BEFORE

MEGHALAYA STATE ELECTRICITY REGULATORY COMMISSION,

SHILLONG

PETITION

FOR

APPROVAL OF
BUSINESS PLAN FOR
FY 2015-16 TO FY 2017-18

FILED BY

MEGHALAYA POWER GENERATION CORPORATION LTD.

Lum Jingshai, Short Round Road, Shillong - 793 001

BEFORE THE HON'BLE MEGHALAYA STATE ELECTRICITY REGULATORY COMMISSION

FILE / PETITION NO……

IN THE MATTER OF

APPROVAL OF BUSINESS PLAN FOR THE CONTROL PERIOD FOR FINANCIAL YEARS 2015-16, 2016-17 & 2017-18 OF THE MEGHALAYA POWER GENERATION CORPORATION LIMITED (MePGCL) UNDER REGULATION 8 OF THE MEGHALAYA STATE ELECTRICITY REGULATORY COMMISSION (MULTI YEAR TARIFF) REGULATIONS, 2014.

AND IN THE MATTER OF

MEGHALAYA POWER GENERATION CORPORATION LIMITED; LUMJINGSHAI, SHILLONG – 793001, MEGHALAYA

PETITIONER

IT IS RESPECTFULLY SUBMITTED BY THE PETITIONER THAT:

1. In exercising its powers conferred under the section 131 and 133 of the Electricity Act 2003, the State Government of Meghalaya notified "The Meghalaya Power Sector Reforms Transfer Scheme 2010" on 31st March 2010 leading to restructuring and unbundling of erstwhile Meghalaya State Electricity Board (MeSEB) into four entities namely (i) Meghalaya Energy Corporation Limited (MeECL), the Holding Company; (ii) Meghalaya Power Distribution Corporation Limited (MePDCL), the Distribution Utility; (iii) Meghalaya Power Generation Corporation Limited (MePGCL), the Generation Utility; & (iv) Meghalaya Power Transmission Corporation Limited (MePTCL), the Transmission Utility. However, the holding company - MeECL carried out the functions of distribution, generation and transmission utilities from 1st April 2010 to 31st March 2012. Therefore, through notification dated 31st March 2012, State Government notified an amendment to The Power Sector Reforms Transfer Scheme leading to effective unbundling of MeECL into MeECL (Holding Company), MePDCL (Distribution Utility), MePGCL (Generation utility) and MePTCL (Transmission Utility) from 1st April 2012 onwards.

2. MePGCL has begun segregated commercial operations as an independent entity from 1st April 2013 onwards. The Meghalaya State Electricity Regulatory Commission (MSERC, hereinafter referred to as "The Hon'ble Commission") has determined the segregated Aggregate Revenue Requirement (ARR) and tariffs for MePGCL for FY 2013-14 and FY 2014-15 in accordance with Meghalaya State Electricity Regulatory Commission (Terms and Conditions for Determination of Tariff) Regulations, 2011.

3. The petition for determination of ARR and Business Plan for the Control Period (FY 2015-16 to FY 2017-18) was filed in accordance with The Meghalaya State Electricity Regulatory Commission (Multi Year Tariff) Regulations, 2014 (hereinafter referred to as

"MYT Regulations, 2014") which have been notified by the Hon'ble Commission on 15th September 2014.

4. The Hon'ble Commission after scrutiny, detailed examination and on completion of procedures passed the Order dated 30.03.2015 on ARR for Multi Year Tariff of FY 2015-16 to FY 2017-18.

5. The Hon'ble Commission in its Tariff Order directed MePGCL to submit Investment Plan for the control period by 30.08.2015. The plan should be accompanied with Detailed Project Reports (DPR), investment agreements, approval from appropriate authority and details of the project with cost benefit analysis, etc.

6. The Board of Directors of MePGCL have accorded approval for the Business Plan for the control period FY2015-16 to FY2017-18 and authorized the undersigned to file accordingly**.**

7. The applicant, therefore, humbly prays to the Hon'ble Commission to pass appropriate orders on the following:

    a. To admit Business Plan of MePGCL for the control period FY 2015-16 to FY 2017-18 in accordance with the MSERC (MYT) Regulations 2014.

    b. Approval of Business Plan for the Control Period of FY 2015-16 to FY 2017-18

    c. To approve the principles and methodology proposed by MePGCL.

    d. To pass such orders, as Hon'ble Commission may deem fit and proper and necessary in view of the facts and circumstances of the case.

    e. To condone any inadvertent omissions, errors & shortcomings and permit the applicant to add/change/modify/alter this filing and make further submissions as required.

Amberlight Lyngdoh,
Superintending Engineer
(Project & Monitoring)
For and on behalf of
Meghalaya Power Generation Corporation Ltd

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1 Background

1.1 Introduction

1.1.1 The Power Supply Industry in Meghalaya had been under the control of the erstwhile Meghalaya State Electricity Board (MeSEB) with effect from 21st January 1975. On 31st March 2010, the State Government issued a Notification "The Meghalaya Power Sector Reforms Transfer Scheme 2010" thereby giving effect to the transfer of assets, properties, rights, liabilities, obligations, proceedings and personnel of the erstwhile MeSEB to four successor companies. On 31st March 2012, Government of Meghalaya issued further amendment to the above mentioned transfer scheme, to transfer Assets and Liabilities including all rights, obligations and contingencies with effect from 1st April, 2012 to namely:

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

1.1.2 The Government of Meghalaya issued further notification on 23rd December 2013 thereby notifying the revised statement of Assets and Liabilities as on 1st April 2010 to be vested in Meghalaya Energy Corporation Limited.

1.1.3 The MSERC is an independent statutory body constituted under the provisions of the Electricity Regulatory Commissions (ERC) Act, 1998, which was superseded by Electricity Act (EA), 2003. The Hon'ble Commission is vested with the authority of regulating the power sector in the State inter alia including determination of tariff for electricity consumers.

1.2 Provision of Law

1.2.1 The Hon'ble Commission has notified the MYT Regulations, 2014 on 15th September, 2014.

1.2.2 As per Regulation 8 of the MYT Regulations, 2014, MePGCL has to file a Business Plan for the control period of FY 2015-16 to FY 2017-18. The relevant regulation is reproduced below:

> *"**8 Business Plan***
>
> *8.1 The Generating Company, Transmission licensee, and Distribution Licensee for Distribution Business, shall file a Business Plan for the Control Period of three (3) financial years from 1st April 2015 to 31st March 2018,*

which shall comprise but not be limited to detailed category-wise sales and demand projections, power procurement plan, capital investment plan, financing plan and physical targets, in accordance with guidelines and formats, as may be prescribed by the Commission from time to time:

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

8.2 The capital investment plan shall show separately, on-going projects that will spill over into the Control Period, and new projects (along with justification) that will commence in the Control Period but may be completed within or beyond the Control Period. The Commission shall consider and approve the capital investment plan for which the Generating Company, Transmission Licensee, and Distribution Licensee for the Distribution Business, may be required to provide relevant technical and commercial details.

8.3 The Distribution Licensee shall project the power purchase requirement based on the Merit Order Dispatch principles of all Generating Stations considered for power purchase, the Quantum of Renewable Purchase Obligation (RPO) under Meghalaya State Electricity Regulatory Commission (Renewal Energy Purchase Obligation and Compliance) Regulations, 2010 and the target set, if any, for Energy Efficiency (EE) and Demand Side Management (DSM) schemes.

8.4 The Generating Company, Transmission Licensee, and Distribution Licensee for the Distribution Business, shall get the Business Plan approved by the Commission.

1.3 Preamble

1.3.1 The petition for determination of ARR and Business Plan for the Control Period (FY 2015-16 to FY 2017-18) was filed in accordance with the Meghalaya State Electricity Regulatory Commission (Multi Year Tariff) Regulations, 2014 (hereinafter referred to as "MYT Regulations, 2014") which have been notified by the Hon'ble Commission on 15th September 2014.

1.3.2 The Hon'ble Commission after scrutiny, detailed examination and on completion of procedures passed the Order dated 30.03.2015 on ARR for Multi Year Tariff of FY 2015-16 to FY 2017-18.

1.3.3 The statement of the Hon'ble Commission as per point number 5.7.3 in its tariff

order is reproduced below:

> *"In accordance with the Regulations, MePGCL is required to get the approval of the business plan prior to submission of ARR application.* ***Accordingly the Commission directs the petitioner to submit the business plan for new investments by 30.8.15 for prior approval for all projects including Sonapani. Till such time the Commission will not allow any investments during the control period****."*

1.3.4 The directive of the Hon'ble Commission in its tariff order is also reproduced below:

> *"**Business Plan***
> *As required in the regulation MePGCL is required to file all investment plans to be undertaken in the control period for approval of the Commission by 30.08.2015 so that same may be considered at the time of midterm review. The Corporation is also required to file mandatory requirement for approval of the project like submission of DPRs, investment agreements, approval of the appropriate authority, cost and benefit analysis of the work to be undertaken, etc with the petition of approval of investment plans."*

1.4 Business Plan

1.4.1 As per the direction of the Hon'ble Commission, MePGCL submits the Business plan for the control period FY 2015-16 to FY 2017-18.

1.4.2 A business plan is conventionally defined as:

> *"Business Plan is a formal statement of a set of business goals, the reasons why they are believed attainable, and the plan for reaching those goals. It may also contain background information about the organization or team attempting to reach those goals."*

1.4.3 Accordingly, this business plan is developed for the Control period bearing in mind the growth plan for the control period after considering the strength and weakness of the company and evaluating its business environment. MePGCL has taken a rational and scientific approach while forecasting various components of Business Plan in order to arrive at realistic forecast with minimal expected deviations. The approach undertaken for preparation of various plans and forecasts is explained in detail in the relevant sections of Business Plan. The business environment has evolved considerably in a number of ways that affects MePGCL's strategic planning. The Business Plan is intended to give a comprehensive and up-to-date representation of the company, its market, the impact of new regulations, and the strategies that has been developed by MePGCL to achieve the company goals. However, as mentioned above, there are number of internal and external factors which affect the planning of the company and thus it makes this document a very

dynamic document and which calls for regular reviews of the plan with a view to introduce any mid-term corrections.

1.4.4 Due to changing business environment and uncertainty over the regulations governing the Generation business, it is submitted that Hon'ble Commission should take cognizance of the fact that the business plan is a dynamic document which may need to be updated at various intervals to align the growth path of the company with the external business environment and internal factors affecting the business / operations of the company.

1.4.5 It is therefore submitted that the MePGCL shall file the Mid-Term review through an application filed three (3) months prior to the filing of Petition for truing-up for the first year of the Control Period and the tariff determination for the third year of the control period.

2 Indian Power Sector Scenario

2.1 Introduction

2.1.1 India is the fourth largest consumer of energy in the world after USA, China and Russia, the second most populous country and one of the fastest growing economies of the world. It must, therefore, meet its development needs by using all available domestic resources of coal, uranium, oil, hydro and other renewable resources, and supplementing domestic production by imports. High reliance on imported energy is costly especially keeping in view the rising energy prices; it also impinges adversely on energy security. Meeting the energy requirement of country, with a targeted economic growth rate of 8%-9% every year and a fast growing population, at affordable prices therefore presents a major challenge. Therefore a sustained effort at increasing energy efficiency is required while increasing domestic production as much as possible to keep import dependence at a reasonable level.

2.1.2 With the growing demand in energy requirement, the annual per capita energy consumption has grown significantly. The low per capita consumption of electric power in India compared to the world average presents a significant potential for sustainable growth in the demand for electric power in India. According to the 18th Electric Power Survey (EPS), India's peak demand is expected to grow at to 207 GW in 2016-17 and 294 GW in 2021-22. India's plans to rapidly deploy more than 150 GW of Renewable energy is slated to change India's dependence on imported coal may make India self reliant in terms of energy.

2.1.3 The Ministry of Power has launched various schemes to promote development of the sector, some of the schemes of the Ministry are as below:

- Strengthening of distribution sector infrastructure under Integrated Power Development Scheme (IPDS),
- Development of rural infrastructure under Deen Dayal Upadhyaya Gram Jyoti Yojana (DDUGJY),
- Revival of stranded gas based generating station under Power Sector Development Fund (PSDF),
- Promotion of Energy Efficiency under Perform Achieve Trade (PAT),
- Financial Restructuring Scheme (FRS) for Discoms to achieve their financial turnaround etc.
- National Smart Grid Mission (NSGM) to plan and monitor implementation of policies and programs related to Smart Grid activities in India.

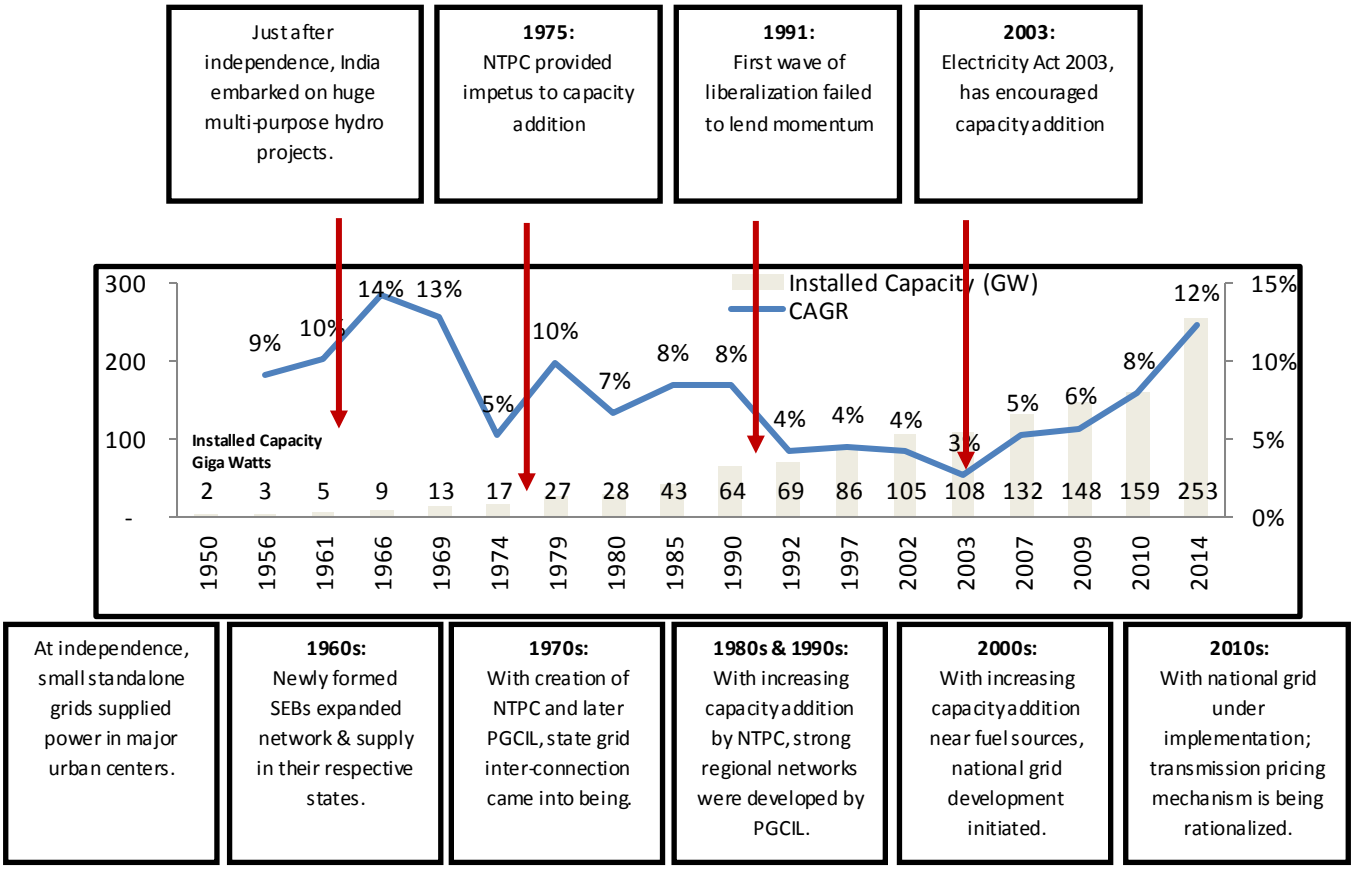
2.2 24 x 7 power supply

2.2.1 The Ministry of Power has also initiated the target of supplying 24x7 power under its 'Power for All' program. The supply of 24x7 power would enhance the satisfaction levels of the consumers and improve the quality of life, leading to rapid economic development of the state in primary, secondary & tertiary sectors resulting in

inclusive development. The Government of India and the Government of Meghalaya have jointly launched a report outlining the roadmap to achieve 24x7 power supply in Meghalaya.

2.3 Sector Evolution

2.3.1 Electricity sector in India has evolved over the years. After independence, in order to fuel India's growth, the government embarked on multi-purpose hydro projects. During this time, the sector was underdeveloped and consisted of small standalone grids which supplied power in major urban centres. Evolution of the electricity sector from 1947 to its current state has been detailed below:



2.3.2 Act 2003 has overhauled the sector framework and has catalysed capacity addition. Fundamental changes brought about by the Electricity Act, 2003 are detailed below.

2.3.3 The objective of Electricity Act 2003 is to introduce competition, protect consumer's interests and provide power for all. The Act provides for National Electricity Policy, Rural Electrification, Open access in transmission, phased open access in distribution, mandatory SERCs, license free generation and distribution, power trading, mandatory metering and stringent penalties for theft of electricity.

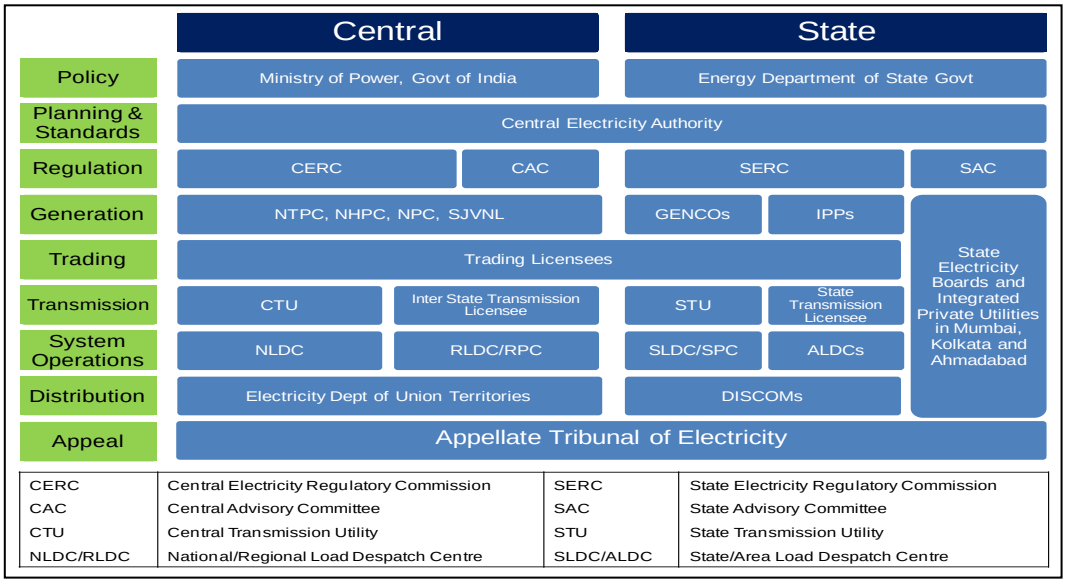
2.3.4 It is a comprehensive legislation replacing Electricity Act 1910, Electricity Supply Act

1948 and Electricity Regulatory Commission Act 1998.The Electricity Act, 2003 has been amended on two occasions by the Electricity (Amendment) Act, 2003 and the Electricity (Amendment) Act,2007. The aim is to push the sector onto a trajectory of sound commercial growth and to enable the States and the Centre to move in harmony and coordination.

2.3.5 Open Access is the paradigm shift brought about by the landmark Electricity Act 2003 to introduce competition in the power sector. It is the back bone of competition and the corner stone of the Act. Open access provides for non-discriminatory access to networks of all transmission & distribution licensees actually facilitates competitions amongst power generators, traders and suppliers.

2.4 Key features of Indian Power Sector

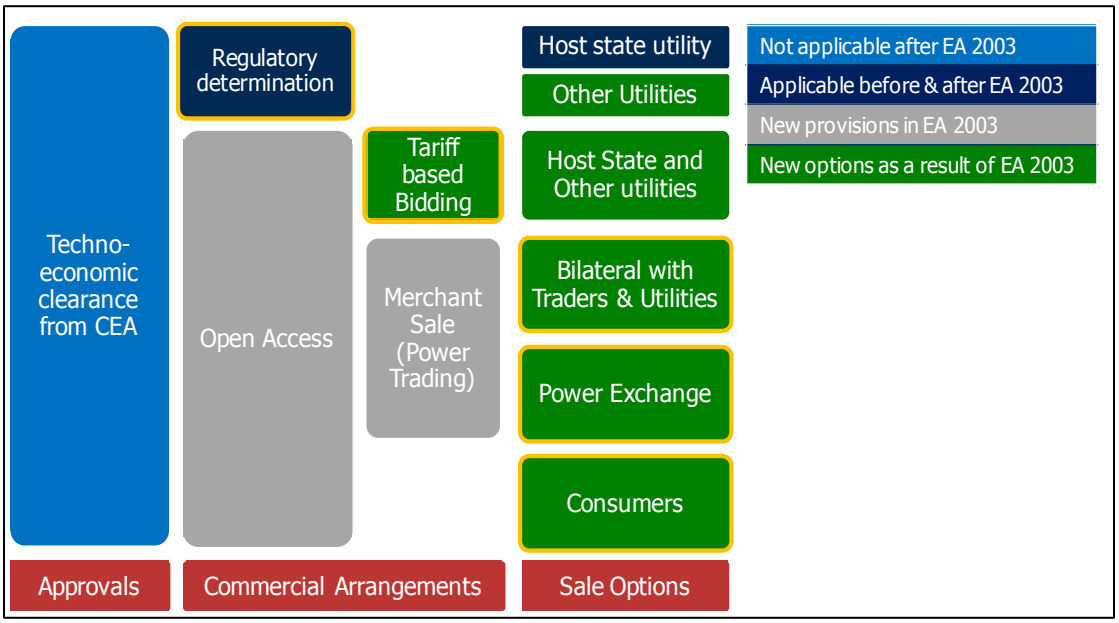
- The Sector is governed by Ministry of Power and Ministry of Renewable Energy with technical support by CEA and Regulatory support by CERC and various SERCs;
- Generation has been delicensed and is owned and operated by a mix of Central, State and Private entities;
  - Private Sector contributes to ~ 36% of the total capacity with Adani Power being the largest with an installed capacity of 9240 MW;
- Transmission is largely owned by State and Central utilities with a few private sector participants;
  - India's national grid comprises of five regions connected to each other through inter-regional links;
  - Operation owned by state and central entities only;
- Distribution is largely state owned;
  - Few exceptions in Mumbai, Delhi, Kolkata;
  - Franchisee model is gaining ground - Uttar Pradesh, Maharashtra, Bihar , Madhya Pradesh and few others
- Following chart highlights the structure and entities of Indian power sector:



2.4.1 Sale Options after EA 2003

- Prior to Electricity Act, 2003 (EA 2003), IPPs sold power only to the host state utility through a cost plus tariff mechanism. EA 2003 opened up new avenues of power sale like sale to other utilities (other than host state), tariff based bidding, trading and direct sale to consumers.

- While options for sale of other state utilities, power traders and power exchange have taken off, sale to consumers is still not as prevalent, largely due to limited development of open access at intra-state level governing such sale.



2.4.2 Renewable Energy

- The supply from Renewable sources of energy is expected to increase rapidly from 24503 MW by the end of the Eleventh Plan to more than 175000 MW by the end of the Thirteenth plan. This manifold increase in the next 10 years is expected to continue in subsequent years as policies provide a strong incentive for the renewables. Nevertheless the base is small and the share of renewables in total commercial energy used will increase significantly. It is expected to rise from about 1 per cent in 2011–12 to more than 30 per cent in 2021–22.

- The Renewable energy market is supported by strong government policies like Renewable Purchase Obligations (RPOs) under the National Action Plan for Climate change (NAPCC) 2008, target installation of 100 GW of solar power under the Jawaharlal Nehru National Solar Mission (JNNSM) 2010 by 2022, CERC Renewable Energy Certificate (REC) Mechanism 2010 (Solar and Non-solar RECs), levy of Clean Energy Cess on coal, target installation of 65 GW of wind power by 2022, Draft National Renewable Energy Act 2015 etc.

- Introduction of International Competitive Bidding and Reverse bidding has not only helped the Indian Renewable energy market to attract international players but also helped tariffs nose dive bringing down the tariff of Renewable energy to Grid parity. India is slated to be the top player in the Renewable energy market.

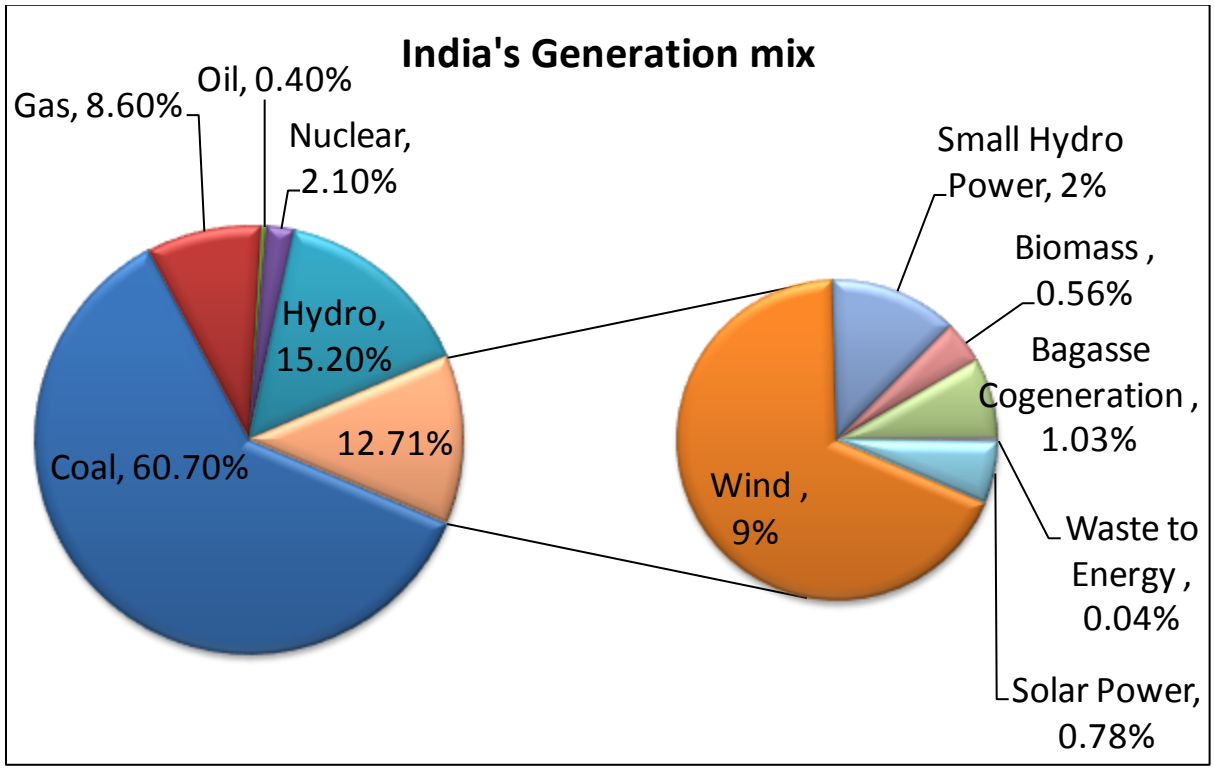
- The Ministry of Power has also planned several Transmission lines for evacuation of Renewable energy, these lines are envisaged to be constructed under the scheme of 'Green Energy Corridors' of the Ministry.

2.5 Generation Sector

2.5.1 India is among the largest power-generating countries in the world with an installed capacity of 278 GW (as of Sept 2015). The ownership of generation capacity lies in the hands of the Centre, State, and Private sector players. In the Centre, generation is mainly owned by NTPC, NHPC, and NPCIL, States have their separate corporations. While the public sector players generate electricity from all sources (coal, gas, nuclear, hydro, renewable energy sources or RES), the private players generate power from hydro, thermal, and Renewable Energy Sources (RES) only. No private player is in the nuclear power generation space, but as India's nuclear isolation has come to an end now, this space is likely to witness the entry of private players.

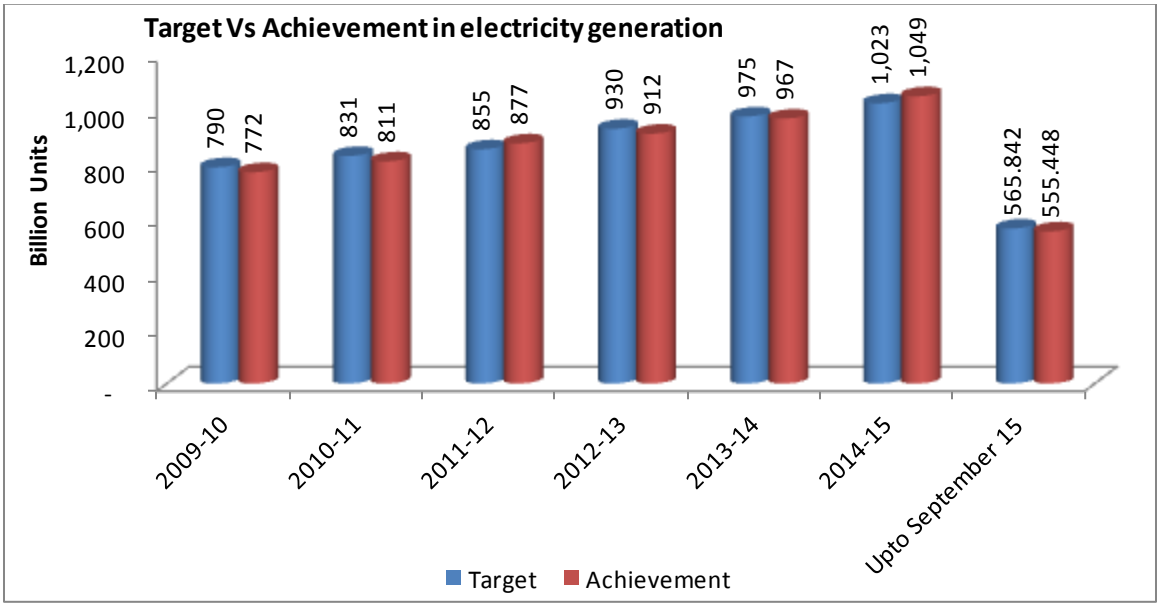
2.5.2 India's Generation mix is as shown below:

Figure 1: India's Generation mix



2.5.3 The electricity generation target for the year 2015-2016 was fixed as 1137.5 Billion Unit (BU) i.e. growth of around 8.47% over actual generation of 1048.673 for the previous year (2014-2015). The generation during (2014-15) was 1048.673 BU as compared to 967.150 BU generated during April- March 2014, representing a growth of about 8.43%.

2.5.4 The Target Vs Achievement in electricity generation from FY 10 to FY 16 is as below:



2.6 12th plan Target

2.6.1 In order to bridge the gap between peak demand and peak deficit and provide for an increased pace of retiring of the old energy inefficient plants, the capacity addition target for the 12th Plan (2012-17) has been fixed at 88,537 MW. The Actual achievement is of 67, 616 MW upto September 2015, which is ~77% of the target. Thus, the actual achievement is likely to surpass the target set.

2.6.2 The table below shows the 12th Plan Capacity Addition Targets and Achievements upto September, 2015:

Table 1: 12th Plan Capacity Addition Targets and Achievements upto September, 2015

Sector / Type	Central		State		Private		Total	
	Target	Achievement	Target	Achievement	Target	Achievement	Target	Achievement
Thermal	14,878	10,593	13,922	13,469	43,540	39,244	72,340	63,305
Hydro	6,004	2,424	1,608	292	3,285	595	10,897	3,311
Nuclear	5,300	1,000	0	0	0	0	5,300	1,000
Total	26,182	14,017	15,530	13,761	46,825	39,839	88,537	67,616

3 Company Profile-MePGCL

3.1 Introduction

3.1.1 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

3.1.2 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 generate 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 business like providing Training, Research and Development activities, Technical consultancy services and O&M related services

3.1.3 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 7 Hydro Generating stations, 4 of these are storage type and 3 are run of the river stations. The details about existing stations are mentioned below:

Table 2: Details of existing stations

Sl. No	Station	Type	No of Units/ Capacity	COD	Capacity (MW)
1	Umiam Stage-I	Storage/ Pondage	4*9 MW	FY 1966	36
2	Umiam Stage-II		2*10 MW	FY 1971	20
3	Umiam Stage-III		2*30 MW	Unit 1: FY 1979 Unit 2: FY 1979	60
4	Umiam Stage-IV		2*30 MW	FY 1993	60
5	Umtru Power Station	ROR	4*2.8 MW	Unit 1-3: FY 1958 Unit 4: FY 1969	11.2
6	Sonapani HEP		1.5 MW	FY 2010	1.5
7	Leshka HEP		3*42 MW	Unit 1& 2:FY 2013 Unit 3: FY 2014	126
	Total				**314.7**

3.1.4 Operational Performance of the Generating Stations- MePGCL

All the Generating stations being hydro, the annual generation depends on the rainfall for the year. The yearly generation for last 5 years for the generating stations is shown in the table below:

Table 3: Historical Energy Generation (MU)

Sl. No	Station	FY 10	FY 11	FY 12	FY 13	FY 14	FY 15	FY 16^
1	Umiam Stage-I	110.32	103.80	108.89	102.68	78.12	90.4	78.99
2	Umiam Stage -II	51.18	47.52	12.89	50.32	41.03	46.00	40.59
3	Umiam Stage -III	137.26	132.24	127.44	129.62	132.55	113.11	78.35
4	Umiam Stage-IV	187.03	204.93	203.82	187.23	173.64	162.72	135.41
5	Umtru Power Station	48.22	15.51	38.04	30.27	20.83	15.27	1.41
6	Sonapani HEP	2.15	4.81	6.03	7.19	5.37	5.75	3.88
7	Leshka HEP	NA	NA	NA	197.42	410.22	409.38	418.11
	Total	**536.15**	**508.81**	**497.11**	**704.74**	**861.76**	**842.62**	**756.75**

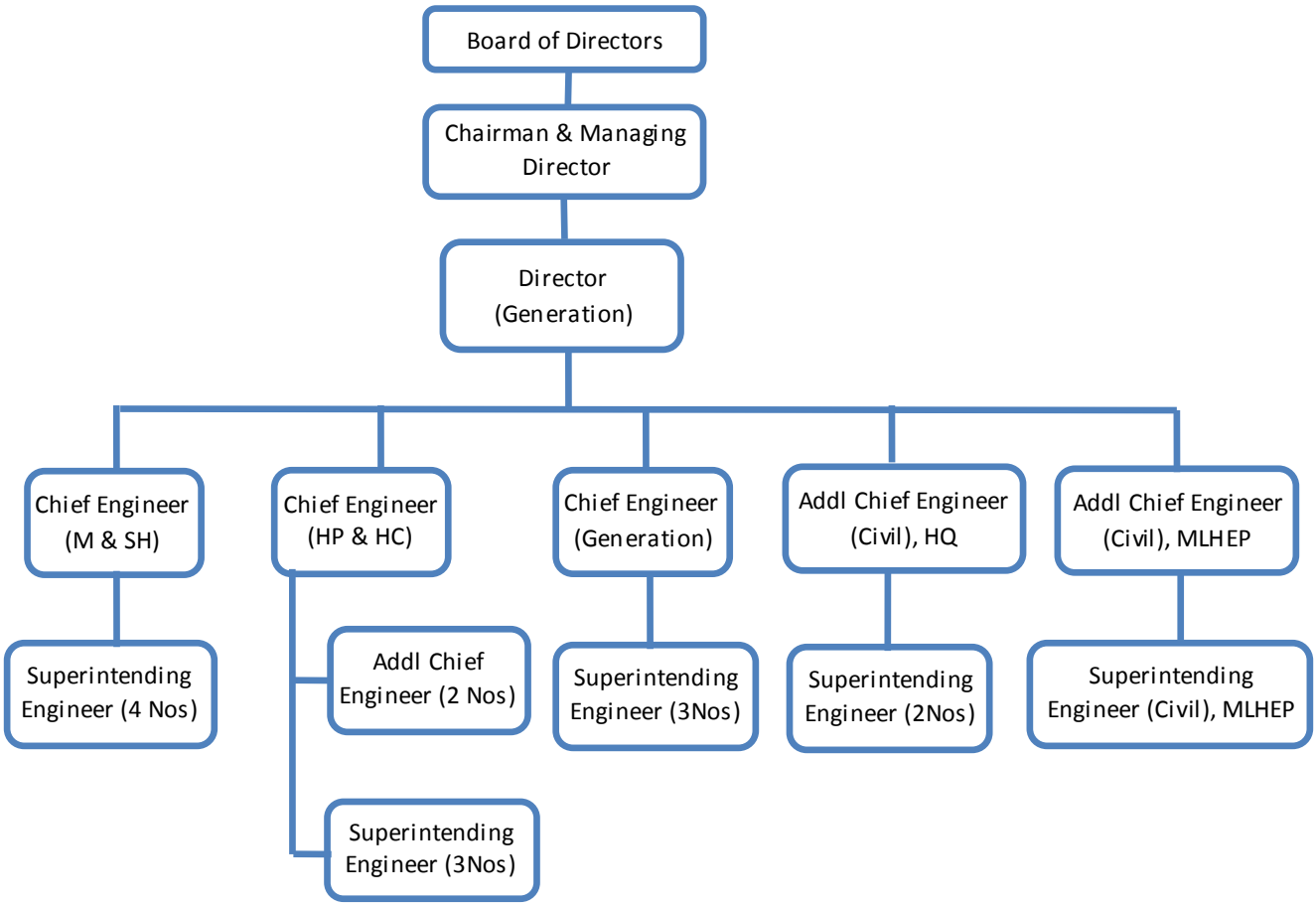
^upto October 2015

3.2 Human Resource

3.2.1 Organisation Structure

The broad organisation chart is shown below:

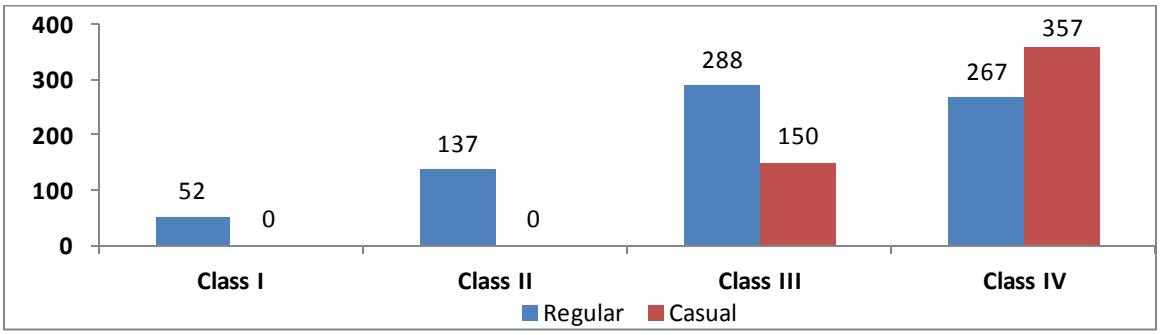
Figure 2: Organisation Chart-MePGCL



3.2.2 Existing Human Resource

- Currently MePGCL has 744 Regular employees on Regular payroll and 507 Casual employees as on March 2015. MePGCL boasts of a strong technical knowhow in form of experienced engineers and operational staff. The technical prowess of MePGCL has helped in establishing, operating and maintaining generating stations. The class wise number of Regular & Casual Employees in MePGCL is depicted in the chart below:

Figure 3: Class Wise No of Employees-MePGCL



3.2.3 Capacity Building

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

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

  - Training institutes recognized by CEA for imparting statutory induction training: There are 74 (seventy four) training institutes recognized by the CEA through the country. These institutes cater to the training needs of personnel working in thermal power stations, hydro generating stations, transmission and distribution utilities. For example, the National Power Training Institute (NPTI) has established a Centre for Advanced Management & Power Studies (CAMPS) at its Faridabad campus. In addition to a number of short-term

courses on Technology-Management interface, NPTI also conducts a two-year full time MBA Program in Power Management. NPTI also conducts professional courses, integrating power-training experience with academics, like PDC & PGDC in Power Plant Engineering and B.E./B.Tech. in Power Engineering etc. The other institution, the Central Board of Irrigation & Power (CBIP) also conducts power industry interfaced placement oriented long term training programmes in generation, transmission and distribution, besides high end short term programmes in advance technologies in all disciplines of power sector.

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

- **Statutory training requirement:** The Central Electricity Authority notifies the mandatory training (measures relating to safety and electricity supply) Regulations 2010, specifically the regulations 6 & 7 of the said CEA Regulations 2010. For implementing the above regulations effectively and on rational basis, the CEA has framed guidelines and norms to prescribe the procedure to be followed by CEA/MoP for recognition and grading of the training institutes for power sector in the country. Presently, following types of training are provided to the workforce in power segment for electricity generation, transmission and distribution personnel:

  - Operation & Maintenance Training to all existing employees engaged in O&M of generating projects and transmission & distribution system ranging from 4 Weeks to 30 Weeks. This includes the classroom training, Simulator training for Thermal & Hydro and On-Job training.
  - Induction level training for new recruits for 1 month (Technical & Non-Technical).
  - Refresher/Advanced training of 5 Days in a year to all existing personnel of varying degrees in various specializations in line with National Training Policy for Power Sector.
  - Management training of 5 Days in a year to the senior Executives/Managers in India/abroad in line with National Training Policy for Power Sector.
  - Distance Learning Certificate Programs on Power Distribution Management for JEs/ AEs.
  - Certificate of Competency in Power Distribution (CCPD).

- Training under Distribution Reforms, Upgrades and Management (DRUM). C&D Employees Training (Non-executives in secretarial staff, accounts wing, technical staff in nonexecutives and Class-IV are categorized as C&D employees).
- Franchisee Training.
- Training under R-APDRP etc.
- Linemen training at linemen training centres.

- **Capacity Building in Meghalaya Energy Corporation Limited (MeECL)**

  Human Resources Development Centre (HRDC), Umiam, MeECL is entrusted with the training for the officers and staffs of the 3 (three) subsidiary corporations of MeECL, namely, Meghalaya Power Generation Corporation Limited (MePGCL), Meghalaya Power Transmission Corporation Limited (MePTCL) and Meghalaya Power Distribution Corporation Limited (MePDCL). Various initiatives taken for capacity building are highlighted as below:

  - Capacity building under Accelerated Power Development Reforms Programme (APDRP) - Capacity Building for MePDCL is being funded by the Ministry of Power (MoP) through Central Institute of Rural Electrification (CIRE), Hyderabad, under Accelerated Power Development Reforms Programme (APDRP). Under this scheme, training for Group C&D employees of MePDCL is being taken up by in-house resources persons as well as by outside agencies. This scheme is expected to continue for 3 (three) more years.
  - Capacity building under World Bank Project - The World Bank has proposed funding for capacity building for MePTCL and MePDCL for the next three years. Proposal under this scheme is being prepared by the nodal officers of the two corporations, namely, Chief Engineer (Transmission) & Chief Engineer (Distribution).
  - Capacity building in various Training Institutes - Officers from the 3 (three) subsidiary corporations are being sent regularly to free training programme organised by various training institutes like National Power Training Institute (NPTI), Indian Institute of Technology (IIT), Roorkee, National Thermal Power Corporation Limited (NTPC) and many more. For such training, the respective corporations bear the expenditure of travelling and boarding only.

  - Capacity building through own resources - The capacity building measures mentioned above are required to be supplemented by training programmes specifically required for the 3 (three) corporations. These include training for

field engineers in technical areas, management and human relationships, among others. For such training programmes, funding is being allocated in the budget of the respective corporations.

3.2.4 Way forward

- In accordance with the CEA Guidelines & Apprentices Act as stated above, the HRDC, MeECL has been imparting On-the-job training, Induction training, C&D Trainings, R-APDRP Trainings, trainings on behavioral 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. Accordingly, in addition to the existing work, the following tasks are proposed for the next three years.
    - Create skill for the current and future requirements, both in terms of numbers as well as types of skills and investigating the underlying reasons for skill gaps.
    - Identify changing technologies and collate technology specific skills which may be required in future. Besides technical skills, identification of soft skill requirement in terms of content, the depth of coverage required and practical training requirement etc.
    - Build capacity for training delivery - Coordinate with all various agencies in the area of skill development specially need based.

4 24x7 Power for All for Meghalaya

4.1 Introduction

4.1.1 The Government of India has declared 24x7 power supply as one of the most important objectives of its policy for reviving economic growth. 24x7 - Power for All for Meghalaya is a Joint Initiative of Government of India (GoI) and Meghalaya State Government with the objective to provide 24x7 power available to all households, industry, commercial businesses, public needs, any other electricity consuming entity and adequate power to agriculture farm holdings by FY 2019.

4.1.2 The objective of providing 24x7 power supply, as declared by the Government of India, was broadly defined by Forum of Regulators (FOR) on the following lines

- Reliable 24x7 power supply to domestic, industrial and commercial consumers within a period of five years, i.e., by 2018-19.
- Power supply for irrigation pump sets to be provided for 8 to 10 hours a day, depending on the agro-climatic factors in different states.
- All un-electrified households to be provided access to electricity in a time bound manner in the next five years.

4.1.3 The broad contours of the strategy for achieving the above objectives shall include the following:

- Ensuring adequate capacity additions and power procurement from conventional and renewable sources to meet the projected demand for power
- Optimizing energy mix to reduce power procurement costs and improving operational efficiency of state generation plant(s)
- Strengthening the Transmission and Distribution (T&D) network to cater to the expected growth in demand
- Substantial reduction of AT&C losses as per a specified loss reduction trajectory
- Introducing energy conservation and energy efficiency measures to reduce specific end-use energy consumption
- Assisting distribution utilities to become efficient service providers and improve their financial viability.

4.2 To achieve the above initiative a roadmap document has been launched, the extracts from the same for the Generation sector of Meghalaya is outlined below:

4.3 Generation

4.3.1 The total installed capacity in Meghalaya including firm share of CGS as on 31st March 2015 (allocated capacity in State, Private, joint and CGS) is 492.47 MW. Hydro based capacity constitutes about 79% of total capacity followed by gas based 21.2%.

In addition to the above capacity, unallocated power from CGS at the disposal of Central Government is allocated to Meghalaya from time to time.

4.3.2 Meghalaya has met a maximum demand of 367 MW in FY 2015 and the present annual energy requirement of the state is of the order of 1930 MU. The maximum demand is expected to increase to 444 MW in FY 2019 and the energy requirement is projected to rise to 2049 MU in FY 2019, taking into account additional energy requirement for providing 24x7 power supply to the state over the normal load growth.

4.3.3 A number of generating stations (hydro, coal based etc.) are planned to be commissioned up to FY 2019. However, the availability is mostly from hydro and other renewable sources which inherently have low capacity utilization factor and same has been appropriately factored for computation of energy availability from existing and upcoming generating stations. The availability from already tied-up firm share will remain more than 120-140% of the energy requirement.

4.3.4 The Projected Energy Availability from Firm Share/Long Term Tie-Ups (in MU) is shown in the table below:

Table 4: Adequacy of Energy Availability for Meghalaya

Particulars	**Adequacy of Energy Availability**			
	FY 16	**FY 17**	**FY 18**	**FY 19**
Total Energy Requirement within State	1,628	1,725	1,891	2,049
Energy Availability from Long Term Firm Tie-ups	1,937	2,407	2,578	2,629
Energy Availability from Long Term Firm Tie-ups (In %)	*118.93%*	*139.48%*	*136.33%*	*128.29%*
Targeted Energy Availability from Long Term Firm Tie-ups (In %)	*90.00%*	*90.00%*	*90.00%*	*90.00%*
Targeted Energy Availability from Long Term Firm Tie-ups (In MU)	1,465	1,553	1,702	1,844
Adequacy of Power Supply	**Adequate**	**Adequate**	**Adequate**	**Adequate**
Additional Energy Required on Long Term Basis (in MU)	**0**	**0**	**0**	**0**
Additional Firm Tie-up Required (80% PLF) on RTC Basis (in MW)	0	0	0	0
Additional Energy Required on Short Term Basis (in MU)	**0**	**0**	**0**	**0**

4.3.5 However, typically the state is surplus in summer and deficit in winter, as is the case of most states which have substantial share of hydro generation. Thus, while the state may see shortfall during winter months, same will be covered through

banking/swapping the surplus power available in summer months.

4.3.6 For the purpose of determining the adequacy of energy availability, it is considered that the state should be able to meet 90% of its projected energy requirement through firm allocations/tieups only and for the balance 10%, the state has to effectively plan (through comprehensive power procurement planning on short term and medium term basis) and look for procurement of power either through competitive bidding or power exchange or through other sources on short term/medium term basis.

4.3.7 As Meghalaya will be having projected energy availability of more than 100% through firm share in FY 2019, the state has to just optimize the power purchase and sale planning. There is no requirement of purchase through short term power as of now. It is also worth mentioning that the firm tieups do not include the availability from the unallocated quota of existing as well as upcoming Central Generating Stations.

4.3.8 The fund requirement for state projects is summarized below:

Table 5: Fund requirement for Meghalaya 24x7

Sl. No.	Category	Fund Requirement (in Rs Crores)				
		FY 16	FY 17	FY 18	FY 19	Total
1	Own Generation	271	16	10	0	**297**
2	R&M of Existing Stations	7	53	13	4	**77**
Total Fund Requirement (Generation)		**278**	**69**	**23**	**4**	**374**

4.3.9 The only action point for the sate in Generation is that there is considerable surplus (20%-30%) available with the state. The state needs to optimize its power purchase and should look forward for selling the surplus power to prospective deficit states so as to earn revenue for the state.

5 Capital Investment Plan

5.1 Need for Capital Expenditure:

5.1.1 The present generating stations of MePGCL except MLHEP 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.

5.1.2 Umiam Stage-I

- **System Augmentation & Improvement Projects**

  The Umiam Stage-I station and DAM being very old some of the components need to be augmented and improved. Various system augmentation & improvement projects such as replacement of main inlet valve, re-engineering of fire fighting system, replacement and reconditioning of transformer etc. are proposed for the control period of FY 2015-16 to FY 2017-18. The details of projects are mentioned below:

Table 6: System augmentation & Improvement Projects- Umiam Stage-I

No.	Project Name	Description
1	Construction of Beams and By-pass Isolators for KPS-1, KPS-2 & Umiam feeders.	KPS-1, KPS-2 & Umiam 132KV Feeders Circuit Breakers do not have Bypass Isolators. In case of any problem of the Circuit Breakers, the feeders cannot be charged without the bypass isolators. As such it is required to construct switchyard structural beams to accommodate bypass isolators as well as installation of Master Isolators for smooth change over from Main to Auxiliary Bus.
2	Replacement of By-pass valve and renovation of butterfly valve mechanism of penstock	There are two Butterfly valves for controlling the flow of water to the Penstock by opening and closing this valve. These valves have been in service since the time of commissioning (1965) and have been working erratically lately with lots of maintenance. The condition of the By-pass Valve and the control mechanism has deteriorated beyond repair and likely to cause havoc if the same is not replaced in time. The failure of this valve will cause immense flood downstream which cannot be controlled. This will also affect the operation of Umiam Stage-1 Power Station as the Station will be partially inundated; the whole

No.	Project Name	Description
		of MIV/Turbine Floor and part of the Generator Floor will be submerged ant therefore, affecting the AVRs and the Governor Regulating Panels. This will cause total shutdown of the Generators. In view of this, there is urgent need to replace the existing By-pass Valve and the control mechanism.
3	Procurement and installation of 250KVA DG Set	As part of Central Electricity Authority (Technical Standards for Construction of Electrical Plants and Electric Lines) Regulation, 2010, Clause 37 (14) of Part III - Section 4, Page 62, a Diesel Generator (DG) set is required for all power stations. A 250KVA DG set will suffice as a backup power source. The set will be placed outside the power house building and a new shed needs to be constructed.
4	Re-engineering of Fire Fighting system of - *Generator* - *Transformer*	*Generator:* 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. *Transformer:* At present the piping, valves and nozzles of the emulsifier system are not functioning due to broken pipes (because of aging), non-functioning valves and it is extremely dangerous to open the same as it may lead to flooding of 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.
5	Replacement of Generator transformer for Unit-1 & Unit-2 Power Station, Sumer	During the Renovation and Modernization of Umiam Stage I in 2001-2002, the Generator Transformers (GTs)were not included in the scope of work due to loan constraints. However, during the course of time, the GT No.3 was replaced by a new one in the April 2006 and the transformer No.4 was replaced by transformer brought from Umiam Stage- II in June 2013 after reconditioning. On account of their age, wear & tear, obsoleteness, several snags, etc. it has become absolutely essential to replace

No.	Project Name	Description
		GTs 1 & 2 at the earliest. Otherwise they may get damage and may cause loss of generation.
6	Installation of supervisory control to monitor the power station parameters.	The supervisory control in the form of LDMS (Local Data Monitoring System) will monitor all the data of the Power Station as well as the Substation like Ampere, Voltage, MW, MVAR, Power Factor, Frequency, All Temperatures, All Pressures etc. The system shall be able to generate log sheet of all the data in variable time blocks. The Supervisory Control (LDMS) will ease the operation & maintenance system by allowing quick and accurate data access. This will do away with the existing system of manual recording of data and parameters which are highly susceptible to errors caused by humans. Besides, the LDMS will allow time synchronization with other Stations using GPS. The LDMS system shall be able to generate log sheet in excel/pdf format of electrical parameters of generators, 132KV feeders/lines, transformers including voltage profile, frequency profile, load profile, etc in variable time blocks. The system shall use a dedicated PC complete with printer, etc for the purpose.
7	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 outlived their useful life. They are susceptible to outages. Besides, these transformers are oil based and are located inside the generator floor of the power house building, which is unsafe and have a high risk of fire. In such an event, there will be generation loss. Therefore, it is proposed that these transformers be replaced with new ones of 500 KVA and placed outside the power house building.
8	Replacement of Intake gate and Trash Rack of Intake structure at Umiam Stage I HEP	The Umiam Stage – I H. E Project was commissioned in 1965. Since its commissioning, the tunnel, surge shaft, water conductor system, etc. have not been inspected due to absence of an Intake gate. Moreover, the Bypass Valve of Umiam Stage-I HEP is in a deteriorated condition and is leaking profusely .Temporary sealing of the valve is being taken up from time to time, as its replacement cannot be taken up at this juncture due to absence of a

No.	Project Name	Description
		gate to empty the water conductor system for the execution of the work. Moreover, on inspection of the gate components by the Central Water Commission, most of them were found to be rusted and damaged. The CWC recommended replacement of most of the parts and installation of a new intake gate including the hoisting system. The above works shall be taken up through under water diving with the help of divers.
9	Proposed metalling and black topping of the approach road from junction of PWD Road to 2nd Stage Colony upto the junction point of PWD Road to Byrwa Colony via the appraoch road to Type-III, Type-IV and Type-IV at Sumer	During the implementation of Stage-I Hydro Electric Project, a total road length of 1.800 Km with an average width of 3.40 m was constructed to ease the movement of departmental vehicles to the Power Station for operation and generation and also for maintenance works of buildings, water supply etc, which have also been of great help to the school going children. Presently, the road condition has become very bad and in a very deplorable condition with huge potholes, the sub-base has been worn out and the black topped portion exists only in few stretches posing a great danger for the site staff which sometimes leads to breakdown of vehicles. Repairing of the road was taken up sometimes after a gap of 5-7 years due to budgetary constraints. The road is proposed to be re-consolidated, metalling and black topping and will immensely improve communication
10	Replacement of existing MIV of unit-3 and unit-4 of stage I power station **(completed)**	Umiam stage-I was commissioned in the year 1965. After such long usage, leakages are observed in Main Inlet Valves (MIV) of Unit-3 and Unit-4. The leakages reached such a stage that it was not possible to take out any maintenance works in the Turbine section like Runner, Guide vane, Draft tube etc. Hence, replacement of existing MIV of unit-3 and unit-4 of stage I power station was undertaken.
11	Construction of RCC Residential buildings and non-residential buildings at Umiam and Sumer under	The buildings of the office complex at Umiam and residential quarters at both Umiam and Sumer were constructed during the early sixties during the construction of the Concrete Dam and Stage – I Power Station. The Assam type buildings constructed decades ago have deteriorated over this period of time. Maintenance cost have escalated and has now become unfeasible, as a

No.	Project Name	Description
	Stage-I Project	result of which many buildings have been abandoned and lies unoccupied due to their unlivable dilapidated condition. The proposed new RCC buildings are envisaged to improve the living conditions of the employees and other occupants. Maintenance cost will be minimized. Smooth running of the power stations can be further enhanced when the accommodation of the Site Officers and Staff becomes decent and comfortable.
12	Improvement of water supply at Umiam and Sumer under Stage-I Project	The main water supply line for the MeECL Umiam Colony is through a 100mm dia gravity pipe line which stretches approximately 8.00 Km from the source at Mawiong to the filter house at Umiam. The second source is from the Borewell near MEDC Complex through the 50mm dia pipe line which stretches approximately 2.00 Km in length to the filter house at Umiam. The gravity pipe line which was laid more than 50 years ago has become very old and rusted which results in frequent breakdown causing acute water shortage to the colony at times. Again, the supply of water through the bore well installed sometime in 2005-06, gets disrupted very frequently due to breakdown of either the motor or submersible pump, thereby, causing immense problems of water supply to the colony and office complex as a whole. With the passage of time, maintenance and repairing works have escalated and no longer practical. Moreover, the surface water sources has either become contaminated or dried up. To improve the water supply for Umiam Colony, it is now proposed to draw water from the Umiam reservoir by installing a pump house, laying of a 3.00 Km long 3 inch dia pipeline upto the sedimentation tank and thereafter, filtration before supplying to the consumers. Further, a new source situated near the Stage-I Barrack Colony have been located with good discharge and quality. Therefore, this source is now proposed to be tapped and taken to the Pump House at Byrwa Colony, Sumer
13	Emergency Preparedness in	All Dams in the Umiam – Umtru Trans Basin Scheme are over 20 years old, with the Umiam Dam at 50 years. An

No.	Project Name	Description
	the Umiam - umtru Trans Basin Development Scheme	emergency Action Plan (EAP)/ Disaster Management Plan (DMP) is therefore the need of the hour for taking necessary corrective steps in the event of flooding caused by dam failure or large releases from dams or other event causing disastrous conditions. This is intended to help emergency officials, save lives, minimize damages to property, structures and habitations and minimize environmental impacts. The EAP will guide the dam operation supervisory personnel in identifying, monitoring, responding to and mitigating emergency situations. Availability of such plans will ensure emergency preparedness and appropriate prompt action whenever needed

The estimated total expenditure for the above System Augmentation & Improvement projects is Rs. 23.26 Cr. The cost for the completed project mentioned at no. 10 in the above table was Rs. 3.37 cr.

Table 7: Project cost for Umiam Stage-I System Augmentation & Improvement Projects

SI No.	Particulars	Project cost
1.	System Augmentation & Improvement Umiam Stage-I	23.26 cr
2.	Completed project	3.37 cr
	Total	**26.63 cr**

5.1.3 Umiam Stage-II

- **System Augmentation & Improvement Projects**

  The Umiam Stage-II station being very old, some of the components need to be augmented and improved. For the control period of FY 2015-16 to FY 2017-18, the following system augmentation and improvement projects are proposed to be undertaken. The details of the projects are mentioned below:

Table 8: System Augmentation & Improvement Projects- Umiam Stage-II

No.	Project Name	Description
1	Installation of 250 KVA, 11kV substation dedicated to the station supply of Umiam Stage-II Power Station	At present, Auxiliary equipment like dewatering pump, compressor battery charger etc. is run by taking power supply from a rural sub-station located outside the station. However the sub-station is unstable. Therefore, in order to have a stable and adequate supply to Auxiliary equipments it is

		necessary to install a dedicated substation for the station.
2	Emulsifier system for Generator Transformer in both Units.	Presently there is no fire fighting system for the Power transformer. As per CEA guidelines, firefighting system is a must to prevent and control any fire in the GT and around to avoid loss of generation.
3	Installation of On Line Supervisory system (SCADA) for the entire Power Station	At present all the machine parameters of the Umiam Stage-II stations are being controlled automatically. However there is no centralized system for monitoring and controlling of the machine parameters. Therefore it is proposed that SCADA system is implemented to enable centralized automatic monitoring and control of various station parameters such as temperature, pressure, flow of water, load condition of machine etc. This will reduce the dependent on manpower and also increase reliability.
4	Improvement of the road-consolidation metalling and black topping of the approach road from junction of PWD road to 2nd Stage Colony upto the junction point of PWD road to Byrwa Colony via the approach road to Type-111 Quarter, Type-IV Quarter and Type-V Quarter at Sumer under Stage-II Project	During the implementation of Stage-II Hydro Electric Project, a total road length of 0.905 Km with an average width of 3.40 m was constructed to connect the PWD Road with Stage II Colony. Presently, the road condition has become very bad and in a very deplorable condition with huge potholes, the sub-base has been worn out and the black topped portion exists only in few stretches posing a great danger for the site staff while travelling. Moreover, the condition of the road had led to breakdown of vehicles. Repairing of the road was taken up sometimes after a gap of 5-7 years due to budgetary constraints. The road is proposed to be re-consolidated, re-metalled and black topped to improve the riding quality and reduce vehicle repair costs.

The estimated total expenditure for the above System Augmentation & improvement projects is Rs. 0.80 Cr.

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

Sl No.	Particulars	Project cost
1.	System Augmentation & Improvement Umiam Stage-II	0.80 crs

5.1.4 Umiam Stage-III

- **System Augmentation Projects**

The Umiam Stage-III station and DAM being very old, some of the components need to be augmented and improved. For the control period of FY 2015-16 to FY 2017-18, the following system augmentation & improvement projects are proposed:

Table 10: System Augmentation & improvement Projects- Umiam Stage-III

No.	Project Name	Description
1	Installation of New D.G. Set at Umiam-Umtru Stage-III Power Station	According to CEA guidelines, all power stations are to equipped with a DG Set for emergency power supply. Stage III Power Station does not have a DG Set. Therefore, a DG Set is now proposed to be installed at the Station. The DG Set will supply emergency power to the auxiliary equipment in the event power is not generated from the machines or grid power is absent. Moreover, the Station is scheduled to be renovated and modernized soon during which process, alternative power supply is necessary.
2	DPR for installation of CCTV at Stage-III Power Station	In the recent past , there has been numerous occasions where unknown outsiders have managed to enter the Switch yard, cable trenches and even the power house premises to commit their illegal activities such as theft, etc. , which cannot be monitored from the Power House Control Room or by shift duty technicians or security personnel. Moreover, the Switch yard is located 200 m away on a hilltop far from the power house. The theft incidents were reported to the police but the culprits were never apprehended nor have the stolen materials been recovered. The National Security Guard (NSG), who inspected the Station in 2014, also recommended the installation of adequate surveillance devices such as CCTV cameras and Spotter Scopes at requisite locations to enhance operational preparedness of the buildings, thereby assisting operations in crisis situation. In order to enhance the security setup and to deter unwanted

No.	Project Name	Description
		activities in and around the power station, it is now proposed to install a CCTV System.
3	DPR for Renovation, Modernisation and Upgradation of Umiam-Umtru Stage-III HE Power Project.	The Power Station/Plant has already crossed its service life of 35 years and in the recent past, the turbine and generator parts have developed serious problems due to deterioration in view of their age. On account of this, the generation of energy has been declining in recent years and forced shutdowns have become regular. At present the station is running only with one unit (unit-2) while the other unit has been damaged (June, 2013). With the growth in demand and the shortage of supply on many occasions, load shedding had to be affected in the State. Therefore, resolving the problems and recovering the performance of the Plant by implementing the renovation and modernization (R&M) for Umiam Umtru Stage III HEPP has become a pressing issue in the state to improve the power availability for use by consumers.
4	DPR for supply and erection of 1250A 415 V LTAC Panel for Umiam Umtru Stage-III Power Station.	On 13th September, 2014, while Unit-2 was running with load, it tripped and was found to be damaged. At that time, temporary power supply was restored from an outside source, especially for water pump, lighting and battery charger. Subsequently, total power supply was restored to the whole station and unit 2 was synchronized on 20.09.2014, by arranging an old LT panel from Work Centre Division, Sumer. This LT panel is aged and cannot accommodate the whole LT System.
5	DPR for Pressure and Temperature Monitoring Meter at Stage-III Power Station.	The performance of all mechanical and electrical equipment in the Power Station needs to be accurately monitored daily by the monitoring instruments in order to ensure their healthiness. The parameters such as temperature, pressure, vibration, etc. are being monitored through various instruments regularly, but since the Power Station is 36 years old, the lot replacement of the several old instruments were found to be damaged. However, the damaged instruments could only be replaced in a piece meal manner. In order to properly maintain the equipment and to avoid any damage to the machines, due to error in display of a

No.	Project Name	Description
		damaged measuring instrument(s), it is proposed to replace the whole set of damaged instrument.
6	Repair of Pressure Releive Valve of Unit-II of Stage-III Power Station, MePGCL, Kyrdemkulai	The Pressure Relief Valve (PRV) forms an important part of the turbine. This is connected to the spiral casing and allow mitigating the transient pressure rise in case of fast shutdown of the turbine during a load rejection, where the valve will open quickly to divert the water away from the turbine, thus avoiding a large over speed of the machine and thereby protecting the penstock and the generator in such an event. During the last inspection in Sept 2012, it was found that the shaft of the PRV has broken and most of the underwater parts are damaged considerably and therefore, required to be replaced. Hence, it is now proposed that the entire PRV be refurbished.
7	DPR for Re-Engineering of 132 KV Bus at switch yard.	The present 132 KV bus of stage III switchyard is of ACSR Panther conductor since its inception i.e. 1979. But the bus loading has been increasing due to more power flow to the system, which has touched to the tune of 114 MW and the bus loading equivalent to the tune of 500 Amps as against the maximum current carrying capacity of 371 Amps. Therefore, current carrying capacity of Bus needs to be enhanced. It is therefore necessary to replace the ACSR Panther bus conductor by ACSR ZEBRA bus conductor as it can no longer cater to the present loading.
8	DPR for repairing of Generator and re-assembly of Unit-I machine	The 1st Unit of the Power Station has been out of order since 2nd June 2013 after a fire that damaged the stator (and rotor) of the unit. Further, the Stage III Power Station has been earmarked for Renovation & Modernization for which a proposal has been submitted to the Government of Meghalaya for arrangement of funding through JICA loan. Since, the approval for the R & M has been taking a long time and will take more time before it can be finalized and executed; repair of the Unit -1 is of utmost importance. Moreover, due to long outage of unit-1, peaking of the station is affected. Further, whenever the other unit i.e.unit-2, is also under planned or forced shutdown, the total generation of Stage-III becomes nil, this situation can be avoided if unit-1 is

No.	Project Name	Description
		repaired and generating.
9	DPR for installation of New 33/0.44 KV Sub Station including 33KV line extension	When the Units are idle, the power supply to the 11/0.440 KV, 500KVA Station Service Transformer of the Power Station is drawn from an outside source by the 11KV rural feeder from Zero Point Sub Station (which is unbalanced - sometimes causing damage to station equipment) which is also used for providing power supply to the villages, such as Umshor shor, Nongmahir , Umsaw and its neighboring areas . The Sub Station is approximately 9 Kms away from Power Station. The 11KV line passes through the dense jungle and during monsoon season, the supply becomes unreliable. Further, the communication system i.e. WLL of the BSNL, is always out of order and communication between the Power Station and the Zero Point Sub Station is regularly unavailable. As and when the power supply from this feeder is out of service, back feed from the Main Bus or spinning of the machine is being done as an alternative source for the station service consumption. At present as the Unit- I is completely under shutdown, spinning of the machine is the only source of option available and this has become a regular practice which in turn causes wastage of water from the reservoir. The auxiliary supply is required for lighting of power station, Battery Charger to maintain the DC supply for control and protection of the control and protection system, Oil Pressure Unit, Station Drainage Pumps etc. In such events, in order to avoid wasting of water by running the machines and to prevent any damage to station equipment due to unbalanced power, it is felt that a new 33/0.44 KV, 500 KVA substation be made, including extension of the 33KV line from the double pole connected to Stage-IV Power Station which passes through the tail race of the Stage III Power Station.
10	Improvement of the approach road from the junction of Stage-IV Power House Road to	This road was constructed during the inception of the Stage-III Project during the seventies and with a total length of 3.864 Km and an average width of 3.25 m to provide accessibility to the switchyard. Though the switchyard is connected to the Power Station by steep

No.	Project Name	Description
	Stage-III Switchyard, Kyrdemkulai (Length= 3.864KM)	steps, materials for maintenance works cannot be carried manually and are therefore required to be transported through the road. About 1.10 Km of the road is black-topped, 1.00 Km surfaced and the remaining is just stone-pitched. No major repairing has been done since its inception except for the 1.10 Km stretch in 2009. Occasional repairing work is done only in case of emergency and in the absence of a regular repairing program, mainly due to the budgetary constraint since the last 4-5 years, has damaged the road surface badly. The portion from Ch: 1.100 Km to 3.864 Km is the worst affected section and requires complete renovation with full consolidation, including black topping for restoration. The portion of the road from Ch: 0.00 – 1.10 Km requires only black topping with partial metalling/pot holes repairing. Therefore, re-metalling, re-consolidation and black topping with partial metalling/pot holes have been proposed for restoration of this road
11	Improvement of approach road to Stage-III Tunnel Intake Face-I from junction of Zero Point market to Intake Tunnel Face-I Length=1.10KM	This black bituminous road was constructed during Stage-III project way back in seventies to provide access to the Intake face-I as well as to the Pump House for water supply to the whole Kyrdemkulai area. The road is 1.10 Km long and having an average width of 3.25 m. At present, the entire road is in a dilapidated condition since no repairing work was taken up for a very long period of time due to budgetary constraint. The sub-base has been worn out with huge pot holes and almost all the metals were washed away and the black topping exists only in few stretches. It is also very difficult to reach site in time in case of any emergency due to this condition of the road. The road is now proposed to be reconsolidated, metalled and black topped for its immediate improvement.
12	Improvement of road from office gate to Stage-III concrete dam, Kyrdemkulai, Ri-	The road was constructed since the inception of the Stage III Project which is meant to provide connectivity to the Dam. It is 2.5 kms long and 3.0 m wide. No major repair was done in the last 30 years. The road is in a dilapidated condition and poses danger to officers and staff travelling

No.	Project Name	Description
	Bhoi District, Meghalaya	through to the dam. During emergency, the Dam could not be accessed quickly due to the road condition. In view of this, it is proposed that the road be refilled, reconsolidated, remettalled and black topped. This will also include replacement of culverts, construction of side drains, guard walls, etc.
13	Constrution of RCC Residential buildings at Kyrdemkulai under Stage-III Project	The existing Assam Type buildings in zero-point and 17th Km Kyrdemkulai colony area were constructed since the inception of Stage-III Project. These Assam Type buildings are decades old and are in dilapidated condition. Maintenance cost thus gets escalated year after year. There are a total no of 98 buildings in Zero point, Kyrdemkulai for the accommodation of officers and staff. At present, the condition of these buildings is in a very deplorable shape as they are very old. The wooden portions are damaged and destroyed by white ants and termites. There are also cases of roof leakages in these buildings. Frequent and adequate annual maintenance repairing works could not be taken up due to budgetary constraints. As the condition of some of the Assam type buildings are no longer reparable economically, it is proposed that new RCC buildings may be constructed as a onetime investment.

The estimated total expenditure for the above System Augmentation & improvement projects is Rs. 427.40 Cr.

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

Sl No.	Particulars	Project cost
1.	System Augmentation & Improvement Umiam Stage-III	427.40 crs

5.1.5 Umiam Stage-IV

- **System Augmentation & Improvement Projects**

  The following system augmentation & improvement projects are proposed for the control period of FY 2015-16 to FY 2017-18:

Table 12: System Augmentation & Improvement Projects- Umiam Stage-IV

No.	Project Name	Description
1	Replacement of	The Excitation system of Stage-IV Power Station is of

No.	Project Name	Description
	static excitation equipments	static type and the AVR (Auto Voltage Regulator) is of solid state type. This type of AVR cannot meet the present demand of Power System as specified in either the state Grid Code or ISOC. Moreover, this has become obsolete and most of the important spares are not easily available. M/s BHEL, the original equipment manufacturer, has also recommended the replacement of excitation control system. Therefore, replacement of existing static excitation equipments is proposed.
2	Automation and monitoring of MIV of the Generating units	Presently Stage IV Power Station is running in the Manual Operation mode in respect of all the systems of generation. Therefore automation in respect of the following is proposed: • *Operation of MIVs, GV Servomotors.* • *Operation of Station Auxiliaries viz. Cooling Water system both for Turbine & Generator.* • *Operation of other Station Auxiliaries viz. Motorized Valves, Compressors and Lubricating Plants etc.* • *Excitation Control System.* • *Synchronization facilities through Auto-mode System.* • *Miscellaneous works which may have to be interfaced through certain microprocessor with CCBs/UCBs/UABs etc.* In view of all the above, certain components with modifications shall be required to 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.
3	Overhauling of hydro-generating unit of Unit-I of Stage-IV Power	Since Commissioning of the station in 1992, no overhauling works have been carried out on the unit, except for annual maintenance and the reconditioning of underwater parts viz Guide Vanes, PRV, MIV seal/seat,

No.	Project Name	Description
	Station	bearing pads both for LGB, UGB, Pressure Tensioning Bolts/ Nuts in all the fronts associated with both Axial and Tangential forces etc. The unit is found to be deteriorating rapidly with each yearly inspection which necessitates immediate overhauling of the machine including the replacement of various turbine and generator parts like Runner, Gate mechanism, Shaft sleeve, Bypass valve, PRV, Rotor, MIV, etc.
4	Overhauling of hydro-generating unit of Unit-II of Stage-IV Power Station	Since Commissioning of the station in 1992, no overhauling works have been carried out on the unit, except for annual maintenance and the reconditioning of underwater parts viz Guide Vanes, PRV, MIV seal/seat, bearing pads both for LGB, UGB, Pressure Tensioning Bolts/ Nuts in all the fronts associated with both Axial and Tangential forces etc. The unit is found to be deteriorating rapidly with each yearly inspection which necessitates immediate overhauling of the machine including the replacement of various turbine and generator parts like Runner, Gate mechanism, Shaft sleeve, Bypass valve, PRV, Rotor, MIV, etc.
5	Supply and erection of Cooling Water Pumps of Stage-IV Power Station	Since last few years, due to ageing and corrosion, the pipe lines have got defective leading to clogging/leakage etc. As a result, this has affected the Cooling System of both the Generator & Turbine, which will ultimately lead to reduction in efficiency of the Plant. Therefore in order to improve the Cooling Water System, its reconditioning is required; which will involve the following: • *Changing of new Pipes, Sockets and Strainers etc.* • *Provision of proper outlet in pipe lines for removal of debris/silt etc.* • *Proper laying, anchoring, reinforcement of the pipe lines as desired with the proper level.* • *Changing of Heat Exchanger System* • *Provision of new Pumps or renovation of Pumps of desired capacity for delivering required output.* • *Provision of storage tanks in case of emergency*.

No.	Project Name	Description
6	Installation of Fire Fighting scheme for generator stator and emulsifier scheme for generator transformer for both units	As per CEA and Insurance guidelines and norms the station should be equipped with the latest working firefighting system. The Station has a nonfunctional firefighting system which therefore, needs to be replaced /refurbished to ensure prompt response to any kind of fire in the Generator Stator section to prevent damage to the Stator in particular and also to control the fire from spreading and cause huge loss. The components which need to be replaced are damaged cylinders, associated valves, pipelines, nozzles, control panel, etc. The proposal also includes installation of an emulsifier system for Generator Transformer fighting which involves installation of a high velocity water spray system to achieve a fast and automatic rear guard action in the event of fire in the Generator Transformers thereby ensuring the early detection and prompt prevention & control of fire.
7	Online Vibration monitoring of Generating Units	The present system of measurement of vibration is use of an offline vibration meter. In case of any abnormality and to avoid aggravation of the abnormality into a major outage, it is important that the operator immediately stops the Unit and initiate preventive measures. However with the present system early detection of fault is not possible. Therefore it is proposed to have an online vibration monitoring system for instant monitoring of any abnormality in the generator and turbine Bearings, under water parts such as runner, guide vane, draft tube etc.
8	Dedicated and reliable outside source power supply from 132 KV Bus of Stage-IV Power Station.	At present, the Outside source supply for the power station as well as for the adjoining employees' colony is derived from 10 MVA 132/33 kV transformer at Stage-III Power Station through a 33 KV Line which is prone to frequent outages as the line passes thorough a reserve forest area in difficult terrain. Therefore, it is proposed that a dedicated outside source

No.	Project Name	Description
		transformer be installed, which taps power from the 132 KV grid for ensuring stable and reliable outside source supply for the station as well as employees' colony.
9	Repair of present runner and Procurement of Spare Runner	During inspection of the 2 runners, it is found that cavitation in the runners has increased and there is a need for repair of the runners to avoid complete breakdown of runner. Further spare runner is also required for ready availability in case of any problem in the fitted runner of any one of the units, to avoid generation loss.
10	Installation of Telecommunication and internet facility at Stage-IV Power Station.	The need for installation of Telecommunication facilities along with an internet network is felt very necessary in order to ensure undisturbed sharing and exchange of urgent information between the Power Station and other establishments within and outside the state. The proposal has also been made in view of problems encountered while accessing/sharing real time power scheduling data by the station-in-charge in order to assist SLDC/Generation Management Cell for real time decision making and scheduling. Further, the need for a proper and dedicated Telecommunication network is of upmost importance for the Station considering its remoteness as the communication through Telephone is the only means for its employees to remain in contact with their families, who are mostly stationed in different parts of Meghalaya.
11	Installation of Supervisory Control and Data Acquisition System for Stage-IV Power Station.	There is a need for installation of the SCADA (Supervisory Control and Data Acquisition) System which is a centralized supervisory control system for monitoring and controlling of different electrical and mechanical parameters from control room to ensure proper monitoring of the generating units, to ensure instant detection of any abnormalities. Electrical parameters include online monitoring of various Current and voltages whereas mechanical parameters will include monitoring of temperature, pressure, vibration, cooling

No.	Project Name	Description
		flow, etc. which would ensure proper care of the hydrogenating Units from the safety and stability point of view, so as to ensure its trouble free operation. Moreover, both the hydrogenating Units are now installed with new microprocessor based digital governors (Unit-2 since July-2011and Unit-1 since February-2012) which require SCADA.
12	Improvement of approach road to office complex from junction of main road to Stage-IV Power House. CH:0.00KM - 1.00KM	This road connecting Stage-III Concrete Dam, Stage-III and Stage-IV Power Stations was constructed during the inception of Stage-III Kyrdemkulai Hydro Electric Project in the seventies. The construction of this stretch of the road of length of 1.00 Km and width 3.25 m, was also undertaken during this period. This section is in a dilapidated condition, the sub-base of which has also worn off, leaving large pot holes. Only temporary repairs could be carried out over this stretch for more than 5 years now due to budgetary constraints. The section of the road is now proposed to be re-metalled, consolidated and black topped, to restore the condition of the road.
13	Restoration of water Bodies of Stage-IV Reservoir	Due to massive erosion near the intake of the Stage –IV reservoir, earth has got deposited in the reservoir. This massive erosion on the Bank of the reservoir is threatening the stability of the existing main road connecting the Stage-IV Dam and Stage-IV & Stage-III Power Station. It may also cause damage to the Head work of the Power Intake of the Stage-IV HEP. Therefore to control the erosion it is proposed to construct retaining walls on this stretch of the Reservoir near the intake and in other places where erosion has been noticed. The Restoration of water bodies of Umiam Stage IV Reservoir will improve the storage capacity of the Stage-IV Reservoir.
14	Flood Control works of Stage-IV Power House	At present the protection wall downstream of the Umiam Stage-IV Power Station has damaged. In regard to the Umtru HEP, it is seen that due to flood and sedimentations, the protection wall of the Tail Race has

No.	Project Name	Description
		been damaged and sediments are now directly entering the Tail Pool, thereby reducing the generating capacity of the Project. Therefore, it is proposed to construct different types of walls depending on the site requirement and at different locations along the river where the power station is located.
15	Installation of Stop log gate, embedded parts of the guide grooves, gantry crane etc. at Umiam-Umtru Stage-IV concrete Dam	At present, in the Umiam-Umtru Stage-IV concrete DAM there is no Stop log gate or embedded parts in guide grooves, gantry grooves etc. In absence of stop log gate, periodic inspection and repairing of radial gates, replacement of any broken hoisting ropes placed on the Upstream side, and replacement of rubber seals of radial gates, etc. need to be done underwater. This leads to high maintenance cost. Therefore it is proposed that Stop log gate, embedded parts of the guide grooves, gantry crane etc be installed. The work includes the following:- • *Structural design of the stop log gate and the gantry crane for the hoisting arrangement has to be carried out by the Central Water Commission.* • *Installation of 1(one) mobile stop log gate and the gantry crane for lifting and hoisting the gate.* • *Provision of the second stage concreting along with embedded parts such as guide rails or plates, seal plates in all the grooves provided on the piers of the gates.*
16	Improvement of Stage-IV Power House Road from CH: 0.00 KM to 19.25 KM	The road was constructed during the inception of the Stage-III Kyrdemkulai Hydro Electric Project for the initial Length of 6.75Km upto the Stage-III Power Station during the seventies and later for an additional length of 12.50Km upto the Stage-IV Power Station when the construction of Stage-IV Hydro Electric Project was taken up in the eighties. The total length of this road is (6.75+12.50) or 19.25 Kms having an average width of 3.25m.Since 1995 onwards, the road repair could be taken up only after a huge gap of 5-7 years interval, due

No.	Project Name	Description
		to budgetary constraints and for which the condition of the road has turned from bad to worse. At present, the road condition is in a dilapidated state where maximum stretches are worn out, with huge pot holes. To travel this mere distance of 19.25 Km, it takes more than an hour. Most of the sub-base has worn out and the black topped portion remains only in few stretches. This condition has proven to be damaging to vehicles resulting in huge vehicle repair costs. In order to improve the communication to these two power stations and to reduce the vehicle repair cost it is essential that this road be repaired at the earliest. The proposal involves reconsolidation and metalling in those worst stretches, pot holes repairing, and providing premixed carpeting and seal coat over the whole stretch of road from Zero Point onwards to Stage-IV Power Station.

The estimated total expenditure for the above System Augmentation & Improvement projects is Rs. 42.40 Cr.

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

SI No.	Particulars	Project cost
1.	System Augmentation & Improvement Umiam Stage-IV	42.40

5.1.6 Umtru HEP

For the Umtru HEP, the following projects are proposed to be undertaken during the control period of FY 2015-16 to FY 2017-18:

Table 14: Projects for Umtru HEP

No.	Project Name	Description
1	Flood control works of Umtru Power House	The Flood control and River management works are intended to control the erosion and scouring of the Umtru river which have taken place in the areas along the stretch where the power station is located.
2	Feasibility study for Renovation Modernisation & Upgradation of 4x2.8MW Umtru HEP, Dehal	The Generation from Umtru HEP has reduced drastically due to wear & tear and non-availability of suitable spares. However, it is possible to improve the Plant Load Factor by taking Renovation Modernisation and Upgradation and hence this proposal.

The above projects are estimated to cost Rs. 7.47 Cr.

Table 15: Funding for Umtru HEP Projects

SI No.	Particulars	Project cost
1.	Projects for Umtru HEP	7.47 Cr

5.1.7 Sonapani Small Hydro Project

For the Sonapani Small Hydro Project, the following projects are proposed to be undertaken during the control period of FY 2015-16 to FY 2017-18:

Table 16: Projects - Sonapani SHP

No.	Project Name	Description
1	Procurement and Installation of 415V 3 Phase LT Panel	The existing LT Panel is out of order and the LT power control has been temporarily used. Therefore it is proposed that a new 415V 3 Phase LT Panel be procured
2	Procurement of Relays and Cards to replace some existing defective ones and as 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
3	Station Battery bank along with Charger	Station Battery Bank along with Charger is required as per CEA Standards operation requirement. Therefore it is proposed that Station Battery bank along with Charger be procured.

No.	Project Name	Description
4	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 17: Project cost for Sonapani SHP Projects

SI No.	Particulars	Project cost
1.	System Improvement projects	0.34 crs

- **Additional Unit of existing Sonapani Mini Hydel Project (1x500KW)**

Introduction: The Additional unit with the proposed installed capacity of 500 KW (single unit) is the expansion of the existing Heritage Project the Sonapani Mini Hydel Project (1 x 1.5 MW), to be constructed on the same place and location as that of the existing project i.e. in Lumkshaid, Lower Mawprem located within the city limit of Shillong, East Khasi Hills district, Meghalaya.

The acquisition of land for the existing Sonapani Mini Hydel Project (after the lease has expired) and that of the proposed additional unit is under process as the total area of land measuring about 4.71 acres more or less where the Project is located is private land and negotiation in this regard is underway.

Total capital project cost:

SI No.	Particulars	Cost (Rs. Lakhs)
1	Civil (including land)	1443.11
2	Electrical Works	367.00
3	**Total Project Cost**	**1810.11**
4	IDC	216.75
5	**Total Project Costs (including IDC)**	**2026.86**

The Project cost is shown in the table below:

Table 18: Project cost for new unit of Sonapani SHP

SI No.	Particulars	Project cost
1.	New unit of Sonapani SHP	20.27 crs

5.1.8 Myntdu Leshka Hydro Electric Project (MLHEP) System Improvement Project

5.1.9 Installation & erection of UPS panel and battery bank for MLHEP DAM Control room

- Radial gates of MLHEP are electrically operated for which adequate motors are in place. However, it is observed that during monsoon due to heavy rain, thunder and storm, power supply fails. In such case a temporary backup of power supply from 2 (two) DG sets of capacity 320kVA and 30kVA each are already installed at Dam site. However, this system is not fool-proof, since the DG sets are susceptible to lightning strikes more frequently during the pre-monsoon season when the surrounding soil is not yet saturated and risky for the hydraulic structures. In few occasions the water level has overtopped the dam for delay in opening of radial gates due to absence of power. This is entirely undesirable for the safety of the structure.
- Therefore, it is proposed that a Battery Bank based power backup system be procured for ensuring uninterrupted power supply at the Dam control room for powering the equipment. The Erection of the UPS Panels & battery bank can be installed in the ground floor of the Dam's control room where the available area is 15mX4.5m = 67.5m^2 more or less. The ground floor area is at present used as a store room-cum-multipurpose room.
- Moreover, in the absence of A.C power from the grid, the D.G. Sets are required to be physically started and the Hydraulic Hoist System controlling the Radial Gates need to be started at the local control panel. This procedure is time consuming and during the control of a large flood in the reservoir, time is what the operational staff on duty do not have. The provision of Battery based power backup is expected to be a fool-proof arrangement.
- The project is estimated to cost Rs. 57.76 Lac and will be funded by taking market loan with equity.

5.1.10 Cooling System Modification & Improvement

- The power plant is expected to generate around 486 MU per annum. However, due to various reasons like deficit rainfall, disturbances, teething problems like clogging of the cooling water system of the units, etc, the maximum generation stays around 413 MU i.e. during FY 13 -14. The maximum generation happens during June to September every year due to heavy rainfall during this period. It is necessary that during this time the station generates 350 MU to reach designed energy generation target of 486 MU. However due to outages, occurring due to factors like clogging of the cooling system and tripping of machine, much of the energy is lost during this period.
- Due to the clogging/blockage of the pipeline there is shortfall in the supply of the

water intended for Cooling system for Generator & turbine as well as the shaft seal system. To remove the clogging/blockage of the pipeline the units need to be shut down. During FY 2013-14, due to the shutdown of the Units for the purpose of maintenance of Shaft Seal and Cooling water, there is a loss of around 4 MUs. Financially, this attributes to the loss of about Rs. 1.13 Cr.

- Therefore, two additional pipelines should be provided to facilitate quick interchange of lines in case of clogging of the pipeline in operation. Moreover Duplex filter should be provided for easy removal of debris and easy facilitation of cleaning process.

- The following are proposed for cooling system modification and improvement:
  - Drawal of 2 new pipe lines of 200 Nominal Bore (NB) having a length of 1750m each from Chingy river. For both the lines, incoming shall be provided with Gate Valves and Duplex Filters.
  - Civil works of casting of RCC/PCC, Anchor blocks or Pedestals for resting the water pipe lines.
  - The Generator/Turbine shall be made Open Looping during summer seasons.
  - The system improvement project for MLHEP is expected to cost Rs. 2.51 Cr and will be funded through equity and loan.

- The benefits will be:
  - Reduction in maintenance cost. Spares costing around Rs. 6.00 lakhs per annum for maintaining the same are reduced.
  - Outages accounted for 617400 units = Rs. 17,47,242/- @ Rs. 2.83 per unit.
  - Reduction of energy consumption of power station, by not having to operate 3 Nos of 45 kW primary cooling water pumps and 3 Nos 55 Kw secondary cooling water pumps for a period of 6 months and therefore the energy saved @ Rs. 2.83/unit = (3 machines x 45kw x 24hr x 184 days x Rs. 2.83) + (3 machines x 55kw x 24hrs x 184 days x Rs 2.83) = Rs 37,49,184/-
  - Therefore the total amount saved per annum is around Rs 60,00,000/-(Rupees Sixty lakhs).

The Project cost is shown in the table below:

Table 19: Project cost for Myntdu Leshka Hydro Electric Project (MLHEP) Improvement Projects

SI No.	Particulars	Project cost
1.	System Improvement projects	3.09 crs

5.2 Medium & Small Hydro Projects

5.2.1 Amkshar SHP (2x1200 KW)

- Objective of the Project:

The main objective of any small hydel project is to ensure more reliable power supply to the villages surrounding the project site. Similarly, the Amkshar Small Hydel project which is located in West Jaintia Hills District of Meghalaya will ease the problems of frequent power cuts experienced by the nearby villages especially during monsoon period when the maintenance of the long transmission lines from the grid supply become difficult.

- Estimated Cost for the Project:

SI No.	Particulars	Cost (Rs. Lakhs)
1	Civil Works	2318.29
2	Electro-Mechanical Works	1050.00
3	**Total Project Cost**	**3368.29**
4	IDC	236.88
5	**Total Project Cost (including IDC)**	**3605.17**

The recent notification by the Ministry of New and Renewable Energy (MNRE), Government of India, under the scheme "Small Hydro Power Programme (upto 25 MW capacity)" provides capital subsidy for setting up new SHP Projects @ Rs. 7.50 Crores/MW limiting to Rs. 20.00 Crores per project. Hence this project is entitled to a maximum subsidy of Rs. 18.00 Crores and the balance amount of Rs. 18.05 Crores shall be borne by the equity and the loan to be arranged from financial institution. The Levelised Tariff for the project is Rs. 2.82/unit

- Project Description:

The Amkshar Small Hydel project is a Run of the River scheme and proposes to generate 2 x 1200 KW of power (installed capacity) by utilizing the design discharge of 3.20 Cumecs and gross head of 90.00m. Amkshar is a south flowing stream and within the project area, it encounters rapids and falls which facilitate the development of a Small Hydel Project.

The Amkshar Small Hydel Project with a designed Load factor of 59.75% will generate an annual energy of 12.20 MU and the electrical energy produced shall be utilized for augmenting the energy supply in the local rural distribution network around Kudeng Rim, Kudeng Thymmai, Nongbareh, Khonglah, Sohkha etc. The energy availability will also improve the voltage profile and reliability of the power system in this area.

The project is also aimed in significantly improving the socio-economic condition of the people living around the project area.

The Project cost is shown in the table below:

Table 20: Project cost for Amkshar SHP (2x1200 KW)

SI No.	Particulars	Project cost
1.	Project cost for Amkshar SHP	36.05 Crs

5.2.2 Sanglet MHP (2x1000 KW)

- Introduction:

The Sanglet Mini Hydro Electric project is located in the remote hilly areas of the East Khasi Hills district and is proposed to meet the local energy demand of the area, through development of potential along the river Sanglet (Sonai). The Sanglet Hydroelectric Project envisages utilization of water of the Sanglet (Sonai) stream as a run-off river scheme. The project is also aimed in significantly improving the overall development in the Mawlong area and its neighboring villages.

- Component Wise Cost of the Project:

SI No.	Particulars	Cost (Rs. Lakhs)
1	Civil Works	2101.63
2	Electro Works	975.00
3	**Total Project Cost**	**3076.63**
4	IDC	238.12
5	**Total Project Cost (including IDC)**	**3314.75**

- Financing of the project:

The recent notification by the Ministry of New and Renewable Energy (MNRE), Government of India, under the scheme "Small Hydro Power Programme (upto 25 MW capacity)" provides capital subsidy for setting up new SHP Projects @ Rs 7.5 Crores/MW limiting to Rs 20 Crores per project. Hence for this particular Project an amount of Rs 18.15 Cr need to be arranged from own resources and through loan, if funding from MNRE is accepted.

The Project cost is shown in the table below:

Table 21: Project cost for Sanglet MHP (2x1000 KW)

SI No.	Particulars	Project cost
1.	Project cost for Sanglet MHP	33.15 Crs

5.2.3 Tyrsaw MHP (2x900 KW)

- Objective of the project:

The main objective of any small hydel project is to ensure more reliable power supply to the villages surrounding the project site. Similarly the Tyrsaw Mini Hydel project which is located in East Khasi Hills District of Meghalaya will ease the problems of frequent power cuts experienced by the nearby villages especially during monsoon period when the maintenance of the long transmission lines from the grid supply becomes difficult.

- Estimated cost for the project:

SI No.	Particulars	Cost (Rs. Lakhs)
1	Civil Works	1490.17
2	Electro-Mechanical Works	860.00
3	**Total Project Cost**	**2350.17**
4	IDC	151.06
5	**Total Project Cost (including IDC)**	**2501.23**

The recent notification by the Ministry of New and Renewable Energy (MNRE), Government of India, under the scheme "Small Hydro Power Programme (upto 25 MW capacity)" provides capital subsidy for setting up new SHP Projects @ Rs. 7.50 Crores/MW limiting to Rs. 20.00 Crores per project. Hence this project is entitled to a maximum subsidy of Rs. 13.50 Crores and the balance amount of Rs. 11.51 Crores shall be borne by the equity and the loan to be arranged from financial institution. The Levelised Tariff for the project is Rs. 2.47/ unit

- Project description:

The Tyrsaw Mini Hydel project is a Run of the River scheme and proposes to generate 2 x 900 KW of power (installed capacity) by utilizing the design discharge of 2.71 Cumecs from Pongtung River and Tyrsaw River and gross head of 84.00m. River Pongtung and Tyrsaw are south flowing rivers and within the project area, which encounters rapids and falls which facilitate the development of a Small Hydel Project.

The Tyrsaw Mini Hydel Project with a designed Load factor of 65.52% will generate an annual energy of 9.32MU and the electrical energy produced shall be utilized for augmenting the energy supply in the local rural distribution network around Pongtung Village, Pynter, Siatbakon, Nongshyrngan, Mawpran, Mawshun etc. The energy availability will also improve the voltage profile and reliability of the power system in this area.

The project is also aimed at significantly improving the socio-economic condition of the people living around the project area.

The Project cost is shown in the table below:

Table 22: Project cost for Tyrsaw MHP (2x900 KW)

SI No.	Particulars	Project cost
1.	Project cost for Tyrsaw MHP	25.01 Crs

5.2.4 Umshamphu SHP (2x1500 KW)

- Objective of the project:

The main objective of any small hydel project is to ensure more reliable power supply to the villages surrounding the project site. Similarly the Umshamphu Small Hydel project which is located in West Jaintia Hills District of Meghalaya will ease the problems of frequent power cuts experienced by the nearby villages especially during monsoon period when the maintenance of the long transmission lines from the grid supply become difficult

- Estimated cost and sources of funding for the project:

SI No.	Particulars	Cost (Rs. Lakhs)
1	Civil Works	2659.89
2	Electro-Mechanical Works	1490.00
3	**Total Project Cost**	4149.89
4	IDC	324.71
5	**Total Project Cost (including IDC)**	**4474.60**

The recent notification by the Ministry of New and Renewable Energy (MNRE), Government of India, under the scheme "Small Hydro Power Programme (upto 25 MW capacity)" provides capital subsidy for setting up new SHP Projects @ Rs. 7.50 Crores/MW limiting to Rs. 20.00 Crores per project. Hence this project is entitled to a maximum subsidy of Rs. 20.00 Crores and the balance amount of Rs. 24.75 Crores shall be borned by the equity and the loan to be arranged from financial institution. The Levelised Tariff for the project is Rs. 2.35/unit.

- Project description:

The Umshamphu Small Hydel project is a Run of the River scheme and proposes to generate 2 x 1500 KW of power (installed capacity) by utilizing the design discharge of 2.24 Cumecs and gross head of 170.00m. River Umshampu is a south flowing river and within the project area, it encounters rapids and falls which facilitate the development of a Small Hydel Project.

The Umshamphu Small Hydel Project with a designed Load factor of 76.11% will generate an annual energy of 19.59MU and the electrical energy produced shall be utilized for augmenting the energy supply in the local rural distribution network around Jarain Village,

Skhentalang, Amlarem, Suchen etc. The energy availability will also improve the voltage profile and reliability of the power system in this area.

The project is also aimed at significantly improving the socio-economic condition of the people living around the project area.

The Project cost is shown in the table below:

Table 23: Project cost for Umshamphu SHP (2x1500 KW)

SI No.	Particulars	Project cost
1.	Project cost for Umshamphu SHP	44.75 Crs

5.3 New Projects

5.3.1 Ganol Small Hydro Project (3X 7.5MW)

- Introduction:

The Ganol Stage-I hydro Electric project is envisaged as a diversion project with pondage on the Ganol River, which runs on the outskirts of the town of Tura, the district Head quarters of West Garo Hills District, Meghalaya.

The Project components comprise of a 35m high concrete gravity dam with a live storage of 0.85M.Cum, 2.5m dia and 2.1KM long Head Race Tunnel, 8m dia and 40m high Surge Shaft, a 2.0m dia and 642m long high pressure Tunnel and Pen stock and a 38mx12.5m surface Power House. It is proposed to install 3 Nos. of Francis Turbines with a capacity of 7.5MW each at a Rated Head of 148m. The annual design energy that would be available is 59.28 GWh in a 90 % dependable year and 67 GWh in a 75 % dependable year.

- **SALIENT FEATURES OF THE PROJECT**

A. Project Location

State	Meghalaya
District	West Garo Hills
Stream	Ganol River
Vicinity	Tura Town

B. Reservoir

Full Reservoir Level / High Flood Level	EL 352.00 m
Maximum Draw Down Level	EL 346.00 m
Live Storage Volume	0.85 M. Cum

Area of submergence at FRL	19.59 Ha
Catchment area	113 Sq.km
Provable Maximum Flood Discharge (PMF)	1080 Cumec

C. Dam

Type	Concrete Gravity
Top level	EL 355.00 m
Full Reservoir Level	EL 352.00 m
Dam height from Foundation Level	35.00 m
Total length of dam	100.28 m

D. Spillway

Spillway type	Radial Gated Sluice Spillway
Crest Elevation	EL 330.00 m
No. and Size of Sluice	3 nos.
Number, type and Size of Gates	Three Radial Gates Each of Size- 6.50 m (W) x 7.5m (H)
Number and size of Stop Log Gate	One set – 6.5m x13.9m
Stop Log Gate	One set of five Panels Each of Size- 6.50 m (W) x 2

E. Intake

Number of openings	One
Inlet Elevation	EL 340.00m
Design Discharge	22.40 cumec
Gate Type (at the Tunnel entrance)	Vertical Fixed Wheel Type
Sill Elevation	EL. 340.0 m
Dimensions (L x W) m	3m x 4m

F. Headrace Tunnel (Hrt)

Shape (D shaped; HxD)	2.50 m dia
Length	2065 m
Internal Diameter	2.50 m dia
Velocity for Nominal Discharge	3.56 m/sec
Nominal Discharge	16.86 cumec
Lining	100 % concrete

G. Surge Shaft

Top elevation	EL 365.00 m
Bottom Elevation of Main Shaft	EL 325.00 m

Height of Shaft	40 m
Internal Diameter	8m
Lining- 100 % concrete	R.C.C. Lining

H. Pressure Shaft, Valve House And Penstock

Total length	642 m
Pressure shaft – Surge Shaft upto first band	2m dia – 104.37 m long with Butterfly valve
Inclined length from first band	537.4 m
Internal Diameter	2.0 m
Steel Liner thickness upto trifurcation Point	Varies from 12mm to 20 mm
Velocity for Nominal Discharge	6.0 m /sec

I. **Power House**

Type	Surface Power House
Dimensions (l x w)	38mx 12.5m
Turbine type	Francis, Vertical
Number of units	Three (3)
Normal Tail Water Level	EL 192.00 m
Max. Tail Water Level	EL 195.00 m
Net Rated Head	148 m
Install capacity	3x7.5 MW
Plant Load Factor	0.56
Inlet Valve Type	Butterfly Valve
Nominal Speed	750 rpm

J. Switchyard

Type	Outdoor
Location of Switchyard	Back slope side of Powerhouse
Voltage / Busbars	132 kV / 11kV
Area (l x w) m	45 m x 35 m

K. **Transmission Lines**

HT Voltage	132 KV Single circuit
Length to Rongkhon sub- station	5 km

L. **Power Benefits**

Design Energy (75 % dependable	67.09 GWh

year)

Energy in Average Year (50 % dependable year) 74.06 GWh

Energy (90 % dependable year) 59.28 GWh

- **Physical Progress of Works as on 31.08.2015:**

Sl. No.	Item	Physical Progress
1	Road and Building	Completed.
2	Office building	Completed.
3	Residential building	Completed.
4	Bridge	Completed.
5	Land	Land acquisition completed, however payment not done yet
6	Open excavation at Surge shaft	Completed.
7	Open excavation at Pressure shaft	Completed.
8	Open excavation at Power house	Completed.
9	Open excavation at Dam site	Under progress. 1. Open Excavation: Started on the right bank but has encountered fractured rock and loose boulders. The senior Geologist, GSI GoI was called in the month of April, 2015 to examine the geology. 2. Drawings: Detail construction drawings are under preparation by CWC, New Delhi. The site specific seismic coefficient conducted by IIT, Roorkee was submitted recently. More discussion are required to adopt final choice of design (various alternatives are available) of the arrangement of gates, gallery, hoisting arrangement, etc
10	Open excavation at switch yard	Under progress.
11	Surge Shaft	1. Excavation: Excavation has completed and Shaft sinking is in progress. The Gantry crane has been erected by M/s Patel Engineering Ltd, the contractor 2. Drawings: Received.
12	Diversion Tunnel	Drawings are being finalized in house in consultation with

		CWC, New Delhi.
13	Intake	Drawings are still awaited.
14	HRT	Drawings are received, works will start soon.
16	Pressure Shaft	1. Excavation: Excavation in progress. 2. Drawings: Received.
17	Power House (a) Civil	1. Excavation: Though the open excavation is completed, the layout of the Power House is still awaited.
18	Evacuation of Power	1. The present transmission lines from Rongkhon to Ampati cross over the Ganol Power House site. This need to be re-aligned Final survey is in progress. 2. Excavation of power from Ganol Project to Rongkhon is being finalized.

- **Financial Details:**

Funding Pattern

The funding pattern is shown below:

Particular	Amount (Rs Lacs)	Percentage (%)
Equity with RoE	5571	15.63%
Equity without RoE	11767.2	33.01%
Loan	13000	36.47%
Grant	5304.8	14.88%
Total	**35643**	**100.00%**

The administrative approval for the construction of Ganol HEP (22.5MW) at Tura was accorded by the Government of Meghalaya, Power Department wide letter no. PE 129/2005/122 dated: 13th May, 2008.

5.3.2 Lakroh Mini Hydel Project (1X 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 components comprise of a Diversion weir (composite structure, i.e. masonry covered with RCC) of about 40metres in length and 4.5 metres in height. The design discharge of the project is 1.15 Cumecs fixed on 66% dependable flow. The water from the intake (developed on the body of the Weir) is led to the Forebay through an open channel of about 800 metres in length. The Overall storage capacity of the Forebay is about 450 cubic meters. The water from the Forebay is led through a penstock pipe made of mild steel with diameter 600mm and thickness varying from 6mm at the top to 10 mm at the Power House. The

Power House is equipped with one number Horizontal Francis Turbine, EOT Crane and Panel Boards. The water from the Power house is discharged back to the river through a tail race of about 150 metres in length.

The project site is located about 6km by road from the Muktapur village near Bangladesh border. Muktapur is approachable from Shillong by the 65km long road on NH-44 upto Jowai, and from there by the 52 km long Jowai –Muktapur road. Muktapur is also approachable from Shillong via Dawki on NH 40 for 86km and another 16 km on the Dawki – Muktapur road.

The Project is having a Design Energy of 11 MUs. The Lakroh project is expected to be commissioned by June, 2015.

The total Estimated Project Cost is Rs. 17.51 Cr. (as per 2013-14 Price Level). The total expenditure incurred till date is Rs. 11.45 Cr. The year wise expenditure is shown in the table below:

Particular	Upto 01.04.12	FY 2013-14	FY 2014-15	FY 2015-16
Capital Expenditure	8.23	1.19	0.64	5.75

The funding pattern of the Lakroh project is shown below:

Table 24: Funding Details-Lakroh

Particular	Amount (Rs. Cr)	Percentage (%)
Loan	5.75	33%
Grant	11.76	67%
Total	**17.51**	**100%**

5.3.3 Riangdo (3X 1000 kW)

The Riangdo Small Hydel project is a run of the river project developed on the Riangdo river located near Shallang Village.

The proposed project components comprise of an RCC Diversion weir of about 58 metres in length. The design discharge of the project is 2.52 Cumecs fixed on 46% dependable flow. The water from the intake (developed on the body of the Weir) is led to the Forebay through an open channel of about 500 metres in length. The Overall storage capacity of the Forebay is about 1200 cubic meters. The water from the Forebay is led through a penstock pipe made of mild steel with diameter 1100 mm and thickness varying from 6mm at the top to 12 mm at the Power House. The

Power House will be equipped with three number Horizontal Francis Turbine, EOT Crane and Panel Boards. The water from the Power house is discharged back to the river through a tail race.

The project site is accessible by road at about 90 Km from Nongstoin.

The Riangdo project is expected to be commissioned by December 2018 and is having a Design Energy of 17.92 MU.

The estimated project cost is ~Rs. 34 Cr. The year wise expenditure phasing is shown below:

Year	FY 2015-16	FY 2016-17	FY 2017-18	Total
CAPEX (Rs. Cr)	8.00	17.00	9.00	34.00

The funding pattern of the Riangdo project is shown in the table below:

Table 25: Funding Details-Riangdoh

Particular	Amount (Rs. Cr)	Percentage (%)
Equity	4.24	12.42%
Loan	9.9	29.00%
Grant	20.00	58.58%
Total	**34.14**	**100%**

5.3.4 New Umtru HEP (2X2000 kW)

The Old Umtru H.E Project (4x2.8 MW) was the first project to be taken up in the Umtru basin with three of its units commissioned in 1957 (the last unit was commissioned in1968). Past operational experience of this plant indicates that the potential of the river is not exploited to its optimum. In 1965, when Umiam Stage-I H.E Project (4x9 MW) was commissioned, the tail water of this station discharges into the Umtru river, resulting in the enhancement of the discharge of Umtru river. Thus, there is scope for development of additional capacity from the enhanced discharge. In this context, the New Umtru H.E Project (2x20 MW) was proposed alongside the Old Umtru Project with common water storage. A New Umtru Dam is being constructed at the location of the Old Umtru Weir to create an enhanced storage for both the existing and new projects.

The New Umtru H.E Project will have a new Dam, Intake, Water Conductor System, Surge Shaft, Pressure Shaft, Power House, Switchyard and Tail Race Tunnel.

The project site is approachable by NH-40 from Guwahati to Byrnihat and thereafter on a state highway to the DAM at Dehal, passing through the existing Umtru Powerhouse.

The New Umtru Hydro Electric Project is expected to be commissioned by October, 2016 and is having an Annual Design Energy of 193 MUs.

The estimated project cost is Rs. 461.27 Cr as approved on 10.12.2013. This project cost is now under revision.
The funding pattern of the New Umtru project is shown in the table below:

Table 26: Funding Details-New Umtru

Particular	Amount (Rs Cr)	Percentage (%)
Equity	138	30%
Loan	323	70%
Total	**461**	**100%**

5.3.5 Power System Development Fund

5.3.5..1 The Government of India has approved a scheme for operationalisation of Power System Development Fund (PSDF) in year 2014. PSDF is a fund constituted under Central Electricity Regulatory Commission (Power System Development Fund) Regulations, 2014 to be utilized for the following purpose:

- Transmission systems of strategic importance based on operational feedback by Load Despatch Centers for relieving congestion in inter-State transmission system (ISTS) and intra-State Transmission Systems which are incidental to the ISTS.
- Installation of shunt capacitors, series compensators and other reactive energy generates for improvement voltage profile in the Grid.
- Installation of special protection schemes, pilot and demonstrative projects, standard protection schemes and for setting right the discrepancies identified in the protection schemes and for setting right the discrepancies identified in the protection audits on regional basis.
- Renovation and Modernization (R&M) of transmission and distribution system for relieving congestion
- Any other scheme/ project in furtherance of the above objectives such as technical studies and capacity building

5.3.5..2 Based on decision taken in the in NERPC forum, a third party audit on protection

was carried out in 135 substations and generating stations of NER at 132 kV voltage level and above. The teams comprising of members from PGCIL, NEEPCO, NHPC, NERPC and NERLDC was formed. The protection audit of the substations and generating stations in NER was completed in February 2013. The findings of the audit team were discussed in the Commercial Sub-Committee and Protection Sub-Committee meetings of NERPC. Subsequently, the Ministry of Power directed for preparation of the Detail Project Report based on the recommendations of the protection audit team for rectifying the defects. The same was sent to CEA with the request for funding through PSDF or any other sources without any financial burden to the constituents.

5.3.5..3 In order to further its objectives of having enhanced grid connectivity, system security, real time data capture etc. MePGCL plans to utilize the funding available through PSDF for implementation of certain schemes. The cost of implementation is estimated to be Rs. 48.5 Cr which is expected to be made available in the form of 100% Grant. The Detailed Project Reports is being prepared and after that approval will be sought from National Load Despatch Centre (NLDC) and Central Electricity Authority (CEA).

5.4 Summary of Capital Expenditure (CAPEX)

The station wise investment plan detail is attached as Investment Plan Format and Format-15. The station wise summarized capital expenditure is shown in the table below:

Table 27: CAPEX-Station wise summary

Sl No	Station	CAPEX (Rs. Cr)	Funding Pattern (Rs. Cr)		
			Debt	Equity	Grant
New Stations					
1	Ganol SH project	356.42	130	173	53.04
2	Lakroh HEP	17.51	5.75	-	11.76
3	Riangdo HEP	34.14	9.90	4.24	20.00
4	New Umtru	461.00	323	138	-
	Sub-Total	**869.07**	**468.35**	**315.92**	**84.80**
Small Hydel Projects - New Stations					
1	Amkshar SHP (2x1200 KW)	36.05	12.64	5.42	18.00
2	Sanglet MHP (2x1000 KW)	33.15	12.71	5.45	15.00
3	Tyrsaw MHP (2x900 KW)	25.01	8.06	3.45	13.50
4	Umshamphu SHP (2x1500 KW)	44.75	17.33	7.43	20.00
5	Additional Unit of existing Sonapani Small Hydel Project (1x500KW)	20.27	11.56	4.96	3.75
	Sub-Total	**159.23**	**62.29**	**26.69**	**70.25**
Existing Stations					

1	Umiam Stage-I	26.63	7.99	18.64	
2	Umiam Stage-II	0.80	0.24	0.56	
3	Umaim Stage-III	427.40	128.22	299.18	
4	Umaim Stage-IV	42.40	12.72	29.68	
5	Umtru HEP	7.47	2.24	5.23	
6	Sonapani	0.34	0.10	0.24	
7	Leshka	3.09	0.75	2.34	
	Sub-Total	**508.14**	**152.27**	**355.87**	**-**
Total		**1,536.44**	**682.90**	**698.48**	**155.05**

MePGCL submits before the Hon'ble Commission to kindly approve the Investment Plan as proposed in the table above for the control period of FY 2015-16 to FY 2017-18.

5.5 Board's approval & DPRs

5.5.1 The Boards approval and the DPRs are attached as Annexure as follows:

Table 28: List of Annexure

Sl. No.	Particulars	Annexure
1	Board's approval	A
2	Umiam stage-I	B
3	Umiam stage-II	C
4	Umiam stage-III	D
5	Umiam stage-IV	E
6	Umtru HEP	F
7	Sonapani HEP	G
8	Myntdu Leshka HEP	H
9	Small Hydro Power Projects	I
10	Ganol SH project	J
11	Lakroh HEP	K
12	Riangdo HEP	L
13	New Umtru	M

5.6 Funding of Capital Expenditure

5.6.1 MePGCL plans on funding majority of its capital expenditure through the State Government. The funding for the works proposed under Financial Institution is envisaged through Power Finance Corporation / Rural Electrification Corporation

Table 29: Investment Plan

Name: MePGCL

Investment Plan

Note:- Information to be provided for FY 13-to-Fy-18 for all heads either spilling into the period starting during FY-13

Sl. No.	Project Details							SOURCE OF FINANCING FOR SCHEME			
								Equity Component		Debt Component	
										Loan amount (Rs. Crs.)	
	Name of Scheme	Year of Start	Nature of Project (Select appropriate code from below)	Whether the scheme is part of approved Business Plan* (Yes/No)	Project Start Date (DD-MM-YY)	Project Completion date (DD-MM-YY)	Total capital expenditure approved by MSERC/Govt. /FI (Rs. Crs.)	Internal Accrual (from free reserves and surplus)	Additional equity infused	Loan	Capital Subsidies/grants component
Umaim Stage-I											
1	Construction of Beams and By-pass Isolators for KPS-1, KPS-2 & Umiam feeders.	FY 2017-18	c	No	Jul'17	Mar'18	0.49	NA	0.15	0.34	
2	Replacement of By-pass valve and renovation of butterfly valve mechanism of penstock	FY 2016-17	c	No	Oct'16	Mar'17	0.93	NA	0.28	0.65	
3	Procurement and installation of 250KVA DG Set	FY 2016-17	c	No	July'16	Dec'16	0.39	NA	0.12	0.27	
4	Re-engineering of fire fighting system of Generator and Transformer	FY 2016-17	c	No	Oct'16	Mar'17	0.47	NA	0.14	0.33	
5	Replacement of Generator transformer for Unit-1 & Unit-2 Power Station, Sumer	FY 2016-17	c	No	Jan'17	Dec'17	3.04	NA	0.91	2.13	
6	Installation of supervisory control to monitor the power station parameters.	FY 2016-17	e	No	Jun'16	Feb'17	0.34	NA	0.10	0.24	
7	Construction of Transformer Yard to accomodate station service transformers, Unit-1 & Unit-3 and procurement of the same.	FY 2016-17	c	No	May'16	Jan'17	0.21	NA	0.06	0.15	

Name: MePGCL
Investment Plan
Note:- Information to be provided for FY 13-to-Fy-18 for all heads either spilling into the period starting during FY-13

Sl. No.	Project Details							SOURCE OF FINANCING FOR SCHEME			
								Equity Component		Debt Component Loan amount (Rs. Crs.)	
	Name of Scheme	Year of Start	Nature of Project (Select appropriate code from below)	Whether the scheme is part of approved Business Plan* (Yes/No)	Project Start Date (DD-MM-YY)	Project Completion date (DD-MM-YY)	Total capital expenditure approved by MSERC/Govt. /FI (Rs. Crs.)	Internal Accrual (from free reserves and surplus)	Additional equity infused	Loan	Capital Subsidies/grants component
Umaim Stage-I											
8	Replacement of Intake gate and Trash Rack of Intake structure at Umiam Stage I HEP	FY 2016-17	b	No	Dec'16	May'17	2.04	NA	0.61	1.43	
9	Emergency Preparedness in the Umiam umtru Trans Basin Development Scheme	FY 2017-18	b	No	April'17	Dec'17	3.15	NA	0.95	2.21	
10	Replacement of exisitng MIV of unit-3 and unit-4 of stage I power station	FY 2013-14	c	No	Oct'14	Jun'15 (completed)	3.37	NA	1.01	2.36	
Road											
11	Proposed metalling and black topping of the approach road from junction of PWD Road to 2nd Stage Colony upto the junction point of PWD Road to Byrwa Colony via the appraoch road to Type-III, Type-IV and Type-IV at Sumer	FY 2017-18	c	No	Oct'17	Mar'18	0.32	NA	0.09	0.22	
Building											
12	Construction of RCC Residendial buildings and non-residential buildings at Umiam and Sumer under Stage-I Proejct	FY 2017-18	c	No	Oct'17	Oct'19	10.77	NA	3.23	7.54	
13	Improvement of water supply at Umiam and Sumer under Stage-I Project	FY 2016-17	c	No	Mar'17	Mar'18	1.11	NA	0.33	0.78	

Name: MePGCL
Investment Plan
Note:- Information to be provided for FY 16-to-Fy-18 for all heads either spilling into the period starting during FY-16

Sl. No.	Project Details							SOURCE OF FINANCING FOR SCHEME					
								Equity Component		Debt Component Loan amount (Rs. Crs.)			
	Name of Scheme	Year of Start	Nature of Project (Select appropriate code from below)	Whether the scheme is part of approved Business Plan* (Yes/No)	Project Start Date (DD-MM-YY)	Project Completion date (DD-MM-YY)	Total capital expenditure approved by MSERC/Govt./FI (Rs. Crs.)	Internal Accrual (from free reserves and surplus)	Additional equity infused	Loan	Capital Subsidies/grants component	Consumer Contribution Component	Details of Project Cost with Cost benefit analysis (write up of Scheme)/ DPR
Umaim Stage-II													
1	Installation of 250KVA, 11kv substation dedicated to the stanion supply of Umiam stage-II Power Station	FY 2016-17	c	No	Oct'16	Mar'17	0.13	NA	0.04	0.09		NA	Yes
2	Emulsifier system for 2x12.0 MVA Generator Transformer in both Units.	FY 2016-17	b	No	Oct'16	Mar'17	0.14	NA	0.04	0.10		NA	Yes
3	Installation of On Line Supervisory system (SCADA) for the entire Power Station	FY 2017-18	e	No	Jun'17	Feb'18	0.34	NA	0.10	0.24		NA	Yes
Road													
4	Improvement of the road-consolidation metalling and black topping of the approach road from junction of PWD road to 2nd Stage Colony upto the junction point of PWD road to Byrwa Colony via the appraoch road to Type-111 Quarter, Type-IV Quarter and Type-V Quarter at Sumer	FY 2017-18	c	No	Oct'17	Mar'18	0.19	NA	0.06	0.13		NA	Yes

Name: MePGCL
Investment Plan
Note:- Information to be provided for FY 16-to-Fy-18 for all heads either spilling into the period starting during FY-16

Sl. No.	Project Details							SOURCE OF FINANCING FOR SCHEME					
								Equity Component		Debt Component Loan amount (Rs. Crs.)			
	Name of Scheme	Year of Start	Nature of Project (Select appropriate code from below)	Whether the scheme is part of approved Business Plan* (Yes/No)	Project Start Date (DD-MM-YY)	Project Completion date (DD-MM-YY)	Total capital expenditure approved by MSERC/Govt./FI (Rs. Crs.)	Internal Accrual (from free reserves and surplus)	Additional equity infused	Loan	Capital Subsidies/grants component	Consumer Contribution Component	Details of Project Cost with Cost benefit analysis (write up of Scheme)/ DPR
Umiam Stage-III													
1	Installation of New D.G. Set at Umiam-Umtru Stage-III Power Station	FY 2016-17	b	No	Oct'17	Mar'18	0.27	NA	0.08	0.19		NA	Yes
2	DPR for installation of CCTV at Stage-III Power Station	FY 2016-17	e	No	Jul'16	Dec'17	0.07	NA	0.02	0.05		NA	Yes
3	DPR for Renovation, Modernisation and Upgradation	FY 2016-17	c	No	Oct'16	Jun'19	411.00	NA	123.30	287.70		NA	Yes
4	DPR for supply and erection of 1250A 415 V LTAC Panel for Umiam Umtru Stage-III	FY 2016-17	c	No	Jan'17	Dac'18	0.24	NA	0.07	0.17		NA	Yes
5	DPR for Pressure and Temperature Monitoring Meter at Stage-III	FY 2016-17	d	No	Jul'16	Dec'17	0.30	NA	0.09	0.21		NA	Yes
6	Repair of Pressure Releive Valve of Unit-II of Stage-III Power Station, MePGCL, Kyrdemkulai	FY 2017-18	e	No	Jul'17	Dec'17	0.26	NA	0.08	0.18		NA	Yes
7	DPR for Reengineering of 132 KV Bus at Switch yard	FY 2017-18	b	No	April'17	Dec'17	0.38	NA	0.11	0.27		NA	Yes
8	DPR for repairing of Generator and re-assembly of Unit-I machine	FY 2017-18	e	No	Jan'17	Dec'18	3.10	NA	0.93	2.17		NA	Yes
9	DPR for installation of New 33/0.44 KV Sub Station including 33KV line extension	FY 2016-17	b	No	Jul'16	Dec'17	0.16	NA	0.05	0.11		NA	Yes

Name: MePGCL
Investment Plan
Note:- Information to be provided for FY 16-to-Fy-18 for all heads either spilling into the period starting during FY-16

Sl. No.	Project Details							SOURCE OF FINANCING FOR SCHEME					
								Equity Component		Debt Component Loan amount (Rs. Crs.)			
	Name of Scheme	Year of Start	Nature of Project (Select appropriate code from below)	Whether the scheme is part of approved Business Plan* (Yes/No)	Project Start Date (DD-MM-YY)	Project Completion date (DD-MM-YY)	Total capital expenditure approved by MSERC/Govt./FI (Rs. Crs.)	Internal Accrual (from free reserves and surplus)	Additional equity infused	Loan	Capital Subsidies/grants component	Consumer Contribution Component	Details of Project Cost with Cost benefit analysis (write up of Scheme)/ DPR
Road													
10	Improvement of the approach road from the junction of Stage-IV Power House Road to Stage-III Switchyard, Kyrdemkulai (Length=3.864KM)	FY 2017-18	c	No	Oct'17	Mar'18	1.13	NA	0.34	0.79		NA	Yes
11	Improvement of approach road to Stage-III Tunnel Intake Face-I from junction of Zero Point market to Intake Tunnel Face-I Length=1.10KM	FY 2017-18	c	No	Oct'17	Mar'18	0.40	NA	0.12	0.28		NA	Yes
12	Improvement of road from office gate to Stage-III concrete dam, Kyrdemkulai, Ri-Bhoi District, Meghalaya	FY 2017-18	c	No	Oct'17	Mar'18	0.87	NA	0.26	0.61		NA	Yes
Building													
13	Constrution of RCC Residential buildings at Kyrdemkulai under Stage-III Project	FY 2016-17	c	No	Mar'17	Mar'19	9.21		2.76	6.45		NA	Yes

Name: MePGCL
Investment Plan
Note:- Information to be provided for FY 16-to-Fy-18 for all heads either spilling into the period starting during FY-16

Sl. No.	Project Details							SOURCE OF FINANCING FOR SCHEME					
								Equity Component		Debt Component			
										Loan amount (Rs. Crs.)			
	Name of Scheme	Year of Start	Nature of Project (Select appropriate code from below)	Whether the scheme is part of approved Business Plan* (Yes/No)	Project Start Date (DD-MM-YY)	Project Completion date (DD-MM-YY)	Total capital expenditure approved by MSERC/Govt./FI (Rs. Crs.)	Internal Accrual (from free reserves and surplus)	Additional equity infused	Loan	Capital Subsidies/grants component	Consumer Contribution Component	Details of Project Cost with Cost benefit analysis (write up of Scheme)/ DPR
Umaim Stage-IV													
1	Installation of Telecommunication and internet facility at Stage-IV	FY 2017-18	e	No	April'17	Mar'19	0.20	NA	0.06	0.14		NA	Yes
2	Installation of Supervisory Control and Data Acquisition System for Stage-IV	FY 2017-18	e	No	April'17	Mar'19	3.06	NA	0.92	2.14		NA	Yes
3	Automation and moniroting of MIV of the Generating units	FY 2017-18	c	No	April'17	Mar'18	0.66	NA	0.20	0.46		NA	Yes
4	Dedicated and reliable outside source power supply from 132 KV Bus of Stage-IV	FY 2017-18	c	No	April'17	Mar'19	3.00	NA	0.90	2.10		NA	Yes
5	Procurement of spare runner	FY 2017-18	c	No	April'17	Mar'19	6.50	NA	1.95	4.55		NA	Yes
6	Installation of Fire Fighting scheme for generator stator and emulsifier scheme for generator transformer for both units	FY 2017-18	c	No	April'17	Mar'19	0.45	NA	0.14	0.32		NA	Yes
7	Supply and erection of Cooling Water pumps of Stage-IV Power station	FY 2016-17	c	No	Nov'16	Mar'16	0.50	NA	0.15	0.35		NA	Yes
8	Online Vibration monitoring of Generating Units	FY 2017-18	c	No	April'17	Mar'18	0.33	NA	0.10	0.23		NA	Yes

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Investment Plan
Note:- Information to be provided for FY 16-to-Fy-18 for all heads either spilling into the period starting during FY-16

Sl. No.	Project Details							SOURCE OF FINANCING FOR SCHEME					
								Equity Component		Debt Component Loan amount (Rs. Crs.)			
	Name of Scheme	Year of Start	Nature of Project (Select appropriate code from below)	Whether the scheme is part of approved Business Plan* (Yes/No)	Project Start Date (DD-MM-YY)	Project Completion date (DD-MM-YY)	Total capital expenditure approved by MSERC/Govt./FI (Rs. Crs.)	Internal Accrual (from free reserves and surplus)	Additional equity infused	Loan	Capital Subsidies/grants component	Consumer Contribution Component	Details of Project Cost with Cost benefit analysis (write up of Scheme)/ DPR
Umaim Stage-IV													
9	Overhauling of hydrogenerating unit of Unit-I of Stage-IV Power Station	FY 2016-17	c	No	Oct'16	Mar'17	3.36	NA	1.01	2.36		NA	Yes
10	Overhauling of hydrogenerating unit of Unit-II of Stage-IV Power Station	FY 2016-17	c	No	Nov'16	Mar'17	4.26	NA	1.28	2.98		NA	Yes
11	Replacement of Static Exitation Equipment of Stage-IV	FY 2017-18	c	No	April'17	Nov'17	2.75		0.83	1.93		NA	Yes
12	Restoration of water bodies of Stage-IV Reservoir	FY 2016-17	c	No	Dec'16	Jan'18	5.87	NA	1.76	4.11		NA	Yes
13	Flood Control works of Stage-IV & Umtru Power House	FY 2017-18	c	No	Nov'17	May'18	2.63	NA	0.79	1.84		NA	Yes
14	Installation of Stop log gate including gantry/over head crane at Umiam-Umtru Stage-IV concrete dam	FY 2016-17	c	No	Oct'16	Mar'18	5.73	NA	1.72	4.01		NA	Yes
Road													
16	Improvement of appraoch road to office complex from junction of main road to Stage-IV Power House. CH:0.00KM - 1.00KM	FY 2017-18	c	No	Oct'17	Mar'18	0.15		0.05	0.11		NA	Yes
17	Improvement of Stage-IV Power House Road from CH: 0.00 KM to 19.25 KM	FY 2017-18	c	No	Oct'17	Mar'18	2.94		0.88	2.06		NA	Yes

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Investment Plan
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Sl. No.	Project Details							SOURCE OF FINANCING FOR SCHEME					
								Equity Component		Debt Component			
										Loan amount (Rs. Crs.)			
	Name of Scheme	Year of Start	Nature of Project (Select appropriate code from below)	Whether the scheme is part of approved Business Plan* (Yes/No)	Project Start Date (DD-MM-YY)	Project Completion date (DD-MM-YY)	Total capital expenditure approved by MSERC/Govt./FI (Rs. Crs.)	Internal Accrual (from free reserves and surplus)	Additional equity infused	Loan	Capital Subsidies/grants component	Consumer Contribution Component	Details of Project Cost with Cost benefit analysis (write up of Scheme)/ DPR
Umtru HEP													
1	Flood control works of Umtru Power House	FY 2017-18	c	No	Oct'17	April'18	4.47	NA	1.34	3.13		NA	Yes
2	Feasibility study for Renovation Modernisation and Upgradation of 4x2.8MW Umtru Power Station, Dehal	FY 2016-17	c	No	Mar'17	Apr'18	3.00	NA	0.90	2.10		NA	Yes
							7.47		**2.24**	**5.23**			
Sonapani HEP													
1	1.Procurment and Installation of 415V 3 Phase LT Panel 2. Relays and Cards to replace some existing defective ones and as spares. 3. Station Battery bank along with Charger 4. Generator Circuit breaker to replace the existing one	FY 2016-17	c	No	April'16	Dec'18	0.34	NA	0.10	0.24		NA	Yes
2	5. Additional Unit of existing Sonapani Small Hydel Project (1x500KW)	FY 2017-18	b	No	Dec '17	Dec '19	20.27		4.96	11.56	3.75	NA	Yes

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Investment Plan
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Sl. No.	Project Details							SOURCE OF FINANCING FOR SCHEME					
								Equity Component		Debt Component			
										Loan amount (Rs. Crs.)			
	Name of Scheme	Year of Start Expted.	Nature of Project (Select appropriate code from below)	Whether the scheme is part of approved Business Plan* (Yes/No)	Project Start Date (DD-MM-YY)	Project Completion date (DD-MM-YY)	Total capital expenditure approved by MSERC/ Govt./FI (Rs. Crs.)	Internal Accrual (from free reserves and surplus)	Additional equity infused	Loan-1	Capital Subsidies/grants component	Consumer Contribution Component	Details of Project Cost with Cost benefit analysis (write up of Scheme)/ DPR
Leshka HEP													
1	Cooling System modification & improvement	FY 2016-17	c	No	April'16	Mar'18	2.51		0.75	1.76		NA	Yes
2	Installation & erection of UPS panel & bateery bank for MLHEP Dam Control Room	FY 2016-17	c	No	Dec'15	Mar'16	0.58			0.58		NA	Yes
							3.09		0.75	2.34			
Small Hydel Projects													
1	Amkshar SHP (2x1200 KW)	FY 2017-18	a	No	Oct'17	Sept'20	36.05	NA	5.42	12.64	18.00	NA	Yes
2	Sanglet MHP (2x1000 KW)	FY 2017-18	a	No	April'17	Mar'20	33.15	NA	5.45	12.71	15.00	NA	Yes
3	Tyrsaw MHP (2x900 KW)	FY 2017-18	a	No	April'17	Mar'20	25.01	NA	3.45	8.06	13.50	NA	Yes
4	Umshamphu SHP (2x1500 KW)	FY 2017-18	a	No	Oct'17	Sept'20	44.75	NA	7.43	17.33	20.00	NA	Yes
Code for Nature of projects													
	a. New Project												
	b. System Augmentation												
	c. System Improvement												
	d. Metering												
	e. Miscelleneous												