# TARIFF PROPOSAL

# FOR

# 3.0 MW QADIRABAD HYDROPOWER PLANT

**Submitted To:**

Islamabad Electric Supply Company

Chief Executive Officer
Street 40, G-7/4, Islamabad, Pakistan

**Submitted By:**

Power Development Organization

PDO Complex, Upper Chattar,
Muzaffarabad, Azad Jammu & Kashmir

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# 1. INTRODUCTION

## 1.1 POWER DEVELOPMENT ORGANIZATION

Azad Jammu & Kashmir, Power Development Organization (AJK-PDO) having head office at Muzaffarabad, is vested with responsibility of development of hydropower resources in the state of Azad Jammu & Kashmir under the Act, 2014. The prime objective of Power Development Organization is development of indigenous hydropower resources to become self-reliant in energy needs of the State of AJ&K. The main functions of the organization include generation of hydroelectricity, dispersal of power from power stations to the grid stations and O&M of power stations.

Presently, hydropower stations having collective capacity of 64.72 MW are operational and HPP of collective capacity 67.20 MW are under construction. Moreover, HPP of collective capacity 172 MW are under process of approval for implementation. The detail of hydropower projects under the jurisdictions of AJK PDO is as under:

*Table 1-1: List of Power Project Under AJK-PDO*

| Sr. No | Name of HPP | Capacity (MW) | Location (Dist.) | Year of Completion |
|---|---|---|---|---|
| **A. Commissioned** | | | | |
| 1 | Kundal Shahi | 2.00 | Neelum | 1997 |
| 2 | Khathi | 3.20 | Jehlum Valley | 1998 |
| 3 | Leepa | 1.60 | Jehlum Valley | 2000 |
| 4 | Jagran-I | 30.40 | Neelum | 2000 |
| 5 | Changan | 0.05 | Neelum | 2008 |
| 6 | Sharian | 3.20 | Jehlum Valley | 2011 |
| 7 | Halmat | 0.32 | Neelum | 2013 |
| 8 | Qadir Abad | 3.00 | Bagh | 2013 |
| 9 | Ranger-I | 0.60 | Poonch | 2013 |
| 10 | Rerha | 3.20 | Bagh | 2014 |
| 11 | Battar | 4.80 | Haveli | 2016 |
| 12 | Sharda | 3.00 | Neelum | 2016 |
| 13 | Kel Margla | 0.75 | Neelum | 2016 |
| 14 | Glater | 1.00 | Kotli | 2018 |
| 15 | Dhanan | 1.70 | Kotli | 2018 |
| 16 | Patika | 0.50 | Muzaffarabad | 2018 |
| 17 | Guin Nallah | 0.25 | Poonch | 2019 |
| 18 | Ranger-II | 0.45 | Poonch | 2019 |
| 19 | Hajira | 1.60 | Poonch | 2019 |
| 20 | Kappa Banamula | 2.00 | Jehlum Valley | 2019 |
| 21 | Kel | 0.50 | Neelum | 2019 |
| 22 | Hillan | 0.60 | Haveli | 2020 |
| | **Total-A** | **64.72** | | |
| **B. Under Construction** | | | | |
| **Sr. No** | **Name of HPP** | **Capacity (MW)** | **Location (Dist.)** | **COD** |
| 1 | Jhing | 15.00 | Muzaffarabad | Apr-21 |
| 2 | Jagran-II | 48.00 | Neelum | Jun-22 |
| 3 | Bhedi Doba | 1.00 | Haveli | Jun-21 |
| 4 | Chamfall | 3.20 | Jhelum Valley | Aug-22 |
| | **Total-B** | **67.20** | | |

| C. Under Process | | | | |
|---|---|---|---|---|
| **Sr. No** | **Name of HPP** | **Capacity (MW)** | **Location (Dist.)** | **COD** |
| 1 | Nardagian | 3.20 | Jhelum Valley | Nov-24 |
| 2 | Makari | 1.00 | Muzaffarabad | Nov-24 |
| 3 | Riali -I | 1.60 | Muzaffarabad | Oct-25 |
| 4 | Batdara | 5.00 | Muzaffarabad | Dec-25 |
| 5 | Nagdar | 35.00 | Neelum | Dec-26 |
| 6 | Dowarian | 40.00 | Neelum | Jan-26 |
| 7 | Jagran- IV | 22.00 | Neelum | Feb-27 |
| 8 | Nairy Bela | 3.20 | Jhelum Valley | Apr-27 |
| 9 | Kasorkot Talwari | 2.90 | Jhelum Valley | Apr-27 |
| 10 | Kappa Banamula Phase –II | 2.00 | Jhelum Valley | May-27 |
| 11 | Nauseri Diversion | 48.00 | Muzaffarabad | Jun-28 |
| 12 | Tajian | 4.00 | Neelum | Jan-28 |
| 13 | Sharda-II | 5.00 | Neelum | Feb-28 |
| | **Total-C** | **172.90** | | |
| **D. Candidate** | | | | |
| **Sr. No** | **Name of HPP** | **Capacity (MW)** | **Location (Dist.)** | **COD** |
| 1 | Paddar, | 3.00 | Bagh | Mar-27 |
| 2 | Janawai | 12.00 | Neelum | Mar-29 |
| 3 | Taobut | 10.00 | Neelum | Apr-29 |
| 4 | Shounter | 48.00 | Neelum | May-29 |
| 5 | Dhani Mai Sahiba | 50.00 | Muzaffarabad | Jun-30 |
| 6 | Kalamula | 2.20 | Haveli | Jul-30 |
| 7 | Hundi Chhapan | 3.50 | Poonch | Aug-30 |
| 8 | Bhango Aronta | 2.10 | Poonch | Sep-30 |
| 9 | Gharata Bhango | 1.70 | Poonch | Oct-30 |
| 10 | Daar Banggan, | 3.00 | Poonch | Nov-30 |
| 11 | Balmi | 2.00 | Kotli | Feb-31 |
| 12 | Malkan Sarsawah | 2.20 | Kotli | Mar-31 |
| 13 | Panagh Dandali | 1.80 | Kotli | Apr-31 |
| 14 | Gurha Panag | 1.50 | Kotli | May-31 |
| 15 | Sandoa Cross | 1.75 | Bhamber | Jun-31 |
| | **Total-D** | **144.75** | | |
| | **Grand Total** | **449.57** | | |

## 1.2 TARIFF PROPOSAL

The Authority is exclusively responsible for regulating the provision of electric power services and to determine tariffs pursuant to the Regulation of Generation, Transmission and Distribution of Electric Power Act, 1997 (the **"NEPRA Act"**). The NEPRA Act specifically mandates the National Electric Power Regulatory Authority (**"NEPRA"**) to determine tariffs and the NEPRA Tariff (Standards & Procedure) Rules 1998 lay down the broad procedural framework for tariff applications and determinations. In addition, the NEPRA (Import of Power) Regulations, 2017 prescribe the requirements for import of power from territories where the applicability of the NEPRA Act is not extended.

This tariff petition is being submitted under following laws, rules and regulations:

- Section 7(3) and Section 31 of the NEPRA Act;
- Regulation 3 of the NEPRA (Import of Power) Regulations, 2017;

- Rule 3 of the NEPRA Tariff (Standards & Procedure) Rules, 1998;
- NEPRA (Benchmark for Tariff Determination), Guidelines, 2018; and
- Any other enabling provisions of the applicable law and policy.

## 1.3 AUTHORIZED REPRESENTATIVES

Authorized representative for the purposes of this tariff proposal are:

- AJK-PDO

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## 1.4 NEED OF PROJECT

The state of Azad Jammu & Kashmir is abundantly blessed with hydropower resources which need to be developed on priority. As primary source of renewable energy, the hydropower potential of the State offers bright prospects of development both for the purpose of meeting local and national demand.

In the face of rising energy crisis and escalating cost of fossil fuels, alternate energy resources are being explored as a National objective. Being inherently deficient in fossil fuels and in view of fast depleting natural gas reserves, Pakistan has to rely heavily on expensive fuel imports if it opts to continue expanding its thermal generation plans. But with escalating cost of imported fuels and international concerns on carbon emissions, this option may not be viable. It is, thus, even more necessary to explore alternate sources of energy within the country to reduce dependence on imported fuel and ensure energy supply to maintain industrial and socio-economic growth.

The electricity from the power plant is being supplied locally to district headquarters, Bagh City and adjacent areas. The approximate demand of the area is 13 MW.

The hydropower plant is connected with 132 KV grid station Bagh for maximum utilization of installed capacity of power station. Presently, power plant is operational in isolation mode and supplying power to Dhuli feeder connected with 132 KV Grid Station Bagh, but during load shedding period on Dhuli feeder, power station face forced outage due to loss of synchronization state with grid station.

## 2. PROJECT DESCRIPTION

3.0 MW Qadirabad Hydropower Project (the Project) is located at Qadirabad, Tehsil and District Bagh, AJK (about 1 km upstream of confluence of Qadirabad Nullah with Mahl river). The project was developed by Hydro Electric Board Now Power Development Organization in August 2013. The Project is currently operated and maintained by PDO. The electricity is being supplied to Local Area bagh city and adjacent areas. The plant is connected to 132kV grid station at Bagh through 11kV overhead dedicated transmission line of 5 km.

Qadirabad Nullah is a right tributary of Mahl river, which itself is a left tributary of Jhelum river. The flows in Qadirabad nullah is a perennial arising out of glacial melts of famous Pir Kanthi mountain Peaks having a elevation of about 3331.2 masl. The nullah has its confluence with Mahl river at about 4 km upstream of Bagh town.

### 2.1 BACKGROUND

Brief background with the milestones achieved are presented below.

*Table 2-1: Major Milestones achieved*

| S. NO. | Milestone | Date |
|---|---|---|
| 1. | Approval of PC-I | February 2008 |
| 2. | Appointment of Contractor for Civil Works | May 2009 |
| 3. | Appointment of E&M Equipment Supplier | June 2010 |
| 4. | Commercial Operation Date | August 2013 |

- IESCO was approached on 25.07.2013 for the interconnection of 3 MW Qadirabad & 3.2 MW Rehra Hydropower Station with 132 KV grid station Bagh.
- Correspondence and meetings were held regarding the matter of interconnection and Power Purchase from the power plants.
- Requisites were made by IESCO for the approval of interconnection including the detail interconnection study, feasibility study report.
- PDO conducted the interconnection study by the Consultants and submitted the same on 30.06.2015.
- Comments were received from IESCO which were replied satisfactorily.
- IESCO was pleased to approve the Interconnection study of 3.2 MW Rehra HPP and 3.0 MW Qadirabad HPP on 18.04.2017.
- Upon request of PDO, IESCO approached NEPRA on 25.04.2016 seeking guidelines to be followed for purchase of electricity from the Project's
- NEPRA on 23.05.2016 responded to follow Interim Power Procurement (Procedures and Standards) Regulations, 2005. (IPPR-2005) Further stated that the tariff negotiated between the two parties should be made part of the Power/Energy Purchase Agreement and may be put up to NEPRA along with a Power Acquisition Request under IPPR-2005 for approval.
- IESCO, second time, approached NEPRA with certain queries on 07.11.2016 which were duly responded by the Authority on 18.11.2016.
- IESCO approached NEPRA on 01.06.2017 with the Power Acquisition Request of the Projects.
- NEPRA vide letter dated 10.01.2018 intimated on the PAR that:

*"request was considered by the Authority and it was decided that NEPRA Interim Power Procurement Regulation 2005 (IPPR-2005) are no more relevant for the purposes of import of electric power. Since both the power projects from where the electric power is proposed to be purchased are located in Azad Jammu & Kashmir, therefore, the applicable law for the purpose is Import of Power Regulations, 2017 notified on 23rd of June, 2017."* Further stated to re-submit the tariff proposed under the relevant provisions.

NEPRA also stated that *"it is, however, observed by the Authority that both the power plants were commissioned in 2013 & 2014 and are delivering electric power to IESCO without any approval of rates from NEPRA. Therefore, you may continue with the existing arrangement with the rate of purchase of Rs. 2.59/kWh as indicated in your subject request subject to final outcoe of the proceedings under Import of Power Regulations, 2017."*

- Soon after the decision of NEPRA, PDO requested IESCO to re-submit the tariff under relevant provision as stated by NEPRA.
- IESCO vide letter dated 04.07.2019 required PDO to submit the tariff proposal to IESCO which was submitted to IESCO on 12.09.2019.

## 2.2 LOCATION

The Project is located about 1 km upstream of confluence of Qadirabad Nullah with Mahl river. Qadirabad is at 4 km from Bagh and 62 km from Muzaffarabad. Qadirabad Nullah is one of many right bank tributaries of Mahl river.

## 2.3 PROJECT DESCRIPTION

The project layout is build with two diversion weirs across the two smaller nullahs that make up larger Qadirabad Nullah. The layout was configured with 3.0 MW Power station with design discharge of 1.7m³/s, net head of 214.50m and a plant factor of 68%.

The salient features of project are provided In below table:

*Table 2-2: Salient Features of Project*

| | |
|---|---|
| **General** | |
| Location | 4 km from bagh and 62 km from Muzaffarabad |
| Name of Tributary | Qadirabad Nullah, right tributary of Mahl River |
| Site Geology | Murree Formation (sandstone/Shales) |
| **Hydrology** | |
| Catchment Area | 25km² |
| Mean Annual Flow | 1.32 m³/s |
| Design Discharge | 1.70 m³/s |
| **Topography** | |
| Gross Head | 222m |
| Net Head | 214.50m |
| **Structural:** | |
| **Diversion Weir-I** | |
| Type of Weir | Tyrolean Weir |
| Height above NSL | 1.5m |
| Length of the Crest | 13m |
| Crest Elevation | 1475m |

| | |
|---|---|
| **Conveyance Channel** | |
| X-Section (Internal) | 1.0m x 0.9m, RCC |
| Velocity | 1.78m/s |
| Length of the Channel | 740m |
| **Diversion Weir-II** | |
| Type of Weir | Tyrolean Weir |
| Height above NSL | 1.5m |
| Length of the Crest | 15m |
| Crest Elevation | 1413m |
| **Silt Excluder** | |
| Total Width | 3m |
| Total Length with Transition | 36m |
| **Power Channel** | |
| X-Section | 1.40m x 1.30m |
| Velocity | 1.50m/s |
| Type of Section | Reinforced Cement Concrete |
| Length of the Channel | 2925m |
| **Forebay** | |
| Width | 6m |
| Length | 35m |
| Depth | 4m |
| **Penstock** | |
| Diameter | 1m |
| Length | 515m |
| Number | 1 |
| Average Thickness | 8mm |
| **Powerhouse** | |
| Length | 23m |
| Width | 13.5m |
| **Electro-Mechanical** | |
| Type of Turbine | Pelton Wheel with Horizontal axis |
| No. of Units | Two (02) |
| No. of Jets each | Two |
| Installed Capacity | 3.0 MW |
| Firm Power (95% of time) | 1.20 MW |
| Plant Factor | 68% |
| Annual Energy Generated | 17.87 GWh |
| Auxiliary Load | 0.03 MW |
| Net Annual Energy (Mean) | 17.69 |
| Voltage of Generator | 3.3KV |
| Voltage of Dispatch | 11KV |
| Location of Grid Station | Bagh |
| Transmission Line | 5km |
| Construction Period | 36 months |
| **Cost** | |
| Total Project Cost | PKR 441.713 Million |
| Debt : Equity | 75 : 25 |

The detail feasibility study has been conducted and made part of PC-I which is provided as Annexure. The feasibility study report covers all relevant aspects of the project i.e. topography, geology, hydrology, project optimization and design, environmental concerns, financial and economic analysis.

A 11KV overhead dedicated lines stand constructed in compliance to load flow study for interconnection of power stations with Grid Station Bagh. The distance of 11 KV overhead line is approximately 5 KM and 8 KM from Qadirabad & Rehra Power Station to Grid Station respectively.

# 3. PROJECT COST & FINANCING

## 3.1 CAPITAL EXPENDITURE

The Project capital cost is based on approved PC-I and actual expenditure incurred for civil works, electro-mechanical equipment, land acquisition, and Other Development Cost. Exchange rate of 104.52 is taken as of COD or conversion purposes.

A summary of the actual project cost is presented below;

*Table 3-1: Summary of Project Cost*

| Item | Total (PKR Million) | Total (USD Million) |
|---|---|---|
| Civil Works | 207.386 | 1.984 |
| Electro-Mechanical Equipment | 145.156 | 1.389 |
| Land Acquisition | 12.50 | 0.120 |
| Other Development Cost | 32.470 | 0.331 |
| **Base Project Cost** | **397.512** | **3.803** |
| Interest During Construction | 44.201 | 0.423 |
| **Total Project Cost** | **441.713** | **4.226** |

### 3.1.1 CIVIL WORKS

Total of PKR 207.386 Million (USD 1.9.84 Million at 104.52) have been expensed out under the head of civil works. The agreements in lots were executed. Total of 5 agreements for civil works were signed and executed with different contractors. Detail is provided in *Table 3-2: Agreements for Civil* Works with detail breakup of each component.

*Table 3-2: Agreements for Civil Works*

| Contract Title | Amount in PKR |
|---|---|
| **(I) Construction of Diversion Weir & Approach Channel** | **43,317,202** |
| Diversion Weir-I | 4,016,661 |
| Diversion Weir-II | 2,950,999 |
| Approach Channel (DW-I to DW-II) | 23,806,453 |
| Connecting Channel | 3,611,971 |
| Desilting Chamber | 7,552,892 |
| Escalation | 1,378,225 |
| **(II) Construction of Power House & tailrace** | **35,064,513** |
| Powerhouse | 31,975,201 |
| Plumbing, sanitary Installations | 77,344 |
| Electrification for Power House | 533,972 |
| Tailrace Channel | 898,996 |
| Escalation | 1,579,000 |
| **(III) Construction of Power Channel** | **89,974,200** |
| Power Channel (DW-II to Forebay) | 89,974,200 |
| **(IV) Construction of forebay, spillway channel & anchor blocks** | **32,514,110** |

| | | |
|---|---|---|
| | Construction of aqueduct | 3,439,035 |
| | Construction of Forebay | 13,844,146 |
| | Construction of Spillway channel | - |
| | Construction of Penstocks anchore Blocks | 14,394,874 |
| | Escalation | 836,055 |
| **(V)** | **Construction of Residential Quarter** | **6,516,305** |
| | Construction of Residential Quarter | 6,641,575 |
| | Sanitary Fittings | 339,781 |
| | Electrification | 258,178 |
| | *(less 10%)* | *(723,229.45)* |
| | **Total Civil Works** | **207,386,330** |

### 3.1.2 ELECTRICAL-MECHANICAL EQUIPMENT

An amount of PKR 145.156 Million (USD 2.016 Million) have been incurred under this head. The component wise expense incurred under this head is provided in *Table 3-3: Breakup of Electro-Mechanical* Equipment.

*Table 3-3: Breakup of Electro-Mechanical Equipment*

| Head | Amount in PKR Million |
|---|---|
| Generators & Exciter, 1800 kVA | 25.000 |
| Inlet Valves | 13.500 |
| Gentry Crane (15 tons) | 4.000 |
| Turbines & Governors | 52.00 |
| Power Transformers & Cable Works | 11.00 |
| Automation and Auxiliary Equipment | 8.500 |
| Switchgear, Protection & Control | 9.735 |
| Sub-station & Transmission Interconnection | 3.00 |
| Penstock Pipes & Gate Equipment | 18.421 |
| **Total E&M Works** | **145.156** |

### 3.1.3 LAND ACQUISITION

An amount of PKR 12.5 Million (USD 0.120 Million) has been expensed out under the head of land acquisition. The cost also includes compensation houses, tress and crops affected in the project area.

### 3.1.4 DEVELOPMENT COST

Total development cost has been incurred amounting PKR 32.470 Million (USD 0.451 Million). The breakup of cost is provided in *Table 3-4: Breakup of Development* Cost.

*Table 3-4: Breakup of Development Cost*

| Head | PKR Million |
|---|---|
| Custom Duties @5% of FEC of E&M | 4.525 |
| L/C Charges & Taxes | 3.195 |
| Port Clearance & Trans. @2% of FEC of E&M | 1.810 |
| Project Engineering & Management | 5.000 |
| Project Staff | 8.420 |
| Owner Administration | 9.520 |
| **Total Development Cost** | **32.47** |

### 3.1.5 INTEREST DURING CONSTRUCTION

Interest During Construction has been calculated on the debt part of the base project cost (PKR 298.134 Million). Total IDC on debt amount to PKR 44.201 Million based on 6-month KIBOR 9.15% as of COD.

*Table 3-5: Debt Drawdown*

| Year | Debt Drawdown Amount (PKR Million) | Interest During Construction (PKR Million) |
|---|---|---|
| First | 59.627 | 5.456 |
| Second | 44.720 | 10.047 |
| Third | 193.787 | 28.698 |
| **Total** | **298.134** | **44.201** |

## 3.2 FINANCING PLAN

The Project is funded through the Annual Development Plan of Government of Azad Jammu & Kashmir. All funds were provided to PDO for the development of the Project. PC-1 was approved and funds were released.

For the purposes of tariff computation, the project cost has been bifurcated into debt & equity based on the NEPRA (Benchmarks for Tariff Determination) Guidelines, 2018.

*Table 3-6: Financing Structure*

| Head | Amount (PKR Million) | Amount (USD Million) |
|---|---|---|
| Total Project Cost | 441.713 | 4.226 |
| Debt (75%) | 331.285 | 3.170 |
| Equity (25%) | 110.428 | 1.057 |

### 3.2.1 EQUITY

An amount of PKR 110.428 is injected as equity to the Project by PDO, as funded through ADP by GOAJK.

### 3.2.2 DEBT

The tariff proposed assumed 75% of the Total Project cost as debt based on the NEPRA (Benchmarks for Tariff Determination) Guidelines, 2018. Key assumptions of the debt are as under.

| | |
|---|---|
| %age of Debt Financing | 75% |
| Total Debt Amount (PKR Million) | 331.285 |
| KIBOR (as of August 2013) | 9.15% |
| Repayment Years | 20 years |

# 4. TARIFF & COST OF OPERATIONS

The Reference Tariff is composed of the following components:

**Reference Tariff** = Operation & Maintenance Cost + Return on Equity + Return on Equity During Construction + Debt Repayment

## 4.1 ASSUMPTIONS

Following assumptions have been made for the computation of tariff.

*Table 4-1: Assumptions for computation of Tariff*

| | |
|---|---|
| Total Project Cost | PKR 441.713 M |
| Debt | PKR 331.285 M |
| Equity | PKR 110.428 M |
| Exchange Rate | 104.52 as of COD (Aug. 2013) |
| KIBOR | 9.15% [6 month KIBOR as of COD] |
| Gross Capacity | 3.00 MW |
| Plant Factor | 68% |
| Auxiliary Load | 0.03 MW |
| Net Capacity | 2.97 MW |
| Gross Annual Energy | 17.87 GWh |
| Net Annual Energy | 17.69 GWh |
| Hydrological Risk | Take & Pay – to be borne by Power Producer |
| Total O&M Cost | PKR 4.916 M |
| Variable O&M | USD 1.229 M |
| Fixed O&M | USD 3.687 M |
| Construction Period | 36 months |
| IRR | 17% |

## 4.2 OPERATION & MAINTENANCE COST

An average expense of PKR 4.916 Million (USD 0.047 Million at PKR/USD of 104.52) per annum resulting into 0.278 PKR/KWh has been spent. The cost included salaries, the salary cost of O&M contractor, security staff, purchase of spare parts, purchase of mechanical equipment, etc.

The breakup of cost is provided in table as per the approved PC-I.

*Table 4-2: Breakup of O&M Cost*

| S.NO. | Item | Amount PKR Million |
|---|---|---|
| 1. | Spare Parts & Supplies | 1.000 |
| 2. | Maintenance of Civil Works | 1.600 |
| 3. | Operational Staff | 2.316 |
| | **Total** | **4.916** |

### 4.2.1 FIXED O&M

The Fixed O&M Component is assumed as 75% of O&M cost i.e. PKR 3.687 million per annum. This cost is translated in terms of KWh as follows:

| S.No. | Item Description | PKR |
|---|---|---|
| 1. | Fixed O&M – Million per annum | 3.687 |
| 2. | Fixed O&M - PKR/KWh | 0.208 |

### 4.2.2 VARIABLE O&M

The variable O&M component is taken at 25% of the total O&M cost i.e. PKR 1.229 million per annum. This cost is translated in terms of KWh as follows:

| S.No. | Item Description | PKR Million |
|---|---|---|
| 1. | Variable O&M – Per annum | 1.229 |
| 2. | Variable O&M - PKR/KWh | 0.069 |

## 4.3 RETURN ON EQUITY

The Return on Equity (ROE) has been calculated on the basis of 17% Internal Rate of Return (IRR) as allowed to other hydropower projects.

| | |
|---|---|
| Total Equity (PKR Million) | 110.428 |
| ROE (%age) | 17% |
| ROE per annum (PKR Million) | 18.773 |
| ROE (PKR/KWh) | 1.061 |

## 4.4 RETURN ON EQUITY DURING CONSTRUCTION

ROEDC is calculated on the equity injected for the period before the actual commercial operation date for 3 years based on 17%. This has been allowed to other hydropower plant as well.

| | |
|---|---|
| Total Equity (PKR Million) | 110.428 |
| ROEDC (%age) | 17% |
| ROEDC (PKR/KWh) | 0.306 |

## 4.5 DEBT REPAYMENT

Following assumptions have been computed for the debt repayment. the repayment is spread over the remaining life of the project.

*Table 4-3: Assumptions for calculating Debt Repayment*

| | |
|---|---|
| Total Debt Amount (PKR Million) | 331.285 |
| KIBOR | 9.15% |
| Repayment Period | 20 Years |
| Total Installments – Bi annum | 40 |
| Total Payment (PKR Million) | 727.849 |
| Total Interest (PKR Million) | 396.564 |
| Total Principal (PKR Million) | 331.285 |

*Table 4-4: Summary of Debt Repayment*

| Year | Principal Payment (PKR Million) | Interest (PKR Million) | Total Payment (PKR Million) | Debt Repayment PKR/KWh |
|---|---|---|---|---|
| 1. | 6.219 | 30.173 | 36.392 | 2.057 |
| 2. | 6.801 | 29.591 | 36.392 | 2.057 |
| 3. | 7.438 | 28.955 | 36.392 | 2.057 |
| 4. | 8.134 | 28.259 | 36.392 | 2.057 |
| 5. | 8.895 | 27.498 | 36.392 | 2.057 |
| 6. | 9.727 | 26.665 | 36.392 | 2.057 |
| 7. | 10.638 | 25.755 | 36.392 | 2.057 |
| 8. | 11.633 | 24.759 | 36.392 | 2.057 |
| 9. | 12.722 | 23.670 | 36.392 | 2.057 |
| 10. | 13.913 | 22.479 | 36.392 | 2.057 |
| 11. | 15.215 | 21.177 | 36.392 | 2.057 |
| 12. | 16.639 | 19.753 | 36.392 | 2.057 |
| 13. | 18.197 | 18.196 | 36.392 | 2.057 |
| 14. | 19.900 | 16.493 | 36.392 | 2.057 |
| 15. | 21.762 | 14.630 | 36.392 | 2.057 |
| 16. | 23.799 | 12.594 | 36.392 | 2.057 |
| 17. | 26.026 | 10.366 | 36.392 | 2.057 |
| 18. | 28.462 | 7.930 | 36.392 | 2.057 |
| 19. | 31.126 | 5.267 | 36.392 | 2.057 |
| 20. | 34.039 | 2.353 | 36.392 | 2.057 |

## 4.6 CALCULATION BASIS FOR TARIFF

In addition to the facts and assumptions provided in foregoing paragraphs, the following have been taken into account while calculating the tariff. Changes in any of these assumptions could result in an adjustment to Reference Tariff.

i. Auxiliary load of 1% has been used.

ii. The Tariff has been calculated based on Annual Net Electrical Output of 17.692 GWh.

iii. A construction period of 36 months is taken and the same is used for the working of ROEDC and IDC.

iv. The tariff has been discounted at 10%.

v. Project financing structure is based on 75:25 debt-equity ratio, although the Project has been entirely funded from PDO sources through ADP-GOAJK.

vi. IDC and ROEDC have been worked out using the following drawdown schedule:

| Period (Years) | Drawdown (%) |
|---|---|
| 1 | 20 |
| 2 | 15 |
| 3 | 65 |

vii. The tariff has been calculated for the period of 30 years starting from the COD.

viii. Exchange rate are assumed to be 104.52 for PKR/USD. Exchange rate variations as per standard EPA shall be accommodated.

ix. The cost of working capital has not been claimed or included in the project cost.

x. Any tax on the income of the Company from the sales of electricity to Power Purchaser, general sales tax and all other corporate taxes will be treated as pass-through items.

xi. The tariff is based on take & Pay.

xii. Hydrological risk is to be borne by the Power Producer.

## 4.7 REFERENCE TARIFF TABLE

Summary of the Reference Tariff Levelized for 30 years is shown below:

*Table 4-5: Summary of Reference Tariff Table*

| **Reference Tariff Table** | |
|---|---|
| **Component of Tariff** | **Levelized Tariff PKR/KWh** |
| Variable O&M | 0.069 |
| Fixed O&M | 0.208 |
| Return on Equity | 1.061 |
| ROEDC | 0.306 |
| Debt Repayment including Interest | 1.858 |
| **Levelized Tariff** | **3.503** |

*Table 4-6: Reference Tariff Table for 3.0 MW Qadirabad Hydropower Plant*

| Period | Variable O&M | Fixed O&M | Return on Equity | ROEDC | Debt Repayment | Interest Charges | Total |
|---|---|---|---|---|---|---|---|
| | PKR/KWh | | | | | | PKR/KWh |
| 1 | 0.069 | 0.208 | 1.061 | 0.306 | 0.352 | 1.706 | 3.702 |
| 2 | 0.069 | 0.208 | 1.061 | 0.306 | 0.384 | 1.673 | 3.702 |
| 3 | 0.069 | 0.208 | 1.061 | 0.306 | 0.420 | 1.637 | 3.702 |
| 4 | 0.069 | 0.208 | 1.061 | 0.306 | 0.460 | 1.597 | 3.702 |
| 5 | 0.069 | 0.208 | 1.061 | 0.306 | 0.503 | 1.554 | 3.702 |
| 6 | 0.069 | 0.208 | 1.061 | 0.306 | 0.550 | 1.507 | 3.702 |
| 7 | 0.069 | 0.208 | 1.061 | 0.306 | 0.601 | 1.456 | 3.702 |
| 8 | 0.069 | 0.208 | 1.061 | 0.306 | 0.658 | 1.399 | 3.702 |
| 9 | 0.069 | 0.208 | 1.061 | 0.306 | 0.719 | 1.338 | 3.702 |
| 10 | 0.069 | 0.208 | 1.061 | 0.306 | 0.786 | 1.271 | 3.702 |
| 11 | 0.069 | 0.208 | 1.061 | 0.306 | 0.860 | 1.197 | 3.702 |
| 12 | 0.069 | 0.208 | 1.061 | 0.306 | 0.941 | 1.117 | 3.702 |
| 13 | 0.069 | 0.208 | 1.061 | 0.306 | 1.029 | 1.029 | 3.702 |
| 14 | 0.069 | 0.208 | 1.061 | 0.306 | 1.125 | 0.932 | 3.702 |
| 15 | 0.069 | 0.208 | 1.061 | 0.306 | 1.230 | 0.827 | 3.702 |
| 16 | 0.069 | 0.208 | 1.061 | 0.306 | 1.345 | 0.712 | 3.702 |
| 17 | 0.069 | 0.208 | 1.061 | 0.306 | 1.471 | 0.586 | 3.702 |
| 18 | 0.069 | 0.208 | 1.061 | 0.306 | 1.609 | 0.448 | 3.702 |
| 19 | 0.069 | 0.208 | 1.061 | 0.306 | 1.759 | 0.298 | 3.702 |
| 20 | 0.069 | 0.208 | 1.061 | 0.306 | 1.924 | 0.133 | 3.702 |
| 21 | 0.069 | 0.208 | 1.061 | 0.306 | - | - | 1.645 |
| 22 | 0.069 | 0.208 | 1.061 | 0.306 | - | - | 1.645 |
| 23 | 0.069 | 0.208 | 1.061 | 0.306 | - | - | 1.645 |
| 24 | 0.069 | 0.208 | 1.061 | 0.306 | - | - | 1.645 |
| 25 | 0.069 | 0.208 | 1.061 | 0.306 | - | - | 1.645 |
| 26 | 0.069 | 0.208 | 1.061 | 0.306 | - | - | 1.645 |
| 27 | 0.069 | 0.208 | 1.061 | 0.306 | - | - | 1.645 |
| 28 | 0.069 | 0.208 | 1.061 | 0.306 | - | - | 1.645 |
| 29 | 0.069 | 0.208 | 1.061 | 0.306 | - | - | 1.645 |
| 30 | 0.069 | 0.208 | 1.061 | 0.306 | - | - | 1.645 |
| **Levelized Tariff** | **0.069** | **0.208** | **1.061** | **0.306** | **0.642** | **1.216** | **3.503** |

*Table 4-7: Debt Repayment Schedule*

| Period | Opening Balance | Total Payment | Principal | Interest | Closing Balance |
|---|---|---|---|---|---|
| 1 | 331.285 | 18.196 | 3.040 | 15.156 | 328.245 |
| 2 | 328.245 | 18.196 | 3.179 | 15.017 | 325.066 |
| 3 | 325.066 | 18.196 | 3.324 | 14.872 | 321.741 |
| 4 | 321.741 | 18.196 | 3.477 | 14.720 | 318.265 |
| 5 | 318.265 | 18.196 | 3.636 | 14.561 | 314.629 |
| 6 | 314.629 | 18.196 | 3.802 | 14.394 | 310.827 |
| 7 | 310.827 | 18.196 | 3.976 | 14.220 | 306.851 |
| 8 | 306.851 | 18.196 | 4.158 | 14.038 | 302.693 |
| 9 | 302.693 | 18.196 | 4.348 | 13.848 | 298.345 |
| 10 | 298.345 | 18.196 | 4.547 | 13.649 | 293.799 |
| 11 | 293.799 | 18.196 | 4.755 | 13.441 | 289.044 |
| 12 | 289.044 | 18.196 | 4.972 | 13.224 | 284.071 |
| 13 | 284.071 | 18.196 | 5.200 | 12.996 | 278.871 |
| 14 | 278.871 | 18.196 | 5.438 | 12.758 | 273.433 |
| 15 | 273.433 | 18.196 | 5.687 | 12.510 | 267.747 |
| 16 | 267.747 | 18.196 | 5.947 | 12.249 | 261.800 |
| 17 | 261.800 | 18.196 | 6.219 | 11.977 | 255.581 |
| 18 | 255.581 | 18.196 | 6.503 | 11.693 | 249.078 |
| 19 | 249.078 | 18.196 | 6.801 | 11.395 | 242.277 |
| 20 | 242.277 | 18.196 | 7.112 | 11.084 | 235.165 |
| 21 | 235.165 | 18.196 | 7.437 | 10.759 | 227.727 |
| 22 | 227.727 | 18.196 | 7.778 | 10.419 | 219.949 |
| 23 | 219.949 | 18.196 | 8.134 | 10.063 | 211.816 |
| 24 | 211.816 | 18.196 | 8.506 | 9.691 | 203.310 |
| 25 | 203.310 | 18.196 | 8.895 | 9.301 | 194.415 |
| 26 | 194.415 | 18.196 | 9.302 | 8.895 | 185.114 |
| 27 | 185.114 | 18.196 | 9.727 | 8.469 | 175.386 |
| 28 | 175.386 | 18.196 | 10.172 | 8.024 | 165.214 |
| 29 | 165.214 | 18.196 | 10.638 | 7.559 | 154.576 |
| 30 | 154.576 | 18.196 | 11.124 | 7.072 | 143.452 |
| 31 | 143.452 | 18.196 | 11.633 | 6.563 | 131.819 |

| | | | | | |
|---|---|---|---|---|---|
| 32 | 131.819 | 18.196 | 12.166 | 6.031 | 119.653 |
| 33 | 119.653 | 18.196 | 12.722 | 5.474 | 106.931 |
| 34 | 106.931 | 18.196 | 13.304 | 4.892 | 93.627 |
| 35 | 93.627 | 18.196 | 13.913 | 4.283 | 79.714 |
| 36 | 79.714 | 18.196 | 14.549 | 3.647 | 65.165 |
| 37 | 65.165 | 18.196 | 15.215 | 2.981 | 49.950 |
| 38 | 49.950 | 18.196 | 15.911 | 2.285 | 34.039 |
| 39 | 34.039 | 18.196 | 16.639 | 1.557 | 17.400 |
| 40 | 17.400 | 18.196 | 17.400 | 0.796 | 0.000 |

## 5. INDEXATIONS

The following indexation shall be applicable to the tariff:

1. **Indexation applicable to O&M:** The local part of O&M cost will be adjusted on account of Inflation (CPI). The foreign component of O&M shall be indexed to the USD exchange rate variation and US CPI. Quarterly Adjustment for local inflation and exchange rate variation will be made on 15th July, 15th October, 15th January & 15th April respectively on the basis of the latest available information with respect to CPI (notified by the Federal Bureau of Statistics).
2. **Adjustment for KIBOR variation:** the interest part of debt service will remain unchanged throughout the term except for the adjustment due to variation in – month KIBOR, according to the NEPRA's already determined formula.

## 6. REQUEST SOUGHT

In the circumstances and light of the facts and ground stated above it is respectfully prayed that instant proposal may kindly be accepted with the project cost and the resultant levelized tariff of PKR 3.503/KWh.

The tariff proposal is requested to be forwarded to NEPRA for the determination of the tariff within the time mentioned under the Import of Power Regulations, 2017.