STATE ELECTRICITY REGULATORY COMMISSION

1st Floor (Front Block Left Wing), New Administrative Building, Lower Lachumiere, Shillong – 793 001
East Khasi Hills District, Meghalaya

CASE No. 14/2020

In the matter of:

Approval of Business Plan for the 3rd MYT Control Period from FY 2021-22 to FY 2023-24.

And

Meghalaya Power Generation Corporation Limited (MePGCL)..... Petitioner

Coram

Shri. P.W.Ignty, IAS (Retd),

Chairman

Shri. Roland Keishing,

Retd District & Session judge,

Member

Chairman

ORDER

Date: 30 .09.2020

1. The Meghalaya Power Generation Corporation Limited (MePGCL) within the meaning of Section 2 (28) of the Electricity Act, 2003 (herein after referred to as Act), engaged in the business of generation and sale of power in the State of Meghalaya.
2. In exercise of powers conferred by clause (Zc), (Zd) and (Ze) of sub-section 2 of section 18, read with sections 61, 62, 64, 65 and 86 of the Act and all other powers enabling on that behalf and after previous publication, the Meghalaya State Electricity Regulatory Commission (herein after referred to as MSERC or the Commission) issued MSERC (Multi-Year Tariff) Regulations, 2014 (herein after referred to as MYT Regulations,2014).
3. The Commission, vide proceedings No. MSERC/REG/2014/01 dated 18.06.2020 has

amended the sub-Regulation 1.4 of MYT Regulations, 2014 and extended the MSERC (Terms and Conditions of Multi Year Tariff) Regulations 2014 for third control period 01.04.2021 to 31.03.2024.

4. As per provisions of sub-Regulations 1.4 (amended) and Regulation 8 of the MYT Regulations, 2014, MePGCL has filed the Petition for approval of its Business Plan for the third MYT Control Period of FY 2021-22 to FY 2023-24 with capital out lay for each year of the Control Period.
5. As per provisions of sub-Regulations 8.1, 8.2 and 8.3, the Business Plan shall comprise mainly capital investment plan, financing plan and physical targets.
6. The Commission, in exercise of powers vested in Clause 8.4 under Regulation 8 of MYT Regulations, 2014, passed this order provisionally approving the Business Plan (attached herewith) for the third MYT control period of FY 2021-22 to FY2023-24.
7. MePGCL shall submit the petition for determination of ARR and generation tariff for MYT Control Period from FY 2021-22 to FY 2023-24 on or before 30th November, 2020 in accordance with Regulation 18.1 of MYT Regulations, 2014.
8. This Order shall be placed on the website of the Commission and a copy shall be sent to MePGCL, MePDCL, MePTCL and MeECL.

Sd/-
Shri.Roland Keishing
Member

Sd/-
Shri P.W.Ignty, IAS(Retd)
Chairman

1. Introduction

1.1 Meghalaya Power Generation Corporation Limited

The Government of Meghalaya has unbundled and restructured the Meghalaya State Electricity Board with effect from 31st March, 2010 into the Generation, Transmission and Distribution businesses. The erstwhile Meghalaya State Electricity Board was transformed into four successor entities, viz:

- Generation: Meghalaya Power Generation Corporation Limited (MePGCL)
- Transmission : Meghalaya Power Transmission Corporation Limited(MePTCL)
- Distribution : Meghalaya Power Distribution Corporation Limited (MePDCL)
- Meghalaya Energy Corporation Limited (MeECL) a holding company.

The Government of Meghalaya issued further notification on 29.04.2015 notifying the revised statement of assets and liabilities as on 1st April, 2012 to be vested in Meghalaya Energy Corporation Limited. As per the said notification issued by the Government of Meghalaya a separate corporation "Meghalaya Power Generation Corporation Limited" (MePGCL) was incorporated for undertaking Generation Business.

As per Meghalaya Power Sector Transfer Scheme, MePGCL has been vested with the function of generation of power by the State Government of Meghalaya. The Business Scope of the Company falls within the legal framework as specified in the Act and includes:

- To supply electricity to any licensee in accordance with this Act and the rules and regulations made there under
- To initiate accelerated power development by planning and implementing new power projects
- To operate the existing generating stations efficiently & effectively
- To implement Renovation and Modernisation for existing plants to improve performance through constant R & M activities, regular maintenance, etc
- Achieve high reliability and safety levels in all operational areas

- Taking appropriate steps towards ensuring safety and adhering to environmental norms
- Adopt best industry practices to become the best and efficient generating company
- Other associated businesses like providing Training, Research and Development activities, Technical consultancy services and O&M related services

MePGCL is a Generation Company within the meaning of Section 2 (28) of the Electricity Act 2003. Further, Section 7 and 10 of the Electricity Act 2003 prescribe the following major duties of the Generating Company:

- To establish, operate and maintain generating stations, tie-lines, sub-stations and dedicated transmission lines connected therewith in accordance with the provisions of this Act or the rules or regulations made there under
- To supply electricity to any licensee in accordance with this Act and the rules and regulations made there under
- To submit technical details regarding its generating stations to the Appropriate Commission and the Authority
- To co-ordinate with the Central Transmission Utility or the State Transmission Utility, as the case may be, for transmission of the electricity generated by it

MePGCL has started functioning as an independent Commercial entity with effect from 01.04.2013.

1.2 Meghalaya State Electricity Regulatory Commission

Meghalaya State Electricity Regulatory Commission (herein after referred to as "MSERC" or the Commission) is an independent statutory body constituted under the provisions of the electricity Regulatory Commission (ERC) Act, 1998, which was superseded by Electricity Act (EA), 2003. The Commission is vested with the authority of regulating the power sector in the state inter alia including determination of tariff for electricity consumers.

The Hon'ble Commission has notified the Meghalaya State Electricity Regulatory Commission (Multi Year Tariff) Regulations, 2014 which was published in the

Meghalaya Gazzette on 25th September 2014. It is submitted that Meghalaya State Electricity Regulatory Commission (Multi Year Tariff) Regulations, 2014 since amended vide notification dated 18th June 2020, states as under:

"The applicability of these Regulations is hereby extended for a further period of 3 years with effect from 1.04.2021 to 31.03.2024 onwards".

Regulation 4.2 of MYT Regulation, 2014 reads as below:

The Multi-Year Tariff framework shall be based on the following elements, for determination of Aggregate Revenue Requirement and expected revenue from tariff and charges for Generating Company, Transmission Licensee, and Distribution Business:

a. *A detailed Business Plan based on the principles specified in these Regulations, for each year of the Control Period, shall be submitted by the applicant for the Commission's approval: Provided that the performance parameters, whose trajectories have been specified in the Regulations, shall form the basis of projection of these performance parameters in the Business Plan: Provided further that a Mid-term Review of the Business Plan may be sought by the Generating Company, Transmission Licensee and Distribution Licensee through an application filed three (3) months prior to the filing of Petition for truing-up for the second year of the Control Period and the tariff determination for the third year of the control period.*

b. *Based on the Business Plan, the applicant shall submit the forecast of Aggregate Revenue Requirement (ARR) for the entire Control Period and expected revenue from existing tariffs for first year of the Control Period and the Commission shall determine ARR for the entire Control Period and the tariff for the first year of the control period for the Generating Company, Transmission Licensee, Distribution Business;*

1.3 Business Plan

As per Regulation 8 of the MYT Regulations, 2014, MePGCL has to file the Business Plan for the control period of FY 2021-22 to FY 2023-24. The relevant regulation is reproduced below:

*"**8 Business Plan***

8.1 The Generating Company, Transmission licensee, and Distribution Licensee for Distribution Business, shall file a Business Plan for the Control Period of three (3) financial years from 1st April 2015 to 31st March 2018, which shall comprise but not be limited to detailed category-wise sales and demand projections, power procurement plan, capital investment plan, financing plan and physical targets, in accordance with guidelines and formats, as may be prescribed by the Commission from time to time:

Provided that a mid-term review of the Business Plan/Petition may be sought by the Generating Company, Transmission Licensee and Distribution Licensee through an application filed three (3) months prior to the specified date of filing of Petition for truing up for the second year of the Control Period and tariff determination for the third year of the Control Period.

Based on the Business Plan, Meghalaya Power Generation Corporation Limited (MePGCL) is required to forecast the Aggregate Revenue Requirement (ARR) for three years of control period from FY 2021-22 to FY 2023-24. As per the MYT Regulations, Business Plan should comprise of estimates for demand and supply forecast, capital investment plan, power procurement plan, financing plan, physical targets etc.

1.4 Admission of the Petition

MePGCL has submitted the current petition for approval of Business Plan for the Control Period FY 2021-22 to FY 2023-24. The Commission has examined the petition and taken on record as Case No ……../2020.

1.5 Approach of the Order

The MSERC Multi-Year Tariff Regulations, 2014 provides for approval of Business Plan of MePGCL for the three years Control Period FY 2021-22 to FY 2023-24. MePGCL has filed the petition before the Commission for approval of Business Plan for MYT Control Period FY 2021-22 to FY 2023-24 on 08.09.2020.

The Commission has undertaken approval of Business Plan for the Control Period FY 2021-22 to FY 2023-24 based on the MYT Regulations, 2014.

1.6 Contents of the Order

This Order is in three Chapters as detailed below:

Chapter 1: Introduction

Chapter 2: Summary of Business Plan submitted by the Petitioner for Control Period FY 2021-22 to FY 2023-24

Chapter 3: Approval of Business Plan for Control Period FY 2021-22 to FY 2023-24.

2. Summary of MePGCL Business Plan Petition

2.0 The summary of the Business Plan Petition filed by MePGCL for the Control Period FY 2021-22 to FY 2023-24 briefly is given below:

2.1 Generating Stations of MePGCL

MePGCL started functioning as an independent commercial entity from 1st April 2013. The power generated by the MePGCL stations is sold to MePDCL as per the signed power purchase agreements and transmitted to MePDCL at MePTCL interface points. At present, MePGCL is having 9 Hydro Generating stations. The details of existing stations are mentioned below:

Table 2.1: Details of existing stations

Sl. No.	Station	Type	No. of Units/Capacity	COD		Capacity (MW)
1	Umtru MHP	ROR	4x2.8 MW	Unit – I	May-1957	11.2
				Unit - II	May-1957	
				Unit – III	May-1957	
				Unit - IV	July-1968	
2	Umiam Stage-I HEP	Storage	4x9 MW	Unit – I	21.02.1965	36
				Unit - II	16.03.1965	
				Unit - III	09.06.1965	
				Unit - IV	09.11.1965	
3	Umiam Stage-II HEP	Pondage	2x10 MW	Unit – I	22.07.1970	20
				Unit - II	24.07.1970	
4	Umiam-Umtru Stage-III HEP	Pondage	2x30 MW	Unit – I	06.01.1979	60
				Unit - II	30.03.1979	
5	Umiam-Umtru Stage-IV HEP	Pondage	2x30 MW	Unit – I	16.09.1992	60
				Unit - II	11.08.1992	
6	Sonapani MHP	ROR	1x1.5 MW	Unit-I	27.10.2009	1.5
7	Myntdu Leshka HEP	ROR	3x42 MW	Unit – I	01.04.2012	126
				Unit - II	01.04.2012	
				Unit - III	01.04.2013	
8	New Umtru HEP	Pondage	2x20 MW	Unit – I	01.07.2017	40
				Unit - II	01.07.2017	
9	Lakroh MHP	ROR	1x1.5 MW	Unit-I	01.03.2019	1.5
	Total					**356.2**

2.2 Energy Generation Trend in Past Years

All the Generating stations being hydro, the annual generation depends on the rainfall for the year. The generation trend from FY 2016-17 to FY 2019-20 has been presented in the table below:

Table 2.2: Energy Generation Trend of MePGCL (MU)

Sl. No	Station	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20
1	Umiam Stage-I	96.63	128.61	85.12	108.32
2	Umiam Stage-II	50.23	63.92	43.31	55.25
3	Umiam-Umtru Stage-III	65.3	132.15	133.83	141.83
4	Umiam-Umtru Stage-IV	166.12	217.48	166.61	164.5
5	Sonapani MHP	7.63	7.47	7.12	3.59
6	Myntdu Leshka HEP	443.85	502.57	363.06	421.65
7	New Umtru HEP	-	167.79	179.82	181.43
8	Lakroh MHP	-	-	0.05	2.11
Total		**829.756**	**1219.99**	**978.92**	**1078.68**

2.3 Upcoming Plants

There are two ongoing hydro projects of the utility which are scheduled to be commissioned in the near future. The details of these plants are given below:

Table2.3: Details of Upcoming Plants

Sl No	Name of the Plant	Design Energy (MU)	Capex Outlay (INR. Crs)	Debt (INR Crs)	Equity (INR Crs)	Grant (INR Crs)	Year of Commissioning
1	Ganol SH Project (3x7.5 MW)	67	507.71	223.11	54.62	229.98	May,2022
2	Riangdo SH Project (3 MW)	17.92	33.99	11.40	20.00	2.59	2022-2023

2.4 Auxiliary Consumption

The auxiliary consumption from FY 2016-17 to FY 2019-20 for the generating stations is shown in the table below:

Table 2.4: Auxiliary Consumption (MUs)

Sl. No	Station	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20
1	Umiam Stage-I	1.07	1.20	0.933	1.01
2	Umiam Stage-II	0.34	0.386	0.909	0.335
3	Umiam Stage-III	0.53	0.910	1.12	0.863
4	Umiam Stage-IV	1.17	1.41	2.75	1.12
5	Sonapani MHP	0.06	0.05	1.47	0.032
6	Leshka HEP	3.15	1.39	0.27	3.67
7	New Umtru HEP	-	3.415	0.05	1.3
8	Lakroh MHP	-	-	0	0.029
	Total	**6.32**	**8.77**	**7.503**	**8.36**

2.5 Energy Generation in FY 2020-21 & in the Third Control Period:

Based on the previous generation trend for the existing stations and the projected energy generation for the upcoming plants, the projected generation in FY 2020-21 & the 3rd Control Period is given below:

Table 2.5: Projected Energy Generation for MePGCL(MU)

Sl. No	Station	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24
1	Umiam Stage-I	116.00	116.00	116.00	116.00
2	Umiam Stage-II	46.00	46.00	46.00	46.00
3	Umiam-Umtru Stage-III	139.00	139.00	139.00	139.00
4	Umiam-Umtru Stage-IV	207.00	207.00	207.00	207.00
5	Sonapani MHP	5.00	5.00	5.00	5.00
6	Myntdu Leshka HEP	486	486	486	486
7	New Umtru HEP	235	235	235	235
8	Lakroh MHP	11	11	11	11
9	Ganol SHP	-	-	67	67
Total		**1245.31**	**1245.31**	**1312**	**1312**

2.6 Capital Investment Plan

MePGCL has submitted that the present generating stations of MePGCL except MLHEP, NUHEP and Lakroh HEP are very old. Therefore, to maintain efficient generation from these stations, the generation utility needs to undertake various system improvement & augmentation activities. Moreover, to utilize the natural resources of Meghalaya, few hydro-electric projects have been undertaken, and some more will be added in the upcoming years. The Capital Expenditure can be broadly segregated into New Projects and additional investment in existing stations for augmentation, improvement, metering etc.

2.6.1 Summary of Capital Expenditure (CAPEX)

The station wise investment plan with details is attached as Investment Plan Format. The station wise summarized capital expenditure is shown in the table below:

Table 2.6: CAPEX-Station wise summary

Sl No	Station	CAPEX	Funding Pattern (Rs. Cr)		
		(Rs. Cr)	Equity	Debt	Grant
Existing Stations					
1	Umiam Stage-I	77.56	69.81	7.76	
2	Umiam Stage-II	21.11	19.00	2.11	
3	Umaim Stage-III	410.77	115.08	2.36	293.33
4	Umaim Stage-IV	35.98	10.79	25.19	
5	Umtru HEP	110.50	33.00	77.00	0.50
6	Sonapani	0.34	0.10	0.24	
7	Leshka	16.31	14.68	1.63	
8	New Umtru HEP				
9	Lakroh HEP	1.54	1.39	0.15	

Sl No	Station	CAPEX	Funding Pattern (Rs. Cr)		
		(Rs. Cr)	Equity	Debt	Grant
10	MePGCL System Protection and Communication	8.98	2.69	6.29	
11	Dam Rehabilitation and Improvement Project (DRIP)	441.00	123.48		317.52
	Sub-Total (a)	1124.10	390.02	122.72	611.35
Upcoming Generation Plants					
1	Ganol SHP	507.71	54.62	223.1	229.98
2	Riangdo SHP	33.99	2.59	11.4	20
3	MLHEP Stage-II (3x60 MW)	2069.23	113.88	248.24	1707.11
4	Solar Park (10MW each) in Suchen and Thamar	11.64	9.24	0	2.4
5	Umshamphu (2x1.5 MW)	48.7	14.61	34.09	
6	Amkshar (2x1.20 MW)	46.24	13.87	32.37	
7	Umrina (3x1.50 MW)	75.08	22.52	52.56	
	Sub-Total (b)	2792.59	231.33	601.76	1959.49
Projects under Survey & Investigation					
1	MLHEP-II(3X70)MW	9.6		0.96	8.64
2	UMNGI(2X31)MW	5		0.5	4.5
3	UMNGOT(3X70)MW	8.35		0.835	7.515
4	SELIM(2X48)MW	7.92		0.792	7.128
5	NONGKOHLAIT(3X31)MW	5.02		0.502	4.518
6	MAWBLEI(2X37.5)MW	8.92		0.892	8.028
7	Upper Khri Stage-II HEP	13		13	0
8	Nongnam HEP	13		13	0
9	Mawput HEP	13		13	0
	Sub-Total (c)	**83.81**		**43.481**	**40.329**
Grand Total(a+b+c)		**4000.50**	**621.35**	**767.96**	**2611.17**

2.6.2 Detailed Investment Plan as per MSERC Formats

The detailed Capital Expenditure plan for FY 2020-21 and for the third control period FY 2021-22 to FY 2023-24 is attached as Annexure- A. The format includes the ongoing and proposed works under different schemes, total project cost, start and end date of completion of works and its funding pattern.

3. Business Plan of MePGCL for the Control Period FY 2021-22 to FY 2023-24

3.1 Existing Generation Stations

Petitioner's Submission

The details of existing generating stations of MePGCL along with their capacities and date of commissioning are as given in Table below:

Table 3.1: Details of existing stations

Sl. No.	Station	Type	No. of Units/Capacity	COD		Capacity (MW)
1	Umtru MHP	ROR	4x2.8 MW	Unit – I	May-1957	11.2
				Unit - II	May-1957	
				Unit – III	May-1957	
				Unit - IV	July-1968	
2	Umiam Stage-I HEP	Storage	4x9 MW	Unit – I	21.02.1965	36
				Unit - II	16.03.1965	
				Unit - III	09.06.1965	
				Unit - IV	09.11.1965	
3	Umiam Stage-II HEP	Pondage	2x10 MW	Unit – I	22.07.1970	20
				Unit - II	24.07.1970	
4	Umiam-Umtru Stage-III HEP	Pondage	2x30 MW	Unit – I	06.01.1979	60
				Unit - II	30.03.1979	
5	Umiam-Umtru Stage-IV HEP	Pondage	2x30 MW	Unit – I	16.09.1992	60
				Unit - II	11.08.1992	
6	Sonapani MHP	ROR	1x1.5 MW	Unit-I	27.10.2009	1.5
7	Myntdu Leshka HEP	ROR	3x42 MW	Unit – I	01.04.2012	126
				Unit - II	01.04.2012	
				Unit - III	01.04.2013	
8	New Umtru HEP	Pondage	2x20 MW	Unit – I	01.07.2017	40
				Unit - II	01.07.2017	
9	Lakroh MHP	ROR	1x1.5 MW	Unit-I	01.03.2019	1.5
	Total					**356.2**

Commission's Analysis

MePGCL is having 9 Hydro Generating Stations out of which 4 are storage types and 5 are Run of River (RoR) type. All the generating stations except Sonapani Mini Hydel Project and Leshka Project are hydel power stations with main reservoir at Umiam for all stages. Therefore, all these stages depend mainly on water availability at the Umiam Reservoir.

The total installed capacity of all the stations is 356.20 MW. But the units of Umtru suffered due to construction of New Umtru HEP and are not in service. Therefore, the present effective installed capacity of MePGCL is 345 MW only.

3.2 Upcoming Plants

Petitioner's Submission

There are two ongoing hydro projects of the utility which are scheduled to be commissioned in the near future. The details of these plants are given below:

Table 3.2: Details of Upcoming Plants

Sl No	Name of the Plant	Design Energy (MU)	Capex Outlay (INR. Crs)	Debt (INR Crs)	Equity (INR Crs)	Grant (INR Crs)	Year of Commissioning
1	Ganol SH Project (3x7.5 MW)	67	507.71	223.11	54.62	229.98	May,2022
2	Riangdo SH Project (3 MW)	17.92	33.99	11.40	20.00	2.59	2022-2023

Commission's Analysis

The MePGCL has submitted that Ganol SH Project (3X7.5 MW) and Riangdo SH Project (3 MW) will be commissioned in May, 2022 and in the year FY 2022-23 respectively. But no generation from the Riangdo Plants is projected in the Control Period FY 2021-22 to FY 2023-24. Hence, Commission has also not considered any generation from this plant in FY 2022-23 or in FY 2023-24.

3.3 Normative Plant Availability Factor (NAPAF)

Petitioner's Submission

MePGCL has not provided Plant Availability Factor of its Generating Stations for the Control Period FY 2021-22 to FY 2023-24.

Commission's Analysis

As per Regulation 58.1 of MYT Regulation, 2014 the Normative Plant Availability Factor norms for various types of hydro plants of MePGCL are as given below:

a) Storage and pondage type plants where plant availability is not affected by silt and

   (i) with head variation between Full Reservoir Level (FRL) and Minimum Draw Down Level (MDDL) of upto 8 % …….. 90 %

(ii) with head variation between FRL and MDDL of more than 8% = (Head at MDDL/Rated Head) x 0.5+0.2

b) Pondage type plant where plant availability is significantly affected by silt ….. 85%

c) Run –of- River type plants: NAPAF to be determined plant-wise, based on 10-day design energy data, moderated by past experience where available / relevant.

Note:

(i) A further allowance may be made by the Commission under special circumstances, eg. Abnormal silt problem or other operating conditions, and known plant limitations.

(ii) A further allowance of 5 % may be allowed for difficulties in the North East Region.

(iii) In case of new hydro electric project the developer shall have the option of approaching the Commission in advance for further above norms

However in the Tariff Order for FY 2020-21 of MePGCL, Commission has considered NAPAF for the generating stations as given in the Table below:

Table 3.3: NAPAF of MePGCL Generating Stations

Sl. No	Name of the Station	NAPAF
1	Umiam Stage – I	59.83%
2	Umiam Stage – II	85.00%
3	Umiam Stage – III	63.67%
4	Umiam Stage – IV	61.79%
5	Sonapani MHP	45.00%
6	Myntdu Leshka	39.00%
7	New Umtru	62.60%
8	Lakroh MHP	45.00%

* As approved in New Umtru Tariff Order for FY 2017-18.

** Considered at the same level of Sonapani.

Commission approves the Normative Plant Availability Factor for different generating stations of MePGCL as shown in the above Table.

3.4 Auxiliary Consumption

Petitioner's Submission

MePGCL has submitted the auxiliary consumption from FY 2016-17 to FY 2019-20 for its generating stations as shown in the Table below:

Table 3.4: Auxiliary Consumption (MUs)

Sl. No	Station	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20
1	Umiam Stage-I	1.07	1.20	0.933	1.01
2	Umiam Stage-II	0.34	0.386	0.909	0.335
3	Umiam Stage-III	0.53	0.910	1.12	0.863
4	Umiam Stage-IV	1.17	1.41	2.75	1.12
5	Sonapani MHP	0.06	0.05	1.47	0.032
6	Leshka HEP	3.15	1.39	0.27	3.67
7	New Umtru HEP	-	3.415	0.05	1.3
8	Lakroh MHP	-	-	0	0.029
	Total	**6.32**	**8.77**	**7.503**	**8.36**

Later, on a query from the Commission, MePGCL has submitted the percentage of Auxiliary consumption and transformation loss vide its letter dated 29.09.2020 as given below:

Table 3.5: Percentage of Auxiliary Consumption and Transformation

Sl. No	Station	Auxiliary Consumption (%)	Transformation loss (%)	Total (%)
1	Umiam Stage-I	0.70	0.50	1.20
2	Umiam Stage-II	0.70	0.50	1.20
3	Umiam Stage-III	0.70	0.50	1.20
4	Umiam Stage-IV	1.00	0.50	1.50
5	Sonapani MHP	0.70	0.50	1.20
6	Myntdu Leshka HEP	1.00	0.50	1.50
7	New Umtru HEP	1.00	0.50	1.50
8	Lakroh MHP	1.00	0.50	1.50
9	Ganol SHP	1.00	0.50	1.50

Commission's Analysis

As per Regulation 58.2 of MYT Regulation, 2014, the Auxiliary Energy consumption for different type of hydro stations of MePGCL are as given below:

(a) Surface hydro electric power generating stations with rotating exciters mounted on the generator shaft …… …0.7% of energy generated.

(b) Surface hydro electric power generating stations with static excitation system……1.0% of energy generated. 71

(c) Underground hydro electric power generating stations with rotating exciters mounted on the generator shaft ….0.9% of energy generated.

(d) Underground hydro electric power generating stations with static excitation system ……..1.2% of energy generated.

Regulation 58.3 of MYT Regulation, 2014 reads as below

58.3 Transformation Loss:

From generation voltage to transmission voltage ……0.5% of energy generated.

Only Umiam Stage IV, Myntdu Leshka, New Umtru HEPs are provided with Static Excitation System for which the Auxiliary consumption is 1.0% and other stations are provided with rotating exciter mounted the generator shaft for which the auxiliary consumption is 0.70%.

As discussed above, Commission has considered Auxiliary Consumption (%) for Lakroh MHP and Ganol SH projects at 0.70% only.

Commission approves the Auxiliary consumption and Transformation losses for all the 3 years of the Control Period FY 2021-22 to FY 2023-24 as given in the Table below:

Table 3.6: Auxiliary Consumption and Transformation Loss

Sl. No	Name of the Station	Auxiliary Consumption (%)	Transformation Loss (%)	Total (%)
1	Umiam Stage-I	0.7	0.5	1.2
2	Umiam Stage-II	0.7	0.5	1.2
3	Umiam Stage-III	0.7	0.5	1.2
4	Umiam Stage-IV	1.0	0.5	1.5
5	Sonapani MHP	0.7	0.5	1.2
6	Myntdu Leshka HEP	1.0	0.5	1.5
7	New Umtru HEP	1.0	0.5	1.5
8	Lakroh MHP	0.7	0.5	1.2
9	Ganol SHP	0.7	0.5	1.2

3.5 Design Energy

Petitioner's Submission

On a query from the Commission, MePGCL has not provided the Design Energy details of its stations.

Commission's Analysis

Commission considers the Design Energy of MePGCL generating stations for FY 2020-21 and for the Control Period FY 2021-22 to FY 2023-24 as approved in the previous Tariff Order as shown in the Table below:

Table 3.7: Design Energy of Generating Stations

Sl. No	Name of the Station	Design Energy (MU)
1	Umiam Stage-I	116.00
2	Umiam Stage-II	46.00
3	Umiam Stage-III	139.00
4	Umiam Stage-IV	207.00
5	Sonapani	5.00
6	Myntdu Leshka	486.00
7	New Umtru	235.00
8	Lakroh	11.00
9	Ganol SHP	67.00

3.6 Summary of the Technical Details Considered for MePGCL Generating Stations.

Table 3.8: Various Parameters

Sl. No	Name of the Station	Installed Capacity (MW)	Type of Station	Type of Excitation	NAPAF (%)	Aux. Cons. (%)	Design Energy (MU)
1	Umiam Stage-I	36	Storage	Rotating Exciter as Generator	59.83	0.7	116
2	Umiam Stage-II	20	Pondage	Rotating Exciter as Generator	85.00	0.7	46
3	Umiam Stage-III	60	Pondage	Rotating Exciter as Generator	61.67	0.7	139
4	Umiam Stage-IV	60	Pondage	Static Excitation	61.79	1.0	207
5	Sonapani MHP	1.5	RoR	Rotating Exciter as Generator	45.00	0.7	5
6	Myntdu Leshka	12.6	RoR	Static Excitation	99.00	1.0	486
7	New Umtru	4.0	Pondage	Static Excitation	62.60	0.7	235
8	Lakroh MHP	1.5	RoR	Rotating Exciter as Generator	45.00	0.7	11
9	Ganol SHP	22.5	Pondage	Rotating Exciter as Generator	-	0.7	67

3.7 Gross and Net Generation

Petitioner's Submission

MePGCL has submitted the Energy Generation trend of its stations for the past four years and projections for the year FY 2020-21 and for the Control Period FY 2021-22 to FY 2023-24 as shown in the Tables below:

Energy Generation Trend in Past Years:

All the Generating stations being hydro, the annual generation depends on the rainfall for the year. The generation trend from FY 2016-17 to FY 2019-20 has been presented in the table below:

Table 3.9: Energy Generation Trend of MePGCL (MU)

Sl. No	Station	FY 2016-17	FY 2017-18	FY 2018-19	FY 2019-20
1	Umiam Stage-I	96.63	128.61	85.12	108.32
2	Umiam Stage-II	50.23	63.92	43.31	55.25
3	Umiam-Umtru Stage-III	65.3	132.15	133.83	141.83
4	Umiam-Umtru Stage-IV	166.12	217.48	166.61	164.5
5	Sonapani MHP	7.63	7.47	7.12	3.59
6	Myntdu Leshka HEP	443.85	502.57	363.06	421.65
7	New Umtru HEP	-	167.79	179.82	181.43
8	Lakroh MHP	-	-	0.05	2.11
	Total	**829.756**	**1219.99**	**978.92**	**1078.68**

Energy Generation in FY 2020-21 & the 3rd Control Period:

Based on the previous generation trend for the existing stations and the projected energy generation for the upcoming plants, the projected generation (Gross) in FY 2020-21 & in the 3rd Control Period is given below:

Table 3.10: Projected Energy Generation for MePGCL(MU)

Sl. No	Station	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24
1	Umiam Stage-I	116	116	116	116
2	Umiam Stage-II	46	46	46	46
3	Umiam-Umtru Stage-III	139	139	139	139
4	Umiam-Umtru Stage-IV	207	207	207	207
5	Sonapani MHP	5	5	5	5
6	Myntdu Leshka HEP	486	486	486	486
7	New Umtru HEP	235	235	235	235
8	Lakroh MHP	11	11	11	11
9	Ganol SH (New)	-	-	67	67
	Total	**1245.31**	**1245.31**	**1312**	**1312**

Commission's Analysis

On a query from the Commission, MePGCL has submitted the Gross and Net Generation for its different generating stations as shown below:

Table 3.11: Projected Energy Gross Generation for FY 2020-21

Sl. No	Station	Installed Capacity (MW)	Gross Generation (%)	Auxiliary losses (%)	Transformation losses (%)	Auxiliary & Transformation losses (%)	Auxiliary & Transformation losses (MU)	Net Generation (MU)
1	Umiam Stage-I	4x9	128.00	0.70	0.50	1.20	1.536	126.46
2	Umiam Stage-II	2x10	65.00	0.70	0.50	1.20	0.780	64.22
3	Umiam-Umtru Stage-III	2x30	130.00	0.70	0.50	1.20	1.560	128.44
4	Umiam-Umtru Stage-IV	2x30	150.00	1.00	0.50	1.50	2.250	147.75
5	Umtru Power Station	4x2.8	0.00	0.00	0.00	0.00	0.000	0.00
6	Sonapani MHP	1x1.5	5.50	0.70	0.50	1.20	0.066	5.43
7	Myntdu Leshka HEP	3x42	410.00	1.00	0.50	1.50	6.150	403.85
8	New Umtru HEP	2x20	22.00	1.00	0.50	1.50	3.300	216.70
9	Lakroh MHP	1x1.5	4.60	1.00	0.50	1.50	0.069	4.53
	Total	**356.2**	**1113.10**					**1097.39**

Table 3.12: Projected Energy Gross Generation for FY 2021-22

Sl. No	Station	Installed Capacity (MW)	Gross Generation (%)	Auxiliary losses (%)	Transformation losses (%)	Auxiliary & Transformation losses (%)	Auxiliary & Transformation losses (MU)	Net Generation (MU)
1	Umiam Stage-I	4x9	116.00	0.70	0.50	1.20	1.392	114.61
2	Umiam Stage-II	2x10	46.00	0.70	0.50	1.20	0.552	45.45
3	Umiam-Umtru Stage-III	2x30	112.00	0.70	0.50	1.20	1.344	110.66
4	Umiam-Umtru Stage-IV	2x30	207.00	1.00	0.50	1.50	3.105	203.90
5	Umtru Power Station	4x2.8	0.00	0.00	0.00	0.00	0.000	0.00
6	Sonapani MHP	1x1.5	5.00	0.70	0.50	1.20	0.060	4.94
7	Myntdu Leshka HEP	3x42	486.00	1.00	0.50	1.50	7.290	478.71
8	New Umtru HEP	2x20	235.00	1.00	0.50	1.50	3.525	231.48
9	Lakroh MHP	1x1.5	11.00	1.00	0.50	1.50	0.165	10.84
	Total	**356.2**	**1218.00**					**1200.57**

Table 3.13: Projected Energy Gross Generation for FY 2022-23

Sl. No	Station	Installed Capacity (MW)	Gross Generation (%)	Auxiliary losses (%)	Transformation losses (%)	Auxiliary & Transformation losses (%)	Auxiliary & Transformation losses (MU)	Net Generation (MU)
1	Umiam Stage-I	4x9	116.00	0.70	0.50	1.20	1.392	114.61
2	Umiam Stage-II	2x10	46.00	0.70	0.50	1.20	0.552	45.45
3	Umiam-Umtru Stage-III	2x30	0.00	-	-	-	-	-
4	Umiam-Umtru Stage-IV	2x30	207.00	1.00	0.50	1.50	3.105	203.90
5	Umtru Power Station	4x2.8	0.00	0.00	0.00	0.00	0.000	0.00
6	Sonapani MHP	1x1.5	5.00	0.70	0.50	1.20	0.060	4.94
7	Myntdu Leshka HEP	3x42	486.00	1.00	0.50	1.50	7.290	478.71
8	New Umtru HEP	2x20	235.00	1.00	0.50	1.50	3.525	231.48
9	Lakroh MHP	1x1.5	11.00	1.00	0.50	1.50	0.165	10.84
10	Ganol SHP	3x7.5	67.00	1.00	0.50	1.50	1.005	66.00
	Total	**356.2**	**1218.00**				**17.09**	**1155.91**

Table 3.14: Projected Energy Gross Generation for FY 2023-24

Sl. No	Station	Installed Capacity (MW)	Gross Generation (%)	Auxiliary losses (%)	Transformation losses (%)	Auxiliary & Transformation losses (%)	Auxiliary & Transformation losses (MU)	Net Generation (MU)
1	Umiam Stage-I	4x9	116.00	0.70	0.50	1.20	1.392	114.61
2	Umiam Stage-II	2x10	46.00	0.70	0.50	1.20	0.552	45.45
3	Umiam-Umtru Stage-III	2x30	0.00	-	-	-	-	-
4	Umiam-Umtru Stage-IV	2x30	207.00	1.00	0.50	1.50	3.105	203.90
5	Umtru Power Station	4x2.8	0.00	0.00	0.00	0.00	0.000	0.00
6	Sonapani MHP	1x1.5	5.00	0.70	0.50	1.20	0.060	4.94
7	Myntdu Leshka HEP	3x42	486.00	1.00	0.50	1.50	7.290	478.71
8	New Umtru HEP	2x20	235.00	1.00	0.50	1.50	3.525	231.48
9	Lakroh MHP	1x1.5	11.00	1.00	0.50	1.50	0.165	10.84
10	Ganol SHP	3x7.5	67.00	1.00	0.50	1.50	1.005	66.00
	Total	**356.2**	**1218.00**				**17.09**	**1155.91**

The Gross and Net Generation for different stations as approved by the Commission based on Design Energy, Auxiliary Consumption and Transformation losses discussed in the earlier paras are given in the Tables below:

Table 3.15: Gross and Net Generation for FY 2020-21

Sl. No	Name of Station	Gross Generation (MU)	Aux. Cons (%)	Transformation Loss (%)	Total Loss Auxiliary + Transformation (%)	Auxiliary Consumption+ Transformation Loss (MU)	Net Generation (MU)
1	Umiam Stage-I	116.00	0.70	0.50	1.20	1.392	114.608
2	Umiam Stage-II	46.00	0.70	0.50	1.20	0.552	45.448
3	Umiam Stage-III	139.00	0.70	0.50	1.20	1.668	137.332
4	Umiam Stage-IV	207.00	1.00	0.50	1.50	3.105	203.895
5	Sonapani MHP	5.00	0.70	0.50	1.20	0.06	4.94
6	Myntdu Leskha HEP	486.00	1.00	0.50	1.50	7.29	478.71
7	New Umtru HEP	235.00	1.00	0.50	1.50	3.525	231.475
8	Lakroh MHP	11.00	0.70	0.50	1.20	0.132	10.868
9	Ganol S.H.P (New)						
	Total	**1245.00**				**17.72**	**1227.28**

Table 3.16: Gross and Net Generation for FY 2021-22

Sl. No	Name of Station	Gross Generation (MU)	Aux. Cons (%)	Transformation Loss (%)	Total Loss Auxiliary+ Transformation (%)	Auxiliary Consumption+ Transformation Loss (MU)	Net Generation (MU)
1	Umiam Stage-I	116.00	0.70	0.50	1.20	1.392	114.608
2	Umiam Stage-II	46.00	0.70	0.50	1.20	0.552	45.448
3	Umiam Stage-III	139.00	0.70	0.50	1.20	1.668	137.332
4	Umiam Stage-IV	207.00	1.00	0.50	1.50	3.105	203.895
5	Sonapani MHP	5.00	0.70	0.50	1.20	0.06	4.94
6	Myntdu Leskha HEP	486.00	1.00	0.50	1.50	7.29	478.71
7	New Umtru HEP	235.00	1.00	0.50	1.50	3.525	231.475
8	Lakroh MHP	11.00	0.70	0.50	1.20	0.132	10.868
9	Ganol S.H.P (New)						
	Total	**1245.00**				**17.72**	**1227.28**

Table 3.17: Gross and Net Generation for FY 2022-23

Sl. No	Name of Station	Gross Generation (MU)	Aux. Cons (%)	Transformation Loss (%)	Total Loss Auxiliary+ Transformation (%)	Auxiliary Consumption+ Transformation Loss (MU)	Net Generation (MU)
1	Umiam Stage-I	116.00	0.70	0.50	1.20	1.392	114.608
2	Umiam Stage-II	46.00	0.70	0.50	1.20	0.552	45.448
3	Umiam Stage-III	0.00	0.70	0.50	1.20	0	0
4	Umiam Stage-IV	207.00	1.00	0.50	1.50	3.105	203.895
5	Sonapani MHP	5.00	0.70	0.50	1.20	0.06	4.94
6	Myntdu Leskha HEP	486.00	1.00	0.50	1.50	7.29	478.71
7	New Umtru HEP	235.00	1.00	0.50	1.50	3.525	231.475
8	Lakroh MHP	11.00	0.70	0.50	1.20	0.132	10.868
9	Ganol S.H.P (New)	67.00	0.70	0.50	1.20	0.804	66.196
	Total	**1173.00**				**16.86**	**1156.14**

Table 3.18: Gross and Net Generation for FY 2023-24

Sl. No	Name of Station	Gross Generation (MU)	Aux. Cons (%)	Transformation Loss (%)	Total Loss Auxiliary+ Transformation (%)	Auxiliary Consumption+ Transformation Loss (MU)	Net Generation (MU)
1	Umiam Stage-I	116.00	0.70	0.50	1.20	1.392	114.608
2	Umiam Stage-II	46.00	0.70	0.50	1.20	0.552	45.448
3	Umiam Stage-III	0.00	0.70	0.50	1.20	0	0
4	Umiam Stage-IV	207.00	1.00	0.50	1.50	3.105	203.895
5	Sonapani MHP	5.00	0.70	0.50	1.20	0.06	4.94
6	Myntdu Leskha HEP	486.00	1.00	0.50	1.50	7.29	478.71
7	New Umtru HEP	235.00	1.00	0.50	1.50	3.525	231.475
8	Lakroh MHP	11.00	0.70	0.50	1.20	0.132	10.868
9	Ganol S.H.P (New)	67.00	0.70	0.50	1.20	0.804	66.196
	Total	**1173.00**				**16.86**	**1156.14**

3.8 Capital Investment Plan

Petitioner's Submission

3.8.1 MePGCL has projected capital investment plan to the extent of Rs. 4000.50 Crore for FY 2020-21 and for the control period FY 2021-22 to FY 2023-24. The projected capital investment is mainly towards system augmentation & improvement of existing stations, upcoming new projects and for survey & investigation of additional hydro power projects.

MePGCL has submitted that the present generating stations of MePGCL except MLHEP, NUHEP and Lakroh HEP are very old. Therefore, to maintain efficient generation from these stations, the generation utility needs to undertake various system improvement & augmentation activities. Moreover, to utilize the natural resources of Meghalaya, few hydro-electric projects have been undertaken, and some more will be added in the upcoming years. The Capital Expenditure can be broadly segregated into New Projects and additional investment in existing stations for augmentation, improvement, metering etc.

3.8.2 System Augmentation & Improvement Projects

MePGCL has proposed the capital expenditure for R&M of the existing stations as below:

1.	System Augmentation & Improvement for Umiam Stage – I	….Rs. 77.56 Crore
2.	System Augmentation & Improvement for Umiam Stage – II	….Rs. 21.11 Crore
3.	System Augmentation & Improvement for Umiam Stage – III	….Rs. 410.77 Crore
4.	System Augmentation & Improvement for Umiam Stage – IV	….Rs. 35.98 Crore
5.	System Augmentation & Improvement for Umtru – HEP	….Rs. 110.50 Crore
6.	System Augmentation & Improvement for Sonapani – MHP	….Rs. 0.34 Crore
7.	System Protection and Communication Project	….Rs. 8.98 Crore
8.	Dam Rehabilitation and Improvement Project (Drip – II & III)	….Rs. 441.00 Crore
9.	System Augmentation & Improvement for Myntdu Leshka HEP (MLHEP)	….Rs. 16.31 Crore
10.	System Augmentation & Improvement for Lakroh MHP	….Rs. 1.54 Crore
	Total	**….Rs.1124.10 Crore**

The details of each item-wise R&M works to be carried-out in the above proposal are provided in the attached Annexure – B (1)

3.8.3 Upcoming New Plants

MePGCL has projected the capital expenditure for upcoming Ganol SH project which was started in the year 2014, for Riangdo SH project which is under tendering process and some other projects which they would like to take us during the 3rd control period as detailed below:

1.	Ganol Small Hydro Project (3 X 75 MW)	….Rs. 507.71 Crore
2.	Riangdo Small Hydro Project (3.0 MW)	….Rs. 33.99 Crore
3.	Myntdu Leshka Stage – II HEP (3 X 60 MW)	….Rs. 2069. 23 Crore
4.	Solar Parks (20 MW)	….Rs. 11.64 Crore
5.	Umshamphu SHP (2 X 1.5 MW)	….Rs. 48.70 Crore
6.	Amkshar SHP (2 X 1.2 MW)	….Rs. 46.24 Crore
7.	Umrina (3x1.50 MW)	….Rs. 75.08 Crore
	Total	**….Rs. 2792.59 Crore**

Further details of the above projects are provided in the attached Annexure – B(2)

3.8.4 Survey & Investigating for new Projects

MePGCL has submitted that capital expenditure is required for preparing detailed investigation reports (DPRs) for the following 9 numbers identified projects to utilize the natural resources of Meghalaya.

1.	Umngot HEP (3 x 70 MW)	….Rs. 8.35 Crore
2.	Myntdu Leshka Stage – II HEP (3 X 70 MW)	….Rs. 9.60 Crore
3.	Mawblei HEP (2 X 38 MW)	….Rs. 8.92 Crore
4.	Nongkohlait HEP (2 X 31 MW)	….Rs. 5.02 Crore
5.	Selim HEP (2 X 40 MW)	….Rs. 7.92 Crore
6.	Umngi HEP (2 X 31 MW)	….Rs. 5.00 Crore
7.	Upper Khri Stage – II (2 X 48 MW)	….Rs.13.00 Crore
8.	Nongans (2 X 15 MW)	….Rs. 13.00 Crore
9.	Maniput HEP (2 X 19 MW)	….Rs. 13.00 Crore
	Total	**….Rs. 83.81 Crore**

Details of power stations for which Survey & Investigation is to be conducted are provided in a attached Annexure – B(3)

3.8.5 Fund requirement & capitalization for the control period

MePGCL has submitted that the objective of the schemes is to revitalize the power sector within Meghalaya to achieve sustainable development in long term. The maintenance of existing stations as well as addition of new plants is required for catering to growing demand throughout the state. Given below is the fund requirement for capex works in FY 2020-21 and in the third control period.

Table 3.19: Fund Requirement for MePGCL Works (Rs Cr)

Sl. No.	Category	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	Total
1	Existing Plants	27.90	106.66	223.25	254.79	**612.61**
2	Upcoming Generation Plants	87.00	160.00	77.27	112.18	**436.45**
3	Investigation Survey	10.59	3.13	9.75	9.75	**33.22**
	Total Fund Requirement (Generation)	**125.49**	**269.79**	**310.27**	**376.72**	**1082.28**

Some of the schemes under implementation are scheduled to complete in FY 2020-21 and during the third control period. The same will add to existing asset base of MePGCL. The details of expected capitalization in FY 2020-21 and in the third control period are given below:

Table 3.20: Expected Capitalization in the Control Period (Rs Cr)

Sl. No.	Category	FY 2020-21	FY 2021-22	FY 2022-23	FY 2023-24	Total
1	Existing Plants	0.50	39.47	57.25	57.69	**154.90**
2	Upcoming Generation Plants/ S&I	27.97	16.84	507.71	45.63	**598.15**
	Total Capitalization (Generation)	**28.47**	**56.31**	**564.96**	**103.32**	**753.05**

Commission's Analysis

The Commission has noted the capital investment / expenditure and capitalization projections for the year FY 2020-21 and for FY 2021-22 to FY 2023-24 of 3rd control period submitted by MePGCL.

It is observed that system Augmentation & Improvement works are proposed for all the existing hydro generating stations, including Lakroh MHP which was commissioned recently i.e. on 06.12.2018.

Regulation 53 of MYT Regulation, 2014 reads as below:

The generating company for meeting the expenditure on renovation and modernization (R&M) for the purpose of extension of life beyond the useful life of the generating station or a unit thereof, shall make an application before the Commission for approval of the proposal with a detailed project report giving complete scope, justification, cost benefit analysis, estimated life extension from a reference date, financial package, phasing of expenditure, schedule of completion, reference price level, estimated completion cost including foreign exchange component, if any) record of consultation with beneficiaries and any other information considered to be relevant by the generating company.

Where generating company makes an application for approval of its proposal for renovation and modernization the Commission shall give its approval after due consideration of reasonableness of cost estimates, financing plan, schedule of completion, interest during construction, use of efficient technology, cost benefit analysis and such other factors which the Commission may consider relevant.

MePGCL has not provided detailed project reports along with approvals from the competent authority. Therefore, the Commission is allowing the MePGCL proposal to the extent it may meet out its obligations and consumers are not unduly burdened. However, MePGCL shall ensure to take up the R&M works for the existing plants contemplated in the Business Plan where cost benefits and improved performance parameters are anticipated. The Commission shall validate the numbers while approving the ARR for MYT control period of FY 2021-22 to FY 2023-24.

Commission also observed that capital expenditure for new hydro projects viz., Riangdo, Myntdu Leshka Stage – II, Umshampu, Amkshiar, Umina hydro projects and solar parks are projected along with ongoing Ganol Small Hydro Project. Regulations 28 and Regulation 52 of MYT Regulations, 2014 provides for approval of actual capital cost for new projects subject to prudence check of new investments. Since the detailed project reports and approvals from competent authorities for the above proposed projects are not submitted, the Commission shall scrutinize the reasonableness of the capital cost, financial plans year-on-year etc while finalizing the ARR for the 3rd MYT control period of FY 2021-22 to FY 2023-24.

MePGCL shall prioritize the upcoming generating projects contemplated in the Business Plan where DPRs are approved and subject to availability of funding tie-up granted from the authorities.

Further, Commission has observed that nine projects, under Survey & Investigation viz Umngot HEP, MLHEP-II, Mawblei HEP, Nangkhri Stage – II, Nonganon and Mawput HEP are proposed. It is noticed that the survey and investigation works for the first six projects are already under progress. The copies of detailed cost estimates approved by the competent authorities for undertaking the Survey & Investigation of the project, contemplated in the Business Plan shall be submitted for perusal of the Commission.

However, to facilitate MePGCL to file the ARR and tariff petition for the 3rd MYT control period FY 2021-22 to FY 2023-24 in time, the Commission is inclined to provisionally approve the MePGCL Business Plan for FY 2021-22 to FY 2023-24 as projected by the Petitioner as detailed in the Table below:

Table 3.21: Summary of CAPEX-Station wise

Sl No	Station	CAPEX	Funding Pattern (Rs. Cr)		
		(Rs. Cr)	Equity	Debt	Grant
Existing Stations					
1	Umiam Stage-I	77.56	69.81	7.76	
2	Umiam Stage-II	21.11	19	2.11	
3	Umaim Stage-III	410.77	115.08	2.36	293.33
4	Umaim Stage-IV	35.98	10.79	25.19	
5	Umtru HEP	110.5	33	77	0.5
6	Sonapani	0.34	0.1	0.24	

Sl No	Station	CAPEX	Funding Pattern (Rs. Cr)		
		(Rs. Cr)	Equity	Debt	Grant
7	Leshka	16.31	14.68	1.63	
8	New Umtru HEP				
9	Lakroh HEP	1.54	1.39	0.15	
10	MePGCL System Protection and Communication	8.98	2.69	6.29	
11	Dam Rehabilitation and Improvement Project (DRIP)	441	123.48		317.52
	Sub-Total (a)	**1124.1**	**390.02**	**122.72**	**611.35**
Upcoming Generation Plants					
1	Ganol SHP	507.71	54.62	223.1	229.98
2	Riangdo SHP	33.99	2.59	11.4	20
3	MLHEP Stage-II (3x60 MW)	2069.23	113.88	248.24	1707.11
4	Solar Park (10MW each) in Suchen and Thamar	11.64	9.24	0	2.4
5	Umshamphu (2x1.5 MW)	48.7	14.61	34.09	
6	Amkshar (2x1.20 MW)	46.24	13.87	32.37	
7	Umrina (3x1.50 MW)	75.08	22.52	52.56	
	Sub-Total (b)	**2792.59**	**231.33**	**601.76**	**1959.49**
Projects under Survey & Investigation					
1	MLHEP-II(3X70)MW	9.6		0.96	8.64
2	UMNGI(2X31)MW	5		0.5	4.5
3	UMNGOT(3X70)MW	8.35		0.835	7.515
4	SELIM(2X48)MW	7.92		0.792	7.128
5	NONGKOHLAIT(3X31)MW	5.02		0.502	4.518
6	MAWBLEI(2X37.5)MW	8.92		0.892	8.028
7	Upper Khri Stage-II HEP	13		13	0
8	Nongnam HEP	13		13	0
9	Mawput HEP	13		13	0
	Sub-Total ©	**83.81**		**43.481**	**40.329**
Grand Total(a+b+c)		**4000.5**	**621.35**	**767.96**	**2611.17**

MePGCL shall submit the approved DPRs along with copies of sanctioned of working estimates from competent authority and funding arrangements etc., while projecting the year-wise Capex and capitalization in the ARR Petition for the control period FY 2021-22 to FY 2023-24.

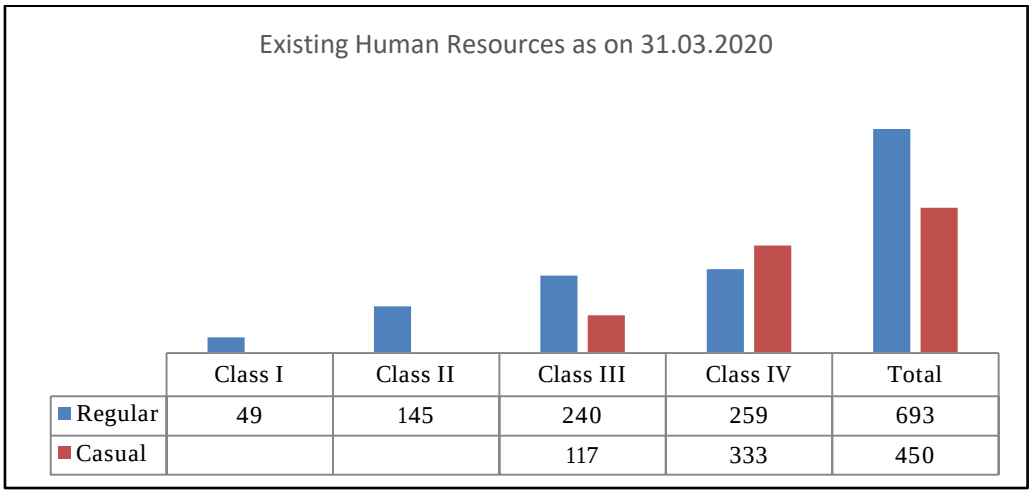
3.9 Human Resources

Petitioner's Submission

3.9.1 Existing Human Resource

MePGCL has submitted that as on 31st March 2020, MePGCL had 693 Regular employees and 450 Casual employees. MePGCL boasts of a strong technical knowhow in the form of experienced engineers and operational staff. The technical progress of MePGCL has helped in establishing, operating and maintaining generating stations. The class-wise number of Regular & Casual Employees in MePGCL is depicted in the chart below:

Class Wise No of Employees-MePGCL



	Class I	Class II	Class III	Class IV	Total
Regular	49	145	240	259	693
Casual			117	333	450

3.9.2 Manpower Requirement Plan of MePGCL

It is submitted that the utility has planned to recruit new personnel which would be required when the upcoming projects would be operational and also for the existing power stations which are facing shortage of manpower. The table below represents the financial year-wise employee requirement of MePGCL during the third control period.

Table 3.22: Financial Year-Wise Employee Requirement for MePGCL for the Control Period from FY 2021-22 to FY 2023-24

Sl. No.	Category	Requirement		
		FY 2021-22	FY 2022-23	FY 2023-24
Class I				
1.	Regular	-	-	-
2.	Casual	-	-	-
Sub-total (I)		-	-	-
Class II				

Sl. No.	Category	Requirement		
		FY 2021-22	FY 2022-23	FY 2023-24
1.	Regular	10	27	19
2.	Casual	-	-	-
Sub-total (II)		10	27	19
Class III				
1.	Regular	30	41	52
2.	Casual			
Sub-total (III)		30	41	52
Class IV				
1.	Regular	10	21	40
2.	Casual			
Sub-total (IV)		10	21	40
Grand Total (I+II+III+IV)		**50**	**89**	**111**

The power station-wise/ office-wise employee requirement of MePGCL during the control period is represented below:

Table 3.23: Power station wise/ office wise Employee Requirement of MePGCL for the Control Period from FY 2021-22 to FY 2023-24

	FY 2021-22	FY 2022-23	FY 2023-24
Chief Engineer (Generation)			
Assistant Engineer	5	6	3
Junior Engineer	5	7	2
Grade-III	30	33	40
Grade IV	10	9	20
Sub-total (a)	50	55	65
Chief Engineer (Medium and Small Hydro)			
Assistant Engineer		6	
Junior Engineer		8	
Grade-III		8	
Grade IV		12	
Sub-total (b)		34	
Chief Engineer (Hydro Planning and Hydro Construction)			
Assistant Engineer			6
Junior Engineer			8
Grade-III			12
Grade IV			20
Sub-total (c)			46
Grand total (a+b+c)	50	89	111

Commission's Analysis

Commission appoints that considers that the existing manpower is on higher side considering the size of the business and generation capacity of the existing stations.

The Financial commitment on account of available manpower is part of the O&M expenditure attributable to tariffs. Any additional commitment on account of employee recruitment projected shall be subject to the resources availability and on real need basis.

3.9.3 Capacity Building in Meghalaya Energy Corporation Limited (MeECL)

Petitioner's Submission

In order to meet the increasing demand for electricity, there is a requirement for addition of generating capacity, expansion of associated transmission and distribution networks and upgrading of technology. The challenge to provide power to all requires a corresponding increase, not only in the quantity, but also in the quality of human resources. Hence, the purpose of establishing the Human Resources Development Centre (HRDC) is to ensure that skilled manpower in adequate numbers is made available across various activities of MeECL. The HRDC therefore identifies the skill gaps, frame occupational standards, facilitate development of practical as well as high quality training contents and ensure adequate availability of faculty for capacity building. Thus, training and upgrading the skills of the manpower is the primary objective of HRDC.

At the national level, a statutory body, namely, the Central Electricity Authority (CEA) was constituted under the Electricity Act to promote measures for advancing the skill of persons engaged in electricity industry. CEA has already set up the standards for mandatory training required for various skills for the generation, transmission, distribution, etc. The CEA has recognized 74 (seventy-four) training institutes throughout the country under the Government and Private Sector, for providing such training at various levels.

Three types of training infrastructures and facilities are available for personnel in the power industry:

- Training institutes recognized by CEA for imparting statutory induction training: These training institutes recognized by the CEA, cater to the training needs of personnel working in thermal power stations, hydro generating stations,

transmission utilities and distribution utilities. For example, the National Power Training Institute (NPTI) has established a Centre for Advanced Management & Power Studies (CAMPS) at its Faridabad campus. In addition to several short-term courses on Technology-Management interface. NPTI also conducts professional courses, integrating power-training experience with academics, like PDC & PGDC in Power Plant Engineering and B.E./ B.Tech. in Power Engineering etc. The other institution, the Central Board of Irrigation & Power (CBIP) also conducts power industry interfaced placement oriented long-term training programmes in generation, transmission and distribution, besides high-end short term programmes in advanced technologies in all disciplines of power sector.

- Lineman Training Institutes: Most utilities are having at least one lineman-training center. These institutes are set up by the respective organizations for imparting training to their own employees.
- Other training facility include training program with academic institutions outside power sector.

Statutory training requirement: The Central Electricity Authority notifies the mandatory training (measures relating to safety and electricity supply) Regulations 2010, specifically the regulations 6 & 7 of the said CEA Regulations 2010. For implementing the above regulations effectively and on rational basis, the CEA has framed guidelines and norms to prescribe the procedure to be followed by CEA/ MoP for recognition and grading of the training institutes for power sector in the country. Presently, following types of training are provided to the workforce in power segment for electricity generation, transmission and distribution personnel: Operation & Maintenance Training to all existing employees engaged in O&M of generating projects and transmission & distribution system ranging from 4 Weeks to 30 Weeks. This includes classroom training, simulator training for Thermal & Hydro and On-Job training.

- Induction level training for new recruits for 1 month (Technical & Non-Technical).
- Refresher/Advanced training of 5 Days in a year to all existing personnel of varying degrees in various specializations in line with National Training Policy for Power Sector.
- Management training of 5 Days in a year to the senior Executives/Managers in India/abroad in line with National Training Policy for Power Sector.
- Distance Learning Certificate Programs on Power Distribution Management for JEs/ AEs.
- Certificate of Competency in Power Distribution (CCPD).
- Training under Distribution Reforms, Upgrades and Management (DRUM). C&D Employees Training (Non-executives in secretarial staff, accounts wing, technical staff in nonexecutives and Class-IV are categorized as C&D employees).
- Franchisee Training.

Human Resources Development Centre (HRDC):

Human Resources Development Centre (HRDC), Umiam, MeECL is entrusted with the training for the officers and staffs of the 3 (three) subsidiary corporations of MeECL, namely, Meghalaya Power Generation Corporation Limited (MePGCL), Meghalaya Power Transmission Corporation Limited (MePTCL) and Meghalaya Power Distribution Corporation Limited (MePDCL). Details of trainings conducted in FY 2019-20 and FY 2020-21 for the officers is given below:

Details of trainings conducted in FY 2019-20 and FY 2020-21 for the officers is given below:

Training Details for FY 2019-20

Sl. No	Name of Institute	Field of Training (Thermal/ Hydro /Transmission/ Distribution/ Management)	Total training (Days/ Man)
1	Training programme on **"Technician Development Programme**", organized by Power Grid Corporation of India Ltd. (PGCIL), Lapalang, Shillong under Capacity Building & Institutional Strengthening (CBIS) of NERPSIP, with effect from 16.04.2019 to 10.05.2019 at Powergrid, Misa Substation, Nowgaon, Assam. **Total Personnel-25 (twenty five) [Technical]. Linemen-25.**	**Transmission**	**20 x 25= 500**
	Workshop on **"National eVidhan Application (NeVA)**", organized by Meghalaya Legislative Assembly, held on	**Management**	**2 x 2= 4**

Sl. No	Name of Institute	Field of Training (Thermal/ Hydro /Transmission/ Distribution/ Management)	Total training (Days/ Man)
	the 24th & 25th April, 2019 at the Annexe Hall, Assembly Building, Rilbong, at 10:30 A.M. **Total Personnel-2 (two) [Technical]. AEE-1, JE-1.**		
2	Training programme on **"*Finance & Accounts Practices*", ** organized by Power Grid Corporation of India Limited (PGCIL) from 22nd to 24th April, 2019 at 10:00 A.M in the ICSSR Hall, NEHU, Shillong.. **Total Personnel-26 (twenty six) [Technical]. CE-1, ACE-4, SE-8, EE-8, RE-5**	**Management**	**2 x 26 = 52**
3	Training Programme, organised by the Central Project Management Unit (CPMU) of Dam Rehabilitation and Improvement Project, CWC, New Delhi in association with the IIT, Roorkee and Motilal Nehru National Institute of Technology, Allahabad on **"Conventional and Advanced Hydrometric Technique for Discharge Estimation"** held on The 10th – 12th June, 2019 at Indian Institute of Technology, Roorkee, Uttarakhand. **Total Personnel-2(two) [Technical], AEE(C)-2.**	**Hydro**	**2 x 3 = 6**
4	Training Programme respectively under IPDS conducted by PFC Ltd, held on the 8th & 9th May, 2019 at 10.00 A.M in the Hotel Polo Towers, Shillong. **Total Personnel-83(eighty three) [Technical], AEE (Elect)-23, JE-24, ES-1, Linemen-II- 11, Electrician-3, C/Electrician-2, Jugali-19.**	**Distribution**	**2 X 83 = 166**
5	Training Programme, organised by the Central Project Management Unit (CPMU) of Dam Rehabilitation and Improvement Project, CWC, New Delhi in association with the IIT, Roorkee and Motilal Nehru National Institute of Technology, Allahabad on **"Hydrological and Hydraulic Methods of Flood Routing**" held on the 13th -14th June, 2019 at Indian Institute of Technology, Roorkee, Uttarakhand. **Total Personnel-2(two) [Technical],AEE(C)-2.**	**Management**	**2 X 2 = 4**
6	Programme on "**Power System Logistics Conclave**" organized by North Eastern Regional Load Dispatch Centre (NERLDC), POSOCO, Lower Nongrah, Lapalang, Shillong to be held on 6th & 7th June, 2019 at NERLDC Conference Hall, Shillong. **TotalPersonnel-2(two) [Technical], SE(Elect)-1, EE(Elect)-1.**	**Transmission**	**2 X 2 = 4**
7	Training Programme, organised by the Central Project Management Unit (CPMU) of Dam Rehabilitation and Improvement Project, CWC, New Delhi in association with the IIT, Roorkee and Motilal Nehru National Institute of Technology, Allahabad on **"Geotechnical**	**Management**	**2 X 2 = 4**

Sl. No	Name of Institute	Field of Training (Thermal/ Hydro /Transmission/ Distribution/ Management)	Total training (Days/ Man)
	and Seismic consideration in Dams" held on the 17th - 18th June, 2019 at Indian Institute of Technology, Roorkee, Uttarakhand. **Total Personnel-2(two) [Technical],AEE (C)-2.**		
8	Training Programme, organised by the Central Project Management Unit (CPMU) of Dam Rehabilitation and Improvement Project, CWC, New Delhi in association with the IIT, Roorkee and Motilal Nehru National Institute of Technology, Allahabad on **"Geotechnical and Seismic consideration in Dams"** held on the 19th - 21st June, 2019 at Indian Institute of Technology, Roorkee, Uttarakhand. **Total Personnel-2(two) [Technical], AEE(C)-2.**	**Management**	**2 X 3 = 6**
9	Workshop on **"Latest Trends in Inspection & Investigations of Dam"**, organised by AF Academy under the aegis of Central Water Commission and in association with Central Board of Irrigation & Power (CBIP), ICID-CIID and World Bank on 30th & 31st May, 2019 at New Delhi. **Total Personnel-2(two) [Technical], CE(C)-1, SE(C)-1**	**Management**	**2 X 3 = 6**
10	Training programme on "Emerging Trends in Power Sector –NER" for senior management, organized by POWERGRID from 17th to 19th June, 2019 at POWERGRID Academy of Leadership (PAL), Manesar, Gurugram, Haryana. **Total Personnel-4(four) [Technical], SE(Elect)-2, EE(Elect)-2**	**Management**	**4 X 3 = 12**
11	Training on "***Capacity Development Proramme***", organized by Asian Development Bank held on 8th - 10th July, 2019 at ASCI, Hyderabad. **Total Personnel-1(one) [Technical], SE(Elect)-1.**	**Distribution**	**1 X 3 = 3**
12	Training programme on **"Project Planning Implementation, Monitoring & Evaluation"** organized by Department of Public Enterprises (DPE), Government of India held on 15th -19th July, 2019 at IIT Kharagpur. **Total Personnel-1(one) [Technical], AEE(C)-1**	**Hydro**	**1 X 5 = 5**
13	Training Programme on "**Website Quality Certification**" at Electronics Test & Development Centre, STQC Directorate, Ministry of Electronics & Information Technology, Government of India, 1st & 2nd Floor, Central Block, HOUSEED Complex, Beltola-Basistha Road, Dispur, Guwahati – 781006 from 10:00 A.M to 5:00 P.M on the 15th – 16th July, 2019. **Total Personnel-1(one) [Technical], AEE(Comp. Engr)-1.**	**Management**	**1 X 2= 2**

Sl. No	Name of Institute	Field of Training (Thermal/ Hydro /Transmission/ Distribution/ Management)	Total training (Days/ Man)
14	The 22nd National Conference on e-Governance (NCeG) 2019 to be held on the 8th and 9th August, 2019 at State Convention Centre, Shillong. **Total Personnel-1(one) [Technical], SE(Elect)-1, EE(Elect)-1**	**Management**	**2 X 2= 4**
15	Training programme on ***"Finance & Accounts Practices"*** (INDAS), to be organized by Power Grid Corporation of India Limited (PGCIL) under Capacity Building & Institution Strengthening (CBIS) of NERPSIP on 2nd & 3rd September, 2019 from 9.30 A.M in the ICSSR Hall, NEHU, Shillong. **Total Personnel-26 (twenty six) [Accounts], DAO/SO -26.**	**Management**	**2 X 26= 52**
16	Training programme on **"Online Right To Information Portal"** organized by Meghalaya Administrative Training Institute", Shillong held on 4.10.2019 at IT Training Hall, IT & C Department at 11.00 A.M. **Total Personnel-6(six) [Administration], CE-4, ACE(C)-1, Under Secretary-1**	**Management**	**1 X 6= 6**
17	Training programme on **"Project Planning Implementation, Monitoring & Evaluation"** organized by Department of Public Enterprises (DPE), Government of India to be held on 15th -19th July, 2019 at IIT Kharagpur. **Total Personnel-1(one) [Technical], AEE(C)-1.**	**Hydro**	**5 X 1 = 5**
18	Training programme on **"Smartgrid"** organised by Power Grid Corporation of India Limited, at Smart Grid Knowledge Centre, Manesar, Haryana with effect from 9th – 11th September, 2019. **Total Personnel-1(one) [Technical], AEE (Elect)-1.**	**Distribution**	**3 X 1 = 3**
19	Training programmme on **"Urban Planning & Management"**conducted by Meghalaya Administrative Training Institute (MATI), Shillong held on 24.10.2019 from 9.30 A.M at MATI, Shillong. **Total Personnel-3(three) [Technical], AEE (Elect)-2, AEE (C)-1.**	**Management**	**1 X 3 =3**
20	Training programme on **"ADB Procurement, bid Evaluation (Technical & Financial etc)"** conducted by ADB on the 20th & 21st November, 2019 in the Conference Hall, Lumjingshai, MeECL, Shillong from 10.00 A.M onwards. **Total Personnel-32(thirty two) [Technical], CE(Elect)-2, Comp Secretary-1, ACE-4, SE-8, Dy. CAO-1,Sr. AO-1, EE-8, AAO-3,AEE-3,DAO-1**	**Management**	**2 X 32 =64**
21	Workshop on **"Breakdown Analysis and Remedies of Electrical Equipment"** conducted by NTPC, Bhubaneswar to be held on26.11.2019from 10.00 A.M to 4.00 PM in the HRD Centre Hall Umiam. **Total Personnel-40(forty) [Technical], SE-2, EE(Elect)-12, EE**	**Distribution**	**1X 40 = 40**

Sl. No	Name of Institute	Field of Training (Thermal/ Hydro /Transmission/ Distribution/ Management)	Total training (Days/ Man)
	(C)-6, AEE/RE-20		
22	Workshop on **"a cloud based modular HR Management system under CBIS Programme of NERPSIP Project"** organized by the Power Grid Corporation of India Ltd., to be held on the 28th February, 2020 in the Conference Hall, Lumjingshai, Shillong from 11.00 A.M onwards. **Total Personnel-21(twenty one) [Technical], Directors= 3, CEs=7, Comp. Secretary=1, CAO(I/C)=1, ACEs/Dy. Director (HRDC)= 9**	**Management**	**1X 21 = 21**
23	Seminar on "Implementation of Smart Metering System" organized by Genus Power Infrastructures Limited, New Delhi held on 27th February, 2020 in the Conference Hall, Lumjingshai, Shillong from 1:00 P.M onwards. **Total Personnel-20(twenty) [Technical], Director= 1, CEs=3, ACEs =6, SE=4, EEs =6**	**Distribution**	**1X 20 = 20**
24	Workshop to demonstrate **"a cloud based modular HR Management system under CBIS Programme of NERPSIP Project"** organized by the Power Grid Corporation of India Ltd., held on the 28th February, 2020 in the Conference Hall, Lumjingshai, Shillong from 9.30 A.M onwards. **Total Personnel-28(twenty Eight) [Technical], Directors= 3, CS=1,CEs=7, CFO= 1, CAO(I/C)=1, Jt. Secretary=1, Dy. Director(HRDC)=1, ACEs =11, Dy. CAO=1, , EE =1**	**Management**	**1X 28 = 28**

Training Details for FY 2020-21 (As on August):

Sl. No	Name of Institute	Field of Training (Thermal/ Hydro /Transmission/ Distribution/ Management)	Total training (Days/ Man)
1	Training on **"E-learning Course on Project management through live Webinars under CBIS Programme of NERPSIP for Executives"** organized by Power Grid held on 12th June, 2020 from 3:00 P.M onwards. **Total Personnel-29 (twenty nine) [Technical]. CE-1, ACE-1, EE-8, AEE/RE-19.**	**MANAGEMENT**	**1 x 29 = 29**
2	Training on **"Webinar on Contract Management, Project Management & Risk Assessment"** organized by Power Grid Corporation of India Ltd.(PGCIL), held on 15th & 16th May, 2020 from 3:00 P.M onwards. **Total Personnel-10 (ten) [Technical]. CE-1, ACE/Dy**	**MANAGEMENT**	**2 x 10 = 20**

Sl. No	Name of Institute	Field of Training (Thermal/ Hydro /Transmission/ Distribution/ Management)	Total training (Days/ Man)
	Dir-1(HRDC)-2, SE-1, EE-5, AEE-1.		
2	E-learning course under CBIS –NERPSIP on "**Prevention of Sexual Harassment for Internal Committee"** organized by the PGCIL held from 7th July, 2020 to 10th July, 2020 from 11.A.M to 1.P.M. **Total Personnel-4 (four) [Technical/Administration]. SE-1, Under Secy-1,AEE-1,AE-1**	**MANAGEMENT**	**4 x 4 = 16**
3	Training programme on the subject "**Accounting Finance (Basic)"** (Capacity Building plan 2020-22) under CBIS –NERPSIP, organized by the PGCIL through Administrative Staff College of India (ASCI) Hyderabad, held from 20th July, 2020 to 24th July, 2020. **Total Personnel-25 (twenty five) [ACCOUNTS].CFO-1,SrAO-1,DAO-23**	**MANAGEMENT**	**5 x 25 = 125**
4	Online training programme on the topic **"CEA Contractual Standards for Distribution Works"** organized and sponsored by TATA Power DDL, New Delhi through Chief Program Manager, REC Ltd, RO, Shillong held on 5th August, 2020 from 11:00 A.M to 12:30 P.M. **Total Personnel-30 (thirty) [TECHNICAL]. EE-13, AEE-17.**	**DISTRIBUTION**	**1 x 30 = 30**

Commission's Analysis

The capacity building is part of the operational efficiency of the utility to be achieved. MePGCL shall ensure improve the performance of the utility by providing training to the existing manpower in the advanced technologies within the available resources and attain the performance parameters laid down by CEA/MOP.

Annexure- A:

Investment Plan for MePGCL

a) Proposed and Ongoing Renovation & Modernisation works for Existing Stations

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
A	**Umiam Stage I Power Station**												
1	Replacement of Intake gate and Trash Rack of Intake structure at Umiam Stage I HEP.	c	2020-21	2022-23	3.96	0.89	2.07	1		3.56	0.4	State Govt.	
2	Replacement of Two penstock butterfly Valve including By-pass valve along with all servo mechanism and related control system.	c	April'21	Mar'22	6.14		2.14	4		5.53	0.61	State Govt.	
3	Re-engineering of firefighting system of Generator and Transformer	c	April'22	Mar'23	0.09			0.09		0.08	0.01	State Govt.	PSDF Phase 2

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
4	Replacement of transformer for Unit-1, Unit-2 and Unit-4.	c	April'23	Mar'24	8.73				8.73	7.86	0.87	State Govt.	
5	Construction of Transformer Yard to accommodate station service transformers, Unit-1 & Unit-3 and procurement of the same.	c	April'23	Mar'24	0.35				0.35	0.32	0.04	State Govt.	
6	Construction of Beams and By-pass Isolators for KPS-1, KPS-2 &Umiam feeders.	c	April'22	Mar'23	0.49			0.49		0.44	0.05	State Govt.	
7	132 KV SF6 Circuit Breaker (Spare)	c	April'21	July'21	0.36		0.36			0.32	0.04	State Govt.	PSDF Phase 2
8	Complete Installation of SCADA including Hardware and Software	e	April'22	Oct'22	18.12			18.12		16.31	1.81	State Govt.	PSDF Phase 2

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
9	Replacement of Governor and AVR system.	c	April'23	Mar'24	33.2				33.2	29.88	3.32	State Govt.	PSDF Phase 2
10	Replacement of Generator Stator Air Cooler for three Units	c	April '22	Oct'22	3.51			3.51		3.16	0.35	State Govt.	PSDF Phase 2
11	Modification of cooling system for improvement at Stage-I Power station	c	21-Jan	21-Jun	2.62	0.92	1.7			2.35	0.26	FI	
B	**Umiam Stage II Power Station**												
1	Installation of 250 KVA, 11/0.4 kv substation dedicated to the station supply of Umiam Stage-II Power Station	c	April'22	July'22	8.99			8.99		8.09	0.9	State Govt.	PSDF Phase 2
2	Emulsifier system for Generator Transformer in both Units.	b	April'22	Mar'23	0.1			0.1		0.09	0.01	State Govt.	

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
3	Installation of On Line Supervisory system (SCADA) for the entire Power Station	e	23-Apr	24-Mar	9.06				9.06	8.15	0.91	State Govt.	
4	Replacement of 11 KV Switchgear Panel	c	23-Apr	24-Mar	2.72				2.72	2.45	0.27	State Govt.	PSDF Phase 2
5	132 KV SF6 Circuit Breaker (Spare)	c	April'21	July'21	0.24		0.24			0.22	0.02	State Govt.	PSDF Phase 2
C	**Umiam –Umtru Stage III Power Station**												
1	Renovation Modernisation and Upgradation of Umiam-Umtru Stage III HEPP.	c	Sept'20	Dec '24	407.4		5.31	87.62	97.46	91.5		JICA	315.90
2	Re-Engineering of 132 KV BUS.	c	April'21	Mar'22	1.5		1.5			0.45	1.05	State Govt	

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
3	Construction of 33 KV Bus and Bay for Outside source power supply from the existing 132/33 KV 10 MVA Transformer	C	April'21	March'22	1.87		1.87			0.56	1.31	State Govt	
D	**Umiam-Umtru Stage IV Power Station.**												
1	Automation and monitoring of MIV of the Generating units	c	April'22	Mar'23	1.06			1.06		0.32	0.74	State Govt	
2	a) Overhauling and replacement of damaged parts of Unit-II b) Procurement of excitation transformer	c	April'21	Mar'22	5.04		5.04			1.51	3.53	State Govt	
3	Online Vibration monitoring of Generating Units	c	April'21	Mar'22	0.5		0.5			0.15	0.35	State Govt	

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
4	Dedicated and reliable Outside Source power supply from 132 KV Bus.	c	April'21	Mar'22	2.79		2.79			0.84	1.95	State Govt	
5	Telecommunication and Internet Facility	e	April'22	Mar'23	0.24			0.24		0.07	0.17	State Govt	
6	Supervisory Control System	e	April'22	Mar'23	8.73			8.73		2.62	6.11	State Govt	
7	Procurement of Spare Runner	c	April'21	Mar'22	6.5			6.5		1.95	4.55	State Govt	
8	Refurbishment of Stator winding of Unit 1	c	20-Sep	21-Aug	6.84	2	4.84			2.05	4.79	State Govt	
9	Hydraulic Power Pack with Control Panel for Butterfly Valve	C	21-Apr	22-Mar	0.8		0.8			0.24	0.56	State Govt	
10	Installation of Firefighting Scheme for Generator Stators	c	21-Apr	22-Mar	0.36		0.36			0.11	0.25	State Govt	
11	Residual Life	e	21-Sep	23-Mar	3.12		0.78	2.34		0.94	2.18	State	

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
	Assessment of Power Station											Govt	
E	**Umtru Power Station**												
1	Residual Life Assessment (RLA) of Umtru HEP	c	April,20	Mar,21	0.5	0.5							0.5
2	Renovation Modernisation and Upgradation of Umtru Power Station.	b	April'23	Mar,26	110				25	33	77	State Govt	
F	**Sonapani Mini Hydro Power Plant**												
1	a) Procurement and Installation of 415V 3 Ph LT panel.	b	April,22	23-Aug	0.34			0.14	0.2	0.102	0.238	State Govt	
	b) Relays and Cards to replace some existing defective ones and spares.												
	c) Generator Circuit Breaker to replace the existing one.												

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
G	**Generation System Protection and Communication**												
1	Procurement of Diagnostic Tools, Plant & Machineries for Generation system protection division	b	April'21	22-May	2.51		1.51	1		**0.75**	1.76	State Govt	PSDF Phase 2
2	Installation of OPGW for communication system between Stage-3 & Stage-4, Stage-1 & Stage-2 and Umtru-New Umtru power stations including all Fibre Optic Terminal Equipments.	b	21-Oct	22-Dec	3.19		1.19	2		**0.96**	2.23	State Govt	PSDF Phase 3
3	Procurement of Online Oil Filtration Machine for all Generator Transformers under MePGCL.	c	22-Jan	23-Dec	2.11		0.2	1	0.91	0.63	1.47	State Govt	PSDF Phase 4

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
4	Installation of ADSS OFC for communication system (Dam Water Level monitoring) of Stage-3, Stage-4 and Leshka power stations including all Tranducers, Converter, Fibre Optic Terminal Equipments and all associated accessories	b	22-Apr	23-Dec	1.18			0.5	0.68	0.35	0.83	State Govt	PSDF Phase 5
H	**Dam Rehabilitation and Improvement Project** (DRIP): Phase 2 and 3	b	2020-21	2026-27	441	22.05	69.825	69.825	69.825	123.48		World Bank	317.52

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
I	**Name of Establishment: MyntduLeshka Stage - I PS, MePGCL, Suchen**												
1	Cooling System modification & improvement @ 251 lakhs	C	Dec. 2020	May. 2021	2.51	1	1.51			2.26	0.25		
2	Supply and erection of spare Generator Transformer 1Ø, 17.5 MVA, 132/33 KV with accessories for Leshka Power Station		21-Jun	22-Apr	1.25		0.44	0.81		1.13	0.13	FI	
3	Replacement of Switchgear & Protection System for Leshka Power Station		22-Apr	24-Sep	10			3.5	6.5	9	1	FI	
4	Upgradation of SCADA for Leshka Power Station		20-Mar	21-Oct	1.4	0.49	0.91			1.26	0.14	FI	
5	Communication from Leshka Dam to Leshka Power House		21-Dec	22-Jul	0.35		0.12	0.23		0.32	0.04	FI	

Sl. No.	Project Details				Total capital Expenditure Approved by MSERC/ Govt/ DPR/ FI (INR Cr)	Project Outlay in FY 2020-21 (Projected) In INR Cr	Project Outlay in FY 2021-22 (Projected) In INR Cr	Project Outlay in FY 2022-23 (Projected) In INR Cr	Project Outlay in FY 2023-24 (Projected) In INR Cr	Source of financing for the scheme			
	Name of the Scheme	Nature of Project (Select Appropriate Code from below)	Project Start Date (DD-MM-YY)	Project Competition Date (DD-MM-YY)						Equity Component	Debt Component		Capital/ Subsidies/ Grant components
											Loan 1 Loan Amount (INR Cr)	Loan 1 Loan Source	
6	Replacement of Air coolers including accessories for Stator for all 3 Units for Leshka PS		22-Oct	24-Apr	0.8			0.64	0.16	0.72	0.08	FI	
J	**Lakroh Mini Hydel Project**												
1	Replacement of Generator Transformer (with 3.3/33 KV, 2.5 MVA) including augumentation of Switchyard from 11 KV to 33 KV for Lakroh PS		21-Nov	22-Oct	1.14		0.4	0.74		1.03	0.11	FI	
2	Communication for Lakroh PS with SLDC		21-Mar	22-Nov	0.4	0.06	0.26	0.08		0.36	0.04	FI	

b) Ongoing & Upcoming Plants/Solar Parks

Project Details											Source of Financing for Scheme				
											Debit Component				
											Loan Amount (INR Crs.)		Loan Source		
Sl. No.	Name of Scheme	Whether the Scheme is part of Approved Business Plan (YES/No)	Project Start Date (DD-MM-YY)	Project Completion & Date (DD-MM-YY)	Total Capital Expenditure Approved by MSREC/Govt/DPR/FI (in INR Crs)	Project Outlay in FY 2020-21 (Projected) in INR Crs	Project Outlay in FY 2021-22 (Projected) in INR Crs	Project Outlay in FY 2022-23 (Projected) in INR Crs	Project Outlay in FY 2023-24 (Projected) in INR Crs	Equity Component	Loan-1	Loan-2	Loan-1	Loan-2	Capital Subsidies/ Grants Component (in INR Cr)
1	GANOL -1		01.07.2014	May, 2022	507.71	80	150	55.13		54.62	100	123.1	FI	FI	229.98
2	RIANGDO		12.05.2020	May, 2023	33.99	7	10	12	4.99	2.59	11.4		FI		20
3	MLHEP Stage-II (3x60 MW)	No	2023-24	2029-30	2069.23				70	113.88	82.71	165.53	Market Loan	Go ME	1707.11
4	Solar Park (10MW)each in Suchen and Thamar	Yes	2020-21	2023-24	11.64			1.64	7.19	9.24					2.4
5	Construction of Umshamphu hydel project (2x1.5 MW)	No	22-Aug	25-Jan	48.7			2.435	10	14.61	34.09		FI		
6	Construction of Amkshar hydel project (2x1.20 MW)	No	22-Sep	25-Feb	46.24			2.312	10	13.87	32.37		FI		
7	Construction of Umrina hydel project (3x1.50 MW)	No	22-Nov	25-Mar	75.08			3.754	10	22.52	52.56		FI		

c) Survey & Investigation projects

Sl. No.	Project Details			Total Expenditure projected (INR Cr.)	Project Outlay in FY 2020-21 (Projected in NR Cr.)	Project Outlay in FY 2021-22 (Projected in NR Cr.)	Project Outlay in FY 2022-23 (Projected in NR Cr.)	Project Outlay in FY 2023-24 (Projected in NR Cr.)	Source of Financing for Scheme						
	New H.E. Project Details								Equity Component	Debt Component				Capital Subsidies/ Grant Component (INR Cr.)	Consumer Contribution Component
	Name of Scheme	Project Start Date (DD-MM-YY)	Project Completion Date (DD-MM-YY)							Loan Amount (NR Cr.)		Loan Source			
										Loan-1	Loan-2	Loan-1	Loan-2		
1	MLHEP-II(3X70)MW	Nov,2006	2020-21	9.6	4.86					0.96		State Govt.		8.64	
2	UMNGI(2X31)MW	March,2014	2020-21	5	0.2					0.5		State Govt.		4.5	
3	UMNGOT(3X70)MW	Nov,2006	2020-21	8.35	2.37					0.835		State Govt.		7.515	
4	SELIM(2X48)MW	March,2008	2021-22	7.92	1.18	1.18				0.792		State Govt.		7.128	
5	NONGKOHLAIT(3X31)MW	March,2014	2020-21	5.02	0.05					0.502		State Govt.		4.518	
6	MAWBLEI(2X37.5)MW	Jan, 2009	2021-22	8.92	1.93	1.95				0.892		State Govt.		8.028	
7	Upper Khri Stage-II HEP	2022-23	2025-26	13.00			3.25	3.25		9.36	3.64	ADB	State Share		
8	Nongnam HEP	2022-23	2025-26	13.00			3.25	3.25		9.36	3.64	ADB	State Share		
9	Mawput HEP	2022-23	2025-26	13.00			3.25	3.25		9.36	3.64	ADB	State Share		

Annexure – B (1)

System augmentation & Improvement Projects-

1. Umiam Stage-I

Sl. No.	Project Name	Description
1	Replacement of Intake gate and provision of Stoplog gate at Umiam Stage I HEP.	The intake structure of Umiam Stage-I HEP is located on the left bank of the dam with the invert level is kept at EL 955.50 m. The water from the reservoir is diverted to the power house through the intake to the tunnel of diameter 3.05 m and length of 2078 m and into the penstock (2 nos) of diameter 1.98 m each. A surge shaft of height 54.40 m and diameter 4.88 m connect the HRT and penstock. The bypass valve connects to the butterfly valve and is situated just upstream of penstock. These valves require replacement since they have developed leakage and may fail, which will result in flooding of the Power Station and villages downstream due to uncontrolled flow from the Umiam reservoir. To replace the Butterfly and Bypass Valves, the Intake Gate has to be closed to cut off the flow of water into the water conductor system. Since the present Intake Gate and embedded parts which were installed way back in 1960's have become heavily rusted and not functioning anymore, a new Intake Gate along with Stoplog gate have to be installed.
2	Replacement of two penstock Butterfly Valves including By-pass valves along with all servo mechanism and related control system.	Over the years there is a heavy water leakage from the flange of the pipe of Penstock Butterfly Valve causing undue damage to the valve and adjacent pipes. This valve is necessary for the regular maintenance of penstock and turbine parts of the station. If these components of the station are not maintained regularly there may be catastrophes in future. It is to be noted that since installation of this valve in the 1960's, no

Sl. No.	Project Name	Description
		major maintenance work has been carried out on this valve. Therefore, to avoid any catastrophes in the future and for smooth functioning of the station, it is necessary to replace the two bypass valves with new ones. Further there is no control system for the valves and therefore new control system also needs to be procured.
3	Re-engineering of firefighting system of Generator and Transformer	**Generator:** The existing flooding system of fire protection for generator uses the old cylinder which since 1965 has not been replaced. So, it is required to replace existing cylinder along with the control circuit so that the same firefighting of generator housing can be made active. **Transformer:** At present the piping, valves and nozzles of the emulsifier system are not functioning due to broken pipes (because of aging), non-functioning valves and it is extremely dangerous to open the same as it may lead to flooding of powerhouse. It is to be noted that the components of the emulsifier system have not been replaced since 1965. Therefore, to make the firefighting system functional, it is necessary to renovate the piping and valves along with nozzles.
4	Replacement of transformer for Unit-1, Unit-2 and Unit-4.	The existing transformers have been in service for quite a long time. The transformer No.3 was replaced by new one in April 2006 and the transformer No.1 and No.4 were replaced by transformers brought from Umiam Stage-II in June 2013 after reconditioning. These two transformers that were brought from Umiam Stage II Power Station after its Renovation, Modernization and Upgradation works are also the original transformers.

Sl. No.	Project Name	Description
		These transformers were installed and commissioned along with the Generating units of Umiam Stage II Power Station in 1970. Therefore, both the transformers have outlived their useful lifespan. For reliable and smooth operation of the Power Station, these transformers too need to be replaced by new ones which meet the current international standards and specifications
5	Construction of Transformer Yard to accommodate station service transformers of Unit-1 & Unit-3 and procurement of the same.	The Station Service Transformers of Unit-1 & Unit-3 have completed their useful life. Besides, these transformers are oil based and are located inside the generator floor of the powerhouse building. Therefore, it is proposed that these transformers be replaced with new ones of 500 KVA be placed outside the power house building.
6	Construction of Beams and By-pass Isolators for KPS-1, KPS-2 &Umiam feeders.	KPS-1, KPS-2 &Umiam 132KV Feeders Circuit Breakers do not have Bypass Isolators. In case of any problem of the Circuit Breakers, the feeders cannot be charged without the bypass isolators. As such, it is required to construct switchyard structural beams to accommodate bypass isolators as well as installation of Master Isolators for smooth change over from Main to Auxiliary Bus.
7	132 KV SF6 Circuit Breaker (Spare)	At Umiam Stage I Power Station, there are 4 nos Generator Circuit Breaker, 1 no Bus coupler Circuit Breaker and 7nos 132 KV feeders Circuit Breaker. Altogether there are 12nos 132 KV Circuit Breakers installed in this station. As the circuit breakers are used for synchronizing to the grid for evacuation of power and also for protection during abnormal conditions of the generators and external fault in the grid and transmission line, hence its

Sl. No.	Project Name	Description
		healthiness is of vital importance. In the event of its failure, the available electrical power to generate will not be possible to transmit. Also, in the event that it fails to operate when a protection relay signals to open, the generator and transformer will be exposed to the electric stress due to external short circuit faults. This may even cause damages to all the power equipments of the Station. Hence, in order to maintain uninterrupted generation of power in the event of failure of any of these Circuit Breakers, it is felt necessary that two spare Circuit Breakers be procured to be made readily available for replacement of the damaged one.
8	Complete Installation of SCADA including Hardware and Software	There is a need for installation of a centralized supervisory control system for monitoring and controlling of different electrical and mechanical parameters from control room to ensure proper monitoring of the generating units, to ensure instant detection of any abnormalities. Electrical parameters include online monitoring of various currents and voltages whereas mechanical parameters will include monitoring of temperature, pressure, vibration, cooling flow etc which would ensure proper monitoring of the hydrogenating Units from the safety and stability point of view so as to ensure their trouble-free operation.
9	Replacement of Governor and AVR system.	The present Digital AVR and Governing system installed in 2001-2002 has become prone to malfunctioning due to damage of installed cards and modules which has led to outage of the Units on several occasions. Further, the

Sl. No.	Project Name	Description
		Original Equipment Manufacturer (OEM) has stated that the existing cards and modules have become obsolete and the manufacturing of these spare cards and modules have been discontinued and therefore it is evident that failure of these cards/modules will force the Generating Units into prolonged period of outages leading to huge generation loss
10	Replacement of Generator Stator Air Cooler for three Units	Umiam Stage I Power Station was Renovated and Modernized in FY 2001-02 by M/s Toshiba with funding from JBIC (now JICA). During R&M works, replacement of Stator Air Cooler was not included in the scope due to loan constraint. After having been in service continuously for a period of 55 years, the copper tubes of these coolers have shown signs of massive deterioration and the brittleness of these tubes have resulted in water leakages from the coolers persistently at an alarming rate which not only resulted in huge outage and consequent generation loss but is also detrimental to the health of the stator windings leading ultimately to the failure of insulation due to moisture ingression as a result of persistent leakage. Since the above leakage has both short time and longtime ramifications in the form of generation loss and ultimate insulation failure of the Stator Winding, it is proposed that the stator air coolers of Unit-I,II&III be completely replaced by new coolers at the earliest to avoid prolonged generation loss from these Units .

Sl. No.	Project Name	Description
11	Modification of cooling system for Stage-I Power station	The present cooling system at Umiam Stage-I Power station needs to be modified in order to control the outages which occur due to factors like clogging of the cooling water system and tripping of cooling water pumps which can cause much energy losses. However, if this cooling water system is modified accordingly, then the outages due to the cooling water system will practically be nil.

The Project cost is shown in the table below:

Sl. No.	Particulars	Project Cost(INR Cr)
1.	System Augmentation & Improvement Umiam Stage-I	77.56

2. Umiam Stage-II

As the Umiam Stage-II station is quite old, some of its components need to be augmented and improved. The system augmentation & improvement projects that would be taken up during FY 2020-21 and the third control period (FY 2021-22 to FY 2023-24) are mentioned below:

System Augmentation& Improvement Projects- Umiam Stage-II

Sl. No.	Project Name	Description
1	Installation of 250 KVA, 11/0.4 kv substation dedicated to the station supply of Umiam Stage-II Power Station	The existing station service outside source is taken from the 11 KV rural substation from Umiam which feeds Umiam Stage II Power Station and nearby adjoining villages. There is heavy load imbalance at the low tension (LT) level among the three phases of this distribution transformer causing large neutral current to circulate. On many occasions, this current has caused tripping due to neutral over-current in the AC Distribution Panel of the Power Station and thereby causing loss of power supply to the entire station. This imbalance of load also causes voltage imbalance among the three phases which leads to overheating in running the auxiliary equipment

Sl. No.	Project Name	Description
		like EOT Crane, Oil pump motors, dewatering pump motors, air compressors, battery charger and other equipments installed in the Power Station. In order to have a stable and adequate supply, it is necessary to install a dedicated outside source substation for the station. It may also to be noted that the work was beyond the scope of Renovation, Modernisation and Upgradation works carried out in 2011-12
2	Emulsifier system for Generator Transformer in both Units.	Presently there is no firefighting system for the Power transformer. Therefore, it is necessary to provide this system for safety of operation.
3	Installation of On Line Supervisory System (SCADA) for the entire Power Station	There is a need for installation of a centralized supervisory control system for monitoring and controlling of different electrical and mechanical parameters from control room to ensure proper monitoring of the generating units and to ensure instant detection of any abnormalities. Electrical parameters include online monitoring of various current and voltages whereas mechanical parameters will include monitoring of temperature, pressure, vibration, cooling flow etc which would ensure proper monitoring of the hydrogenating Units from the safety and stability point of view so as to ensure their trouble-free operation.
4	Replacement of 11 KV Switchgear Panel	Umiam Stage II Power Station was Renovated, Modernized and Upgraded in January 2012 by M/s Toshiba with funding from JBIC (now JICA). The 11 KV Switchgear Panels were also renovated during 2012. However, numerous problems have occurred inside the Switchgear Panels of both Units causing heavy loss to the corporation. The problems or faults were mostly short circuits between adjacent auxiliaries like PT's, C.T's, Surge Arrestors etc. A lot of

Sl. No.	Project Name	Description
		care has been taken by the Station engineers and staff to insulate the adjacent components and seal numerous holes to avoid rodents inside but to no avail. Therefore, after numerous discussions with higher authority, a decision was made for complete replacement of the existing 11 KV Switchgear panel for both Units.
5	132 KV SF6 Circuit Breaker (Spare)	The Generator Circuit Breaker is used to synchronize the generator to the grid and to protect the generator in case of fault occurrence and also to prevent excessive stresses to the power equipments like transformers and generators for long duration due to external short circuit faults that may damage the generators or transformers. The two Generators and Turbines were upgraded in 2012 with all new auxiliaries including the 132KV SF6 Gas Circuit Breakers. At Umiam Stage-II, there are a total of 3 Nos 132KV SF6 Gas Circuit Breakers. 2 (Two) Unit Circuit Breakers to connect the generators with the 132KV Bus at Umsumer and one 132 KV Sumer-Umsumer Line Circuit Breaker to evacuate the electricity generated to Stag –I Power Station switchyard for onward transmission of power to the 132 KV Grid. Frequent operations are made to these two Machine Breakers during Starting and stopping of Generators and while taking station service from the grid when both the Generators are idle or under plant shutdown. These two Machine Breakers have been in operation for about 9 years as of August 2020. Both the Circuit Breakers have crossed more than 5000 operations and during recent years they have started to malfunction causing a lot of unnecessary outages of Machines.

Sl. No.	Project Name	Description
		As the circuit breakers are used for synchronizing to the grid for evacuation of power and also for protection during abnormal conditions of the generators and external fault in the grid and transmission line, hence its healthiness is of vital importance. In the event of its failure, the available electrical power to generate will not be possible to transmit. Also, in the event that it fails to operate when a protection relay signals to open, the generator and transformer will be exposed to the electric stress due to external short circuit faults. This may even cause damages to all the power equipments of the Station

The Project cost is shown in the table below:

Sl. No.	Particulars	Project Cost (INR Cr)
1.	System Augmentation & Improvement - Umiam Stage-II	21.11

3. Umiam-Umtru Stage-III

The Umiam-Umtru Stage-III Power station and hydraulic structures being very old, some of the components need to be augmented and improved. The system augmentation & improvement projects that would be taken up during FY 2020-21 and the third control period (FY 2021-22 to FY 2023-24) are mentioned below:

Sl. No.	Project Name	Description
1	Renovation, Modernisation and Upgradation of Umiam Stage III HEPP.	The plant is already past its useful life and has deteriorated for obvious reasons of aging. The generation of energy has been declining in recent years and forced shutdown has become the order of the day. Resolving the problem by implementing the Renovation and Modernization (R&M) will extend the life of the Plant by another 20 to 25 years
2	Re-Engineering of 132 KV BUS.	The present 132 KV bus of Stage III switchyard is of ACSR Panther since its inception, i.e., 1979. But the bus loading has been increasing due to more power flow to the system, which

Sl. No.	Project Name	Description
		has touched to the tune of 114 MW and the bus loading equivalent to the tune of 500 Amps as against the maximum current carrying capacity of 371 Amps. Therefore, current carrying capacity of Bus needs to be enhanced. It is proposed that the present ACSR Panther Bus be replaced by ACSR ZEBRA.
3	Construction of 33 KV Bus and Bay for Outside source power supply from the existing 132/33 KV 10 MVA Transformer	At present, the outside source supply for the power station as well as for the (a) adjoining employees' colony, (b) penstock butterfly valve house and (c) security barracks at penstock valve house is derived from 10 MVA 132/33 KV transformer located in the 132KV Switchyard of Stage-III Power Station, Kyrdemkulai. The present system of the 132/33KV, 10MVA substation is connected to the four (4) pole structure which has two outgoing 33KV feeders that supply to Stage-IV power station, Stage-IV Dam and Zero-point substation which caters to the public of many villages and Umsning town. A considerable amount of time and manpower is spent as two linemen in a shift consisting of four-shift groups i.e, a total of eight linemen have to be engaged 24X7 for monitoring the line and for the restoration as well as routine maintenance of the line which could have been better utilized in the maintenance of the power station. The outgoing feeders are protected only with the Dropout fuse switch which is not safe for the overall control of the protection of the transformer and lines and there are cases that it impacts on the failure of the power system due to heavy fault which occurs in the lines. The routine as well as preventive maintenance works of the power station has been severely hampered due to the huge amount of time, manpower and effort engaged for this line and thus there is an urgent need for installation of a 33KV bus with all switchgears like Circuit breakers with control and relay panels for the one

Sl. No.	Project Name	Description
		incoming and three outgoing lines for ensuring stable and reliable outside source supply for the stations (Stage-III & Stage-IV), Stage-IV Dam as well as employees' colony along with penstock butterfly valve house and its surroundings. The proposal envisages installation of a suitable 33KV Bus and bay for the existing 132/33 KV Power Transformer, 10MVA along with necessary terminal equipments viz. Lightning Arrestors, Isolators, Current Transformer (CT), Circuit Breaker,33KV Cables, Control & Relay Panel along with four 33KV Bays for one incoming and three outgoing lines.

The Project cost is shown in the table below:

Sl. No.	Particulars	Project Cost (INR Cr.)
1.	System Augmentation & Improvement- Umiam-Umtru Stage-III	410.77

4. Umiam-Umtru Stage-IV

The system augmentation & improvement projects that would be taken up during FY 2020-21 and the third control period (FY 2021-22 to FY 2023-24) are mentioned below:

Table 4: System Augmentation &Improvement Projects- Umiam-Umtru Stage-IV

Sl. No.	Project Name	Description
1	Automation and monitoring of MIV of the Generating units	Presently Stage IV Power Station is running in the Manual Operation mode in respect of all the systems of generation. Therefore, automation in respect of the following is proposed: • Operation of MIVs, GV Servomotors. • Operation of Station Auxiliaries viz. Cooling Water system both for Turbine & Generator. • Operation of other Station Auxiliaries viz. Motorized

Sl. No.	Project Name	Description
		Valves, Compressors and Lubricating Plants etc. • Excitation Control System. • Synchronization facilities through Auto-mode System. • Miscellaneous works which may have to be interfaced through certain microprocessor with CCBs/UCBs/UABs etc. In view of all the above, certain components with modifications shall be required to be in-built in the system viz. Proximity Switches, Sensors, Motorized Values, Pressure Transducers, Transmitter, OFC, and Cabling works etc. Further certain piping shall be needed to rectify both the Water-Cooling System, Lubricating System etc. RTUs may as well be involved for direct Data Communication with SLDC. As such UPS, Monitors, CPUs, Bay Controllers, etc. shall be required to be incorporated.
2	a) Overhauling and replacement of damaged parts of Unit-II	Since Commissioning of the station, no overhauling works have been carried out except for annual maintenance and the condition of underwater parts, viz. guide vane, PRV, MIV seal/seat, bearing pads both for LCB, UGB, Pressure Tensioning Bolts/ Nuts in all the fronts associated with both Axial and Tangential forces etc is found to be deteriorating rapidly with each yearly inspection, which necessitates immediate overhauling of the machine and replacement of underwater parts.
	b) Procurement of excitation transformer	Due to ageing and loading of the Excitation Transformers 375 KVA, 11/0.240 KV, on many occasions the units got tripped. Moreover, due to spiking, the Transformers may have had an extra burden. Therefore, the old Excitation Transformers at

Sl. No.	Project Name	Description
		Stage IV need to be replaced by new ones. Hence, in order to maintain the generation level of Stage IV Power Station; 2 new Excitation Transformers need to be procured.
3	Online Vibration monitoring of Generating Units	The present system of measurement of vibration uses of an offline vibration meter. In case of any abnormality and to avoid aggravation of the abnormality into a major outage, it is important that the operator immediately stops the Unit and initiate preventive measures. However, with the present system early detection of fault is not possible. Therefore, it is proposed to have an online vibration monitoring system for instant monitoring of any abnormality in the generator and turbine bearings, under water parts such as runner, guide vane, draft tube etc.
4	Dedicated and reliable Outside Souce power supply from 132 KV Bus.	At present, the outside source supply for the power station as well as for the adjoining employees' colony is derived from 10 MVA 132/33 kV transformer at Stage-III Power Station thorough a 33 KV Line which is prone to frequent outages as the line passes through a reserved forest area in difficult terrain. Therefore, it is proposed that dedicated outside source transformer is installed which will tap power from the 132 KV grid for ensuring stable and reliable outside source supply for the station as well as employees' colony.
5	Telecommunication and Internet Facility	At present, the telecommunication facility at Umiam Stage-IV is very weak. Therefore, for continuous sharing and exchange of information between the Power Station, SLDC and Head office it is important to have proper Telecommunication along with an internet network.

Sl. No.	Project Name	Description
6	Supervisory Control System	At present, the Umiam-Umtru Stage-IV power station is being run on semiautomatic mode. The speed and voltage are being controlled automatically. Whereas, the start and stop of the machine needs to be done manually. With increase in speed of operation, it is necessary to have a system for centralized automatic monitoring and control of the machine parameters. Therefore, it is proposed that SCADA system is implemented to enable centralized automatic monitoring and control of various station parameters such as temperature, pressure, flow of water, load condition of machine etc. This will reduce the dependence on manpower and also increase reliability.
7	Procurement of Spare Runner	Spare runner is required for ready availability in case of any problem in the fitted runner of any one of the units, to avoid generation loss.
8	Refurbishment of Stator winding of Unit 1	On the 2nd August 2019, Unit-1 of Stage IV Power Station was connected to the grid w.e.f 18:25 hrs. With 30 MW load, the Unit suddenly tripped at 19:20 hrs of 2nd August 2019 due to damage of Stator winding. The machine needs to be refurbished in order to make it operational.
9	Hydraulic Power Pack with Control Panel for Butterfly Valve	The Power Station is having two surface steel penstocks for feeding water to two hydro-generating Units of the Station. There are two Butterfly valves for controlling the flow of water to the Penstocks by opening and closing these valves. The Butterfly valve is operated with the help of the Control system which is by hydraulic oil. In recent time due to aging, all the control system has been damaged and it becomes difficult to operate the valves whenever shutdown is required in the Power Station. This may pose danger especially during emergency situation. Hence it is required that the control equipment of these valves is replaced with new one.

Sl. No.	Project Name	Description
10	Installation of Firefighting Scheme for Generator Stators	The proposal for installation of generator stator firefighting envisages complete refurbishment of existing non-functional firefighting system which includes replacement of damaged cylinders, replacement of associated valves, pipelines ,nozzles etc along with replacement of existing control panel by a new panel to achieve automatic and fast response to any kind of inferno in the Generator Stator section, which includes earliest detection within the shortest possible time and initiation of action by release of C02 to ensure minimum damage to the Stator in particular and also to control the fire from spreading to the vicinity, which could otherwise have a catastrophic effect on all other healthy equipments resulting in huge amount of loss and also endangering the safety of operating personnel. Further as per the latest insurance guidelines, it is mandatory to have a working fire protection system in place for any insurance claims in the event of any unfortunate fire related accidents
11	Residual Life Assessment (RLA of Umiam-Umtru Stage-IV power station	The Stage-IV power station was commissioned in 1972 and is now giving problems as it nears the end of its useful life. It is therefore necessary to carry out RLA studies of the power station to know the extent/scope of R&M works to be taken up once the station reaches the end of its useful life.

The Project cost is shown in the table below:

Sl. No.	Particulars	Project cost (INR Cr.)
1.	System Augmentation & Improvement Umiam-Umtru Stage-IV	35.98

5. Umtru HEP

There was a drastic decrease in generation from Umtru Power Station during the last few years and the generation from this power station was completely stopped when the New

Umtru Project was in the final stages of construction. It is of utmost importance to resume its generation by taking up Renovation, Modernization and Upgradation (RM&U) works.

The system augmentation & improvement projects that would be taken up during FY 2020-21 and the third control period (FY 2021-22 to FY 2023-24) are mentioned below:

Sl. No.	Project Name	Description
1	Residual Life Assessment (RLA) of Umtru HEP (4x2.8 MW)	The Old Umtru HEP (4x2.8MW) has stopped functioning due to aging of the machines. Moreover, during the modification of the existing diversion structure to develop a larger head for the New Umtru Project (2x20MW), a huge amount of silt has accumulated in the Powerhouse. To augment the capacity of peaking from New Umtru Project during lean season and to utilize the excess water during monsoon, it is proposed to revive the Old Station by adopting the same alignment and utilizing the same components/structures of the Old Umtru Project to draw water from the common reservoir and to install a single Francis Turbine of 11MW capacity with a rated head of 60.14 m. With the installed capacity of 11MW, the annual energy and design energy at 95% plant availability is worked out approximately to be 40.42 Mu and 40.03 Mu respectively. The annual PLF is 41.95%. The strength and quality of all the components of all the Civil Structures from the Intake to the power house have to be ascertained. For this, the existing components/structures will have to be investigated by conducting the Residual Life Assessment (RLA) at the cost of about INR 50 lakhs. Based on the report of the study, the components are to be strengthened as found necessary.
2	Renovation Modernisation and	Umtru H.E. Project was commissioned with three Units of 2.8 MW each in 1957 and the fourth Unit of 2.8 MW was commissioned in 1968. It was the first Hydro Electric Project

Sl. No.	Project Name	Description
	Upgradation of Umtru Power Station.	developed in the Umtru River Basin of Meghalaya. The station has outlived its useful life. During these last few years, the hydro-generating units are under shutdown. It is possible to revive the station by taking up Renovation, Modernization and Uprating (RM&U) activities

The Project cost is shown in the table below:

Sl. No.	Particulars	Project Cost (INR Cr.)
1.	Projects for Umtru HEP	110.50

6. Sonapani Mini Hydel Project

Sonapani Mini Power Station is an old power station which has been running since 1922 for supplying power to Shillong. As the power house building has become old and the machines at the power station have become obsolete, a new Power house with one new machine of 1500 KW was installed and commissioned in 2009.

The system augmentation & improvement projects that would be taken up during FY 2020-21 and the third control period (FY 2021-22 to FY 2023-24) are mentioned below:

Sl. No.	Project Name	Description
1	Procurement and Installation of 415V 3 Ph LT panel	The existing LT Panel is out of order and the LT power control has been temporarily used. Therefore, it is proposed that a new 415V 3 Phase LT Panel be procured
2	Relays and Cards to replace some existing defective ones and spares.	Most of the relays and cards are not functioning and spares are also not available. Therefore, it is proposed that Relays and Cards be procured to replace some existing defective ones and as spares
3	Generator Circuit Breaker to replace the existing one.	The existing Generator Circuit Breaker is giving problem and requires frequent maintenance leading to forced outage of the machine. Therefore, it is proposed that a new generator circuit breaker be procured.

The Project cost is shown in the table below:

Sl. No.	Particulars	Project Cost (INR cr.)
1.	System Improvement projects	0.34

The works to be taken up under this head during FY 2020-21 and the third control period (FY 2021-22 to FY 2023-24) are mentioned below:

Works Description under System Protection and Communication

Sl. No.	Project Name	Description
1	Procurement of Diagnostic Tools, Plant & Machineries for Generation system protection division	Procurement of these items is necessary for improvement of Generation System Protection and Communication System along with Diagnostic Tools and installation of Optical Fiber Cable Link at different Generating Stations. These will improve the performance of power station and will enable quick response in case of emergency.
2	Installation of OPGW for communication system between Stage-3 & Stage-4, Stage-1 & Stage-2 and Umtru-New Umtru power stations including all Fibre Optic Terminal Equipments.	
3	Procurement of Online Oil Filtration Machine for all Generator Transformers under MePGCL.	
4	Installation of ADSS OFC for communication system (Dam Water Level monitoring) of Stage-3, Stage-4 and Leshka power stations including all Tranducers, Converter ,Fibre Optic Terminal Equipments and all associated accessories	

The Project cost for the above works is shown in the table below:

Sl. No.	Particulars	Project Cost (INR cr.)
1.	System Protection and Communication	8.98

7. Dam Rehabilitation and Improvement Project (Drip- II & III)

Dam Rehabilitation and Improvement Project (DRIP) is one of the flagship projects of the Ministry of Water Resources (MoWR), River Development (RD) and Ganga Rejuvenation (GR), Govt. of India and the World Bank with an objective to improve safety and operational performance of selected dams in the country. The DRIP-I which envisaged rehabilitation of

198 dams at an estimated cost of Rs. 3466 crore across 7 (seven) states is slated to be completed by 2020.

The MoWR, RD&GR, Govt. Of India has initiated the DRIP-II &III with the assistance of the World Bank.18 (eighteen) states and 2 (two) Central Organisations are included for DRIP-II&III at a total financial outlay of Rs. 10,200 crore with assistance of Rs. 7000 crore from the World Bank. Meghalaya is one of the 18 (eighteen) states included for DRIP-II. Six number of dams under MePGCL are proposed under the project as follows:

i. Umiam Stage-I Dams

a) Concrete Dam

b) Umiam Stage-I Dyke-I

c) Umiam Stage-I Dyke-II

ii. Umiam-Umtru Stage-III Concrete Dam

iii. Umiam-Umtru Stage-IV Concrete Dam

iv. Myntdu Leskha Stage-I Concrete Dam

The initial proposed financial outlay for the project was Rs. 109 crore which was later revised and submitted to Central Water Commission (CWC) at Rs. 441.00 crore. The World Bank has finalised the amount **of Rs.441 Cr. for** Meghalaya.

The funding pattern of the project will be 80(Loan):20 (Counterpart) ratio for Special Category States like Meghalaya, 80% of the cost will be financed by World Bank as Loan Component to the Govt. of India. 90% of the loan component will be passed on to the Government of Meghalaya as Grant and 10% will be borne by the State government as Loan. The balance 20% shall be counterpart funding by the State Government.

8. Myntdu Leshka Hydro Electric Project (MLHEP)

For the Myntdu Leshka Hydro Electric Project, the following R&M works are proposed to be undertaken during FY 2020-21 or third control period:

The system augmentation & improvement projects that would be taken up during FY 2020-21 and the third control period (FY 2021-22 to FY 2023-24) are mentioned below:

Sl. No.	Project Name	Description
1	Cooling System modification & improvement	Due to frequent clogging of the cooling water system during monsoons, much energy is lost due to forced shutdown. The present system is of closed loop type. It is proposed to convert this system into an open loop system which will be more efficient than the present system and it is expected that forced shutdowns will be reduced on account of clogging and tripping of the system.
2	Supply and erection of spare Generator Transformer 1Ø, 17.5 MVA, 132/33 KV with accessories for Myntdu Leshka Power Station	Myntdu Leshka Power Station is a generating station with three installed Units, where each unit is of capacity 42 MW. The overall generating capacity of this station is 3 X 42 MW i.e., 126 MW. Each unit of this generating station is provided with three single phase generator transformers. In the event of failure of any one of the generator transformers, a spare transformer will be required for its replacement to maintain the smooth functioning and un-interrupted generation of power supply. The present spare transformer has failed and is not reliable with its history of similar failure in the past. Considering the importance of maintaining un-interrupted generation, it is necessary to procure a new spare transformer for the power station.
3	Replacement of Switchgear & Protection System for Myntdu Leshka Power Station	The existing switchgears in Leshka have often encountered pole discrepancies problem due to which machines are often forced to shut down. This leads to unwanted loss of revenue and due to outage of the machine. It is therefore, proposed that the existing switchgears are re placed with new switchgears.
4	Upgradation of SCADA for Myntdu Leshka Power Station	The MLHEP is SCADA controlled plant; however, the existing system is obsolete and is required to be upgraded to a newer and higher system, to ensure smooth and reliable operation of the plant.
5	Communication from Myntdu Leshka Dam to Leshka Power house	In order that optimum generation from MLHEP PS can be achieved, effective monitoring in digital form of reservoir levels from Powerhouse including Voice and Data communication is required between Myntdu Leshka Dam, BFV and Power Station.
6	Replacement of Air coolers	MLHEP power station was commissioned in the year 2012-13. In the last 8 (eight) years the generating station has been

Sl. No.	Project Name	Description
	including accessories for Stator for all 3 Units for Myntdu Leshka PS	generating maximum power during the monsoon season. As such the units in the generating station are provided with their respective air coolers to maintain the temperature of the stator winding and its accessories. It has been observed that in the course of generation, the cooling pipes embedded within the air coolers have deteriorated as a result of clogging, rust accumulation resulting in the decrease in the inner dimension of the pipe which reduces the actual flow of water through it. This has affected the cooling of the stator of the machine and other accessories leading to disruption of generation. In order to avoid the occurrence of such events in the future, replacement for air coolers are required.

The estimated cost for the above works is shown in the table below:

Sl. No.	Particulars	Project Cost (INR Cr.)
1.	System Improvement projects	16.31

9. Lakroh Mini Hydel Project (1 X 1500 Kw)

The Lakroh Mini Hydel Project is a run-of- the river project developed on the Lakroh River near Muktapur village in West Jaintia Hills District of Meghalaya. The project was successfully commissioned on 6thDecember, 2018 and the Commercial Operation Date declared on 1st March, 2019.

The system augmentation & improvement projects that would be taken up during FY 2020-21 and the third control period (FY 2021-22 to FY 2023-24) are mentioned below:

Sl. No.	Project Name	Description
1	Replacement of Generator Transformer (with 3.3/33 KV, 2.5 MVA) including augumentation of Switchyard from 11	The present voltage evacuation from Lakroh Power Station is at 11 KV and this is observed to be very unstable and had frequently failed leading to long outage of the plant. In order to improve the stability and reliability of power evacuation, it is being considered to step up the voltage from 11 KV to 33 KV. In doing so, the present switchyard would have to be augmented and thus the 3.3/33 KV, 2.5

Sl. No.	Project Name	Description
	KV to 33 KV for Lakroh PS	MVA transformer including other switchyard accessories will be necessary.
2	Communication for Lakroh PS with SLDC	Lakroh power station is a mini hydel project having capacity of (1 x 1.5 MW). Presently the power station is running independently with no communication system. It is necessary that the generating station should have a communication system to link it with SLDC, as the system operator for communication. This would ensure proper communication between the system operator and the station and thus help in effectively running of the station.

The Project cost is shown in the table below:

Sl. No.	Particulars	Project Cost (INR Cr.)
1.	System Improvement projects	1.54

Annexure – B(2)

Upcoming Plants for MePGCL

1. Ganol Small Hydro Project (3X 7.5MW)

Introduction: The Ganol Small Hydro Project, the first power project in Garo Hills, was envisioned to be implemented at an installed capacity of 22.5 MW with 3 units of 7.5 MW each. It is located at 7 km from Tura, the Headquarters of West Garo Hills District and will contribute 67.09 million units of energy in a year. This is expected to bring a significant change in the power scenario of Garo Hills which is suffering from frequent power cuts and perpetual voltage fluctuations. The construction of the project was started in 2014 and its completion is scheduled in May 2022. The revised cost of project is INR 507.71 crore.

Salient features of the Project:

Project Location	West Garo Hills Dist., Meghalaya
Project Cost	INR507.71 Crores
Installed Capacity	3x7.5 MW
Net Rated Head	148 m
Dam	Concrete Gravity, 98.10 m long, 35 m high
Spillway	Gated Radial Sluice Spillway (3 no.of gates)
Intake	1 no. with Vertical Fixed Wheel Type Gate
Headrace Tunnel	3.20 m dia, 1990 m long, D-Shaped
Surge Shaft	8 m dia, 47 m height
Pressure Shaft	2.20 m dia, 708.90 m long
Power House	Surface
Turbines	Francis, Horizontal

Financial Details:

Funding pattern

Particular	Amount (Rs Cr)	Percentage (%)
Equity	54.62	10.76%
Loan	223.1	43.94%
Grant	229.98	45.30%
Total	**507.71**	**100.00%**

2. Riangdo Small Hydro Project (3000 KW)

Introduction: The Riangdo SHP is located at Swanggre village, Shallang, West Khasi Hills. The Installed Capacity is proposed at 3MW. The total project cost is estimated at INR33.99 crore. The annual energy from the project is 17.92 MU.

Land acquisition has been completed and tendering is under process. The project is scheduled to be completed in 3 (three) years.

Salient features of the Project:

Project Location	Shallang, West Khasi Hills District
Project Cost	Rs 33.99 Crores
Installed Capacity	3.00 MW
Design Head	135m
Design Discharge	2.52 cumecs
Annual Energy	17.92 Mu
Weir	58 m long, RCC, 1 Intake Gate
WCS	458 m long
Forebay	312.23 Sq.m
Penstock	1x1100mm dia., 390 m long
Power-House	Surface, 30mx12.5mx8m
Turbine	Francis, 3 no
Tailrace	Rectangular, 20mx2mx1.5m
Switchyard	1 no.
Completion	3 years from date of commencement

Financial Details:

Funding Pattern

Particular	**Amount (INR Cr)**	**Percentage (%)**
Equity	2.59	7.62%
Loan	11.4	33.54%
Grant	20	58.84%
Total	**33.99**	**100.00%**

3. Myntdu Leshka Stage-II HEP

Myntdu Stage-II HE Project, proposed to be located in West Jaintia Hills district of Meghalaya, is a run of the river type development downstream of existing Myntdu Stage-I (126MW) H.E. Project. The catchment area of Myntdu Stage II is 480 SqKm.

The Myntdu Stage-II H.E. Project for the Meghalaya Energy Corporation Ltd. had envisaged construction of about 44 m high concrete gravity dam with FRL at El.270 m just downstream of confluence of Myntdu and Lynriang rivers in Myntdu Basin and about 7km. downstream of Myntdu Stage-I dam. Water from the dam is proposed to be diverted to a surface power house through a 7km. long circular HRT of 5.8m dia. for power generation. The power house, proposed to be located on the right bank of Myntdu River, is near Borghat, 10km downstream of the proposed dam.

An installation of 180 MW is proposed, with 3 X 60 MW. The annual energy generation in 90% dependable year is 562.34Mu and in 50% dependable year is 737.24 MU.

4. Solar Parks

The proposed 20 MW solar park in Meghalaya is an initiative undertaken by the Meghalaya Power Generation Corporation (MePGCL) and the Solar Energy Corporation of India (SECI) and is one of the first among the North-Eastern states of the India. It is located in the Jaintia Hills District and is to be implemented over two sites, at the villages of Thamar and Suchen, distanced 8 km by road, the sites are owned by MePGCL. The power is to be evacuated as follows:

i. The 10MW Power of Thamar will be evacuated to Amlarem 33 KV Sub Station by Tapping on the existing Amlarem MLHEP-I 33KV Line at Thamar.

ii. The 10MW from Suchen will be evacuated through a new 33KV transmission in line directly to Rymbai Sub-Station which is under construction.

The system output from the proposed 20 MW plant in terms of annual energy generation is estimated to be about 30 million units. The corresponding annual capacity utilization factor (CUF) is estimated to be 17 %.

The Cost for development of the Solar Parks is INR 11.64 crores. The breakup is as follows:

i.	Cost of Land	:	Rs. 495 Crs.
ii.	Road Infrastructure	:	Rs. 136 Crs
iii.	Water infrastructure	:	Rs. 0.68 Crs.
iv.	Electrical Infrastructure (Power Evacuation)	:	Rs. 4.13 Crs

5. Umshamphu SHP (2x1.5 MW)

The Project site is at Shkentalang village (Near Jarain) on Jowai-Amlarem-Dawki Road (NH 40E) at a distance of about 20 Km from Jowai. The proposed project is located across the Umshamphu River which is a tributary of the Myntdu River. The total estimated cost of the Umshamphu Small Hydel Project (2 x 1500 kW) is INR 4870.00 Lakhs, with the Civil Works at INR 2748.81 Lakhs, the E & M Works at INR 1499.00 Lakhs, the Other Costs at INR 318.60 Lakhs and the IDC amounting to INR303.15 Lakhs.

The Project is being targeted to complete within 3 years from the date of start of the major components of the civil structure of the project.

6. Amkshiar SHP

The Amkshar Stage-I Small Hydel Project is located near Kudengrim Village under Amlarem Civil Sub-Division, West Jaintia Hills District.

The main objective of any small hydro project is to ensure more reliable power supply to the villages surrounding the project site. Similarly, the Amkshar Stage-I Small Hydel Project will ease the problems of frequent power cuts experienced by the nearby villages especially during monsoon period when the maintenance of the long transmission line from the grid supply become difficult. The project will also enable utilization of the natural potential in the neighbourhood and allow relief to the grid power source to divert the power to bigger load centres.

The Project is being targeted to complete within 3 years from the date of start of the major components of the civil structure of the project. The total project cost is estimated at INR 46.24 crore.

7. Umrina SHP Project

For generating power from the first stage of the Umrina river, a drop of about 129.00 m from the proposed Weir site and Powerhouse can be utilize along with a design discharge of 4.43 cumecs.

The Project site is located near Mawpen village on Shillong-Mairang road (NH-44E) and then via Mairang-Nongkhlaw Road and then via a village road upto Mawpen village with a total distance of about 68 Km from Shillong and 20 Km from Mairang. The Installed Capacity is projected at 4.5 MW. The project cost is estimated at INR 75.08 crore.

Annexure B (3)

Survey & Investigation projects

An ideal approach for covering the total gamut of Survey and Investigation of hydropower projects constitute Pre-feasibility Stage, Feasibility Stage and Detailed Investigation (DPR) Stage. There are 9 (nine) nos. of projects under Survey & Investigation works under MePGCL; namely, Umngot HEP, MLHEP-II, Mawblei HEP, Nongkohlait HEP, Selim HEP, Umngi HEP, Upper Khri Stage-II, Nongnam and Mawput HEP.

a) **Pre-Feasibility Stage:** It is more of a desk study with limited field checks. Based on the 1:50000 or 1:25000 scale Survey of India topo sheets, possible hydroelectric sites are marked. These sites are examined by preliminary field traverses wherein topography, broad geological aspects in terms of locating the project components is looked into. If required, broad assessment of the terrain at the likely site is also carried out by geophysical survey to understand the sub surface condition of the rocks.

b) **Feasibility Stage:** After selecting the site during Pre-feasibility stage, intensive field traverses are undertaken. The scope of works involved during this stage are broadly classified as under.

i. **Hydro-meteorological Survey**: Existing Hydroelectric projects as well as the proposed Hydel projects in the state of Meghalaya are all rain dependent. One of the parameters that is very important to assess accurately is the volume of water that is available in a basin. These surveys are carried out to establish Rainfall, Gauge Discharge, Sediments, Water quality, Evaporation, Availability of water for benefits envisaged and Design flood for various structures. The Ministry of Water Resources, Government of India in its Guidelines for preparation of Detailed Project Reports of Irrigation & Multipurpose Projects has specified that the length for collecting these data depends on the type of scheme, e.g., diversion projects without pondage / with pondage and storage projects.

ii. **Topographical Survey:** Topographical survey for dam, water conductor system, reservoir power house, etc is carried out for the various alternatives considered to justify the final choice of the location of different components of the project.

iii. **Engineering Geological, Geophysical, Seismological and Construction Material Survey:** These investigations are now considered as fundamental requirements for planning & design of large civil engineering structures pertaining to hydroelectric projects. Subsurface explorations comprising particularly of diamond core drilling and exploratory drifts are the mainstay of geological investigations. Geological investigations of hydroelectric projects are of paramount importance in understanding the geological set up of varied terrains and their geo-dynamic development. The purpose of most engineering geological work is to ensure that a proposed structure is built at the lowest cost consistent with currently accepted safety standards.

iv. **Environment & Forest Survey:** These surveys are carried out to get the firsthand information on the flora & fauna presence in the project area. Rapid assessment on the impact of the environment by the project is also carried out during this stage and thereafter to formulate the environment management plan.

Based on the data above, layout of the project is prepared, and its techno-economic viability is established and once the project is viable, it is taken for Detailed Investigation.

c) Detailed Investigation (DPR) Stage: Detailed geological mapping is undertaken during this stage for all the sites in which major hydraulic structures are proposed to be set up like dam, power house, etc. Exploratory drilling for a dam is carried out by drilling few holes on either abutment or in the river. The depth of the holes depends on the geological set up and type and height of dam, but generally the holes are drilled into fresh and sound rock to the extent of 10 to 25 metres. Exploratory drilling for water conductor tunnels (HRT/TRT) is carried out to establish rock cover available above the proposed crown level of the tunnel especially in low cover zones such as in the beds of stream and to know the substrata along the proposed alignment of the tunnel. Drill holes are also proposed at the intake and portal sites at outlet and along proposed alignment of the tunnel. These holes are drilled to the proposed invert level of the tunnel. As such, all geological maps are updated in this stage. Similarly, drill holes for ascertaining the geology of surge shaft and pressure shaft etc. are also carried out.

1. Umngot HEP (3x70MW)

The Umngot H.E. Project envisages a storage scheme (within the year storage) for generation of peak power with the setting up of a 3 x 70 MW power station on the river Umngot, a south flowing river which flows into Bangladesh with an annual energy of 708.98 MU in a 90% dependable year and 901.56 Mu in a 50% dependable year.

The Umngot H.E. Project is situated in the border of East Khasi Hills District and Jaintia Hills District of Meghalaya. The catchment area of 304 Sq.km is upto dam site, with an average inflow ranges from 70,000 Ham to 80,000 Ham. The reservoir submerges an area of 253.85 Ha upto FRL 1040m.

The compliance to the major observations of CWC on the Dam is in progress and the DPR is likely to be completed by December 2020

2. Myntdu Leshka Stage-II HEP (3x70 MW)

The Myntdu Leshka Stage-II Hydro Electric project located in West Jaintia Hills District of Meghalaya State envisages utilization of the water of the river Myntdu for power development on a Run of River type development, harnessing a head of about 236.83m.

The project with a proposed installation of 210 MW (3 x 70 MW) would afford an annual energy generation of 562.34 MU and 737.24 MU in a 90% dependable year and 50% dependable year respectively.

The S & I works of the projects is in progress and the preparation of DPR on different chapters is on full swing and is likely to be completed by Dec, 2020.

3. Mawblei HEP (2x38 MW)

The Mawblei H.E. Project was conceived by the Meghalaya Power Generation Corporation Limited envisages utilization of the waters of Wahblei for generation of hydel power. Wahblei is a tributary of Kynshi river, a south flowing river which flows into Bangladesh. It is a storage type scheme which envisages the setting up of a 2x38 MW power station. The project with the proposed installation of 76 MW would generate an annual energy generation of 277.08MU and 322.20MU in 90% & 50% dependable year respectively.

The S & I works of the projects is in progress and the preparation of DPR on different chapters is on full swing and is likely to be completed by Dec, 2021.

4. Nongkohlait HEP (2x31 MW)

The S & I works of the project is in progress and the preparation of DPR on different chapters is on full swing and is likely to be completed by Dec, 2022.

The Dam site of the proposed Nongkohlait H.E. Project is located between East and South West Khasi Hills District whereas other components fall in South West Khasi Hills District of Meghalaya. It envisages utilization of the regulated water of the proposed Umngi Project(2x31MW) and the waters of the river Umngi (own catchment) for power generation on a run- of –the river (ROR) type development. The project with the proposed installation 62 MW (2X31 MW), would afford an annual energy generation of 276.35 Gwh.

5. Selim HEP (2x40 MW)

The Selim H.E. Project is located in East Jaintia Hills District of Meghalaya. It envisages utilization of the waters of the river Myntdu for power generation. It is a run- of –the river (ROR) type development. The project with the proposed installation 80 MW (2X40 MW), would afford an annual energy generation of 315.67MU in 90% dependable year.

The S & I works of the projects is in progress and the preparation of DPR on different chapters is on full swing and is likely to be completed by March, 2022.

6. Umngi HEP (2x31 MW)

The Umngi H.E. Project is located in East Khasi Hills District of Meghalaya. It envisages utilization of the waters of the river Umngi for power generation. It is a storage type development/scheme with the setting up of a 2x31 MW power station. The project with the proposed installation of 62 MW would generate an annual energy generation of 276.42MU in 90% dependable year corresponds to about 50.90 % Plant Load Factor with a minimum peaking hour of about 4 hours during the lean season.

The S & I works of the projects is in progress and the preparation of DPR on different chapters is on full swing and is likely to be completed by Dec, 2022.

7. Upper Khri Stage-II (2x48 MW)

The Upper Khri Stage-II HE Project located in the West Khasi Hills District of Meghalaya envisages utilization of the waters of river Khri for power generation on storage type development, harnessing a head of above 290m. The project with the proposed installation of 48MW (2x24MW) would afford on annual energy generation of 165.00 MU. The location of the dam is at latitude 25o 46' 17" N and longitude 91o 36' 33" E. the nearest rail head is located at Guwahati in Assam (103.00 Km from Shillong) and nearest Airport is located at Umroi (34.00 Km from Shillong).

8. Nongnam (2x15 MW)

The Nongnam H.E. Project located in West Khasi Hills District of Meghalaya envisages utilization of the waters of river Umngi for Power Generation on storage type development, harnessing a head of about 130m.

The project with the proposed installation of 30MW (2 x 15 MW) would afford an annual energy generation of 118.92 MV.

The dam site is located at latitude 25o 16' 19" N and longitude 91o 28' 33.5" E. the nearest rail head is located at Guwahati in Assam (103Km from Shillong) and nearest Airport is located at Umroi (34Km from Shillong).

9. Mawput H.E. Project (2x19 MW)

The Mawput H.E. Project located in West Khasi Hills District of Meghalaya envisages utilization of the waters of Umngi for Power Generation on storage type development, harnessing of about 130m.

The project with the proposed installation of 38 MW (2 x 19 MW) would afford an annual energy generation of 146.17MV.

The dam site is located at latitude 25o 16' 15.5" N and longitude 91o 26' 11.8" E. The nearest rail head is located at Guwahati and airport at Umroi.

Survey and Investigation Works Summary

The estimated total expenditure for S&I works is Rs 83.81 crore, the break-up of which is given in the table below:

Details of Survey & Investigation Costs

SI No.	Particulars	Project cost (Rs Cr)
1	MLHEP-II(3X70)MW	9.6
2	UMNGI(2X31)MW	5
3	UMNGOT(3X70)MW	8.35
4	SELIM(2X48)MW	7.92
5	NONGKOHLAIT(3X31)MW	5.02
6	MAWBLEI(2X37.5)MW	8.92
7	Upper Khri Stage-II HEP	13.00
8	Nongnam HEP	13.00
9	Mawput HEP	13.00
	Total S&I Works	**83.81**