

MEGHALAYA 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.10 /2022

In the matter of:

Approval of Mid Term Review of Business Plan for third MYT Control period FY 2021-22 to FY 2023-24

And

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

Coram

Shri P.W. Ingty, IAS (Retd)

Chairman

Shri Roland Keishing

Member (Law)

ORDER

Date: 29. 09 . 2022

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 in 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) and further extended up to 31.03.2024 vide notification dated 18.06.2020.
3. As per provisions of Regulation 8.1 of MSERC MYT Regulations, 2014, MePGCL has filed the Petition for approval of Mid Term Review of Business Plan approved by the Commission on 30.09.2020 for the third MYT Control Period of FY 2021-22 to FY 2023-24 after assessing revised capital investment plan for each year of the Control Period and sought for approval of the Midterm Review of Business plan.

4. The Commission, in exercise of powers vested in Clause 8.4 of MYT Regulations, 2014, provisionally passed this order approving the Midterm Review of Business Plan annexed hereto for the third MYT control period of FY 2021-22 to FY2023-24.
5. The Petitioner shall ensure implementation of the revised Business plan duly obtaining financial tie up for the capital investment including the capital Grant and contributions projected in the petition for the rest of the control period FY 2022-23 and FY 2023-24.

Sd/-

Member

Shri. Roland Keishing

Sd/-

Chairman

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

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 Modernization 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.

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

Meghalaya Gazette on 15th 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”.

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 2021 to 31st March 2024, 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.

Accordingly, MePGCL has filed the petition for approval of its Business Plan for the Control period FY 2021-22 to FY 2022-23 and the Commission has provisionally approved the Business plan for the Control period FY 2021-22 to FY 2023-24 with order dated 30.09.2020.

1.4 Admission of the Petition

MePGCL has filed the present petition for Midterm Review of Business plan for the rest of Control period FY 2022-23 and FY 2023-24 after assessing the revised capital investment plan.

MePGCL has submitted the current petition for approval of Mid Term Review of Business Plan for the rest of Control Period FY 2022-23 and FY 2023-24.

Commission has examined the petition and taken on record as Case No. 10 /2022.

1.5 Approach of the Order

The MSERC Multi-Year Tariff Regulations, 2014 provides for approval of Mid Term Review of Business Plan of MePGCL for the rest of the Control Period FY 2022-23 and FY 2023-24.

MePGCL has filed the petition before the Commission for approval of Mid Term Review of Business Plan for rest of the MYT Control Period FY 2022-23 and FY 2023-24 on 05.08.2022.

2. Company Profile of MePGCL

2 Company Profile-MePGCL

2.1 Introduction

2.1.1 The Company 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 prescribes 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

2.1.2 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

2.1.3 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 1: Details of existing stations

SI No	Station	Type	No of Units/ Capacity	COD	Capacity (MW)
1	Umiam Stage-I	Storage	4*9	1965	36
2	Umiam Stage-II	Pondage	2*10	1970	20
3	Umiam Stage-III	Pondage	2*30	1979	60
4	Umiam Stage-IV	Pondage	2*30	1992	60
5	Umtru Power Station	Pondage	4*2.8	1957	11.2
6	Sonapani MHP	Run-of-the river	1*1.5	2009	1.5
7	Leshka HEP	Run-of-the river	3*42	2011-2013	126
8	New Umtru HEP	Pondage	2*20	2017-2018	40
9	Lakroh MHP	Run-of-the river	1*1.5	2018-2019	1.5
	Total				356.2

2.1.4 On-going 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

Table 2 : Details of On-going Plants

SI No	Name of the Plant	Design Energy (MU)	Capex Outlay (Rs. Crs)	Debt (Rs. Cr)	Equity (Rs. Cr)	Grant (Rs. Cr)	Year of Commissioning
1	Ganol SH Project(3x7.5 MW)	67	507.71	223.11	54.62	229.98	2022-23
2	Riangdo SH Project (3 MW)	17	33.99	11.4	2.59	20	2022-23

2.1.5 Upcoming plants

Table 3 : Details of Upcoming Plants

SI. No	Name of the Scheme	Project Start	Project Completion Date	Total Expenditure (INR Cr.)
1	Dam Rehabilitation and Improvement Project (DRIP): Phase 2 and 3	2020-21	2026-27	441.00
2	Myntdu Leshka Stage-II HE Project (3x70 MW)	2023-24	2029-30	2187.88
3	Solar Park (10MW) each in Suchen and Thamar			11.64

4	Umrina Stage-I Small Hydro Project(3x 2000KW)	2022-2023	2025-26	90.46
5	Umshamphu Small Hydro Project (2x2000KW)	2022-2023	2025-26	62.32
6	Amkshar Stage-I Small Hydro Project (2x2250 KW)	2022-2023	2025-26	68.94
Total				2862.24

2.1.6 Operational Performance of the Generating Stations- MePGCL

2.1.6.1 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 for the last 4 years is shown in the table below:

Table 4 : Energy Generation Trend of MePGCL (MU)

Sl. No	Station	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22
1	Umiam Stage-I	85.12	108.32	149.49	64.92
2	Umiam Stage-II	43.92	55.25	76.09	33.89
3	Umiam Stage-III	133.83	141.83	163.61	110.18
4	Umiam Stage-IV	166.61	164.50	188.34	125.25
5	Umtru Power Station	0	0	0	0
6	Sonapani MHP	7.12	3.59	6.08	5.55
7	Leshka HEP	363.06	421.65	420.61	380.35
8	New Umtru HEP	179.82	181.44	229.1	160.79
9	Lakroh MHP	0.05	2.11	3.69	4.03
Total		979.53	1078.69	1237.81	884.99

2.1.6.2 Energy Generation in Remaining Control Period: Based on the previous generation trend for the existing stations and the projected energy generation for the upcoming plants, given below is the projected generation details for FY 2022-23 and FY 2023-24.

Table 5 : Projected Energy Generation for MePGCL (MU)

Sl. No	Station	FY 2022-23	FY 2023-24
1	Umiam Stage-I	116.00	116.00
2	Umiam Stage-II	46.00	46.00
3	Umiam Stage-III	139.00	139.00
4	Umiam Stage-IV	207.00	207.00
5	Umtru Power Station	0.00	0.00
6	Sonapani MHP	5.00	5.00
7	Leshka HEP	486.00	486.00
8	New Umtru HEP	235.00	235.00
9	Lakroh MHP	11.01	11.01
10	Ganol SHP	67	10.00
Total		1245.01	1255.01

2.1.6.3 Auxiliary Consumption of MePGCL Generating Stations: The auxiliary consumption for last 4 years for the generating stations is shown in the table below:

Table 6 : Auxiliary Consumption

(MUs)

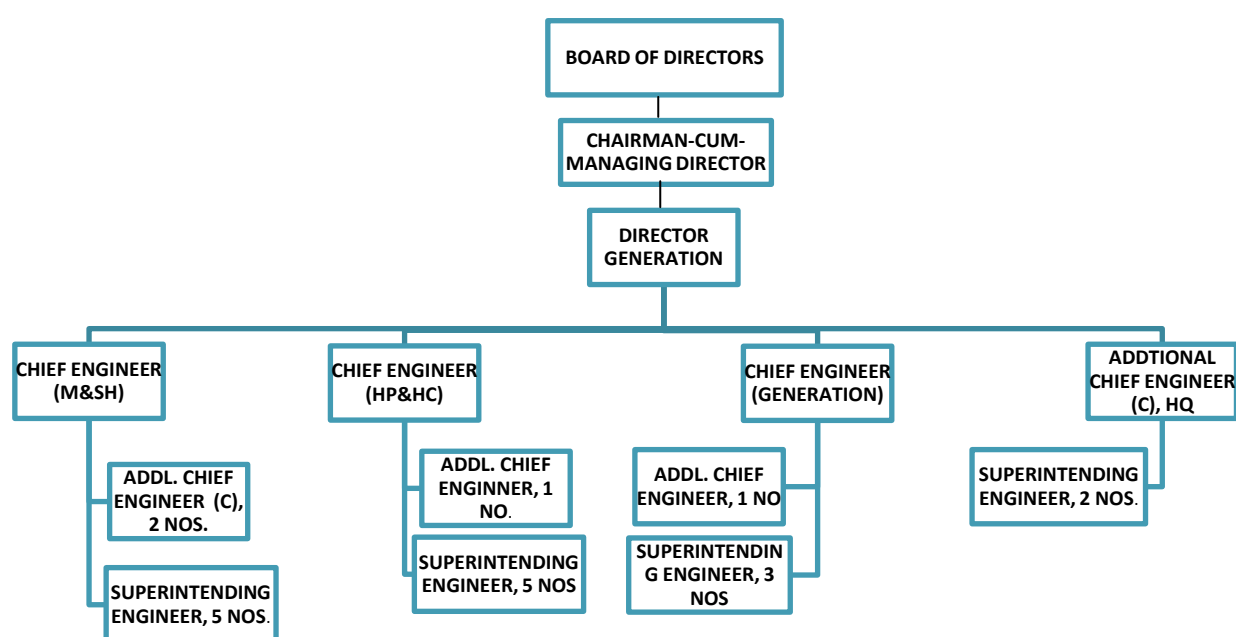
Sl. No	Station	FY 2018-19	FY 2019-20	FY 2020-21	FY 2021-22
1	Umiam Stage-I	0.92	1.01	0.96	0.56
2	Umiam Stage-II	0.27	0.33	0.42	0.20
3	Umiam Stage-III	0.91	0.86	0.92	0.63
4	Umiam Stage-IV	1.12	1.12	1.18	0.85
5	Umtru Power Station	0.05	0	0	0
6	Sonapani MHP	0.05	0.03	0.10	0.10
7	Leshka HEP	2.75	3.67	3.50	3.60
8	New Umtru HEP	1.46	1.30	1.48	1.12
9	Lakroh MHP	0.00	0.03	0.05	0.05
TOTAL		7.55	8.35	8.61	7.11

2.2 Human Resource

2.2.1 Organization Structure

The broad organisation chart is shown below:

Figure 1: Organisation Chart-MePGCL



2.2.2 Existing Human Resource

Currently, MePGCL has 640 Regular employees on Regular payroll and 338 Casual employees as on 31.03.2022. 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.

2.2.3 Capacity Building in Meghalaya Energy Corporation Limited (MeECL)

Human Resources Development Centre (HRDC), Umiam, MeECL is entrusted with the training for the officers and staff 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).

In accordance with the CEA Guidelines & Apprentices Act, the HRDC, MeECL has been imparting On-the-job training, Induction training, C&D Trainings, trainings on behavioural attitudes, etc as required. The HRDC is striving to develop the entire human resources of MeECL by meeting the growing and evolving demands of the technological advancement.

3. Mid Term of Review of Capital Investment Plan

3 Midterm review of Capital Investment Plan

Petitioner's Submission

3.1 Purpose of Mid Term Review of CIP

There are number of internal and external factors which affect the planning of the company and thus the investment plan calls for regular reviews with a view to introduce any mid-term corrections considering the current business environment. Certain project attributes such as construction period, actual project cost, completion dates etc. for ongoing projects have changed due to uncontrollable externalities with respect to projections in the Business Plan submitted for control period FY 2021-22 to FY 2023-24. Therefore, the project particulars need to be modified.

3.2 Need for Capital Expenditure

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

3.3 Details of R&M Works on Existing Stations

3.3.1 Umiam Stage-I

3.3.1.1 System Augmentation & Improvement Projects

The Umiam Stage-I station and dam being very old, some of the components need to be augmented and improved. The details of projects required to be taken up during the remaining control period FY 2021-22 to FY 2023-24 are mentioned below:

Table 7 : System augmentation & Improvement Projects- Umiam Stage-I

Sl. No.	Project Name	Description
	Replacement of Two penstock butterfly Valve including By-pass valve along with all servo mechanism and related control system.	Over the year 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 1960, no 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.
	Re-engineering of fire fighting system of Generator and Transformer	<p><u>Generator:</u> The existing flooding system of fire protection for generator used the old cylinder, since 1965 have 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.</p> <p><u>Transformer:</u> 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 power house. It is to be noted that the components of the emulsifier system have not been replaced since 1965. Therefore to make the fire fighting system functional it is necessary to renovate the piping and valves along with nozzles.</p>
	Replacement of transformer for Unit-1, Unit-2 and Unit-4.	<p>The existing transformer has been in service since the time of commissioning i.e. 1965, which is almost 57 yrs.</p> <p>The transformer No.3 was replaced by new one during April 2006 and the transformer No.1 and No.4 were replaced by transformer 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 up gradation works are also the original transformers. These transformers were installed and commissioned along with the Generating units of Umiam Stage II Power Station in July 1970. Therefore both the transformers has outlived its reliable lifespan of 35-40 years. For a reliable and smooth operation of the Power Station, these transformer too needs to be replaced by new ones which meets the current international standards and specifications</p>
	Construction of Transformer Yard to accommodate station service transformers, Unit-1 & Unit-3 and procurement of the same.	The Station Service Transformers of Unit-1 & Unit-3 have completed the useful life. Besides these transformers are oil based and are located inside the generator floor of the power house building. Therefore it is proposed that these transformers be replaced with new ones of 500 KVA and placed outside the power house building.
	Construction of Beams and Bypass 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.

Sl. No.	Project Name	Description
	132 KV SF6 Circuit Breaker (Spare)	<p>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.</p> <p>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 signal to open, the generator and transformer will be expose to the electric stress due to external short circuit faults. This may even cause damages to all the power equipments of the Station.</p> <p>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 that two spares Circuit Breaker be procured to be made readily available for replacement of the damaged one.</p>
	Complete Installation of SCADA including Hardware and Software	<p>There is a need for installation of a this 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 Current and voltages whereas mechanical parameters will include monitoring of temperature, pressure, vibration, cooling flow etc which would ensure proper of the hydrogenating Unit from the safety and stability point of view so as to ensure its trouble free operation.</p>
	Replacement of Governor and AVR system.	<p>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 lead to outage of the Units on several occasions. Further, the 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</p>
	Replacement of Generator Stator Air Cooler for three Units	<p>Umiam Stage I Power Station was Renovated and Modernized on 2001-2002 by Toshiba Company with funding from JBIC (now JICA). During R&M works, replacement of Stator Air Cooler was not included in the scope due to constraint of loan. After having been in service continuously for a period of 57 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 ingress as a result of persistent leakage.</p> <p>Since the above leakage has both short time and long time ramifications in the form of generation loss and ultimate insulation failure of the Stator Winding it is proposed that the stator air</p>

Sl. No.	Project Name	Description
		coolers of Unit-I,II&III are completely replaced by new coolers at the earliest to avoid prolonged generation loss from these Units .

Table 8 : Project cost for Umiam Stage-I System Augmentation &Improvement Projects

SI No.	Particulars	Project cost (Rs Cr)
1.	System Augmentation & Improvement Umiam Stage-I	70.99

3.3.2 Umiam Stage-II

3.3.3.1 System Augmentation& Improvement Projects

The Umiam Stage-II station, being very old, some of the components need to be augmented and improved. The system augmentation and improvement projects proposed to be taken up during the remaining control period are mentioned below:

Table 9 : System Augmentation& Improvement Projects- Umiam Stage-II

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 unbalance 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 unbalance of load also causes voltage unbalance among the three phases which leads to overheating in running the auxiliary equipment 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, Modernization and Up gradation works carried out in 2011-12
2	Emulsifier system for Generator Transformer in both Units.	Presently there is no fire fighting system for the Power transformer.
3	Installation of On Line Supervisory system (SCADA) for the entire Power Station	There is a need for installation of a this 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 Current and voltages whereas mechanical parameters will include monitoring of temperature, pressure, vibration, cooling flow etc which would ensure proper of the hydrogenating Unit from the safety and stability point of view so as to ensure its trouble free operation.
4	Replacement of 11 KV Switchgear Panel	Umiam Stage II Power Station was Renovated, Modernized and Upgraded in January 2012 by Toshiba Company with funding from 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

No.	Project Name	Description
		<p>the corporation.</p> <p>The problems or faults were mostly short circuit between adjacent auxiliaries like PT's, C.T's, Surge Arrestors etc. A lot of care has been taken by the Station engineers and Staffs to insulate the adjacent components and seal numerous holes to avoid rodent inside but to no avail. Therefore, after numerous discussions with higher authority, a conclusion was drawn and that will be a complete replacement of the existing 11 KV Switchgear panel for both Units.</p>
5	132 KV SF6 Circuit Breaker (Spare)	<p>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.</p> <p>The two Generators and Turbine 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 Breakers to evacuate the electricity generated to Stag –I Power Station switchyard for onward transmission of power to the 132 KV Grid.</p> <p>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 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.</p> <p>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 signal to open, the generator and transformer will be expose to the electric stress due to external short circuit faults. This may even cause damages to all the power equipments of the Station</p>

Table 10 : Funding for Umiam Stage-II System Augmentation &Improvement Projects

SI No.	Particulars	Project cost
1.	System Augmentation & Improvement - Umiam Stage-II	Rs. 21.11 crore

3.3.3 Umiam Stage-III

3.3.3.1 System Augmentation Projects

The Umiam 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 taken up during the remaining control period FY 2018-19 to FY

2020-21 are mentioned below:

Table 11 : System Augmentation& Improvement Projects- Umiam Stage-III

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 has touched 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 employee's 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 group and so a total no 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 impact 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 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 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 employee' colony along with penstock butterfly valve house and its surrounding. 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 estimated total expenditure for the above System Augmentation& Improvement projects is Rs.410.77Cr.

Table 12 : Funding for Umiam Stage-III System Augmentation& Improvement Projects

SI No.	Particulars	Project cost
1.	System Augmentation & Improvement- Umiam Stage-III	Rs. 410.77cr

3.3.4 Umiam Stage-IV

3.3.4.1 System Augmentation &Improvement Projects

The following system augmentation & improvement projects to be taken up in the

remaining control period FY 2021-22 to FY 2023-24 are mentioned below:

Table 13 : System Augmentation & Improvement Projects- Umiam Stage-IV

No.	Project Name	Description
1	Automation and monitoring of MIV of the Generating units	<p>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:</p> <ul style="list-style-type: none"> • <i>Operation of MIVs, GV Servomotors.</i> • <i>Operation of Station Auxiliaries viz. Cooling Water system both for Turbine & Generator.</i> • <i>Operation of other Station Auxiliaries viz. Motorized Valves, Compressors and Lubricating Plants etc.</i> • <i>Excitation Control System.</i> • <i>Synchronization facilities through Auto-mode System.</i> • <i>Miscellaneous works which may have to be interfaced through certain microprocessor with CCBs/UCBs/UABs etc.</i> <p>In view of all the above, certain components with modifications shall be required to 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 for 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.</p>
a	A. Overhauling and replacement of damaged parts of Unit-II	<p>e Commissioning of the stations, no overhauling works have been carried out except for annual maintenance and the condition of underwater parts viz guide vane, PRV, MIV seal/seal, 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. LOA for the work has been issued to M/s Multitech Engineers, and the work will start tentatively in the month of June 2022.</p>
b	B. Procurement of excitation transformer	<p>Due to ageing and loading of the Excitation Transformers 375 KVA, 11/0.240 KV at many occasions the units got tripped.</p> <p>Moreover, due to spiking the Transformer may have had an extra burden. Therefore, the old Excitation Transformers at Stage IV need to be replaced by new ones.</p> <p>Hence, in order to maintain the generation level of Stage IV Power Station; 2 new Excitation Transformers need to be procured.</p>
c	Online Vibration monitoring of Generating Units	<p>The present system of measurement of vibration is use of an offline vibration meter. In case of any abnormality 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.</p> <p>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.</p>
d	Dedicated and reliable Outside Source power supply from 132 KV Bus.	<p>At present the Outside source supply for the power station as well as for the adjoining employee's 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 thorough a reserve forest area in difficult terrain.</p> <p>Therefore, it is proposed that dedicated outside source transformer is installed which taps power from the 132 KV grid for ensuring stable and reliable outside source supply for the station as well as employee's colony.</p>
e	Telecommunication and Internet Facility	<p>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.</p>
f	Supervisory Control System	<p>At present the Umiam Stage-IV station is being run on semiautomatic mode. The speed and voltage is being controlled automatically. Whereas, the start and stop of</p>

No.	Project Name	Description
		<p>the machine needs to be done on manual basis. With increase of speed in operation, it is necessary to have a system for centralized automatic monitoring and control of the machine parameters.</p> <p>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 dependent on manpower and also increase reliability.</p>
g	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.
h	Refurbishment of Stator winding of Unit 1	On the 2 nd 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 2 nd August 2019 due to damaged of Stator winding. The refurbished of the Unit by M/s Andritz Hydro Pvt. Ltd. is in progress and shall be completed soon.
2	Hydraulic Power Pack with Control Panel for Butterfly Valve	The Power Station is having two-surfaced steel penstock for feeding water to two hydro-generating Units of the Station. There are two Butterfly valve for controlling the flow of water to the Penstock by opening and closing this valve. The Butterfly valve is operating with the help of the Control system which is by hydraulic oil in recent time due to aging all the control system has damaged and it become difficult to operate the valve whenever the shutdown is required in the Power Station. This may pose danger especially during emergency situation. Hence it is required that the control equipment of this valve is replaced with new one.
a	Installation of Fire fighting Scheme for Generator Stators	The proposal for installation of generator stator fire fighting envisages complete refurbishment of existing non-functional fire fighting scheme 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 a automatic and fast response to any kind of inferno in the Generator Stator section which includes earliest detection within a shortest possible time and initiation of action by release of CO ₂ to ensure minimum damage to the Stator in particular and also to control the fire in spreading in 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
b	Residual Life Assessment (RLA) of Stage IV Power Station	<p>Umiam-Umtru Stage-IV Power Station was commissioned in the year September-1992 with 2 (Two) units of 30MW each. With the growing demand of power it is necessary that healthiness of different part of the generating unit has to be maintained along with the different auxiliaries to enable the regular generation of the power from these generating units. Of late due to frequent running of the machine, most of the parts have deteriorated and forcing unit to be kept under shutdown for rectification. The most affected part are:-</p> <ol style="list-style-type: none"> 1. The runner, where heavy cavitations has occurred. 2. The gate mechanism, where cavitations of guide vane have occurred and cause heavy leakage of water. 3. The worn out of link mechanism of guide apparatus causing shutdown of units. 4. The shaft sleeve, where water leakage occurred frequently needing total shutdown of the station. 5. The leakage from the bypass valve and Pressure relief valve causing loss of water. 6. Frequent occurrence of rotor earth fault due aging and looseness of connecting part. 7. Water leakage from the cooler. 8. Water leakage from the main inlet valve system. <p>On many occasion, because of the above conditions, it was found that the generating unit has to be put under shutdown for rectification and this cause heavy loss of generation</p> <p>The generating units have been operating for almost 30 (Thirty) years and to enable the system to operate longer it is necessary to renovate and modernize the</p>

No.	Project Name	Description
		generating unit. The remaining life of the Power Station needs to be studied and assess so as to know the exact nature of the problem before the Renovation and modernization is carried out. The Expression of Interest (EOI) has been floated and four firms has responded and submitted their document against expression of interest (EOI) and evaluation of the credentials of the firms is in progress.

The estimated total expenditure for the above System Augmentation & Improvement projects is Rs. 38.05 crore.

Table 14 : Funding for Umiam Stage-IV System Augmentation & Improvement Projects

SI No.	Particulars	Project cost
1.	System Augmentation & Improvement Umiam Stage-IV	Rs.38.05 crore

3.3.5 Umtru HEP

Table 15 : System Augmentation &Improvement Projects- Umtru HE Project

SI No.	Particulars	Project cost
1	Residual Life Assessment (RLA) of Umtru HEP	Umtru H.E. Project was commissioned with three Units of 2.8 MW each in 1957 and the fourth Unit of 2.8 MW commissioned in 1968. It was the first Hydro Electric Project developed in the Umtru River Basins of Meghalaya. The station has outlived its life. During these years, the hydro-generating units are under shutdown. It is possible to revive the Generating Units by taking up Renovation, Modernization and Uprating (RM&U) activities However, before taking up RM&U the remaining life of the Station need to be assessed so as to know the exact nature of the problem. Presently, RLA wotks is being carried out by WAPCOS.
2	Renovation Modernization and Upgradation of Umtru Power Station.	Umtru H.E. Project was commissioned with three Units of 2.8 MW each in 1957 and the fourth Unit of 2.8 MW commissioned in 1968. It was the first Hydro Electric Project developed in the Umtru River Basins of Meghalaya. The station has outlived its life. During these years, the hydro-generating units are under shutdown. It is possible to revive the Generating Units by taking up Renovation, Modernization and Uprating (RM&U) activities

The above project is estimated to cost Rs. 110.50Cr.

Table 16 : Funding for Umtru HEP System Augmentation & Improvement Projects

SI No.	Particulars	Project cost
1.	Projects for Umtru HEP	Rs 110.50 Cr

3.3.6 Sonapani Mini Hydel Project

Sonapani Mini Power Station was an old power station which was 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.

Table 17 : System Augmentation &Improvement Projects- Sonapani Mini Hydel Project

SI No.	Particulars	Project cost
1	a) 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
	b) Relays and Cards to replace some existing defective ones and spares.	Most of the relays and cards are not functioning and spares also not available. Therefore it is proposed that Relays and Cards be procured to replace some existing defective ones and as spares
	c) Generator Circuit Breaker to replace the existing one.	The existing Generator Circuit Breaker is giving problem and requires frequent maintenance leading to force 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:

Table 18 : Project cost for Sonapani SHP System Augmentation & Improvement Projects

SI No.	Particulars	Project cost
1.	System Improvement projects	Rs0.34crs

3.3.7 Generation System Protection Division (GSPD)

Table 19 : System Augmentation &Improvement Projects- GSPD

SI No.	Particulars	Project cost
1	Procurement of Diagnostic Tools, Plant & Machineries for Generation system protection division	For Improvement of Generation System Protection and Communication System along with Diagnostic Tools and installation of Optical Fiber Cable Link at different Generating Stations.
2	Installation of OPGW for communication system between Stage III & Stage IV, Stage I & Stage II and Umtru-New Umtru Power Stations including all Fiber Optics terminal equipments.	The only existing communication system between various power stations is through PLCC. Considering the importance and relevance attached to the Power Generating Station it is mandatory to have an alternative and more reliable communication system through OPGW, besides considering the limitation of PLCC system. Moreover, availability of telemetry data of both analog and digital data of Power Stations can be improved considerably by use of OPGW. Further, the maintenance cost of OPGW is negligible.
3	Procurement of Online Oil Filtration Machine for all Generator Transformer under MePGCL	At present, whenever oil filtration of the Generator Transformer is required, shutdown of the affected Generator Transformer is mandatory to be taken and this result in huge generation loss since this type of work is time consuming and usually completed in days or weeks together, especially if the period is during monsoon season. Therefore, in order to avoid this type of shutdown for oil filtration, online oil filtration machine for all generator transformer is strongly recommended.
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	At present, the dam water level monitoring system of Stage III, Stage IV is not available. The actual levels at the dams are physically monitored at frequent intervals and then send by voice/sms communication to the relevant recipients. Hence there is an urgent need to have a reliable communication system of the dams water levels by installation of ADSS OFC and related equipments etc for the purpose.

The above project is estimated to cost Rs. 8.99 Cr.

Table 20 : Funding for Generation System Protection Division System Augmentation & Improvement Projects

SI No.	Particulars	Project cost
1.	Generation System Protection Division	Rs.8.99 Cr

3.3.8 Myntdu Leshka Hydro Electric Project (MLHEP)

For the Myntdu Leshka Hydro Electric Project, the following R&M works are being undertaken during the remaining control period:

3.3.8.1 Supply and erection of spare Generator Transformer 1Ø, 17.5 MVA, 132/33 KV with accessories for Leshka Power Station:

Myntdu Leshka Power Station is a generating station with three installed Units, where each unit is of capacity of 42 MW. The overall generating capacity of this station is (3 X 42 mw). Each unit of this generating station is provided with three single phase generator transformers.

In the event of failure 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 not reliable with the 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.

3.3.8.2 Replacement of Switchgear & Protection System for Leshka Power Station:

The existing switchgears in Leshka have often encountered with pole discrepancies problem due to which machines are often forced shutdown. This leads to unwanted loss of revenue and due to outage of the machine. It is therefore, considered that the existing switchgear be placed out with the new switchgears.

3.3.8.3 Replacement of Air coolers including accessories for Stator for all 3 Units for Myntdu Leshka Power Station:

MLHEP power station was commissioned in the year 2012. In these 8 years the generating station has been generating power during the peak season. As such the units in 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 cooling of the stator of the machine and its other accessories leading to disruption of generation. In order to avoid the occurrences of such events in the near future, replacement for air coolers are required.

3.3.8.4 Communication from Leshka Dam to Leshka Power House:

In order that optimum generation from MLHEP Stage – I PS can be achieved, effective monitoring in digital form of Dam level from Power House including Voice and Data communication is required between Myntdu Leshka Dam, BFV and Power Station.

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

Table 21 : Funding for MLHEP System Augmentation & Improvement Projects

SI No.	Particulars	Project cost
1.	System Improvement projects	Rs. 12.40crs

3.3.9 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 6th December, 2018 and the Commercial Operation Date declared on 1st March, 2019.

3.3.9.1 Replacement of Generator Transformer (with 3.3/33 KV, 2.5 MVA) including augmentation of Switchyard from 11 KV to 33 KV for Lakroh Power Station:

The present voltage evacuation from Lakroh is at 11 KV and this has been 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 MVA transformer including other switchyard accessories will be necessary.

3.3.9.2 Communication for Lakroh PS with SLDC:

Lakroh power station is a mini hydel project with a 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 station.

Table 22 : Funding for Lakroh MHP System Augmentation & Improvement Projects

SI No.	Particulars	Project cost
1.	System Improvement projects	Rs. 1.54crs

Commission's Analysis

Commission has observed that the CAPEX proposed against the existing stations for system augmentation and improvement approved in the Business plan dated 30.09.2020 remained the same in the Midterm Review petition except little revision in the CAPEX in the existing stations as detailed in the below table.

Table 23 : Revised CAPEX in the Midterm Review

SI No.	Station	CAPEX Approved in the Business Plan	CAPEX filed in the Midterm Review petition	(Rs.Cr)	
				Equity	Debt
1	Umiam Stage -I	77.56	70.99	63.90	7.10
2	Umiam Stage -IV	35.98	38.05	11.42	26.63
3	Leshka	16.31	12.40	11.17	1.25

The petitioner has submitted the CIP for Dam Rehabilitation and Improvement Project (DRIP- II&III) for Rs.441.00 Crore is now projected under upcoming projects separately analyzed.

The Project wise capital investment plan in respect of existing projects filed for Midterm Review is annexed in the summary of CAPEX of this order.

3.4 On – going projects

Petitioner's Submission

3.4.1 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 September, 2022. The revised cost of project is INR 507.71 crore.

Table 24 : Salient features of the Project

Project Location	West Garo Hills Dist., Meghalaya
Project Cost	INR 507.71 Crores
Installed Capacity	3x7.5 MW
Net Rated Head	148m
Dam	Concrete Gravity,98.10m long,35mhigh
Spillway	Gated Radial Sluice Spillway(3no.ofgates)
Intake	1no.with Vertical Fixed Wheel TypeGate
HeadraceTunnel	3.20mdia,1990 m long, D-Shaped
Surge Shaft	8m dia,47m height
Pressure Shaft	2.20mdia,708.90 m long
Power House	Surface
Turbines	Francis, Horizontal

Table 25 : 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%

3.4.2 Riangdo Small Hydro Project (3000KW)

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 17.92MU.

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

Table 26 : 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	2.52cumecs
Annual Energy	17.92Mu
Weir	58 m long, RCC, 1 Intake Gate
WCS	458 m long
Forebay	312.23Sq.m
Penstock	1x1100mm dia.,390 m long
Power-House	Surface,30mx12.5mx8m
Turbine	Francis, 3no
Tailrace	Rectangular,20mx2mx1.5m
Switchyard	1no.
Completion	3 years from date of commencement

Table 27 : Financial Details: Funding Pattern

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

Commission's Analysis

The MePGCL has submitted in the Midterm Review petition that the completion date rescheduled for Ganol Project SHP (3x7.5 MW) to September 2022 as against May 2022 considered in the Business plan approved on 30.09.2020.

Similarly the completion date of Riango (3 MW) projected as 3 years from the date of commencement. Petitioner has submitted that the land acquisition has been completed and tendering is under process.

Commission considers that the project execution of Riango has yet to be commenced.

3.5 Up-coming projects**Petitioner's Submission****3.5.1 DAM REHABILITATION AND IMPROVEMENT PROJECT, PHASE-II (DRIP-II)**

- a. Name of the Project: Dam Rehabilitation And Improvement Project, Phase-II
- b. Location: Meghalaya
- c. Cost: Rs. 441 Crore
- d. Source of funding:
 - 1. Government of India (World Bank Loan)
 - 2. Government of Meghalaya.

Objective of the Project: 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.

The MoWR, RD&GD, Govt. of India, has initiated the DRIP-II with the assistance of the World Bank. 4 (four) dams under MePGCL have been approved for rehabilitation under this project at an amount of Rs. 441 Cr. as follows:

Table 28 : Details dams to be taken up under DRIP-II

Sl.	Name of Dam	Amount (Rs. in Cr.)
1.	Umiam Stage-I Dams (Concrete Dam, Main Dyke & Road Dyke)	Rs. 215.45
2.	Umiam-Umtru Stage-III Concrete Dam	Rs. 73.10
3.	Umiam-Umtru Stage-IV Concrete Dam	Rs. 77.42
4.	MLHEP St-I Dam (in lieu of Nongmahir main dyke, UmiamUmtru Stage-III HEP)	Rs. 75.03
	Total	Rs. 441.00

Status of Works and expected date of completion

Loan Agreement signed on 4th August, 2021 between Gol and World Bank and Loan has been effective w.e.f. 12th October, 2021. At present, LOA for Hydro Mechanical package has been issued. The Tender process of the other packages is under progress.

The project is scheduled to be completed by 2027.

3.5.2 MYNTDU LESHKA STAGE-II HYDRO ELECTRIC PROJECT (Proposed Installed Capacity = 3x70MW)

INTRODUCTION:-

The proposed Myntdu Leshka Stage II Hydro Electric Project (3x70 MW) is located in the West Jaintia Hills District of Meghalaya is a run of river (ROR) Scheme downstream of existing MLHEP Stage-I (3x42 MW). The catchment area of MLHEP Stage-II is 480 Sq.Km including the catchment area of MLHEP Stage-I (350 Sq.Km).

The proposed Dam site of MLHEP -II is located near the Bataw village on the left Bank and Trangblang village on the right bank at a Longitude of 92° -13'-45" E and Latitude of 25° -13'-45" N downstream of confluence of river Myntdu with the river Lynriang and about 3km downstream of the tail race of MLHEP Stage-I.

The DPR of MLHEP-II is in an advance stage where most of the Aspects have been cleared by the CWC and CEA, the details are attached herewith. The remaining aspects such as Geological aspects, where compliance to the observations made by GSI, New Delhi on the Report submitted on the 3.6.2022 is under process by MePGCL. The compliance on Electro-Mechanical Aspects were furnished to CEA, New Delhi on the 14.9.2022 for vetting.

FUNDING FOR THE PROJECT:-

As approved by the State Level Screening Committee on 23.08.2021, the Project has been recommended for external assistance from ADB. The tentative total Project Cost is Rs. 2187.88 crore and the levellized tariff is Rs. 2.26 per unit.

Table 29: Financial Details

SI No	Name of Scheme	Project Start	Project Completion Date	Total Expenditure (Crore)
1	MyntduLeshka H E Project Stage-II	2023-24	2029-30	2187.88

SALIENT FEATURES:-

LOCATION

State	Meghalaya
District	West Jaintia Hills District
River	Myntdu

Annual Energy Potential

Energy Generated	605.64MU
Design Energy	593.04MU
Annual PLF	32.92%

DAM SITE.

Location.	Right Bank: Near Village Tangblang
	Left Bank: Near village Bataw
Latitude	25° 13' 17.45" N
Longitude	92° 13' 35.96" E
Nearest Airport	Shillong, Meghalaya
Nearest Rail Head	Guwahati (103 km from Shillong)

HYDROLOGY

Catchment area at dam site	480.00 Sq Km
Average annual runoff	2205.57 MCM
90% dependable annual runoff	1668.717 MCM
50% dependable annual runoff	2304.89 MCM

RESERVOIR

Full Reservoir Level (FRL)	EL 270.00 m
Maximum Water Level (MWL)	EL 270.00 m
Minimum Drawdown Level (MDDL)	EL 254.50m
Gross Storage at FRL	5.06 MCum
Live Storage	2.73MCum
Area under submergence at FRL	0.14 SqKm

DAM/ WEIR

Type	Concrete Gravity
Top elevation of dam	EL 272.00 m
River bed level	EL 226.00 m
Height of dam above river bed level upto Crest Level	27.40 m
Height of dam above river bed level	46 m

upto FRL	
Length of dam at top	216.00 m.
SPILLWAY	
Design flood (PMF)	10400 Cumecs
Type	Ogee
Crest Elevation	EL 240.5 m
Number of bays	7
Length of Spillway	140.00m
Energy dissipation	Ski-Jump Bucket
Gate Size (Radial)	7 Nos. x 8.0 m x 16.60 m
INTAKE	
Invert level	EL 242.5 m
Number	1
Gate Size	6.50Mx6.30M
HEAD RACE TUNNEL	
Number	1
Size	6.0 m dia
Shape	Modified Horse Shoe
Length	6175m
Design Discharge	97.29Cumecs
Maximum Discharge	107.02Cumecs
Slope	1:231
SURGE SHAFT	
Number	1
Type	Restricted orifice
Size	21.00m dia.
Height	69 m.
Latitude	25 ⁰ 10' 2.18" N
Longitude	92 ⁰ 13' 0.86" E
PRESSURE SHAFT	
Numbers	1 (Trifurcated into 3 of 3.09 m Ø)
Size	4.8 m dia.
Length	835 m
POWER HOUSE	
Type	Over ground
Latitude	25 ⁰ 9' 36.47" N
Longitude	92 ⁰ 12' 55.46" E
Size (Length x Breadth)	
(i) 53.20 m x 19.4 m	Machine hall
(ii) 20.00 m x 19.4 m	Service bay
(iii) 73.80 m x 8.50m	Control bay
Height of service bay/ generation level	16.20 m
Installed capacity	3 x 70 MW
Number of Units	3 Nos.
GIS Hall	73.80mx16m
Pot Head Yard (220KV)	83mx23.50m
TAILRACE	
Type	Open Channel

Length	175m
Size	7.0m
Bed Level	El. 6.0m
TURBINE	
Type of turbine	Francis turbine
Max Gross head	250.80 m
Min Gross head	231.80 m
Rated Head	239.17 m
Centre line of machine	13 m
Specific speed	123 rpm
Synchronous speed	375 rpm
GENERATOR	
Rated Output	70000 KW
Capacity Overload	77000 KW
Power Capacity Factor	0.85 lagging
Frequency	50 Hz
Rated Terminal Voltage	11 KV

Capital Expenditure (CAPEX)

The MLHEP Stage-II is an Upcoming project which is to be started in this control period i.e FY 2023-24. The following is the capital expenditure of the project:

Table 30: Capital Expenditure (CAPEX): Funding Pattern

SI No	Station	CAPEX (Rs. Crore)	Funding pattern (Rs. Crore)		
			Equity	Debt	Grant
1	Myntdu Leshka HE Project Stage-II	2187.88	180.51	388.97	1618.40

STATUS OF CLEARANCES FROM CW, CEA ETC

Date of MOA/ Consent of State Govt.	: 31/01/2017 – for S&I
	: 31/01/2018 – for Execution
Date of TOR from MoEF / State Govt.	: 07.12.18, valid upto 7.12.24

Sl. No.	Activities	Status of work completed
1	Topographical Survey	Completed
2	Hydrological/ Hydro meteorological Observations	In progress
3	Geological Survey	
	a) Drilling	Completed
	b) Drifting	99%
4	EIA/EMP Studies	78%

Consultation meeting and Clearances.

Date of First Consultation Meeting	: 19.10.2016
Date of Second Consultation Meeting	:

Sl. No.	Aspect			Comments by Agencies	Reply by Developer	Remarks
1.	Hydrology (CWC)			Cleared on 13.06.2017		Cleared No. 4/151/2016-Hyd (NE)/190 dt. 13.06.2017
2.	Power Potential Studies (CEA)			Cleared on 05.05.2021		Cleared EA-HY-12-33/3/2019-HPA Division dt. 05.05.2021
3.	Geological (GSI)			15.11.16	No. CE/C/HP&HC/T-25/Pt-X/2021/24 dt. 29.10.2021	Geological Chapter submitted to GSI, New Delhi on 29.10.2021
				2 nd observation on 09.03.2022		Reply submitted on 03.06.2022.
				3 rd observation on 18.07.2022		Reply being process
4	Foundation Engg. And Seismic (FE&SA-CWC)			Cleared on 11.03.2019		Cleared 2/88/2012-HCD(E&NE)/34 dt. 31.07.2019
5.	General layout & Planning	CWC	HCD	Cleared on 31.07.2019		Cleared
			CMDD	Cleared on 08.05.2019		Cleared
		CEA-HE&TD		12.10.2021	CE/C/HP&HC/T-61/PT-I/2021/113 dt 08.09.2021	Modification of Power Factor from 0.90 to 0.85 (written to Director HE&TD)
					No. CE/C/HP&HC/T-25/Pt-X/2021/38 dt. 17.12.2021	The updated E&M Chapter submitted to HE&TD, CEA.
				30.03.2022		Reply submitted to HE&TD on 07.06.2022
				18.07.2022		Observation received from HE&TD. Reply being process
6.	Construction material and Geotechnical (CSMRS)			Cleared on 04.02.2022		
7	Inter-State (ISM – CWC)			Cleared on 23.05.2019		Cleared No. T-85013(17)/1/2019-ISM-2/DTE/4972/2019 dt. 23.05.2019
8	International (MOJS)			Cleared on 20.10.2021 by Ministry of Jal Shakti, Govt. of India		
9	RoR/Storage (STC-CEA)			Cleared on 01.07.2019		Cleared
10	Ministry of Defence				In progress	To be taken up after clearances of other aspects of the DPR as instructed by Ministry of Power, vide letter No.F.NO.14-15/6/2015-H.I (225010) dt. 04.01.2022.
11	Ministry of Social Justice and Empowerment/Tribal Affairs				In progress	Power Department, Govt. of Meghalaya sent a reminder to Ministry of Social Justice and Empowerment/Tribal Affairs

				No.POWER-63/2010/225dt 01.12.2021
12.	Water availability	Cleared by Water Resources Dept. Govt. of Meghalaya vide letter No.WR(G)105/2019/5 dt. 08.01.2020		
13.	Ministry of environment, Forest and Climate change GOI		In progress	Work entrusted to M/S Envirolink for preparation of the EIA/EMP Report.
14	Funding	Cleared on 23.08.2021	Memo.Mo.PLR.99/2018/31-A dt. 08.09.2021	Cleared The State Level Screening Committee (SLSC) held on 23.08.2021 recommended the proposal for posing to DEA for external assistance from ADB. The project cost is Rs. 2187.88 Crores with levelised tariff of Rs. 2.26/unit.

3.5.3 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 33KV Sub-Station by Tapping on the existing Amlarem MLHEP-I33 KV 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 11.64crores.The breakup is as follows:

- | | |
|---|-----------------|
| i. Land | : Rs.3.459 Crs. |
| ii. Civil Infrastructure | : Rs.1.136 Crs |
| iii. Water Infrastructure | : Rs.0.682 Crs. |
| iv. Electrical Infrastructure (Power Evacuation | : Rs.4.13 Crs. |
| v. LAD | : Rs. 0.1 Crs. |

vi. Contingency	: Rs. 0.19 Crs.
vii. Development Cost	: Rs. 0.19 Crs
viii. GST	: Rs. 1.72 Crs

3.5.4 Umshamphu SHP (2x2000 KW)

The Project site is at Shkentalang village (Near Jarain) on Jowai-Amlarem-Dawki Road (NH40E) 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 2000 KW) is INR 62.32 crore.

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.

3.5.5 Amkshar 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 68.94 crore.

3.5.6 Umrina Stage-I SHP Project

For generating power from the first stage of the Umrina river, a drop of about 129.00m from the proposed Weir site and Power house can be utilized 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 (3 x 2000 KW). The project cost is estimated at INR 90.46 crore.

Commission Analysis

The Petitioner MePGCL has submitted the project wise action plan for upcoming projects at an investment of RS.2862 Crore which includes Rs.11.64 Crore for development of 20

MW solar parks in Thamar and Suchen of Meghalaya State.

The petitioner has submitted a sum of Rs.1938.32 Crore to be funded as Grant for implementation of the upcoming projects during the control period.

3.6 Survey & Investigation projects

Petitioner's Submission

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 6 (six) nos. of projects above 25 MW under Survey & Investigation works under MePGCL; namely, Umngot HEP, MLHEP-II, Umngi HEP, Mawblei HEP, Selim HEP and Nongkohlait HEP.

3.6.1 UMNGOT HYDRO ELECTRIC PROJECT (3X70MW)

The Survey and Investigation works of the Umngot HEP are being worked out in depth on the different possible alternatives after the sanctioned amount of Rs. 430.78 Lakhs from North Eastern Council (NEC) was approved. The Project was sanctioned with 90% grant by the North Eastern Council (NEC) vide letter No. NEC/IRGN/ANP/Megh/2k/2/1699 dated: 26th October, 2006 and 10% State Share loan. The works were carried out by the Office of the Executive Engineer, Investigation Division-I, MePGCL erstwhile MeSEB under the supervision of the Chief Engineer, MePGCL, Shillong. The estimate was again revised for an estimated amount of Rs. 859.29 lakhs (Gross) and Rs. 833.99 lakhs (Net) and the same was sanctioned by NEC for an amount of Rs. 835.00 lakhs by NEC vide Letter no. NEC/IRGN/ANP/MEGH/2K/2/Vol I / dated 14th March 2018.

The Umngot H.E. Project as conceived by the Meghalaya Energy Corporation Limited, envisages a storage scheme (within the year storage) for generation of peak power with the setting up of a 3x70 MW power station on the river Umngot, a south flowing river which flows into Bangladesh. The Umngot reservoir drains a catchment of 304 Sq.Km up to the dam site. The project is intended to ease the acute shortage of peak power in the state during lean season.

The project consists of a 111 metres high concrete dam with a length of 362 metres across river Umngot to impound 71.31 MCum of water. An Intake will lead the water from the reservoir to a 3.40m diameter low pressure tunnel of length 5.646 Km and a 2.5m diameter steel lined pressure shaft of length 2.209 Km will then carry the water to three Pelton turbines of 70 MW capacity each in a surface Power House of length 107.5m

and width 22m for generation of 210 MW of peak power. The water after discharging from the turbines will be led through three tail race tunnel of 3.78m dia and 41m length which will join into the main rectangular Tail Race channel of 111m length x 6.6m width x 2.8m depth which discharges the tail water into the river Umngot again. A restricted orifice surge shaft which opens into the atmosphere at the top of 12 m diameter and 68.10 m height will be placed at the junction of HRT and pressure shaft for releasing the pressure due to water hammer.

The Umngot H.E. Project contributes an annual design energy of 705.54 GWh in a 90% dependable Year at an economically attractive levelised tariff. The project may be taken up immediately to meet the power requirements in the state. The Project can be implemented in a period of 72 months.

3.6.2 MYNTDU- LESHKA STAGE II HYDRO ELECTRIC PROJECT, WEST AND EAST JAINTIA HILLS DISTRICT, MEGHALAYA.

The Survey and Investigation works including DPR preparation of the MLHEP-II was started in the year 2006 with a sanctioned by NEC for an amount of Rs. 293.75 lakhs (Gross) and Rs. 268.37 lakhs (Net). This Project was funded by NEC with 90% grant and 10% State share loan. The MeECL, erstwhile MeSEB, had sign an MOU with the Central Water Commission (CWC) to carry out this particular assignment for a period of 3years. The CWC during the course of Survey and Investigation works had asked for a revised estimate of Rs. 455.62 lakhs (Gross) and Rs. 447.35lakhs (Net) and the same was sanctioned by NEC for an amount of Rs. 359.42 lakhs by NEC vide Letter no NEC/IRGN/ANP/MEGH/2K/2/Vol I / 890 -915 dated 23rd March 2010. The Survey & Investigation works like Topographical, Hydro-meteorological, and Construction material survey were completed by the Central water Commission (CWC) and the Interim report of the project was submitted to MeECL. On Geo-technical and Sub-surface investigation works, these were mainly carried out by MePGCL. However due to financial constraint by MePGCL, CWC could not carry further than survey and investigation works. Then, it was mutually agreed by MePGCL and CWC to end the contract with CWC and MePGCL will have to complete the remaining works. Also, the data that are available with CWC will be handed over to MePGCL. On handing over of the works to MePGCL, The estimate was again revised for an estimated amount of Rs. 973.59 lakhs (Gross) and Rs. 960.19 lakhs (Net) and the same was sanctioned by NEC for an amount of Rs. 960.00 lakhs by NEC vide

Letter no NEC/IRGN/ANP/MEGH/2K/2/Vol s- I / dated 24th March 2018.

The Myntdu Leshka Stage-II Hydro Electric project located in West & East 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 249.47m.

The project with a proposed installation of 210 MW (3 x 70 MW) would afford an annual energy generation 613.80 MU in a 90% dependable year. The diversion site is located at Latitude 25°13'45"N, Longitude 92°13'45"E near village Trangblang D/s of the Myntdu Leshka Stage-I Hydro Electric Project. The Dam is located at a distance of 113 km from Shillong via Jowai in West Jaintia Hills District of Meghalaya State. The nearest rail head is located at Guwahati (103 Km from Shillong) and the nearest Airport is at Shillong/Guwahati.

The Myntdu Leshka Stage- II Hydro Electric Project envisages construction of:

- A 44.0m high concrete gravity dam across the River Myntdu to provide a Live Storage of 2.73MCum with FRL at EL 270.0m and MDDL at EL 254.50m
- A 6.164km long and 6.0m dia head race tunnel terminating in a surge shaft
- A 72m high, 21 m dia surge shaft
- A 837 m long, 4.8m dia pressure shaft
- A Surface power house having an installation of 3 Francis Turbine driven generating unit of 70 MW each operating under a rated head of 228.28m; and
- Tail water level at an elevation of 13m to release water back to the river.

Myntdu Leshka Stage-II HEP involves simple civil works and could be completed in 6 years. The project would afford design energy of 603.72 MU.

3.6.3 UMNGI STAGE I (REVISED) HYDRO ELECTRIC PROJECT (2 x 31 MW)

The Survey and Investigation works including DPR preparation of the Umngi HEP was started in the year 2014 with a sanctioned by North Eastern Council (NEC) for an amount of Rs. 500.22 lakhs (Gross) and Rs. 500.00 lakhs (Net) vide letter no.NEC/IRGN/Megh/2k/7 dated 05th March 2014 and 10% State Share loan. The works were carried out by the office of the Executive Engineer, Investigation Division-I, MePGCL erstwhile MeSEB under the supervision of the Chief Engineer, MePGCL, Shillong.

Initially, Pre-Feasibility Report on the development of Hydro Projects of Umngi Basin was carried out by M/S WAPCOS in 2004. Recently, the Investigation Division-I & Design Division -I, MePGCL, has carried out the studies of Umngi Storage Stage-I HE Project as

per the site proposed by WAPCOS and found that the project is not feasible and viable. Due to the unfeasibility of the Umngi Stage I HE project, new diversion site has been proposed which is about 6.75Km downstream from the existing site.

The Umngi Hydroelectric Project located in East and West Khasi Hills District of Meghalaya State envisages utilization of the waters of the river Umngi, a tributary of Jadukata River for power generation on storage type development, harnessing a head of about 525.0m. The project with a proposed installation of 62MW (2x31MW) would afford an annual energy generation of 276.42 MU in a 90% dependable year. The diversion site is located at Latitude 25°23'15"N; Longitude 91°32'45.57"E. The dam site is located at a distance of 55.0 Km from Shillong and is approachable from Shillong by road via Mawphlang highway. The nearest rail head is located at Guwahati in Assam (103km from Shillong) and nearest airport is located at Shillong.

The river Umngi drains a catchment of area of about 191.0 sq km at the proposed dam site. The water availability considered in the power potential studies is based on the observed data w.e.f 1999-2014. The Umngi Stage-I Revised is proposed to be a storage scheme Project, with a view to utilize its storage in a cascading manner to achieve power benefits and thus enhanced the power potential in all the 3(three) downstream projects. The release from Umngi St-I HEP is further utilize in the power potential study of Nongkhlait HEP. Thus the regulated discharge of the project at the upstream and its own discharge has been considered in the studies of power potential of the immediate project.

3.6.4 SELIM HEP (2 X 40 MW)

The survey and investigation of the proposed Selim HE Project was initially carried out as per the details provided in the Preliminary Feasibility Report where the dam site was located (at Shkamynkjai) at 25°21'41"N and 92°11'30"E near the village Umsalang (mistaken as Selim) on the right bank of the river.

Fixing of the Dam Axis and the location of the Intake were carried out jointly with the officials of the GSI,EGD,NER, Shillong after which detailed topographical survey of the dam area, the reservoir area, the alignment of the Water Conductor System and the Power House area was carried out with reference to the proposed height of the dam of 77m as given in the PFR. The actual reduced levels were being established simultaneously at the dam site by carrying out fly-levels from a GTS benchmark located at Jowai which is about 30 Km away

Particulars	As per PFR	Alternative-I		Alternative -II
		Stage-I	Stage-II (Final)	Combined
Catchment area (Sq.Km)	174.00	147.00	170.803	147.00
Dam Location	Downstream of Rynji Fall	Upstream of Rynji Fall	As per PFR (downstream of Rynji Fall)	Upstream of Rynji Fall
Installed Capacity	2 x 85 MW	2 x 11 MW	2 x 40 MW	2 x 42.50 MW
FRL(m)	1210	1200	1103.50	1200
MDDL(m)	1191.00	1189.60	1093.50	1194.35
Power House Location	PFR (left bank)	Right Bank	As per PFRR (left bank)	As per PFR (left bank)
Annual Energy (MU)	534.68	73.44	273.52	286.64
		347.00		

In order to arrive at an optimum viable option, studies were made by adopting the following Alternatives

The Standing Technical Committee (STC), CEA in its Tenth meeting held on the 11th June, 2015 at the office of the CEA, Sewa Bhawan, R.R. Puram, New Delhi made a decision to allow conversion of Selim HEP from Storage to ROR and allowed the development of the project in line with Stage-II of Alternative-I .

3.6.5 MAWBLEI HYDRO ELECTRIC PROJECT (2 X 38 MW)

The Mawblei H.E.Project envisages utilization of the waters of Wahblei river for generation of hydel Power. Wahblei is a tributary of Kynshi river, a south flowing river which flows into Bangladesh.

The Mawblei H.E.Project is a storage type development/scheme with the setting up of a 2x38 MW power station. It is located in Mawshynrut C & RD Block, West Khasi Hills District of Meghalaya where the dam site is located at latitude 25° - 31' – 36.96" N and longitude 91° –02' – 14.40" E near Nongmawlong and Nongpyndeng mawlieh villages on the Right and Left bank respectively.

The length of the dam at the proposed height and location as per PFR studies was found to be 1035 m long. This would entail a huge structure to be constructed. This site was also found to be not suitable from geological considerations. After a detailed survey of the area, the site at about 900 meter downstream was found suitable for locating the dam and other hydraulic components of the project.

With the objective to arrive at an optimum viable option, the following Alternative project layouts scenarios have been considered for survey and investigation.

Alt-I: An underground powerhouse with pressure shaft

Alt-II: Surface power house with pressure shaft

Alt-III: Surface power house with surface penstock.

SCOPE OF WORKS

The Mawblei HE project envisages construction of:

- 36.37 m high concrete Gravity dam across the River wahblei to provide a live storage of 20.61 M.cum with FRL at EL 762.00 m and MDDL at 750.80 m; with a Tail Race channel to drain back to water to the river.
- 3.813 Km long and 3.00 m Φ Head Race Tunnel terminating at a surge shaft
- 59.00 m high 15.0 m Φ Surge Shaft.
- 2.997 km long, 2.25 m Φ pressure shaft.
- Surface Power House having an installation of 2 Pelton Turbine driven generating units of 37.5 MW each operating under a rated head of about 367.34 m

3.6.6 NONGKOLAIT H.E PROJECT (2 X 60 MW)

The proposed Nongkhlait Hydro Electric Project envisages utilization of the waters of the Umngi river for power generation on a run –of- the river (ROR) type development. The damsite is located at Latitude 25020'23" N and Longitude 91032'18" E.

The project with a proposed installation of 120MW (2X60MW) would afford an annual energy generation of 385.24 Gwh considering upstream Umngi HE project and 332.87 based on natural inflow without Umngi HE Project in a 90% dependable year. The project envisages construction of 43m high concrete gravity dam above the deepest foundation level across river Umngi to provide a live storage of 0.46m cum with FRL at 880m and MDDL at 871m, 5.32Km long and 3.5dia D-shaped Head Race Tunnel terminating in a Surge Shaft of 57m high 10m, 655m long and 2.70m dia penstock. The Power House has been proposed as underground having an installation of 2 vertical axes Pelton driven generating units of 60MW each operating under a rated head of 463m and 923m long tail race tunnel to carry the power house releases back to the river.

The Optimization Study of Umngi Basin carried by MePGCL indicated that the Nongkhlait HEP as per the layout/proposal at the PFR stage may not be feasible wherein Revised Planning is required.

The estimated total expenditure for S&I works for projects above 25MW is Rs 44.82 crore, the break-up of which is given in the table below:

Table 31 : Details of Survey & Investigation Costs

SI No.	Particulars	Project cost (Rs Cr)
1	Umngot HEP	8.36
2	Leshka - II HEP	9.6
3	Umngi HEP	5.00
4	Selim HEP (2x48 MW)	7.92
5	Mawblei HEP (2x38 MW)	8.92
6	Nongkohlait HEP (2x31 MW)	5.02
	Total S&I Works (above 25 MW)	44.82

Commission's Analysis

Petitioner has submitted that there are six (6) projects of above 25 MW under survey and investigation works.

The Survey and Investigation works are required & envisaged a storage scheme intended to ease the acute shortage of peak power in the state during lean season.

The capital investment proposed at Rs.44.82 Crore includes Rs.40.33 Crore as Capital Subsidy/Grant and Rs.4.48 Crore to be met as loan.

3.7 Fund Requirement& Capitalization for the Control Period**Petitioner's Submission**

Within Meghalaya, the objective of the schemes is to revitalize the power sector 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 the remaining control period.

Table 32 : Fund Requirement for MePGCL Works

Sl. No.	Category	FY 2022-23	FY 2023-24	Total
1	Existing Plants	104.96	258.34	363.3
2	Ongoing	67.13	4.99	72.12
3	Upcoming Plants/Solar Parks	115.805	213.53	329.33
4	Investigation Survey (above 25 MW)	8.21	3.51	11.72
	Total Fund Requirement (Generation)	296.105	480.37	776.47

Some of the schemes under implementation are scheduled to complete in the remaining control period. The same will add to existing asset base of MePGCL. The details of expected capitalization for the remaining control period is given below:

Table 33 : Expected Capitalization in the Control Period

(Rs Cr)

Sl. No.	Category	FY 2022-23	FY 2023-24	Total
1	Existing Plants	8.91	19.93	28.84
2	Ongoing & Upcoming Plants/Solar Parks	-	541.70	541.70
	Total Capitalization (Generation)	8.91	561.63	570.54

Commission's Analysis

Commission considers that Capital investment plan approved for 3rd MYT Control period FY 2021-22 to FY 2023-24 is half the way. The petitioner intends to execute the projects contemplated to revitalize the power sector to achieve sustainable development in the state of Meghalaya.

Petitioner proposed fund requirement for MePGCL works for the balance control period of FY 2022-23 and FY 2023-24 and Capitalization projected in the above table is approved at Rs.570.54 Crore.

3.8 Summary of Capital Expenditure (CAPEX)**Petitioner's Submission**

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 34 : CAPEX-Station wise summary

Sl No	Station	CAPEX	Funding Pattern (Rs. Cr)		
		(Rs. Cr)	Equity	Debt	Grant
Existing Stations					
1	Umiam Stage-I	70.99	63.90	7.10	
2	Umiam Stage-II	21.11	19.00	2.11	
3	Umaim Stage-III	410.77	92.51	33.95	284.33
4	Umaim Stage-IV	38.05	11.42	26.63	
5	Umtru HEP	110.50	33.15	77.35	
6	Sonapani	0.34	0.103	0.238	
7	GSPD	8.99	2.69	6.30	
8	Leshka	12.40	11.17	1.25	
9	Lakroh MHP	1.54	1.39	0.15	
	Sub-Total	674.69	235.33	155.08	284.33
On-going projects					
1	Ganol SHP	507.71	54.62	223.10	229.98
2	Riangdo SHP	33.99	2.59	11.40	20.00
	Sub-Total	541.70	57.21	234.50	249.98
Projects under Survey & Investigation					
1	Umngot HEP	8.35		0.835	7.515
2	Leshka HEP-II	9.60		0.96	8.64
3	Umngi HEP	5.0		0.50	4.50

4	Selim HEP	7.92		0.792	7.128
5	Mawblei HEP	8.92		0.892	8.028
6	Nongkohlait HEP	5.02		0.502	4.518
	Sub-Total	44.81		4.48	40.329
Up-coming plants					
1	Dam Rehabilitation Improvement Projects (DRIP) Phase II&III	441	123.48		317.52
2	MyntduLeshka Stage-II HE Project	2187.88	180.51	388.97	1618.40
3	Implementation of Solar power parks	11.64	9.24		2.4
4	Umrina SHP	90.46	25.33	65.13	
5	Amkshar SHP	68.94	19.30	49.64	
6	Umshamphu SHP	62.32	17.45	44.87	
	Sub-Total	2862	375.3	548.6	1938.32
Grand Total		4123	667.9	942.7	2512.96

Commission's Analysis

Commission considers revised CAPEX proposed for the third MYT Control period FY 2021-22 to FY 2023-24 projected vide table no. 33 of the petition.

MePGCL shall ensure to implement capital investment plan by obtaining capital subsidy/Grant and complete the works during the rest of the control period as per the schedule projected in the petition.

3.9 Detailed Mid Term Review of Investment Plan as per MSERC Formats

Petitioner's Submission

The detailed Capital Expenditure plan for the remaining control period is provided as Annexure- A as per prescribed format of MSERC vide MYT Regulations, 2014. The WCIP includes the ongoing and proposed works under different schemes, total project cost, start and end date of completion of works and its funding pattern.

MePGCL submits before the Hon'ble Commission to kindly approve the Mid Term Review of Investment Plan for the control period FY 2021-22 to FY 2023-24.

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 (Rs.Crs)	Project Outlay in FY 2020-21 (projected) In Crs	Project Outlay inFY 2021-22 (projected) In Crs	Project Outlay in FY 2022-23 (projected) In Crs	Project Outlay in FY 2023-24 (projected)In Crs	Equity Component	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 Completion Date (DD-MM-YY)							Debt Component		Capital/Subsidies/ grant components
											Loan 1	Loan 1	
A	Umiam Stage I Power Station												
1	Replacement of Two penstock butterfly Valve including By-pass valve along with all servo mechanism and related control system.	c	April'23	Mar'24	6.14				6.14	5.53	0.61	GoME	
2	Re-engineering of fire fighting system of Generator and Transformer	c	April'23	Mar'24	0.09				0.09	0.08	0.01	GoME	PSDF phase 2
3	Replacement of transformer for Unit-1, Unit-2 and Unit-4.	c	April'23	Mar'24	8.73				8.73	7.86	0.87	GoME	
4	Construction of Transformer Yard to accomodate 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	GoME	

5	Construction of Beams and By-pass Isolators for KPS-1, KPS-2 & Umiam feeders.	c	April'23	Mar'24	0.49				0.49	0.44	0.05	GoME	
6	132 KV SF6 Circuit Breaker (Spare)	c	Sept'22	Mar'24	0.36			0.18	0.18	0.32	0.04	GoME	PSDF phase 2
7	Complete Installation of SCADA including Hardware and Software	e	Jan'23	Mar'24	18.12			1.81	16.31	16.31	1.81	GoME	PSDF phase 2
8	Replacement of Governor and AVR system.	c	April'23	Mar'24	33.2				33.2	29.88	3.32	GOME	PSDF phase 2
9	Replacement of Generator Stator Air Cooler for three Units	c	April'23	Mar'24	3.51				3.51	3.16	0.35	GOME	PSDF phase 2
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'23	July'23	8.99				8.99	8.09	0.9	GoME	PSDF phase 2
2	Emulsifier system for Generator Transformer in both Units.	b	April'23	Mar-24	0.1				0.1	0.09	0.01	GoME	
3	Installation of On Line Supervisory system (SCADA) for the entire Power Station	e	Apr-23	Mar-24	9.06				9.06	8.15	0.91	GoME	
4	Replacement of 11 KV Switchgear Panel	c	Apr-23	Mar-24	2.72				2.72	2.45	0.27	GoME	PSDF phase 2
5	132 KV SF6 Circuit Breaker (Spare)	c	Sept'22	Oct'23	0.24			0.12	0.12	0.22	0.02	GoME	PSDF phase 2
C	Umiam Stage III Power Station												
1	Renovation Modernisation and Upgradation of Umiam Stage III HEPP.	c	Jan'21	April'26	407.4		4.123	87.62	97.46	91.5	31.57	JICA	284.33

2	Re-Engineering of 132 KV BUS.	c	Apr-23	Mar-24	1.5				1.5	0.45	1.05	GoME	
3	Construction of 33 KV Bus and Bay for Outside source power supply from the existing 132/33 KV 10 MVA Transformer	C	Apr-23	Mar-24	1.87				1.87	0.56	1.31	GoME	
D	Umiam Umtru Stage IV Power Station.												
1	Automation and monitoring of MIV of the Generating units	c	Apr-23	Mar-24	1.06				1.06	0.32	0.74	GoME	
2	1.Overhauling and replacement of damaged parts of Unit-II 2. Procurement of excitation transformer	c	June'22	Feb'23	5.04			2.24	2.8	1.51	3.53	GoME	
3	Online Vibration monitoring of Generating Units	c	Apr-23	Mar'24	0.5				0.5	0.15	0.35	GoME	
4	Dedicated and reliable Outside Souce power supply from 132 KV Bus.	c	Apr-23	Mar-24	2.79				2.79	0.84	1.95	GoME	
5	Telecommunication and Internet Facility	e	Apr-23	Mar-24	0.24				0.24	0.07	0.17	GoME	
6	Supervisory Control System	e	Apr-23	Mar-24	8.73				8.73	2.62	6.11	GoME	
7	Procurement of Spare Runner	c	Apr-23	Mar-24	6.5				6.5	1.95	4.55	GoME	
8	Refurbishment of Stator winding of Unit 1	c	Sep-20	Jun-22	8.91			0.59	5.38	2.67	6.24	O&M	
9	Hydraulic Power Pack with Control Panel for Butterfly Valve	C	Aug-22	Mar-23	0.8			0.8		0.24	0.56	GoME	
10	Installation of Fire fighting Scheme for Generator Stators	c	Aug-22	Mar-23	0.36			0.36		0.11	0.25	GoME	
11	Residual Life Assessment (RLA) of Stage IV Power Station	e	Nov-22	Dec-23	3.12			0.78	2.34	0.94	2.18	GoME	

E	Umtru Power Station												
1	Residual Life Assessment (RLA) of Umtru HEP	c	Aug'21	Apr'23	0.5		0.24	0.26		0.15	0.35		
2	Renovation Modernisation and Upgradation of Umtru Power Station.	b	April'23	Mar'26	110				25	33	77	GoME	
F	Sonapani Mini Hydro Power Plant												
1	a) Procurement and Installation of 415V 3 Ph LT panel. b) Relays and Cards to replace some existing defective ones and spares. c) Generator Circuit Breaker to replace the existing one.	b	April'23	Aug-24	0.34				0.34	0.102	0.238	GoME	
G	Generation System Protection Division												
1	Procurement of Diagnostic Tools, Plant & Machineries for Generation system protection division	b	July'22	Aug'23	2.51			1.51	1	0.75	1.76	GoME	PSDF phase 2
2	Installation of OPGW for communication system between Stage III & Stage IV, Stage I & Stage II and Umtru-New Umtru Power Station including all Fiber Optics terminal equipments.	b	Jan'23	Mar'24	3.19			1.19	1	0.96	2.23	GoME	PSDF phase 3
3	Procurement of Online Oil Filtration Machine for all Generator Transformer under MePGCL	c	Jan'23	Dec'24	2.11			1	1.11	0.63	1.48	GoME	PSDF phase 4

4	Installation of ADSS OFC for communication system (Dam Water Level monitoring) of Stage-3, Stage-4 and Leshka power stations including all Transducers, Converter, Fibre Optic Terminal Equipments and all associated accessories	b	Jan'23	Mar'24	1.18			0.5	0.68	0.35	0.83	GoME	PSDF phase 5
H	Myntdu Leshka Stage-I Power Station, MePGCL, Shillong												
1	Supply and erection of spare Generator Transformer 1-Phase, 17.5 MVA, 132/33 KV with accessories for Leshka Power Station		22-Nov	23-Nov	1.25		0.44	0.81		1.13	0.13		FI
2	Replacement of Switchgear & Protection System for Leshka Power Station		22-Jun	24-Sep	10			3.5	6.5	9	1		FI
3	Communication from Leshka Dam to Leshka Power House		22-Dec	23-Jul	0.35		0.12	0.23		0.32	0.04		FI
4	Replacement of Air Coolers including accessories for Stator for all 3 units for Leshka Power Station		22-Oct	24-Apr	0.8			0.64	0.16	0.72	0.08		FI
I	Lakroh Mini Hydel Power Station												
1	Replacement of Generator Transformer (with 3.3/33 KV, 2.5 MVA) including augmentation of Switchyard from 11KV to 33 KV for Lakroh PS		22-Nov	23-Oct	1.14		0.4	0.74		1.03	0.11		FI
2	Communication for Lakroh PS with SLDC		23-Mar	23-Nov	0.4	0.06	0.26	0.08		0.36	0.04		FI

b) Ongoing & Upcoming Plants/Solar Parks

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.	Equity Component	Source of financing for the scheme				
	Name of the Scheme	Whether the scheme is part of Approved Business Plan (Yes/NO)	Nature of Project (Select Appropriate Code from below)	Project Start (DD-MM-YY)	Project Completion Date (DD-MM-YY)							Debt Component				Capital/Subsidies/Grant Component (in INR Cr.)
												Loan Amount (INR Cr.)	Loan Source	Loan 1	Loan 2	
1	Ganol-1	Yes	a	01.07. 2014	Feb. 2023	507.71	80	150	55.13		54.62	100	123.1	FI	FI	229.98
2	Riangdo	Yes	a	12.05. 2020	May, 2023	33.99	7	10	12	4.99	2.59	11. 40		FI		20 .00
3	Dam Rehabilitation and Improvement Project (DRIP): Phase 2 and 3	yes	b	2020- 21	2026- 27	441	22.0 5	69.8 25	69.825	69.825	123.48				World bank	317.52
4	MyntduLeshka Stage-II HE Project	yes	a	2023- 24	2029- 30	2187.8 8				70	180.51	388.97		ADB		1618.4 0
5	Solar Park (10MW) each in Suchen and Thamar	Yes	a			11.64			1.64	7.19	9.24					2.4
6	Umrina Stage-I Small Hydro Project(3x 2000KW)	No	a	2022- 2023	2025-26	90.46		9.05	18.09	27.14	25.33	65.13		State Govt.		
7	Umshamphu Small Hydro Project (2x2000KW)	No	a	2022- 2023	2025-26	62.32		6.23	12.46	18.7	17.45	44.87		State Govt.		
8	Amkshar Stage-I Small Hydro Project (2x2250KW)	No	a	2022- 2023	2025- 26	68.94		6.89	13.79	20.68	19.3	49.64		State Govt.		

NB: The work for replacement of Intake gate and Trash Rack of Intake structure at Umiam Stage-I HEP is to be removed as it is included in this DRIP works.

d) Survey & Investigation projects

Sl. No	Project Details			Total Expenditure project (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)	Equity Component	Source of Financing for the Scheme					
	New H.E. Project Details									Debt Component				Capital Subsidies/Grant component (INR Cr.)	Consumer Contribution Component
										Name of the Scheme	Project Start (DD-MM-YY)	Project Completion (DD-MM-YY)	Loan Amount (INR Cr)		
Loan 1	Loan 2	Loan 1	Loan 2												
1	Umngot (3x70MW)	Nov, 2006	2020-21	8.35	2.37	0.45	2.62	2.91		0.835		State Govt		7.515	
2	MLHEP-II(3x70MW)	Nov, 2006	2021-23	9.6	4.86					0.96		State Govt		8.64	
3	Umngi (2 x 27 MW)	March, 2014	2020-21	5	0.2	0.08	4.09	0.6		0.5		State Govt		4.5	
4	Selim HEP (2x48 MW)	March, 2008	2021-23	7.92	1.18	0.68	0.50			0.792		State Govt		7.128	
5	Mawblei HEP (2x37.5 MW)	Jan, 2009	2021-23	8.92	1.93	0.95	1.00			0.892		State Govt		8.028	
6	Nongkohlait HEP (2x 60 MW)	March, 2014	2020-21	5.02	0.05					0.502		State Govt		4.518	

Commission's Analysis

Commission considers the revised capital investment plan along with capitalization proposed during the rest of the control period FY 2022-23 and FY 2023-24 filed by petitioner.

MePGCL shall ensure start date and completion date as projected for the control period, while capitalization of the works which envisages returns anticipated may be expedited.

The Midterm Review petition for approval of the Business plan for rest of the control period FY 2022-23 and FY 2023-24 Stands Disposed off.

Sd/-

Member

Shri. Roland Keishing

Sd/-

Chairman

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