

# Part - V

**Tariff Petition for the FY 2022-23**

for

**Generation Function**

Submitted by:

**Power & Electricity Department**

**Government of Mizoram**

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## **1. BASIS OF FILING**

P&ED's tariff determination is now governed by "Joint Electricity Regulatory Commission for Manipur & Mizoram (Multi Year Tariff) Regulations, 2014" (referred to as "MYT Regulations, 2014") read with First Amendment Regulations, 2019 which came into force from 09.06.2014. However, Regulation 35.1 of the MYT Regulations, 2014 provide as follows:

*"The Regulations specified in this Chapter shall apply for determining the tariff for supply of electricity to a Distribution Licensee from conventional sources of generation and hydro generation stations of capacity more than 25 MW:*

*Provided that determination of tariff for supply of electricity to a Distribution Licensee from Renewable Energy sources of generation shall be in accordance with terms and conditions as stipulated in the relevant Regulations/Orders of the Commission."*

The Joint Electricity Regulatory Commission for Manipur & Mizoram in exercise of powers conferred under Section 61 read with Section 181 (2) of the Electricity Act, 2003 (36 of 2003), and all other powers enabling it in this behalf, issued Joint Electricity Regulatory Commission for Manipur & Mizoram (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2010 vide notification dated 31.05.2010. Subsequently the Regulation was amended to incorporate certain changes and notified as the Joint Electricity Regulatory Commission for Manipur & Mizoram (Terms and Conditions for Tariff Determination from Renewable Energy Sources) (First Amendment) Regulations, 2014.

Regulation 3 of the above regulations provides as follows:

*"These regulations shall apply in all cases where tariff, for a generating station or a unit thereof based on renewable sources of energy, is to be determined by the Commission under Section 62 read with Section 86 of the Act.*

*Provided that in cases of wind, small hydro projects, biomass power, non-fossil fuel-based cogeneration projects, solar PV and solar thermal power projects, these regulations shall apply subject to the fulfillment of eligibility criteria specified in regulation 4 of these Regulations."*

Further, regulation 4(2) provides that these regulations shall apply to the Small Hydro Project with installed capacity lower than or equal to defining the eligibility criteria for

applicability of the Renewable Energy sources regulations 25 MW. The extract of the regulation is reproduced below:

*“Small hydro project – located at the sites approved by State Nodal Agency/ State Government using new plant and machinery, and installed power plant capacity to be lower than or equal to 25 MW at single location”.*

### **1.1 Filing of Tariff proposal for FY 2022-23**

The Power & Electricity Department, Government of Mizoram owns 4 Small Hydro Projects with installed capacity below 25 MW. Accordingly, the P&ED has submitted the proposal for determination of tariff as per The Joint Electricity Regulatory Commission for Manipur & Mizoram (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2010 read along with First Amendments Regulations, 2014.

## **2. OVERALL APPROACH FOR PRESENT FILING**

### **2.1 Generation Charges for the FY 2022-23**

P&ED hereby submits its petition for approval of Generation Charges for the FY 2022-23. This petition is being submitted in compliance with the provisions of Renewable Energy Sources Tariff Regulations, 2010 and its subsequent amendments. The petitioner has attempted to comply with the various guidelines in the Act and regulations within the limitations of availability of data.

### **2.2 Approach for the Filing**

The subsequent sections provide projection for various expenses, the proposed investment plan for the period and the expected revenue projections.

Projections of various cost components required for determination of Aggregate Revenue Requirement along with the rationale for arriving of such cost, the philosophy adopted by P&ED for projecting generation for the period has been covered in various sections.

## **3. AGGREGATE REVENUE REQUIREMENT FOR THE FY 2022-23**

This section outlines the Aggregate Revenue Requirement of the P&ED for the FY 2022-23. The petition has been structured in the following manner:

- SHP details
  - Installed capacity & COD
  - Capital Cost
  - Design Energy
- Proposed Capital Expenditure and capitalization
  - Scheme wise details
    - Capital Expenditure
    - Asset Capitalisation
- Determination of the Aggregate Revenue Requirement
  - Loan & Finance Charges
  - Depreciation
  - Return on Equity
  - Interest on Working Capital
  - Operation and Maintenance Expenses

#### 4. DETAILS OF THE SHPS

Details of SHPs are provided in the table below:

**Tables 4.1: Details of SHPS**

Sl. No.	Name of Station	Installed Capacity (MW)	Date of COD
1	Serlui 'A'	1.00	24.04.1984
2	Tuirivang	0.30	14.08.1989
3	Maicham-I	2.00	05.01.1996
4	Tuipanglui	3.00	17.12.2004
5	Lamsial	0.50	26.08.2008
6	Maicham-II	3.00	11.11.2009
7	Serlui 'B'	12.00	Not yet Commissioned

It is submitted that P&ED is not operating the **Khawiva SHP, Tuipui SHP, Teirei SHP & Kau Tlabung SHP** and the SHPs have been operated and managed by Amazon Engineering. Hence, the Installed Capacity & energy from Own Generation does not include in Own Generation. However, P&ED has procured the energy generated from the above SHPs and has incorporated the same in the power purchase for the year.

In this regard it is submitted that since the Serlui 'B' SHP has not been commissioned till date the same has not been considered for the calculation of capital cost, ARR & Generation Tariff hereof in accordance with the Joint Electricity Regulatory Commission

for Manipur & Mizoram (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2010 read along with First Amendments Regulations, 2014.

However, the SHP is generating infirm power and the same is being injected in the state grid. The rate at which the energy supplied by the SHP is to be considered while arriving at the total cost of generation has been dealt with separately in the subsequent section of this submission.

#### **4.1 Capital Cost**

Regulation 28 of the JERC for Manipur & Mizoram (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2010 provides that the capital cost of Small Hydro Projects shall be determined as per the normative parameters defined in the regulation. The extract of the regulation is reproduced below:

- (1) The normative capital cost for small hydro projects during first year of Control Period (FY 2012-13) shall be as follows:

Sl. No.	Project Size	Capital Cost (₹ in Lakh/MW)
1	Below 5 MW	770
2	5 MW to 25 MW	700

- (2) The capital cost for subsequent years shall be determined on the basis of indexation formula as outlined under Regulation 29.

Further, regulation 29 provides the Capital Cost Indexation Mechanism. The provisions of the regulation are reproduced below:

“The following indexation mechanism shall be applicable in case of small hydro power projects for adjustments in capital cost over the Control Period with the changes in Wholesale Price Index for Steel and Electrical Machinery.

$$CC(n) = P\&M(n) * (1+F1+F2+F3)$$

$$P\&M(n) = P\&M(0) * (1+d(n))$$

$$d(n) = [a*\{(SI(n-1)/SI(0)) - 1\} + b*\{(EI(n-1)/EI(0)) - 1\}]/(a+b)$$

Small hydro Project	Base Capital Cost (₹ Lakh/MW)	Factor (1+F1+F2+F3)	P&M (0) (₹ Lakh/MW)
SHP (<5MW)	770	1.40	550
SHP (5 - 25 MW)	700	1.40	500

Where,

CC(n) = Capital Cost for nth year

P&M(n) = Plant and Machinery Cost for nth year

P&M(0) = Plant and Machinery Cost for the base year

Note. P&M(0) is to be computed by dividing the base capital cost (for the first year of the control period) by (1+F1+F2+F3) i.e.

d(n) = Capital Cost escalation factor for year (n) of Control Period

SI(n-1) = Average WPI Steel Index prevalent for calendar year (n-1) of the Control Period

SI(0) = Average WPI Steel Index prevalent for calendar year (0) at the beginning of the Control Period i.e. April,2011 to December March,2012

EI(n-1) = Average WPI Electrical Machinery Index prevalent for calendar year (n-1) of the Control Period

EI(0) = Average WPI Electrical and Machinery Index prevalent for calendar year (0) at the beginning of the Control Period i.e. . April,2011 to December March,2012

a = Constant to be determined by Commission from time to time, (In default it is 0.6), for weightage to Steel Index

b = Constant to be determined by Commission from time to time, (In default it is 0.4), for weightage to Electrical Machinery Index



F1 = Factor for Land and Civil Work (0.16)

F2 = Factor for Erection and Commissioning (0.10)

F3 = Factor for IDC and Financing Cost (0.14)”

Capital cost of the SHPs has been calculated in accordance with the above defined norms & mechanism. The calculation of indexed capital cost is detailed below:

**Table 4.2: Indexed Capital Cost**

Sl. No.	Factors	Reference Year	Value
i	d(n)	2017-18	
ii	SI(n-1)	2016-17	105.80
iii	SI(0)	2011-12	100.00
iv	EI (n-1)	2016-17	108.20
v	EI (0)	2011-12	100.00
vi	a		0.60
vii	b		0.40
viii	F1+F2+F3		0.40
ix	P&M(0)		550.00

$$\begin{aligned}
 d(n) &= [a*\{(SI(n-1)/SI(0))-1\}+b*\{(EI(n-1)/EI(0))-1\}]/(a+b) \\
 &= [0.6*\{(105.80/100.00)-1\}+0.40*\{(108.20/100.00)-1\}]/(0.60+0.40) \\
 &= 0.068
 \end{aligned}$$

$$\begin{aligned}
 P\&M(n) &= P\&M(0)*\{1+d(n)\} \\
 &= 550 \{1+ 0.068 \} \\
 &= 587.18
 \end{aligned}$$

$$CC(n) = P\&M(n)*(1+F1+F2+F3)$$

$$= 587.18(1+ 0.40)$$

$$= 822.05$$

Therefore, the indexed cost of project per MW is ₹ 822.05 Lakhs (₹ 8.22 Crores). The indexed capital cost of the 10 SHPs is accordingly calculated below:

**Table 4.3: Capital Cost**

(In ₹ Crores)

Sl. No.	Name of Station	Installed Capacity (MW)	Capital Cost (@ ₹ 822.05 Lakhs/MW)
1	Serlui 'A'	1.00	8.22
2	Tuirivang	0.30	2.47
3	Maicham-I	2.00	16.44
4	Tuipanglui	3.00	24.66
5	Lamsial	0.50	4.11
6	Maicham-II	3.00	24.66

## 5. DETERMINATION OF ANNUAL REVENUE REQUIREMENT

### 5.1 Loan and Finance Charges

Loan has not been availed by the P&ED, therefore interest on Loan and Finance charges has been considered as Nil for the purpose of calculating the AFC.

### 5.2 Depreciation

The Depreciation as approved by the Hon'ble Commission & proposed by the P&ED is given in the table below:

Table5.1: Depreciation for FY 2022-23

(In ₹ Crores)

Sl. No.	Name of Station	Approved in T. O. dated 12.03.2018	Proposed by P&ED	Deviation
1	Khawiva	0.01	0.00	0.01
2	Tuipui	0.01	0.00	0.01
3	Serlui 'A'	0.00	0.00	0.00
4	Tuirivang	0.00	0.00	0.00
5	Maicham-I	0.02	0.02	0.00
6	Tuipanglui	0.00	0.00	0.00
7	Kau-Tlabung	0.03	0.00	0.03
8	Lamsial	0.00	0.00	0.00
9	Maicham-II	0.03	0.03	0.00
10	Total	0.10	0.06	0.04

### 5.3 Return on Equity

The Fixed Assets of P&ED are funded through the budgetary support by the Government of Mizoram and Grants and Aids through Financial Institutions under various schemes like RGGVY, APDRP etc. Approximately 90% of the funding is done through the Government funding/Grants. However, in line with the previous orders of the Hon'ble Commission in this regard Return on Equity has not been considered for computing the ARR for the financial year.

### 5.4 Interest on Working Capital

Interest on working capital as approved by the Hon'ble Commission & proposed by the P&ED is given in the table below:

**Table 5.2: Interest on Working Capital for FY 2022-23**

(In ₹ Crores)

Sl. No.	Name of Station	Approved in T. O. dated 12.03.2018	Proposed by P&ED	Deviation
1	Khawiva	0.03	0.00	0.03
2	Tuipui	0.01	0.00	0.01
3	Serlui 'A'	0.00	0.00	0.00
4	Tuirivang	0.00	0.01	-0.01
5	Maicham-I	0.05	0.04	0.01
6	Tuipanglui	0.00	0.00	0.00
7	Kau-Tlabung	0.07	0.00	0.07
8	Lamsial	0.01	0.01	0.00
9	Maicham-II	0.08	0.07	0.01
10	Total	0.25	0.13	0.13

### 5.5 Operation & Maintenance Expenses

Operation and Maintenance Expenses as approved by the Hon'ble Commission & proposed by the P&ED is given in the table below:

**Table 5.3: O&M Expenses for FY 2022-23**

(In ₹ Crores)

Sl. No.	Name of Station	Approved in T. O. dated 12.03.2018	Proposed by P&ED	Deviation
1	Khawiva	0.46	0.00	0.46
2	Tuipui	0.22	0.00	0.22
3	Serlui 'A'	0.00	0.00	0.00
4	Tuirivang	0.00	0.13	-0.13
5	Maicham-I	0.87	0.87	0.00
6	Tuipanglui	0.00	0.00	0.00
7	Kau-Tlabung	1.31	0.00	1.31
8	Lamsial	0.22	0.22	0.00
9	Maicham-II	1.31	1.31	0.00
10	Total	4.39	2.53	1.86

### 5.6 Annual Revenue Requirement

The ARR of the SHPs has been arrived at based on the components of tariff as detailed in the previous sections. The table below provides the ARR of SHPs.

**Table 5.4: Annual Revenue Requirement for FY 2022-23**

(In ₹ Crores)

Sl. No.	Name of Station	Approved in T. O. dated 12.03.2018	Proposed by P&ED	Deviation
1	Khawiva	0.50	0.00	0.50
2	Tuipui	0.24	0.00	0.24
3	Serlui 'A'	0.00	0.00	0.00
4	Tuirivang	0.00	0.14	-0.14
5	Maicham-I	0.94	0.93	0.01
6	Tuipanglui	0.00	0.00	0.00
7	Kau-Tlabung	1.41	0.00	1.41
8	Lamsial	0.24	0.24	0.00
9	Maicham-II	1.42	1.41	0.01
10	Total	4.74	2.71	2.02

## 6. CAPACITY UTILISATION FACTOR

Capacity Utilisation Factor has been calculated in accordance with the regulation 30 of the JERC for Manipur & Mizoram (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2010 along with amendments. The extract of the regulation is reproduced below:

*“Capacity Utilisation factor for the small hydro projects in Manipur and Mizoram shall be 45%.*

*Explanation: For the purpose of this Regulation normative CUF is net of free power to the home state if any, and any quantum of free power if committed by the developer over and above the normative CUF shall not be factored into the tariff.”*

Generation of approved 6 SHPs at the CUF of 45% is provided in the table below:

**Table 6.1: Total Generation**

Sl. No.	Name of Station	Installed Capacity (MW)	Generation at 45% CUF
1	Tuirivang	0.30	1.183
2	Maicham-I	2.00	7.884
3	Lamsial	0.50	1.971
4	Maicham-II	3.00	11.826

## 7. AUXILIARY CONSUMPTION

Auxiliary Consumption has been calculated in accordance with the regulation 30 of the JERC for Manipur & Mizoram (Terms and Conditions for Tariff determination from Renewable Energy Sources) Regulations, 2010 along with amendments. The extract of the regulation is reproduced below:

*“Normative Auxiliary Consumption for the small hydro projects shall be 1.0%.”*

Normative Auxiliary consumption and Net generation is calculated in the table below:

**Table 7.1: Normative Auxiliary Consumption**

Sl. No.	Name of Station	Generation at 45% CUF	Auxiliary Consumption @1%	Net Generation
1	Tuirivang	1.183	0.012	1.171
2	Maicham-I	7.884	0.079	7.805
3	Lamsial	1.971	0.020	1.951
3	Maicham-II	11.826	0.118	11.708

## 8. GENERATION TARIFF

Generation tariff of the SHPs has been calculated on the basis of the ARR and net generation of the SHPs. Tariff per unit for the 4 SHPs for the FY 2022-23 is provided in the table below:

**Table 8.1: Tariff for Generation**

Sl. No.	Name of Station	Net Generation (In Mus)	ARR (₹ in Crores)	Tariff
1	Tuirivang	1.171	0.14	1.20
2	Maicham-I	7.805	0.93	1.20
3	Lamsial	1.951	0.24	1.21
4	Maicham-II	11.708	1.41	1.20

## 9. TARIFF FOR THE ENERGY SUPPLIED FROM SERLUI 'B' SHP

The Serlui 'B' SHP is generating infirm power and the same is being injected in the state grid. The details of energy supplied from the SHP & the rate for the energy charge considered for arriving at the total cost of generation of the generation function is detailed in the subsequent sections.

### 9.1 Energy Generation

The energy generated from the Serlui 'B' SHP is provided in the table below:

**Table 9.1: Energy Generation from Serlui 'B':**

(In MUs)

Generation Details of Serlui 'B'				
Sl. No.	Name of Station	Approved in T. O. dated 12.03.2018	Proposed by P&ED	Deviation
1	Gross Generation	47.30	4.27	43.03
2	Auxilliary Consumption	0.95	0.18	0.77
3	Net Generation	46.35	4.09	42.26

### 9.2 Energy Charges

Rate of energy charge has been considered as ₹ 1.06 per unit as approved by the Hon'ble Commission in the Tariff Order dated 12.03.2018. The total energy charge for the FY 2022-23 has been provided accordingly. The table below provided the details of energy charges.

**Table 9.2: Energy Charges for Serlui 'B':**

(In ₹ Crores)

Energy Charges for Serlui 'B'				
Sl. No.	Name of Station	Approved in T. O. dated 12.03.2018	Proposed by P&ED	Deviation
1	Net Generation	46.35	4.09	42.26
2	Rate	1.06	1.06	0.00
3	Total Energy Charge	4.91	0.43	4.48

#### 10. ANNUAL REVENUE REQUIREMENT OF THE GENERATION FUNCTION

Total ARR of the Generation function comprising of the 4 commissioned SHPs and Serlui 'B' SHP which is generating infirm power is detailed in the table below:

**Table 10.1: ARR of Generation Function**

(In ₹ Crores)

Sl. No.	Name of Project	Approved in T. O. dated 12.03.2018	Proposed by P&ED	Deviation
1	Khawiva	0.50	0.00	0.50
2	Tuipui	0.24	0.00	0.24
3	Serlui 'A'	0.00	0.00	0.00
4	Tuirivang	0.00	0.14	-0.14
5	Maicham-I	0.94	0.93	0.01
6	Tuipanglui	0.00	0.00	0.00
7	Kau-Tlabung	1.41	0.00	1.41
8	Lamsial	0.24	0.24	0.00
9	Maicham-II	1.42	1.41	0.01
10	Serlui 'B'	4.91	0.43	4.48
	<b>Total</b>	<b>9.65</b>	<b>3.15</b>	<b>6.50</b>

P&ED requests the Hon'ble Commission to kindly consider the submission and approve the ARR for the FY 2022-23.