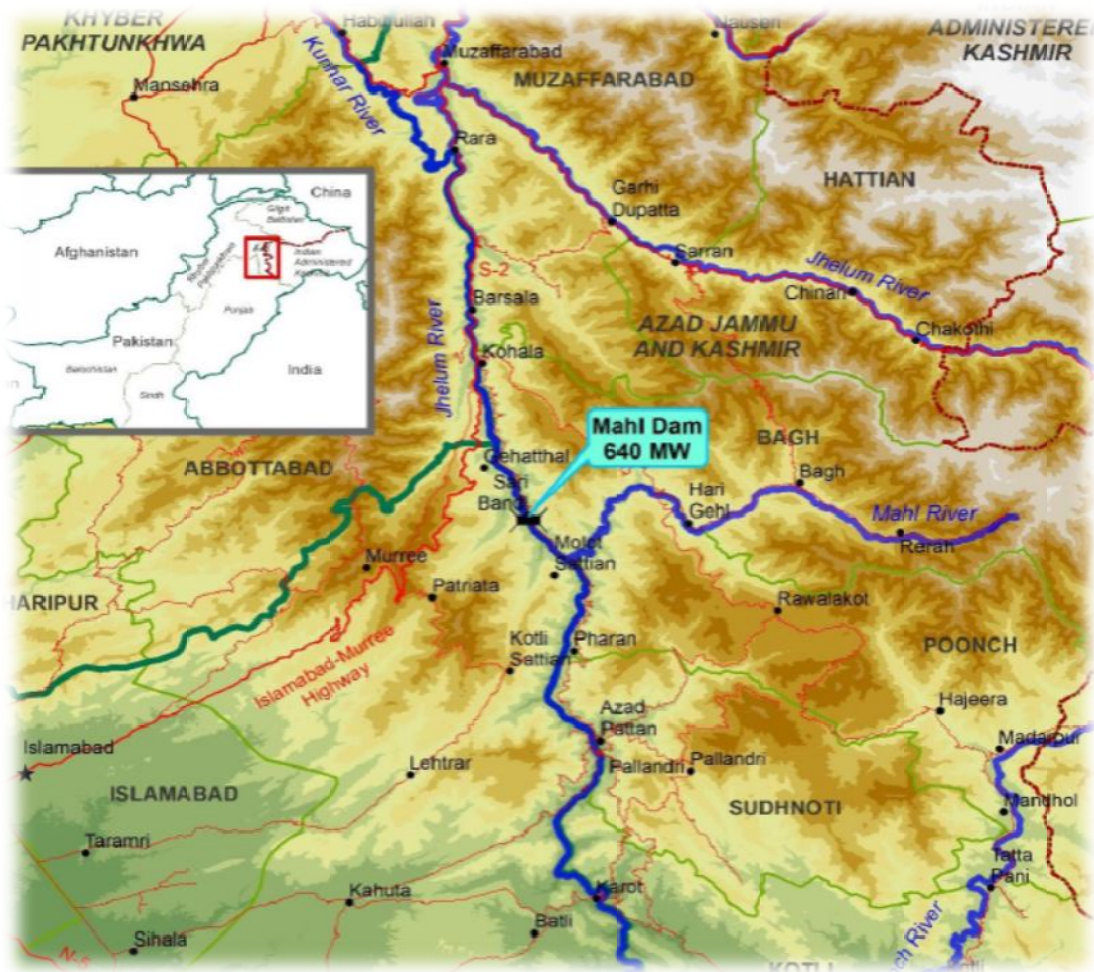


Figure 1: Access Route Map for Mahl Site



From Islamabad, the Project site is accessible by following routes:

- Islamabad – Murree – Mahl Bridge on Jhelum River – Dam site of Mahl Hydropower Station. **Total distance is 138 km.**
- Islamabad - Burma Town - Lehtrar - Tain Dhalkot Bridge – Dam site of Mahl hydropower station. **Total distance is 103 km.**
- Islamabad -Kahuta -Azad Pattan Bridge – Dam site of Mahl hydropower station. **Total distance is 124 km.**
- Islamabad - Nara - Karot Bridge (Dam site of Karot hydropower station)Dam site of Azad Pattan hydropower station – Dam site of Mahl hydropower station. **Total distance is 150 km**

7.2 Project Components

The project comprises of a Roller Compacted Concrete (“RCC”)Gravity Dam, Gated Overflow Spillway, 4 Low Level Outlets (for sediment sluicing as well as for augmenting the release capacity of the overflow spillway), three Power Intakes and Penstocks, three Power Intake Scouring Outlets, River Diversion Tunnel, River Diversion Channel, Surface Powerhouse at toe of the Dam, Gas Insulated Switchgear (“GIS”)Switchyard, an Interconnection with National Power Grid through an In-and-Out arrangement with a 500 kV Double Circuit Transmission Line. Project components are shown in the figure below:

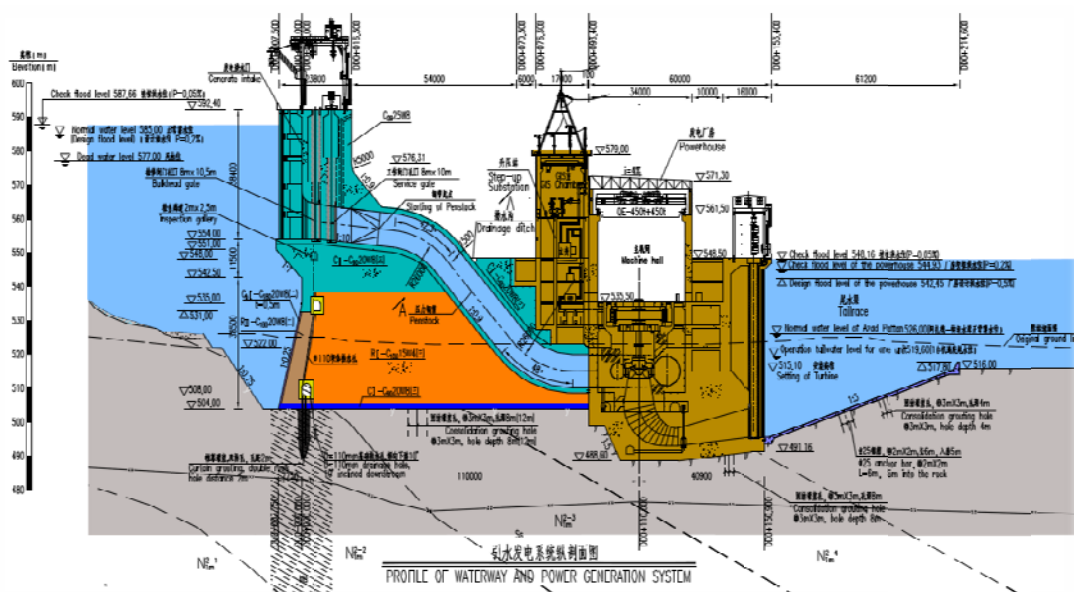


Figure 2: Cross Sectional layout of Mahl Power Project



7.3 Hydrology and Sedimentation

Reliable data series of 40-50 years are available from gauging stations upstream and downstream of Mahl dam site. The data up to year 2014 has been used in hydrological study of the Project. The runoff of the dam site concentrates in the months of March to September, which accounts for over 86% of the annual runoff. The maximum mean monthly flow appears in June with a value of 1,690 m³/s and minimum in January with a value of 204 m³/s.

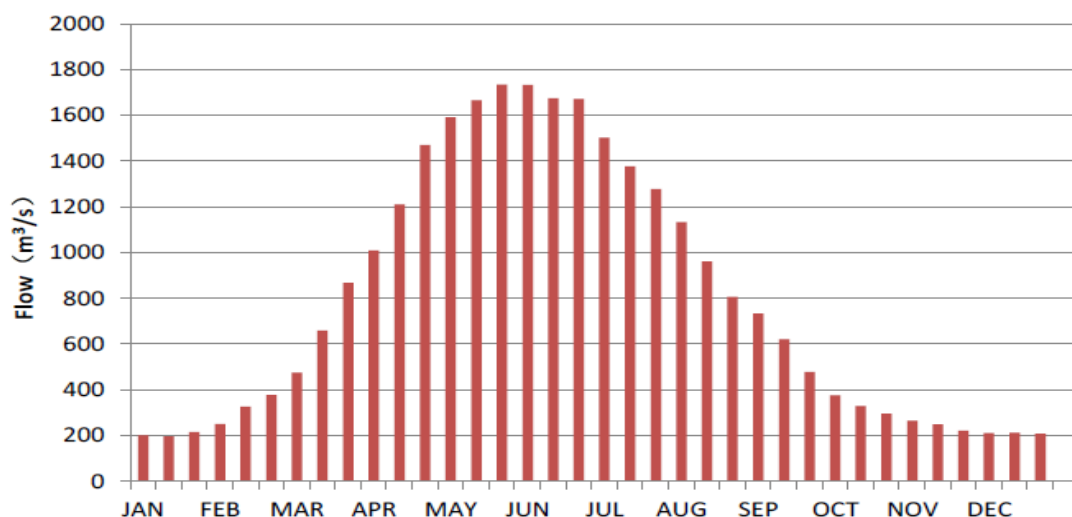


Figure 3: Ten Day Mean Flow at Mahl Dam Site

According to the Chinese Standard for Flood Control and the Classification & Design Safety Standard of Hydropower Projects, Mahl Hydropower Project having a reservoir capacity of 139.67 MCM and powerhouse capacity of 640 MW, falls under Grade II. As such the concrete gravity dam and water-retaining and flood release structures are to be designed for a Basic Design Flood (“BDF”) of 500 years return period and to be checked with 2,000 years return flood as SCF. The corresponding peak discharges are 18,500 m³/s and 23,300 m³/s, respectively. However, following a conservative approach, enhanced safety has been ensured by checking the safe passage of still higher flood of 5,000 year return period with the peak of 26,400 m³/s.

Elevation-Area-Capacity Curves have been developed using Trapezoidal Formula for the Mahl Reservoir. The total reservoir storage at Normal Operating Reservoir Level (“NORL”) of 585 m is estimated to be 139.67 MCM.

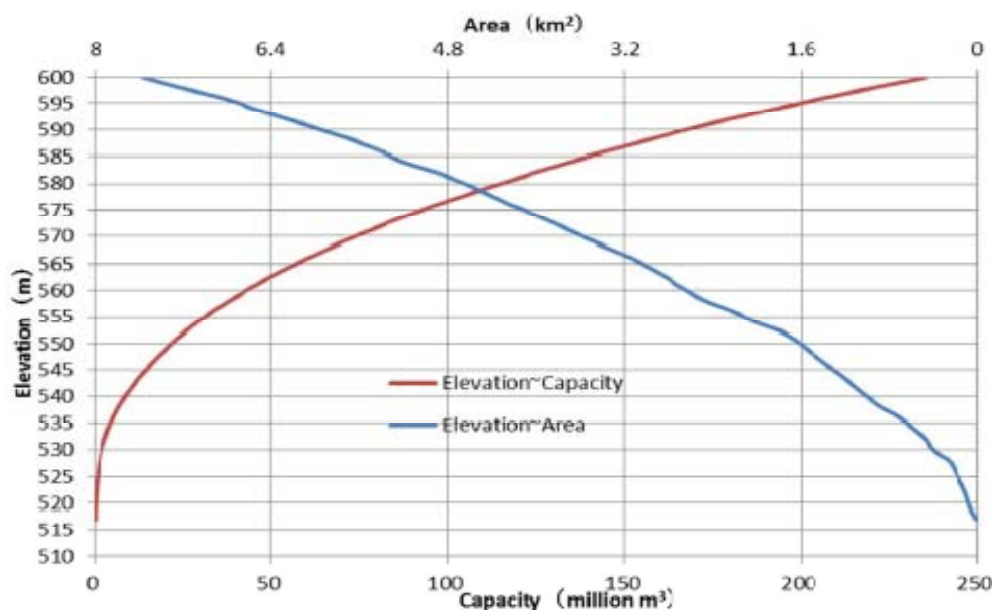


Figure 4: Elevation-Area-capacity curves of Mahl Reservoir

The average annual suspended sediment load is estimated as 30.27 Million tons. Adding 15% bed load, the average annual sediment load is 34.81 Million tons.

The study results of one-dimensional and two-dimensional mathematical model show that under the recommended operation mode, Mahl reservoir basically reaches fluvial equilibrium after 13-15 years and the accumulated reservoir sediments reach about 173 Million tons after twenty years of operation. The remaining reservoir capacity is about 27 Million m³ under the normal operation level, of which the live storage is about 18 Million m³. After 10 years of operations, the delta moves to the front of the Dam and the changes in longitudinal section of the river channel are reduced significantly.

Through physical model study conducted by China Institute of Water Resources and Hydropower Research in Beijing, it is confirmed that the selected layout of the Project has smooth flow condition; effective sediment sluicing and flushing that can form a sourcing funnel, thereby ensuring the “clear area” in front of the power intake. The sediment model study shows that under the recommended sluicing operation mode, the water level of 581m plays a significant role in desilting in front of the dam. Therefore the reservoir operation with this water level can be utilized flexibly according to incoming flow and sediment upstream and the power generation requirements.

7.4 Annual Generation

Annual Average Energy (Gross) of 2,934 GWh has been calculated on the basis of discharges from 1965-2012 which compute Plant Load factor of 52.33% in line with the methodology being followed for the computation of “Availability” for Hydro Power Projects being developed under the Hydro IPP arrangement, including:

Scheduled Outage (maintenance outages, sediment flushing outage, major overhaul outage and tunnel inspection outage) and Forced Outages.

7.5 Seismic Hazard Analysis

The project area is located near the South-West part of Hazara-Kashmir syntaxial bend. In respect of the geological structure, it is situated in West tectonic node of India-Eurasia collision zone and southern foot of Himalayas.

Historically, strong earthquakes have occurred in this region including the Kashmir earthquake of magnitude 7.6, which occurred in 2005. In the nearby area of the project, five active faults have been identified, of which the Murree fault located at a shortest distance of 9km from the dam site is the closest one.

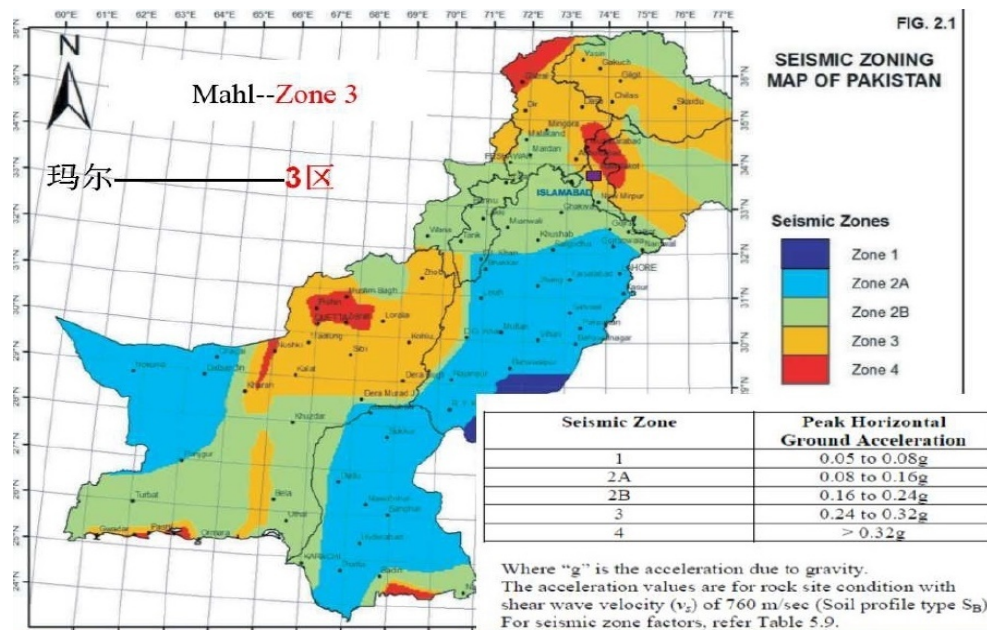


Figure 5: Location of Project Site in Seismic Zoning

None of the faults is crossing or is directed towards the dam site. All the regional and the near-field faults have been duly considered in the seismic hazard evaluation of the project area.



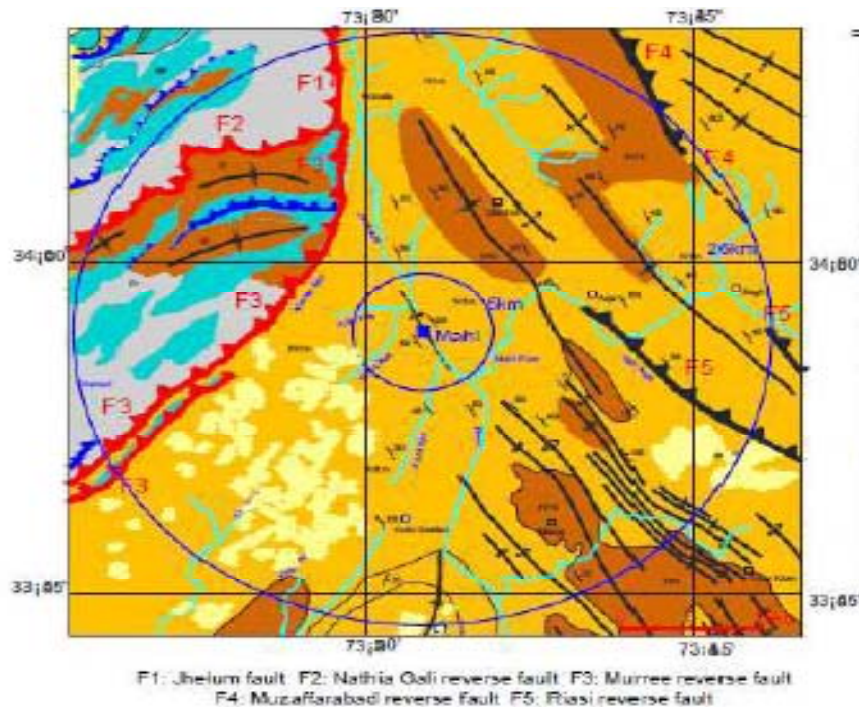


Figure 6: Nearfield Tectonic Map of the Mahl Dam site

Seismic safety of the project has been evaluated following the International Commission on Large Dams (“ICOLD”) guidelines. The Safety Evaluation Earthquake (“SEE”) has been conservatively selected equal to Maximum Credible Earthquake (“MCE”) with Peak Ground Acceleration (“PGA”) of 0.58g (571 gal). The dam safety critical features like dam body, low level outlets and spillway gates are recommended to be designed to maintain their reservoir-retaining integrity during shaking from SEE ground motions. Moreover, these features are recommended to be designed to remain operative in Operating Basis Earthquake (“OBE”) condition with PGA value 0.18g (178 gal). All the appurtenant structures of the project including power house are recommended to be designed for PGA of 0.30g (288 gal), which is associated with horizontal ground motion of Design Basis Earthquake (“DBE”).

7.6 Geological and Geotechnical Studies

Detailed survey, mapping and subsurface investigations of the project area have been carried out including over five thousand meter of drilling, excavation of four adits in the dam abutments and over 1,800 m³ excavation of exploratory trenches. In situ rock mechanics tests, have been conducted in the adits and laboratory testing of foundation materials and natural construction materials has been carried out in Pakistan as well as in China. Based on these extensive studies, a clear understanding of the geological and geotechnical conditions of the Dam site and the Reservoir Rim area has been developed, which has provided sound basis for planning and design of the project structures.

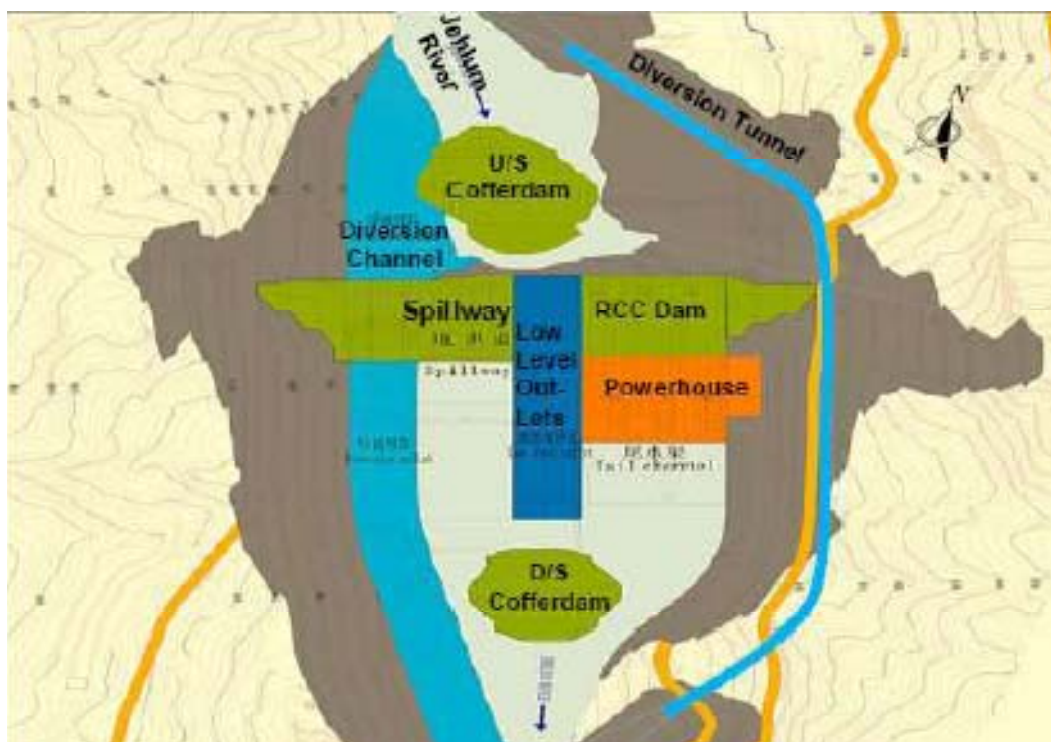


Figure 7: Layout of selected scheme and power house at Dam toe

The river valley in the project area is V-shaped with huge mountains on both banks, mainly comprising sandstone, siltstone and mudstone rocks of Murree formation. The bank slopes are generally covered with overburden comprising mixture of gravels, sandy and clayey soils and rock fragments. Gullies are developed in mountains on the river banks. Jhelum anticline passes through the river bed at the dam site, due to which minor structures like fractures and crinkles have developed. The rock mass at the dam site is weathered and strong unloading depth is 7-50m. The rock mass permeability is high, more than 5 Lu, up to a depth of 75-95m.

The rock mass forming foundation and abutments of the dam has the disadvantage of inhomogeneous deformation, poor stability against sliding on shallow depths and high permeability. Underground excavations also have poor stability.

Through comprehensive understanding of the bedrock characteristics and taking necessary strengthening and treatment engineering measures, the Dam site possesses foundation conditions for up to 100 m high concrete gravity dam.

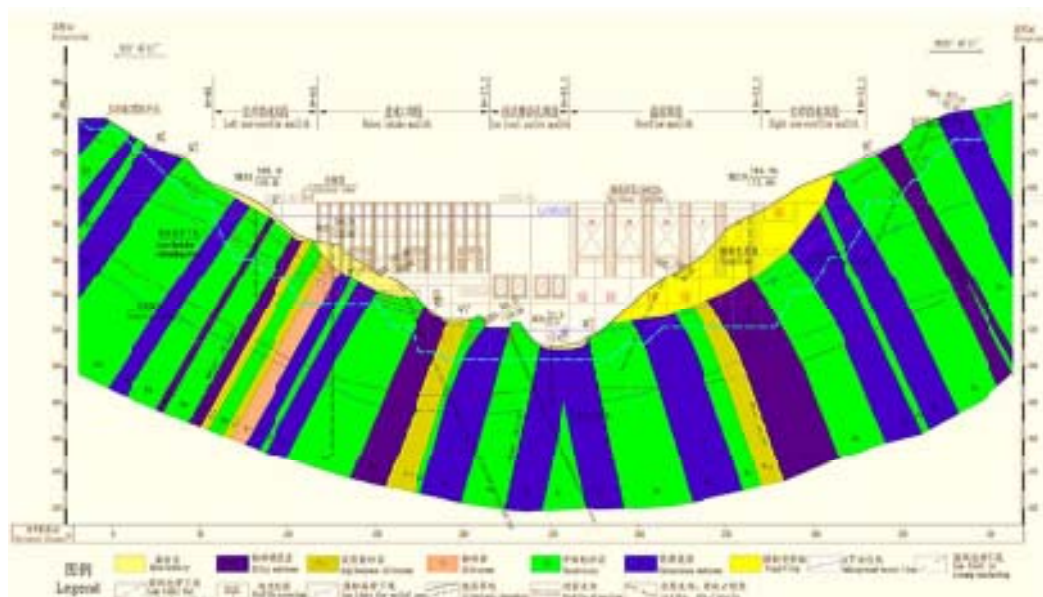


Figure 8: Geological Section of the Dam

The overburden and highly weathered rocks will be completely removed from the dam and powerhouse foundation areas. Moderately weathered rock in the dam foundation may require treatment including consolidation grouting. Grout curtain backed up with drainage holes will be provided in the dam foundations for seepage control.

Engineering measures would be required to take care of inhomogeneous settlement behavior of various types of foundation rock beds. The cut slopes on the two abutments will also require strengthening, protection and drainage measures.

7.7 Optimization and Project Sizing

The Plant sizing of the Mahl Power Project is driven from PPIB's "Study for Hydropower Cascading Projects on Jhelum River" on River Jhelum including Mahl HPP was carried out by PPIB in 2008 to identify: (a) any unutilized head (b) positive/negative effects of upstream projects, and extreme boundary limits of each project area. As per the conclusion of the cascade study, the dam axis for Mahl HPP is extended up to Kohala HPP's tail water level of 585m with gross head of 59m and design discharge will be 1,200 m³/sec. In addition, the study also envisaged that Operating Capacity of 590 MW is expected to be achieved.

Above parameters relating to head, capacity and discharge were further corroborated in the Project's Feasibility.

In order to lessen the adverse influence on the power generation of Mahl HPP due to uneven inflow from the upstream projects and to ensure improved economic index; through comprehensive Techno-Economic analysis of different installed capacities, i.e. 590MW, 640MW, 680MW and 720MW it was concluded by the Feasibility



Consultant that installed capacity of 640MW is technically and financially viable and hence recommended for implementation at Mahl HPP Site.

Mahl HPP is designed to have a layout of Concrete Gravity Dam and Powerhouse on the left bank and dam toe. The layout recommended proves to be appropriate through the technical and economic comparison of multi alternatives. According to the complex layout and installed capacity of Mahl HPP, the four options comprising of 2, 3, 4 and 5 units have been considered for comparison and with an emphasis focus on the comparison between 3 and 4 unit alternatives. However, due to the fact that the river valley where dam lies is relatively narrow, the 3 unit alternative is better adaptive to topographic and geological conditions than the 4 unit alternative. More specifically, the 3 unit alternative can lower the maximum slope height by about 17m on the left side of the powerhouse, decrease the slope excavation scope and reduce the risk of slope works. Therefore the 3 unit scheme, having a unit capacity of 213.33 MW, is eventually recommended for Mahl HPP.

In view of above, Mahl HPP has following design parameters:

- Installed capacity of 640MW with three Units of 213.33 MW capacity each
- Discharge flow of 1,305 m³/s
- Gross Head of 59m

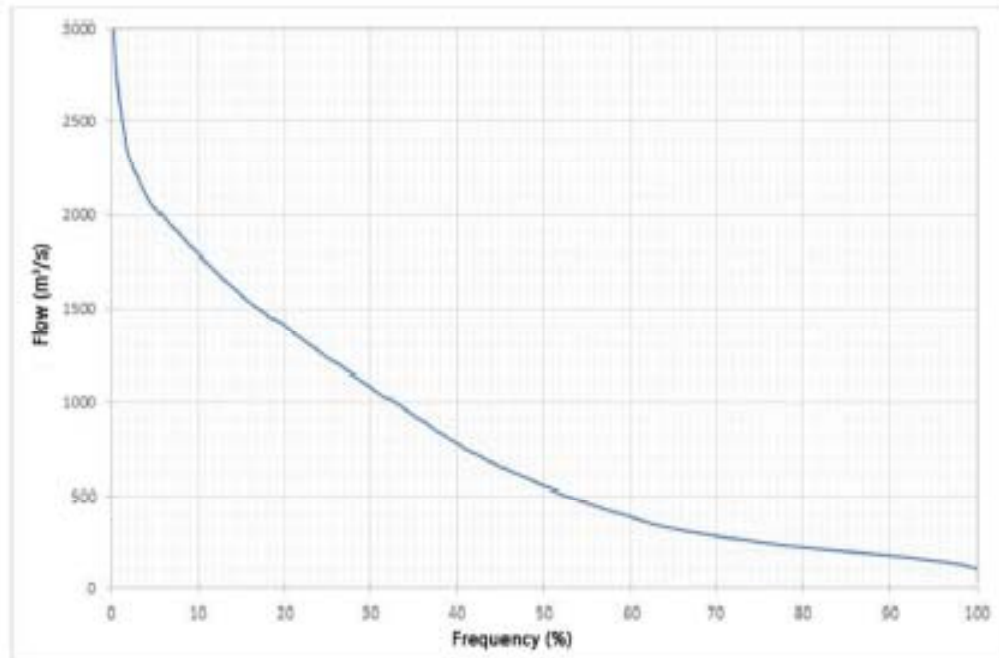


Figure 9: Flow duration curve at Project Site

7.8 Power Plant and Auxiliaries

Mahl hydropower plant would have three Francis hydraulic turbines (mixed flow type) of vertical shaft design. Each turbine would have a rated output of 216.58 MW



at a rated discharge of 434.8 m³/s under a rated head of 55 m and at a synchronous speed of 83.33 revolutions per minute. The range of operating head would be 45 m to 67 m. Turbine runner comprising crown, band and blades would be made of stainless steel which has good cavitation and abrasion resistance and welding quality. The governor of each turbine would be Proportional, Integral, Derivative ("PID") digital microcomputer-based electro-hydraulic.

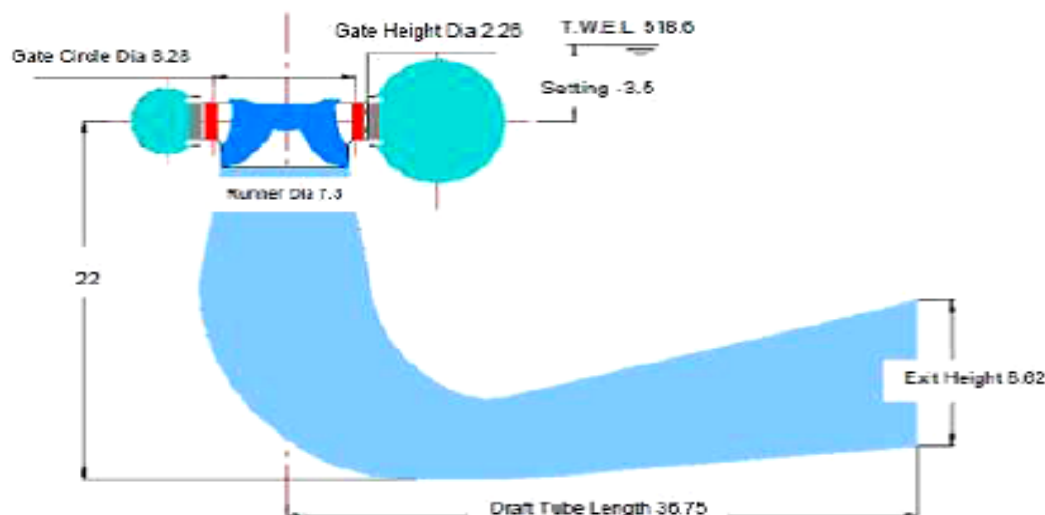


Figure 10: Spiral Casing, runner and draft tube

Each of three generators of Mahal hydropower project would be three-phase salient-pole synchronous generator, with vertical-shaft, semi-umbrella, closed cycle, self-ventilating air cooling and carbon dioxide fire extinguishers. The generator would have self-excited shunt stationary controllable silicone excitation. The stator base is a welded structure. Box-shaped bars and air deflectors are equally distributed along the circumference between rings. The rotor has a non-shaft structure, and comprises rotor center part, magnet yoke and magnetic pole and brake ring. The rotor would be assembled on site and would be designed to have enough rigidity and strength to withstand the runaway speed.

Considering the local highway transportation limitations and the layout of hydropower station, 3 single-phase transformers each of 80MVA capacity per generator are proposed. The transformers would be water cooled and have the no-load voltage ratio of 525/ $\sqrt{3} \pm 2.5\%$ /15.75kV.

Complex also include the balance of plant and various auxiliaries including, but not limited to instrumentation and control systems, switch gear, metering system, firefighting system and miscellaneous mechanical and electrical auxiliaries etc.

7.9 Construction Timelines

The total construction period planned for Mahl HPP is 72 months, including:

- Preparation for construction-4 months
- Construction for main works-67 months
- Completion and acceptance of the Project-1 month

The construction critical path analysis for Mahl HPP reflects that the construction preparation period (4 months), earth and rock excavation of dam abutment at the elevation above 522m (20 months), earth and stone excavation of riverbed part at the elevation below 522m (7 months), concrete placement of dam work and installation of metal structures (35 months), periodic commissioning of all units (5 months) and project completion period of (1 month) necessitate the already communicated 72 month construction duration.

Accordingly, the construction period has been finalized after taking into consideration various features of project's complex layout, geological conditions and practical experience of Project Sponsor's accumulated while working on a number of similar hydropower projects. The construction load and intensity in each stage along the construction critical path coincide with an advanced level of construction activity being carried out by the Project Sponsors in the remaining parts of the World.

The critical path for Mahl HPP is based on construction of Roller compacted concrete gravity dam. The concrete dam body has more openings and greater installation quantities of metal structures exist, resulting in the longer construction schedule.

Mahl HPP adopts staged diversion, i.e. river closure twice as the powerhouse is located at dam toe, resulting in greater construction interference and a longer construction period.

Mahl HPP and downstream Azad Pattan HPP have **concrete gravity dams** and are quite similar in general layout. The construction period is in-line with Azad Pattan HPP having six year construction timeline similar to the construction period requested for Mahl HPP. It may noted that Authority had earlier reduced the construction period of Azad Pattan HPP from six (6) to four (4) years, however subsequently; NEPRA reinstated the construction period to 6 years.

7.10 Grid Interconnection

The Company has already obtained the Grid Interconnection approval from NTDC/CPPA on **29 December 2017**.

The Interconnection scheme of Mahl HPP to evacuate its maximum power of Gross 640 MW is envisaged and studied in detail by considering that Mahl HPP would be connected by double looping in-out the 500 kV circuit from Suki Kinari to Chakothe-



Hattian and from Chakothi-Hattian to Maira S/S using 500 kV Bunting Conductor. The looping distance is around 200 meters. Hence, after the connection of Mahl HPP, Chakothi Hattian HPP 500 kV G/S, which was looped in-out of the Maria S/S – Suki Kinari circuit in the first place, would be connected to Mahl HPP via 500 kV direct double circuit. The scheme of switchgear at Mahl HPP substation would be based on breaker and half scheme and double bus double breaker scheme.

The study has concluded that the proposed scheme of Interconnection has no technical constraints or problems, it fulfills all the criteria of reliability and stability under steady state load flow, contingency load flows considered, short circuit currents and dynamic/transient conditions; and is therefore recommended to be adopted.

7.11 Environmental & Social Impact Assessment

The Company has awarded the contract through SIDRI to Hagler Bailly Pakistan (Pvt.) Ltd. (“HBP”) for an Environmental and Social Impact Assessment (“ESIA”) of the Project and to develop a Resettlement Action Plan (“RAP”) that meets the standards and guidelines prescribed by the IFC, and conforms to environmental legislation of AJK, Punjab and Khyber Pakhtunkhwa.

The Study Area for the ESIA takes into account environmentally sensitive receptors that are most likely to be impacted by the Project’s development activities during construction and operation. For assessment of cumulative impacts, the Study Area was selected to be large enough to allow the assessment of the Valued Ecosystem Components (“VEC”) that may be affected by the Project activities.

The Company has submitted the ESIA to relevant EPAs (EPA Punjab, EPA Khyber Pakhtunkhwa and EPA AJ&K) on **26th and 27th December 2017**.

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8. PROJECT COST

Following deliberations and discussions with CPPAG, the Company is pleased to propose a Project Cost of USD 1,281.46 Million. The details of the Project Cost are given below.

8.1 Project Cost Summary

Table 3: Summarized Project Cost

SECTION REF	PROJECT COST	Total USD Million
8.2.1	EPC COST	870.80
8.2.2	ENGINEERING & SUPERVISION	52.25
8.2.3	PROJECT DEVELOPMENT COST	60.96
8.2.4	LAND ACQUISITION & RESETTLEMENT & ENV. MITIGATION	26.70
8.2.5	CUSTOM DUTIES & TAXES	10.64
8.2.6	INSURANCE DURING CONSTRUCTION	14.03
8.2.7	LAW SERVICES / LEGAL FEES & CHARGES	5.70
8.2.8	SINOSURE OVERSEAS INVESTMENT INSURANCE	53.43
8.2.9	FINANCIAL CHARGES	24.99
8.2.10	INTEREST DURING CONSTRUCTION	161.97
	TOTAL PROJECT COST	1,281.46

The cost estimates used in the Feasibility study were prepared based on price levels prevalent in June 2016. The nominal exchange rate in June 2016 has been taken as 1 USD = PKR104.75.

In line with NEPRA's mechanism for determination of tariff for hydel project, the Project Cost will be firmed up during the EPC stage Tariff.

8.2 Project Cost Details

8.2.1 EPC Cost

The Feasibility stage EPC cost estimates are prepared from (a) Bill of Quantities for the preparatory and permanent civil works (b) Costs of E&M equipment (including engineering/design, cost of procurement, transportation, erection and commissioning) and (c) Contingency. The cost estimates are further subdivided into local and foreign cost components and are benchmarked with similar on-going projects in international and domestic power markets.



The EPC cost is broadly classified into three sub categories which are summarized as under:

Table 4: Summarized EPC

DESCRIPTION	USD Million
CIVIL WORKS & PREPARATORY WORKS	591.90
ELECTRICAL & MECHANICAL EQUIPMENT, ERECTION WORKS AND EQUIPMENT TRANSPORTATION COST	222.61
CONTINGENCY FOR CIVIL COST AND E&M COST	56.29
GRAND TOTAL	870.80

The EPC cost will be firmed up at EPC Stage tariff where EPC Contractor for the Project will be selected through International Competitive Bidding (“ICB”) Process conducted in a transparent manner and complying with the NEPRA’s Guidelines for Selection of EPC Contractor. The ICB process will ensure that the Company receives competitive fixed price EPC offers with further provisions for cost escalations only to the extent as allowed under NEPRA mechanism for Tariff determination for hydel projects.

i. Civil works including Preparatory Works

The Civil Works include Infrastructure Works, Diversion Works, Gravity Dam, Piers and Roadway, Spillway, Intake, Penstocks and Upstream Surge Chambers, Powerhouse and Transformer Gallery, Tailrace and Draft Tube Gate Shafts, Ventilation & Chilling Plant Building and Switchgear Building, Alternate Main Access Tunnel and cost provisioning related to detailed engineering design.

The costs have been sub divided into the following sub-components:

Table 5: Civil Works (Including Preparatory Works)

DESCRIPTION	USD Million
PREPARATORY WORKS	111.66
ACCESS ROAD AND BRIDGES	78.84
CAMPS AND OTHER FACILITIES	27.82
MOBILIZATION / DEMOBILIZATION COST	5.00
MAIN CIVIL WORKS	480.25
COFFER DAMS	4.46
DIVERSION CHANNEL	17.58



DIVERSION TUNNEL	26.82
CONCRETE GRAVITY DAM	220.32
STILLING BASIN	53.30
POWERHOUSE INTAKE	12.28
PENSTOCK	8.60
POWERHOUSE AND STEP-UP SUBSTATION	95.82
TAILRACE	28.52
MINERAL RESOURCE FEE	12.57
TOTAL	591.90

The detailed Bill of Quantities (BOQs) is attached herewith as **Annex C**

The Civil Works cost estimates have been prepared based on detailed Bill of Quantities (Annexure D) and are reflective of the difficult geological conditions and narrow river valley at the Project site a non-availability of public infrastructure with regards to accessibility etc.

The cost related to up gradation of Access roads will be firmed up at the EPC stage after taking into account the status of construction of “Mangala - Mirpur - Muzaffarabad - Mansehra Road” which is planned under the CPEC and is currently being referred to concerned Joint Working Groups for consideration.

ii. Electrical & Mechanical Equipment Cost and Erection works

The scope of E&M Equipment Supply from a reputable Supplier will mainly include (a) Francis turbines, generators, generator step-up transformer, governor & oil pressure system and excitation system (3 units of each), (b) spare parts (c) special tools and technical services/training, (d) balance of plant including Control System, Protection System, Telecommunication System, Fire Fighting System, Gas Insulated Switchgear and hydro mechanical equipment (gates and stop logs). The technical specification of the equipment will be defined in the Project Requirements of the EPC Contract wherein the requirements for frequency response will be according to the Pakistan Grid Code.

The large parts of the generator assembly will be designed and manufactured according to permitted transportation weight and dimension limits. Components exceeding these limits will be designed in a manner to enable assembly of these components on-site. Transportation costs have been assumed to be 10% of the total costs for the M&E equipment for the foreign portion and 5% for the local portion.

The Erection and Commissioning costs have been estimated to be 15% of the total M&E costs for both foreign and local portions.



Table 6: Electrical & Mechanical (Incl. Transportation & Erection)

DESCRIPTION	USD Million
HYDRO MECHANICAL EQUIPMENT	95.40
ELECTRICAL EQUIPMENT	83.41
SUBTOTAL (M&E)	178.81
<i>ADD: TRANSPORTATION COST</i>	16.98
<i>ADD: ERECTION & COMMISSIONING</i>	26.82
TOTAL	222.61

iii. Contingency

Contingencies for latent conditions and requirements for changes of the civil design or technical specifications during construction have been taken into account. The following contingencies are reflected in the EPC cost estimate:

Table 7: Contingency

DESCRIPTION	USD MILLION	%	USD MILLION
CONTINGENCY - CIVIL WORKS & PREPARATORY WORKS	591.90	8%	47.35
CONTINGENCY - ELECTRICAL & MECHANICAL EQUIPMENT	178.81	5%	8.94
TOTAL			56.29

Note: After the promulgation of 18th Constitutional Amendment which provided fiscal autonomy to Provinces, Engineering and Construction (E&C) services are now subject to Sales Tax as per the Provincial and AJK Sales Tax laws.

Recently, AJK & Government of Punjab have reduced sales tax on construction services from 16% to 1%. In case of Government of Punjab the reduction is only given to Karot Project while in AJK the reduction is only for the CPEC hydro projects.

MPCL will be pursuing the case for similar reduction in the relevant jurisdictions in the later stage. Hence Sales tax on construction services is not included in the EPC Cost. However, it is requested that the same will be allowed by the Authority as part of the Project Cost, at a later stage based on the rates prevalent at that time.

8.2.2 Engineering and Supervision

The Project Company has proposed a cost of **USD 52.25 Million** under this category. The amount is calculated as 6% of the EPC cost.



The Engineering and Supervision costs expected to be incurred by the Company comprise costs of the Feasibility Study, Owners Engineer, Independent Engineer, Reopener Verifier under Power Purchase Agreement (PPA) and technical consultancy for Government of China approval, Project Company's other engineering consultants, and Company's own supervision cost during the construction of the Project. Proper Engineering and effective Supervision is the essence for effective and timely execution of the Project.

8.2.3 Project Development Cost

Project development cost is estimated at **USD 60.96 Million** which is 7% of the EPC cost. This cost mainly includes salaries and wages, utilities, travelling and conveyance, office supplies and administration cost, rent rates and taxes, medical and insurance, fees and subscription, vehicles running and maintenance, repair and maintenance, printing stationary and periodical, miscellaneous and other expenses.

Sound project development is key to the success of any project, and is absolutely critical for such project as the Project development activities and has taken several man months of time and efforts of various professionals and staff. Due to projects' complexity this will continue all the way to COD and throughout the term of the PPA. Company needs to ensure it is able to hire and retain both Pakistani as well as Chinese top professionals and has a ready talent pipeline to manage this large infrastructure project.

8.2.4 Land Acquisition & Resettlement & Environment Protection

The cost for Land Acquisition, resettlement and Environment protection is estimated at **USD 26.70 Million** based on standards prevailing in Mahl reservoir area through the investigation by the Feasibility Consultant. This cost will be utilized for acquisition of land, compensation for resettlement to the inhabitants of the area to be affected by the development of the Project, compensation for removal of trees and crops, cost of social welfare of the local community, income generation and community support program, and other allied costs, to be incurred by the Project Company. The Company is cognizant with its environmental obligations under Pakistan, AJ&K and relevant Provisional laws as well as environment and safeguard policies of IFC and other multilateral banks.

The summary of the costs accumulated under this category is provided below for reference. The detail breakup and explanation regarding these costs is available in Mahl HPP Feasibility Report.



Table 8: Land and resettlement cost

S.No.	DESCRIPTION	PKR Million	USD Million
1	LAND ACQUISITION	1,187.22	11.33
2	BUILDING COMPENSATION	670.75	6.40
3	COMMUNITY INFRASTRUCTURE	29.08	0.28
4	TREE COMPENSATION	225.27	2.15
5	CROP COMPENSATION	0.25	0.00
6	RELOCATION / PROTECTION OF GRAVEYARDS	6.00	0.06
7	TRANSITION ALLOWANCE	27.81	0.27
8	LIVELIHOOD ALLOWANCE FOR AFFECTED HOUSES	16.92	0.16
9	SHIFTING CHARGES FOR HOUSES	2.82	0.03
10	LIVELIHOOD ALLOWANCE FOR AFFECTED COMMERCIAL ENTERPRISE	20.16	0.19
11	SHIFTING & TRANSITION ALLOWANCE FOR COMMERCIAL ENTERPRISE	8.40	0.08
12	COMMUNITY AWARENESS	5.00	0.05
13	CAPACITY BUILDING / TRAINING	10.00	0.10
14	ENVIRONMENTAL MANAGEMENT & MONITORING COST	77.40	0.74
15	DEVELOPMENT OF FISH HATCHERIES	144.50	1.38
16	TREE PLANTATION AND AFTER CARE	100.00	0.95
17	LAND CONSERVATION & MANAGEMENT COST	10.00	0.10
		2,541.58	24.26
	CONTINGENCY @ 10%	254.16	2.43
		2,795.74	26.69

In accordance with the NEPRA mechanism for determination of tariff for hydropower projects this cost will be adjusted based on the actual verifiable documentary evidence at the COD.

8.2.5 Custom Duties, taxes & Other Levies

Customs Duty and taxes have been calculated at **USD 10.64 Million** by the Project Company in accordance with the Power Policy, 2002:

- Custom Duty @ 5.00% (Five Percent) has been assumed on the hydro electrical and mechanical equipment and machinery, and materials for the Project, in accordance with the Policy.
- Sindh Infrastructure Development Surcharge @ 0.95% (Zero Point Nine Five Percent) of the imports for the Project has been assumed.

The cost will be adjusted as per actual at COD.



8.2.6 Insurance during Construction

Insurance during construction is estimated at **USD 14.03 Million** which is 1.6% of the EPC cost. Insurance during Construction cost covers the insurance cost of the Project's assets during the construction period. As per the requirement of the PPA, Company is required to maintain following insurances:

- Construction All Risk Insurances (CAR);
- CAR Delay in Start-up Insurance;
- Terrorism Insurance;
- Marine and Inland Transit Insurance;
- Marine - Delay-In-Startup Insurance; and
- Comprehensive General Liability.

At the EPC stage tariff formal quotations will be obtained from the insurance brokers and cost will be claimed based on the quotations.

8.2.7 Law Services / Legal Fee & Charges

In the Feasibility study **USD 5.70 Million** is estimated based on approximately 0.6% of the EPC cost to cover the legal fees and charges associated with engagement of international and domestic law firms for advice on all legal aspects of the Project and Stamp duty and registration fee in respect of project documents. Given long implementation period of the Hydro projects, the services of legal advisors will be required throughout the development and construction period to assist in connection with the negotiation and execution of the project documents.

8.2.8 Sinosure

Sinosure premium is estimated at **USD 53.43 Million** based on following assumptions:

- | | | |
|-------------------|---|-------------------------------|
| ▪ Sinosure Policy | : | Overseas Investment Insurance |
| ▪ Premium Rate | : | 1.25% |
| ▪ Commitment Rate | : | 12% |

Sinosure is China's official export credit insurance agency, offering export credit insurance and overseas investment insurance. The Sinosure covers equity and debt portion of the project and is intended to provide the insured with risk guarantee when they suffer economic losses because of war, currency exchange ban,



requisition, or breach of contract by the government or related counterparts in countries where the insured have made investments.

According to the requirement of the Chinese government, state-owned enterprises such as CTG, undertaking overseas investments are required to acquire overseas investment insurance from Sinasure; similarly loans arranged from Chinese Banks (such as in the case of this Project) will need to be covered under Sinasure insurance.

8.2.9 Financial Charges

The Financial charges of **USD 24.99 Million** are calculated at 3% of the total loan amount (excluding Sinasure Premium, Financial charges and IDC). NEPRA has set a benchmark of 3% of the loan amount and has consistently allowed financial charges based on the same benchmark in almost all the projects. The Financial Fee & Charges include costs related to debt financing of the project i.e. Mandate / Working Fee, Up-front fee, commitment fee and other financing fees cost and charges as may be required by the Lenders.

The financial charges computed are based on feasibility stage project cost and debt requirements. Any change in overall project cost will result change in financial charges thus the above costs will remain subject to revisions at the later stages. The cost will be adjusted in accordance with the executed financing documents and thereafter in accordance with actual drawdown during construction.

8.2.10 Interest during Construction

The Interest during Construction (IDC) has been calculated at **USD 161.97 Million** based on the following assumptions:

- LIBOR : 0.91% (June 29, 2016)
- Spread : 4.50%
- Interest Rate : 5.41%

The assumption for spread of 4.5% over LIBOR is based on feedback from prospective Lenders at the time of feasibility study (2016), and is reflective of their concern with regards to Project's location and general geo-political environment, longer construction period and carries significantly higher construction risk.

Actual IDC, however, shall be subject to change depending on the fluctuations in base rate (6-month LIBOR), funding requirement (draw-downs) of the Project during the construction period, changes in Project Cost including changes due to Re-Openers. The IDC calculations are based on 6 years construction period as per the recommendation of the Feasibility Consultant.

* * * * *

9. FINANCING PLAN

The Project shall be financed at debt to equity ratio of 80:20 as per the assumptions of the feasibility study. The total Project Cost stands at USD 1,281.48 Million, which requires Debt injection of USD 1,025.18 Million and Equity amounting to USD 256.28 Million.

9.1 Debt Financing

The financing plan is based on the assumption that the Project will be financed through foreign loan, however, financing plan will be finalized at a later stage and may include local as well as foreign loans. The risk profile of the Project is higher from lender's perspective due to following reasons:

- Project is located in AJK.
- Lower Credit rating by international rating agencies.
- long construction period

The lending terms assumed in the Feasibility Study are as follows:

Table 9: Lending terms for financing plan

LOAN CURRENCY	USD
FINANCING	100% Foreign
DEBT AMOUNT	USD 1,025.18 Million
CONSTRUCTION PERIOD	6 Years
REPAYMENT PERIOD	12 Years from COD
LIBOR	0.91%
SPREAD	4.50%
LOAN INTEREST RATE	5.41%
REPAYMENT	Semi Annual

Loans arranged from Chinese banks will be covered under the Sinasure insurance.

9.2 Equity Funding

The Equity funding will be 20% of the Project cost as provided in the Feasibility stage tariff which amounts to USD 256.28 Million. According to the requirement of the Chinese government, state-owned enterprises such as CTG, undertaking overseas investments are required to acquire Overseas Investment Insurance from Sinasure. Therefore, it is essential that the Equity investment be secured for political risks.

9.3 ROE, ROEDC and Equity Redemption

As in the case of various hydropower projects being implemented in Pakistan, the Return on Equity ("ROE") and Return on Equity during Construction ("ROEDC") have been computed at 17%. Considering the BOOT nature of the Project, Equity Redemption has also been included in the tariff after repayment of the debt as per NEPRA's Mechanism for Development of Tariff for Hydropower Projects.

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10. TARIFF & DEBT SCHEDULE

The proposed Reference Tariff is a divided in to two-part as per standard structure of tariff:

- **Energy Purchase Price (EPP)** for the energy generated and delivered to the Power Purchaser. EPP includes Variable O&M Component (Foreign & Local) and Water use charge; and
- **Capacity Purchase Price (CPP)** based on the installed capacity taking into account historical hydrological data of River Jhelum. CPP includes Fixed O&M (Foreign & Local), Insurance, Sinusure, Return on Equity, Return of Equity during Construction, Withholding Tax, Debt Service Components

The proposed Feasibility Stage Tariff is prepared based on the cost estimates provided in the feasibility study which will be firmed up at later stages of tariff determinations in accordance with the Mechanism for Tariff Determination by NEPRA for Hydropower Projects and the Assumptions stated herein. A component wise commentary on the Reference Tariff Table follows:

10.1 Operations Costs

The operational cost of the Project comprises of the operations and maintenance cost, water use charge and the cost of the operational period insurances. A brief summary of the operational cost assumed at this stage is as under:

Table 10: Operations Cost

Cost	USD Million p.a.
O&M COST	20.35
WATER USE CHARGE	11.78
INSURANCE COST	11.75
TOTAL OPERATIONS COST	43.88

i. O&M Cost

For Operations and Maintenance of the Complex, the Project Company is proposing an annual figure of **USD 20.35 Million per Annum**. The O&M Cost includes personnel cost, administrative / Management expenses, maintenance cost, replacement of parts necessitated due to regular operation / normal maintenance and other costs.

After the COD, plant's operation & maintenance activities will be carried out by the Project Company itself, or, by an experienced and proficient O&M operator. In either



case, the O&M team will maintain and efficiently operate the plant in accordance with international standards and practices including accepted norms of health, safety and the environment practices.

When presented as a percentage of Project Cost, the O&M cost for Mahl HPP comes out as 1.6% of Project Cost, which is in line with O&M allowance for various other Projects. The O&M cost will be incurred in local as well as foreign currency – percentage of local: foreign is based on recent determination by NEPRA in case of other hydro projects. In the EPC stage tariff determination this percentage will be finalized based on the expenses breakup.

The indexation on these components will be as per the following table:

Table 11: O&M Subcomponents

SUB-COMPONENT	Fixed O&M	Variable O&M	Indexation
LOCAL	30%	70%	Pakistan CPI (General)
FOREIGN	70%	30%	US CPI (All Urban Consumers) PKR / USD Indexation

The ratio of Fixed and Variable O&M is 80:20. For Variable O&M, the breakup between foreign and local sub components is 30% and 70% respectively, while in the case of Fixed O&M, the breakup between foreign and local sub components is 70% and 30% respectively.

ii. Water Use Charge

The amount payable is based on actual energy dispatched to the grid. As per the GOP Power policy 2002 Water Use Charge was fixed at PKR 0.15 / kWh with adjustment for inflation, however, Water Use Charges has now been increased to **PKR 0.425/kWh**. As per decision there will be no indexation, however rates will be revised from time to time so it is requested to allow any change in Water Use Charge.

iii. Insurance Cost

The Insurance during operations period has been revised in line with the NEPRA's established benchmark of 1.35% of EPC Cost which translates to **USD 11.75 Million per Annum**. The insurance cost consists of operations all risk insurance for the project, as well as business-interruption insurance, terrorism insurance and third party liability insurance which are standard insurances required by all lenders' and also set out under the PPA. Aforementioned insurances are required to be maintained throughout the life of the Project.



10.2 Return on Equity & Return on Equity during construction

The ROE component has been computed at 17% IRR based return on the invested equity as per the current rate allowed by the NEPRA to all the hydropower IPP projects. However it is requested if a higher return is allowed to any hydropower project in future the same shall be allowed to MPCL without any discrimination.

10.3 Withholding Tax on Dividend

Withholding tax on dividends has been assumed at the currently applicable rate of 7.5% of dividends paid by the Company. The payment will be treated as a Pass Through item and be paid to the Company after payment of payment of dividend.

10.4 Sinasure

The Tariff proposal currently assumes that Overseas Investment Insurance policy will be obtained which requires payment of Sinasure premium through Loan life of the Project. Sinasure insurance Component in tariff is computed based on the similar assumption as explained in Section 8.2.8. The component shall be indexed for exchange rate variation on quarterly basis.

10.5 Debt Financing

The debt servicing component is worked out based on the following assumptions:

Table 12: Financing Assumptions

LOAN CURRENCY	USD
FINANCING	100% Foreign
DEBT AMOUNT	USD 1,025.18 Million
CONSTRUCTION PERIOD	6 Years
REPAYMENT PERIOD	12 Years from COD
LIBOR	0.91%
SPREAD	4.50%
LOAN INTEREST RATE	5.41%

The Debt servicing component is based on financing structure and the interest rate as explained above. This will be adjusted based on the actual debt drawn and variation in LIBOR.

* * * * *



MAHL POWER COMPANY LIMITED

10.6 Reference Tariff Table

Table 13: Reference Tariff Table

Year	Energy Purchase Price (EPP) (Rs./kWh)				Capacity Purchase Price (CPP) (Rs./kW/Month)									CPP @ Accutal PF	Total Tariff	
	Water Use Charges	Var. O&M (Foreign)	Var. O&M (Local)	Total EPP	Fixed O&M (Foreign)	Fixed O&M (Local)	Insurance	ROE	ROEDC	Loan Repayment	Interest Charges	Sinosure	Total CPP	Rs./kWh	Rs./kWh	USC/kWh
1	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	862.6318	753.1042	185.9636	3139.9664	8.2196	8.8322	8.4316
2	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	909.9637	705.7722	174.5891	3128.5918	8.1898	8.8024	8.4032
3	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	959.8927	655.8433	162.5904	3116.5932	8.1584	8.7710	8.3732
4	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	1012.5612	603.1747	149.9334	3103.9361	8.1253	8.7378	8.3416
5	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	1068.1197	547.6163	136.5819	3090.5846	8.0903	8.7029	8.3082
6	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	1126.7265	489.0095	122.4978	3076.5006	8.0535	8.6660	8.2730
7	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	1188.5491	427.1869	107.6410	3061.6437	8.0146	8.6271	8.2359
8	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	1253.7638	361.9722	91.9689	3045.9716	7.9736	8.5861	8.1968
9	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	1322.5568	293.1792	75.4370	3029.4397	7.9303	8.5428	8.1554
10	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	1395.1244	220.6115	57.9979	3012.0006	7.8846	8.4972	8.1119
11	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	1471.6738	144.0622	39.6020	2993.6047	7.8365	8.4490	8.0659
12	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	1552.4233	63.3126	20.1967	2974.1994	7.7857	8.3982	8.0174
13	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
14	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
15	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
16	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
17	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
18	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
19	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
20	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
21	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
22	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
23	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
24	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
25	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
26	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
27	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
28	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
29	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
30	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022			0.0000	1376.0672	3.6022	4.2147	4.0236
Average Tariff																
Y: 01-12	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	600.2319	367.3022	1176.9989	438.7371	110.4167	3064.4194	8.0219	8.6344	8.2429
Y: 13-30	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	638.0324	367.3022	0.0000	0.0000	0.0000	1376.0672	3.6022	4.2147	4.0236
Y: 01-30	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	622.9122	367.3022	470.7996	175.4948	44.1667	2051.4081	5.3701	5.9826	5.7113
Levelized Tariff																
Y: 01-30	0.4250	0.0563	0.1313	0.6125	146.1406	62.6317	161.9604	610.7106	367.3022	801.1410	366.6989	91.7239	2608.3091	6.8279	7.4404	7.1030

FEASIBILITY STAGE TARIFF PROPOSAL

10.7 Reference Debt Service Schedule

Table 14: Reference Debt Service Schedule

Debt Servicing Schedule (Foreign Currency Loan)									
640 MW Gross Capacity, CTG Mahal Hydroelectric Power Project									
		Outstanding Principal USD	Principal Repayment USD	Interest Payment USD	Balance Principal USD	Total Debt Servicing USD	PKR/kW/Month (Principal) 42.6	PKR/kW/Month (Interest) 382	PKR/kW/Month (Prn.+Int.) 804
Y1	1H	1,025,178,980	30,888,690	27,749,801	994,290,290	58,638,491	425.5564	382.3116	807.8680
	2H	994,290,290	31,724,793	26,913,698	962,565,498	58,638,491	437.0754	370.7925	807.8680
		1,025,178,980	62,613,483	54,663,499	962,565,498	117,276,982	862.6318	753.1042	1,615.7360
Y2	1H	962,565,498	32,583,527	26,054,964	929,981,970	58,638,491	448.9063	358.9617	807.8680
	2H	929,981,970	33,465,506	25,172,984	896,516,464	58,638,491	461.0574	346.8106	807.8680
		962,565,498	66,049,034	51,227,948	896,516,464	117,276,982	909.9637	705.7722	1,615.7360
Y3	1H	896,516,464	34,371,359	24,267,132	862,145,105	58,638,491	473.5374	334.3306	807.8680
	2H	862,145,105	35,301,732	23,336,759	826,843,373	58,638,491	486.3553	321.5127	807.8680
		896,516,464	69,673,091	47,603,891	826,843,373	117,276,982	959.8927	655.8433	1,615.7360
Y4	1H	826,843,373	36,257,288	22,381,203	790,586,085	58,638,491	499.5201	308.3479	807.8680
	2H	790,586,085	37,238,709	21,399,782	753,347,376	58,638,491	513.0412	294.8268	807.8680
		826,843,373	73,495,997	43,780,985	753,347,376	117,276,982	1,012.5612	603.1747	1,615.7360
Y5	1H	753,347,376	38,246,696	20,391,795	715,100,681	58,638,491	526.9283	280.9397	807.8680
	2H	715,100,681	39,281,967	19,356,524	675,818,714	58,638,491	541.1913	266.6766	807.8680
		753,347,376	77,528,663	39,748,319	675,818,714	117,276,982	1,068.1197	547.6163	1,615.7360
Y6	1H	675,818,714	40,345,261	18,293,230	635,473,453	58,638,491	555.8404	252.0275	807.8680
	2H	635,473,453	41,437,337	17,201,154	594,036,116	58,638,491	570.8861	236.9819	807.8680
		675,818,714	81,782,598	35,494,384	594,036,116	117,276,982	1,126.7265	489.0095	1,615.7360
Y7	1H	594,036,116	42,558,973	16,079,518	551,477,144	58,638,491	586.3390	221.5290	807.8680
	2H	551,477,144	43,710,970	14,927,521	507,766,174	58,638,491	602.2101	205.6579	807.8680
		594,036,116	86,269,942	31,007,039	507,766,174	117,276,982	1,188.5491	427.1869	1,615.7360
Y8	1H	507,766,174	44,894,149	13,744,342	462,872,025	58,638,491	618.5109	189.3571	807.8680
	2H	462,872,025	46,109,355	12,529,136	416,762,670	58,638,491	635.2529	172.6151	807.8680
		507,766,174	91,003,504	26,273,477	416,762,670	117,276,982	1,253.7638	361.9722	1,615.7360
Y9	1H	416,762,670	47,357,455	11,281,036	369,405,215	58,638,491	652.4481	155.4199	807.8680
	2H	369,405,215	48,639,338	9,999,153	320,765,877	58,638,491	670.1087	137.7593	807.8680
		416,762,670	95,996,793	21,280,189	320,765,877	117,276,982	1,322.5568	293.1792	1,615.7360
Y10	1H	320,765,877	49,955,920	8,682,571	270,809,957	58,638,491	688.2474	119.6206	807.8680
	2H	270,809,957	51,308,139	7,330,352	219,501,817	58,638,491	706.8770	100.9909	807.8680
		320,765,877	101,264,059	16,012,923	219,501,817	117,276,982	1,395.1244	220.6115	1,615.7360
Y11	1H	219,501,817	52,696,961	5,941,530	166,804,857	58,638,491	726.0110	81.8570	807.8680
	2H	166,804,857	54,123,375	4,515,116	112,681,481	58,638,491	745.6628	62.2052	807.8680
		219,501,817	106,820,336	10,456,646	112,681,481	117,276,982	1,471.6738	144.0622	1,615.7360
Y12	1H	112,681,481	55,588,400	3,050,091	57,093,081	58,638,491	765.8466	42.0214	807.8680
	2H	57,093,081	57,093,081	1,545,410	(0)	58,638,491	786.5767	21.2913	807.8680
		112,681,481	112,681,481	4,595,500	(0)	117,276,982	1,552.4233	63.3126	1,615.7360

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11. INDEXATIONS, ESCALATIONS & COST ADJUSTMENTS

11.1 Adjustments due to variation in Project Cost Components

The proposed Feasibility Stage Reference Tariff for the Project has been computed based on the costs and the basis / assumptions as discussed in this proposal. The project cost and the Reference Tariff as determined pursuant to this proposal shall be subject to adjustment for the following Cost Reopeners at COD:

- a. Sales Tax on EPC Contract
- b. Civil Cost Escalation
- c. Cost variation due to change in Rock classification
- d. Variation in Cost of Land Acquisition and Resettlement
- e. Change in Project Cost due to variation in USD / PKR parity
- f. Change in Project Cost based on Actual Interest during construction
- g. Variation in Duties & Taxes
- h. Change in Principal Repayment and cost of Debt
- i. Insurance Cost
- j. Sinosure fee
- k. Change in Reference Return on Equity and Reference ROEDC
- l. Financial Charges
- m. Withholding tax on Sinosure Fee
- n. Sinosure Fee during Operations
- o. Insurance during Operations
- p. Reference Tariff Table

The mechanism for cost adjustments on account of the above factors is discussed in the following paragraphs.

a. Adjustment for Sales Tax on EPC Contract

After the promulgation of 18th Constitutional Amendment which provided fiscal autonomy to Provinces, Engineering and Construction (E&C) services are now subject to Sales Tax as per the Provincial and AJK Sales Tax laws.

Recently, AJK & Government of Punjab has reduced sales tax on construction services from 16% to 1%. In case of Government of Punjab the reduction is only given to Karot Project while in AJK the reduction is only for the CPEC hydro projects.

MPCL will be pursuing the case for similar reduction in the relevant jurisdictions in the later stage. Hence Sales tax on construction services is not included in the EPC Cost. However, it is requested that the same will be allowed by the Authority as part of the Project Cost, at a later stage based on the rates prevalent at that time

b. Adjustment for Civil Cost Escalation

The Reference EPC Cost shall be adjusted for any changes in the cost of labor, steel, fuel, cement and electricity by the addition or deduction of the amounts determined by the formula prescribed hereunder to determine the EPC Cost on COD.

The adjustment formula for adjustment in the Reference EPC Cost for any changes in the cost of labor, steel, fuel, cement and electricity shall be applied throughout the Construction Period as follows:

Each Milestone amount as will be agreed in EPC Contract shall be multiplied by the following adjustment multiplier:

The formula with the adjustment weightings incorporated into the EPC contract as under:

$$P_n = a + b (C_n/C_0) + c(S_n/S_0) + d(F_n/F_0) + e(L_n/L_0)$$

Where:

- "P_n" is the adjustment factor to be applied to the estimated value of the work carried out in month "n"
- "a" is a fixed coefficient representing the non-adjustable portion of the Onshore Contract price
- "b", "c", "d", and "e" are coefficients representing the estimated proportion of each cost element – labor, fuel, cement, and reinforcing steel, respectively, in the works
- "L₀", "F₀", "C₀", and "S₀" are the base cost indices or reference prices corresponding to the above cost elements
- "L_n", "F_n", "C_n", and "S_n" are the cost indices or prices corresponding to the above cost elements in month "n"

c. Adjustment for Cost variation due to change in Rock classification

Cost Variation due to geological conditions related to all underground works i.e. tunneling will be sought, in accordance with the concepts elaborated in the NEPRA Tariff Mechanism for Hydropower Project which explicitly aims to mitigate for the uncertainties in underground "tunneling".

MPCL will submit necessary details supported by the reports issued by the Re-opener verifier and any document required in this respect to NEPRA after COD for adjustment in Project cost and the Reference Tariff for Cost reopeners.

d. Adjustment for variation in Cost of Land Acquisition and Resettlement



An amount of **USD26.70Million** for Land Acquisition and Re-settlement is included in the project cost estimates to cater for the Land acquisition and resettlement. However as per the NEPRA mechanism for determination of tariff for hydropower projects this cost will be adjusted based on the actual verifiable documentary evidence at the COD.

e. Adjustment in project cost due to variation in USD / PKR parity

Any variation in the project cost during construction period on account of variation in USD / PKR parity shall be allowed through adjustment in project cost based on production of verifiable documentary evidence to the satisfaction of NEPRA

f. Adjustment in project cost based on Actual Interest during construction

Interest during construction has been estimated at **USD161.97 Million** based on the estimated debt injections schedule. This will be adjusted at the COD as per the actual debt injections pattern, variation in PKR/USD, debt drawn and applicable KIBOR & LIBOR during the construction period allowed by NEPRA.

g. Adjustment for variation in Duties & Taxes

Duties and taxes are estimated at **USD10.64 million**. The duties and taxes paid on the imported plant & machinery and other applicable taxes, GOP levies, provincial levies and other charges imposed on the Company, which are non-refundable in nature will be adjusted on actual basis on production of verifiable documentary evidence by the Company to the satisfaction of NEPRA.

h. Adjustment in Principal Repayment and cost of Debt

The Reference Principal Repayment Component and the cost of debt will be adjusted at the COD as per the actual debt composition between Local & Foreign and variation in KIBOR & LIBOR at the COD.

i. Adjustment of Insurance Cost

Insurance during Construction will be adjusted at the COD based on actual subject to the maximum of 2.5% of the adjusted and approved EPC cost upon production of verifiable documentary evidence to the satisfaction of NEPRA.

j. Adjustment of Sinosure fee

Applicable Sinosure fee during the construction period will be adjusted at the COD as per the actual debt and equity injection pattern and variation in PKR/USD subject

to maximum of 1.25% per annum (excluding withholding tax) and payment terms as approved by NEPRA based on documentary evidence provided by the Company.

k. Adjustment in Reference Return on Equity and Reference Return on Equity during construction

Reference Return on Equity and Reference Return on Equity during Construction will be adjusted at Commercial Operation Date on the basis of Actual equity injections and PKR/USD variation (within the overall equity allowed by the NEPRA at the COD) during the Construction period allowed by NEPRA.

l. Adjustment for Financial Charges

Financial charges will be adjusted at the COD on the basis of actual subject to the maximum of 3% of the total debt allowed (Excluding impact of interest during construction, Sinosure Fee and Financial Charges) upon production of verifiable documentary evidence to the satisfaction of NEPRA.

m. Adjustment for withholding tax on Sinosure Fee

If the Company is required to make payment of withholding tax on Sinosure fee during the construction period and debt repayment period of 12 years after the COD, the same shall be allowed as pass through item based on production of verifiable documentary evidence to be provided by the Company.

n. Adjustment for Sinosure Fee during Operations

Reference Sinosure Fee Component of the Reference Tariff for each year expressed in PKR/kW/Month as indicated in the Reference Tariff Table will be adjusted on the basis of variation in the PKR/USD subject to Maximum rate of 1.25% per annum and terms of payment as approved by NEPRA at the COD and the Reference Tariff Table for each year of applicable Sinosure fee will be revised accordingly.

o. Adjustment for Insurance during Operations

Insurance cost for the operational period will be adjusted on the basis of actual subject to maximum of 1.35% of the EPC costs at COD on production of verifiable documentary evidence by the Company.

p. Adjustment of Reference Tariff Table

The Reference Tariff Table shall be revised at COD which taking into account the above adjustments.



11.2 Indexations & Escalation of Tariff Components

It is submitted that indexations be made on 1st January, 1st April, 1st July and 1st October respectively, on the basis of latest information available with respect to Consumer Price Index (CPI) (General), as notified by Pakistan Bureau of Statistics, US CPI (for all Urban-consumer) as notified by US Bureau of Labor Statistics and exchange rate as notified by National Bank of Pakistan. Following indexations have been assumed as part of the application:

Table 15: Indexations

Tariff Component	Indexations
Water Use Charge	Indexation as per ECC Decision
Variable O&M	Local : CPI General Foreign : PKR/USD & US CPI General
Fixed O&M	Local : CPI General Foreign : PKR/USD & US CPI General
Insurance	Adjusted as per actual
Return on Equity	PKR / USD variation
ROEDC	PKR / USD variation
Sinosure	PKR / USD variation
Debt Service (Principal)	PKR / USD variation
Debt Service (Interest)	LIBOR / KIBOR Variation & PKR / USD variation

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12. PASS THROUGH ITEMS

Pass-through items shall be payable by the Power Purchaser to the Company on the basis of the actual costs reasonably incurred by the Company to satisfy the requirements of the Power Purchase Agreement & applicable laws of Pakistan and AJK. The following items shall be Pass-Through items.

a. Withholding Tax on Dividend

Withholding tax on dividend shall be treated as pass through item. Withholding tax shall be paid at the rate of 7.5% of the return on equity (including return on equity during construction). The power purchaser shall make payment on account of withholding tax at the time of actual payment of dividend subject to maximum of 7.5% of 17% return on equity according to the following formula:

$$\text{Withholding tax payable} = [17\% * (E_{(Ref)} - E_{(Red)}) + ROEDC_{(Ref)}] \times 7.5\%$$

Where:

$E_{(Ref)}$: Adjusted Reference Equity at COD
$E_{(Red)}$: Equity Redeemed
$ROEDC_{(Ref)}$: Adjusted Reference Return on Equity during Construction

In case the Project does not declare a dividend in any particular year or only declares a partial dividend, then the difference in the withholding tax amount (between what has been paid in that year and total entitlement as per net return on equity) would be carried forward and accumulated so that the Company is able to recover the same as pass through item from Power Purchaser in future on the basis of total dividend payout.

- b. No withholding tax on dividend has been included in the tariff since payment of withholding tax on dividend is allowed as pass through at the time of actual payment of dividend.
- c. The payments to Workers Welfare Fund and Workers Profit Participation Fund have not been accounted for in the Project budget and have been assumed to be reimbursed as pass through at actual by the Power Purchaser.
- d. Zakat deduction on dividends as required under Zakat Ordinance is considered as a pass through;
- e. No tax on income of MPCL (including proceeds against sale of electricity to Power Purchaser has been assumed. Corporate tax, Minimum Tax, Alternative Corporate Tax, turn over tax, general sales tax / provincial sales tax and all other



taxes, excise duty, levies, fees etc. by any federal / provincial entity including local bodies as and when imposed, shall be treated as a pass through item;

- f. No Provincial or AJ&K taxes such as Education Cess etc. have been assumed in the tariff petition. In case Project is required to pay any such taxes, same shall be treated as a pass through item;
- g. No hedging cost is assumed for exchange rate fluctuations during construction and all cost overruns resulting from variations in the exchange rate during construction shall be allowed as pass through;
- h. Any costs incurred by Project Company, which are required to be incurred by Power Purchaser pursuant to provisions of PPA shall also be treated as pass through.
- i. Except the above-mentioned items and Adjustments for Sales Tax on EPC contract, any other taxes and charges incurred by the Company whether during construction and operation periods shall be treated as pass through.
- j. If the Company is required to make payment of withholding tax on Sinasure and debt servicing the same shall be treated as Pass-through item. The Power Purchaser shall reimburse to the Company the actual amount paid on account of withholding tax.
- k. If the Company is required to make payment on account of Water Utilization Cess to IRSA on total units delivered basis at Paisa 0.50/kWh, the same shall be treated as Pass through cost to the Company and shall be reimbursed by the Power Purchaser on the basis of actual payment made by the Company after verification of documentary evidence.
- l. Cost incurred or suffered by the Company for any change in general Assumptions as provided in Section 13 below.

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13. GENERAL ASSUMPTIONS

The proposed Reference Tariff is based on the following assumptions. A change in any of these assumptions will necessitate a corresponding adjustment in the Reference Tariff:

- a. Considering the three stage tariff determination process as applicable in Pakistan, the tariff is based on the project cost derived from individual costs and quantities as assumed in the feasibility proposal and will remain subject to adjustments, after detailed engineering design and then agreement of a firm EPC cost, during the second and third stage tariff determinations. Typical tariff re-openers as are available under the applicable tariff determination mechanism will be available to the Project at later stages of tariff determination
- b. Currently the Project Company has assumed that the Debt for the Project will be sourced through foreign financial institutions. Exact composition of debt i.e. local: foreign will be finalized prior to financial close; adjustment against the same will be requested at the time of EPC stage tariff
- c. An exchange rate of PKR 104.75/USD has been assumed. Indexation against PKR/USD variations will be permitted for debt servicing payments and all other project costs denominated in foreign currency. Tariff components shall be respectively indexed for exchange rate variations
- d. The timing of drawdown of debt and equity may vary from those specified in this Petition; as such, the Project Cost will be adjusted on the basis of actual IDC at COD. Similarly, ROEDC component will also be updated in the Reference Tariff;
- e. Adjustments in Project Cost due to variation in PKR / USD variations and KIBOR (if applicable) / LIBOR fluctuations will also be catered for at the time of COD;
- f. Taxes and Duties amounting to **USD10.64 Million** have been assumed on the import of plant and equipment under 2002 Generation Policy will be adjusted as per actual payment at COD;
- g. Withholding tax is assumed in arriving at the project cost but sales tax and AJK & provincial sales tax is not assumed at this stage. In case there is any change in any taxes or duties above, or additional taxes, fees, excise duty, levies etc. are imposed, the same shall be treated as part of EPC/Project cost and the Reference Tariff will be adjusted accordingly. Furthermore no AJ&K and other provinces taxes have been assumed in the tariff proposal. In case Project is required to pay any such taxes commensurate adjustment will be requested at the time of EPC



stage tariff or the COD stage tariff (as the case may be).

- h. The Power Purchaser will compensate for energy delivered to the power purchaser prior to COD. For this purpose Energy Purchase Price shall be paid for all energy delivered prior to COD. Payments will be invoiced to the Power Purchaser as per mechanism specified in the PPA;
- i. The Power Purchaser shall be solely responsible for the financing, engineering, procurement, construction, testing and commissioning of the interconnection and transmission facilities. Said facilities will be made available to the Project at least on or before the deadline set in the Power Purchase Agreement. Furthermore, the Power Purchaser will be solely responsible for operation and maintenance of the interconnection and transmission facilities;
- j. Hydrological risk will be borne by the Power Purchaser;
- k. The Power Purchase Agreement will be structured as a take-or-pay contract whereby the Capacity Purchase Price will be payable to the Project Company regardless of actual dispatch levels;
- l. Water Use Charge and its indexation will be in accordance with Power Policy, 2002 as amended from time to time;
- m. Project contingency and maintenance reserves are not included in Reference Tariff calculations. If required by lenders, these will be adjusted accordingly in the Reference Tariff;
- n. In case of any unintentional error or omissions, typographic errors, and any genuine assumption being overlooked, the same will be corrected/incorporated and advised to CPPAG/NEPRA as soon as the Project Company becomes aware of it;
- o. Any additional indexation or concession allowed by the GOP, GOAJK, Provincial Government or NEPRA or any other Govt. entity to any IPP will be allowed to MPCL without any discrimination.
- p. The EPC Cost alongside various other components of Project Cost are currently based on feasibility stage cost estimates and will be firmed up in later stages based on NEPRA Mechanism for determination of tariff for hydropower projects.

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ANNEX - A - LETTER OF INTEREST



ANNEX – B – UPDATED FEASIBILITY STUDY

Provided Separately



ANNEX – C- PPIB APPROVAL OF FEASIBILITY STUDY



ANNEX – D – SUMMARY OF ITEM-WISE BILL OF QUANTITIES (BOQs)

No.	Description	Unit	Qty.	Unit Price (US\$)			Amount (US\$ 000)		
				FC	LD	Total	FC	LD	Total
1	Preparatory Works								
1.1	Access Road and Bridges								
	Access roads (upgrade)	m	8,750	422	784	1,206	3,693	6,860	10,553
	Relocation of existing road across the dam	m	2,810	462	858	1,320	1,298	2,411	3,709
	Left bank road	m	9,040	395	734	1,129	3,571	6,635	10,206
	Right bank road	m	9,090	368	684	1,052	3,345	6,218	9,563
	Aggregate System Road	m	2,600	340	631	971	884	1,641	2,525
	Concrete aggregate transportation road	m	22,600	111	206	317	2,509	4,656	7,164
	New Sari Bandi Bridge	m	165	6,964	12,939	19,903	1,149	2,135	3,284
	Temporary rope bridge	m	175	2,640	4,903	7,543	462	858	1,320
	Temporary bailey bridge	m	60	2,117	3,917	6,034	127	235	362
	Transportation facilities maintenance cost during construction period	LS	1				825	1,533	2,358
	Compensating Road	m	13,850			1,119	0	15,500	15,500
	Compensating Bridge	m	842				0	11,000	11,000
	Compensation of power supply line	km	20				0	1,300	1,300
	Sub-total 1.1						17,862	60,981	78,843
1.2	Camps and Other Facilities								
	Permanent Infrastructure	m ²	6,233	123	1,110	1,233	767	6,919	7,685
	Temporary camp	m ²	44,000	29	264	293	1,276	11,616	12,892
	Processing plants, warehouses, etc.	m ²	30,200	12	108	120	362	3,262	3,624
	Telecommunication	LS	1				211	392	603
	Construction management information system	LS	1				1,056	1,960	3,016
	Sub-total 1.2						3,672	24,148	27,820

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1.3	Mobilization/Demobilization Cost								
	Mobilization/De Mobilization	LS	1				0	5,000	5,000
	Sub-total 1.3						0	5,000	5,000
	Sub-total 1.1 to 1.3						<u>21,534</u>	<u>90,129</u>	<u>111,664</u>
No.	Description	Unit	Qty.	Unit Price (US\$)			Amount (US\$ 000)		
				FC	LD	Total	FC	LD	Total
2	Civil works								
2.1	Coffer Dams								
	Upstream Cofferdam	m³	279,109	4	5	9	1,116	1,396	2,512
	Downstream Cofferdam	m³	97,220	9	11	20	875	1,069	1,944
	Sub-total 2.1						1,991	2,465	4,456
2.2	Diversion Channel								
	Rock excavation	m³	161,711	5	6	11	809	970	1,779
	Shotcrete, 10 cm	m²	20,150	11	14	25	222	282	504
	Structural Concrete	m³	96,577	65	79	144	6,278	7,630	13,907
	Reinforcement	ton	888	468	1,092	1,560	416	970	1,385
	Sub-total 2.2						7,723	9,852	17,575
2.3	Diversion Tunnel								
	Soil excavation	m³	67,976	2	2	4	136	136	272
	Rock excavation	m³	258,262	5	6	11	1,291	1,550	2,841
	Excavation, Tunnel, all classes	m³	153,937	13	15	28	2,001	2,309	4,310
	Shotcrete, 10 cm	m²	85,750	11	14	25	943	1,201	2,144
	Structural Concrete	m³	17,869	71	87	158	1,269	1,555	2,823

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	Concrete Lining	m³	55,582	72	88	160	4,002	4,891	8,893
	Reinforcement	ton	3,430	485	1,130	1,615	1,664	3,876	5,539
	Sub-total 2.3						11,306	15,517	26,823
2.4	Concrete Gravity Dam								
	Soil excavation	m³	161,937	2	2	4	324	324	648
	Rock excavation	m³	2,394,025	8	7	15	19,152	16,758	35,910
	Shotcrete, 10 cm	m²	125,960	14	11	25	1,763	1,386	3,149
	Prestressed Anchor	m	167,187	95	78	173	15,883	13,041	28,923
	Roller compacted concrete(RCC)	m³	492,181	65	35	100	31,992	17,226	49,218
	Grout-enriched RCC(GERCC)	m³	15,471	87	47	134	1,346	727	2,073
	Conventional concrete	m³	536,531	98	53	151	52,580	28,436	81,016
	Reinforcement	ton	10,991	468	1,094	1,562	5,144	12,024	17,168
	Grouting adit	m	220	5,532	4,527	10,059	1,217	996	2,213
	Sub-total 2.4						129,401	90,918	220,319
2.5	Stilling Basin								
	Soil excavation	m³	1,235,457	2	3	5	2,471	3,706	6,177
	Rock excavation	m³	398,077	6	10	16	2,388	3,981	6,369
	Structural Concrete	m³	194,324	57	92	149	11,076	17,878	28,954
	Reinforcement	ton	7,557	468	1,093	1,561	3,537	8,260	11,796
	Sub-total 2.5						19,473	33,825	53,297
2.6	Powerhouse Intake								
	Structural Concrete	m³	38,899	77	81	158	2,995	3,151	6,146
	Reinforcement	ton	3,927	468	1,093	1,561	1,838	4,292	6,130
	Sub-total 2.6						4,833	7,443	12,276
2.7	Penstock								
	Structural Concrete	m³	37,465	72	75	147	2,697	2,810	5,507

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	Reinforcement	ton	1,978	468	1,093	1,561	926	2,162	3,088
	Sub-total 2.7						3,623	4,972	8,595
2.8	Powerhouse and Step-up substation								
	Soil excavation	m ³	27,610	3	3	6	83	83	166
	Rock excavation	m ³	454,601	9	7	16	4,091	3,182	7,274
	Shotcrete, 10 cm	m ²	15,440	14	11	25	216	170	386
	Prestressed Anchor	m	16,470	105	83	188	1,729	1,367	3,096
	Structural Concrete	m ³	282,740	98	77	175	27,709	21,771	49,480
	Reinforcement	ton	18,718	471	1,100	1,571	8,816	20,590	29,406
	Powerhouse decoration	m ²	31,992	105	83	188	3,359	2,655	6,014
	Sub-total 2.8						46,004	49,818	95,822
2.9	Tailrace								
	Soil excavation	m ³	48,131	2	2	4	96	96	193
	Rock excavation	m ³	890,118	9	7	16	8,011	6,231	14,242
	Shotcrete, 10 cm	m ²	23,170	14	11	25	324	255	579
	Prestressed Anchor	m	24,660	100	79	179	2,466	1,948	4,414
	Structural Concrete	m ³	29,234	90	71	161	2,631	2,076	4,707
	Reinforcement	ton	2,807	468	1,094	1,562	1,314	3,071	4,385
	Sub-total 2.9						14,842	13,677	28,519
2.10	Mineral Resource Fee								
	Fee	LS	1				0	12,570	12,570
	Sub-total 2.10						0	12,570	12,570
	Sub-total 2.1 to 2.10						<u>239,196</u>	<u>241,055</u>	<u>480,252</u>