NAGALAND ELECTRICITY REGULATORY COMMISSION

TARIFF ORDER
2x30 MW Thermal Power Plant at Tuli, Nagaland

Dated: 20th February, 2020.

341, Upper Agri Colony, Kohima – 797001, Nagaland
Phone: (0370) 2241592(O)/Fax: 2292104(O)
E-mail: nerc_kohima@yahoo.com / Website: www.nerc.org.in

CONTENTS

ABBREVIATIONS

Abbreviation	Description
ARR	Aggregate Revenue Requirement
CD	Contract Demand
CERC	Central Electricity Regulatory Commission
CoS	Cost of Supply
Crs	Crores
CWIP	Capital Work in Progress
DE	Debt Equity
FAC	Fuel Adjustment Costs
FPPCA	Fuel Power Purchase Cost Adjustment
FY	Financial Year
GCV	Gross Calorific Value
GFA	Gross Fixed Assets
HT	High Tension
KV	Kilovolt
KVA	Kilo volt Amps
KW	Kilo Watt
kWh	kilo Watt hour
LT	Low Tension
MU	Million Units
MW	Mega Watt
MYT	Multi Year Tariff
NER	North Eastern Region
NERC	Nagaland Electricity Regulatory Commission
O&M	Operation & Maintenance
PLF	Plant Load Factor
PLR	Prime Lending Rate
R&M	Repairs and Maintenance
RoR	Rate of Return
Rs./ ₹.	Rupees
S/s	Sub Station
SBI	State Bank of India
YoY	Year on Year

Before the
Nagaland Electricity Regulatory Commission (NERC)
Nagaland, Kohima

Petition No.: 02/2019

In the matter of

Determination of Generation Tariff for petition filed by **M/s. Fitzroy Energy & Minerals,** L.M Complex, 6th Floor, Room No. 13, Purana Bazar, Dimapur, Nagaland. Petitioner.

Present

Er. IMLIKUMZUK AO
Chairman-cum-Member,
NERC, Kohima.

ORDER

(Passed on 20th February, 2020)

1. M/s. Fitzroy Energy and Minerals (herein after referred to as Project Developer/Petitioner), a registered company to conduct power generation business, proposes to set up an independent Thermal Power Plant of 60 MW capacity for power generation in Tuli, Nagaland, from coal and bamboo procured locally.

2. The State Government aims to develop 450 MW from Gas/Thermal Generation in the State in a limited way by 2021 as per the Nagaland State Power Policy 2018.

3. The Project Developer (through State Power Department) filed Petition before the Commission for determination of generation tariff from the proposed 60 MW Thermal Power Project, vide letter No. PWR/MISC-10/17 dated 29th Jan, 2019.

4. M/s. Fitzroy Energy and Minerals proposed to develop the 2X30 MW Thermal Power Project. Out of the 2 (two) units, Unit-I (30 MW) is proposed to be commissioned in 24 months and Unit-II (30 MW) in 27 months from the date of issue of Notice to Proceed (NTP) to EPC contractor. The projected capital cost is Rs 419.33 Crores. The proposed Tariff is @ **₹ 5.65/Kwh** (Fixed Charges @ **₹ 2.38/kwh** and Variable Charges @ **₹ 3.27/kwh)**.

5. In accordance with Section 64 of the Electricity Act 2003, the Commission directed the M/s. Fitzroy Energy and Minerals, to publish a summary of the tariff filing in local dailies to ensure transparency and provide opportunity to all the stakeholders & general public to raise objections & suggestions if any, on the proposed tariff. Copies of the petition and other relevant documents

were made available in the office of the Commission for the stakeholders and other interested parties. A copy of the petition was also made available on the websites of the Commission.

7. The Commission, in exercise of its power vested under Section 62 (1) & (3) and 64 of the Electricity Act 2003 read with the NERC's MYT Regulations, 2016 (herein after referred to as MYT Regulations) and taking into consideration the submission made by the Petitioner, objections and suggestions received and all other relevant materials on records, has carried out the determination of tariff as detailed in this order. The commission has approved Tariff @**₹ 4.70/kWh** (Fixed charges @ **₹ 1.83/kWh** & Variable charges @ **₹ 2.87/kWh**) for both the Units subject to the following conditions.

(a) The tariff will be reviewed based on the submission of capital expenditure actually incurred up to the date of commercial operation duly audited and certified by the statutory auditors in accordance with the Multi Year Tariff (MYT) Regulations 2016.
(b) Any escalation in the tariff shall not be allowed beyond ₹ 4.70/kwh unless on account of uncontrollable factors as prescribed under MYT Regulation 2016.
(c) The tariff shall be determined for every financial year as per the MYT Regulations 2016.
(d) Signing of Power Purchase Agreement (PPA) between the Project developer and the Power Department (Licensee) is done.
(e) The Execution and commissioning is completed within the period prescribed in the Detailed Project Report (DPR).

Evacuation of Power:
The proposed Thermal Power Project shall consist of two units of 30 MW each. Initially Unit-I of the project will be developed & commissioned and will evacuate power to the Receiving End Substation Mokokchung through the existing 66 kv line/substation at Tuli followed by Unit-II when the existing 66kv line is upgraded to 132 kv line or by creating an alternative arrangement.

Environmental Aspects:
The 60 MW Thermal Power plant is to be developed by adhering to all the applicable Standards for Air and Water Pollution Act/Rules and subsequent amendments thereof, and strictly maintaining the emission of pollutants and effluents within the stipulated norms.

M/s. Fitzroy Energy and Minerals also to adopt usage of bamboo firing in a progressive increased manner each year to achieve 100% bamboo firing (instead of coal) from the 11th Year onwards of its commercial operation so that an eco-friendly power plant is created.

Place : Kohima, Nagaland
Dated :

Sd/-
Er. IMLIKUMZUK AO
Chairman,
Nagaland Electricity Regulatory
Commission (NERC), Kohima.

1. INTRODUCTION

1.1. Nagaland Electricity Regulatory Commission.

In exercise of the powers conferred by the Electricity Act, 2003, the State Government of Nagaland constituted an Electricity Regulatory Commission to be known as "Nagaland Electricity Regulatory Commission" for the State of Nagaland, as notified on 21st February, 2008.
The Commission is a one-member body designated to function as an autonomous authority empowered to regulate the power sector in the State of Nagaland. The powers and the functions of the Commission are as prescribed in the Electricity Act, 2003. The head office of the Commission is presently located at Kohima, Nagaland.

The Nagaland Electricity Regulatory Commission started to function with effect from 4thMarch, 2008 with the objectives and purposes for which the Commission has been established.

1.2 Admission of Petition and Publication.

The M/s. Fitzroy Energy and Minerals has filed Petition before the Commission for determination of tariff for supply of electricity from the proposed 2X30 MW Thermal Project to be set up at Tuli. On preliminary analysis of the petition, it was observed that certain data/information was lacking/required as per MYT Regulations. The Commission, in its letter and e-mail directed the Petitioner to furnish the data. After receiving the required additional Informations/clarification, the Petition was admitted on 20th February, 2019.

In order to provide opportunity to all stakeholders and general public for making suggestions/objections on the Tariff Petition, the Commission directed the petitioner to publish the summary of the petition in an abridged form and manner as approved in accordance with section 64 of the Electricity Act, 2003.

Accordingly, the public notice was published on 27th October, 2019 in 4 (four) leading daily local newspapers inviting the stakeholders/public to submit their objections and suggestions, if any, to the Secretary NERC on or before 21st November, 2019.

Sl. No.	Name of the Newspaper	Language	Date of Publication
1.	Nagaland Post	English	27.10.2019
2.	The Morung Express	English	27.10.2019
3.	Eastern Mirror	English	27.10.2019
4.	Tir Yimyim	Vernacular (Ao)	27.10.2019

No written objection was received by the Commission on the said petition till the last date of submission.

1.3 Notice for Public Hearing:

In order to ensure more transparency in the process of Tariff Determination, the Commission published a Public Notice in the following leading local English Newspapers for Public Hearing to be held on 29th November, 2019 in the Conference Hall of the Engineer-in-Chief, Department of Power, Nagaland.

Sl. No.	Name of the Newspaper	Language	Date of Publication
1.	Nagaland Post	English	20-11-2019
2.	The Morung Express	English	20-11-2019
3.	Eastern Mirror	English	20-11-2019

Thereafter, Public Hearing was held as scheduled on 29th November, 2019 at the Conference Hall of the Engineer-in-Chief, Department of Power, Nagaland where the Officers of the Power Department & the Project Developer were present. The detailed proceedings of the public hearing are given in Chapter – 3.

SUMMARY OF TECHNICAL & FINANCIAL PARAMETERS.

Technical & Financial Parameters as projected in the DPR:

Particulars	**Parameters**	
Generation capacity:		
Generation capacity (MW)	60	MW
Installed Capacity (MW)	60	MW
No of Days Working	365	days
No of Hours	24	hours
PLF (1st Year)	93.0%	
PLF (2nd Year)	93.0%	
Gross Power Generated (MU)	**537.69**	**MU**
Auxiliary consumption %	9.00%	
Transmission losses %	2.00%	
Net Power Generation	**479.51**	**MU**
Project Cost Details:		
Project Cost	419.33	Rs. Crs
Debt	75.00%	
Equity	25.00%	
Debt	314.50	Rs. Crs
Equity	104.83	Rs. Crs
Debt Equity	3.00	
Cost Per MW	6.35	Rs/MW
Tariff (Net off Minimum Demand)	**5.65**	Rs/kWh
Coal Details		
Effective Calorific Value	6500.00	Kcal/kg
Effective Cost	6000.00	Rs/Ton
Fuel Required	0.44	Kg/KWh
Bamboo Details		
Gross calorific Value	4500.00	Kcal/kg
Landed cost at Site	6000.00	Rs/Ton
Term Loan		
Interest on Working capital	13.00%	
Interest on Term loan	13.00%	
Tax rates:		
MAT	20.00%	
Corporate	30.00%	
Depreciation Rates SLM		
Civil works	3.34%	

Particulars	**Parameters**	
Plant & Machinery	5.28%	
Miscellaneous Fixed Assets	5.28%	
Depreciation Rates WDV		
Civil Works	10.00%	
Plant & Machinery	15.00%	
Miscellaneous Fixed Assets	10.00%	
Performance		
Boiler efficiency	85.0%	
Turbine heat rate	2404.0	kcal/kwh
Gross/Plant heat rate	2828.2	kcal/kwh
Fuel data		
Quantity of secondary fuel	0.005	ml/kwh
Cost of secondary fuel	50	₹/litre
Cost of water	10	₹/m^3
O&M Cost at average ff 36ps/kWh	0.29	Crores/MW
Make-up water	120888	m^3 /annum
Escalations:		
On fuel price	2%	
On tariff		
On O&M cost	2%	
On Secondary Fuel Charges	2%	
Working Capital Assumptions	**Holding Period**	
Fuel Cost	60	Days
O&M Cost	30	Days
Receivables	30	Days
Spares	36	Days
Creditors	60	Days

2.1 Prayers of petitioner:

The petitioner has prayed in its petition for the following:

To admit and approve the Petition.

To approve the projected capital cost of the project.

To approve the tariff submitted.

Condone any inadvertent delay/omissions/errors/rounding off differences/shortcoming and may please be permitted to add/change/modify/alter the petition.

Permit petitioner to file additional data/information as may be necessary.

Pass such orders as the Commission may deem fit and proper, keeping in view the facts and circumstances of the case.

3 PUBLIC HEARING

3.1 Public Hearing:

The public hearing was held at Kohima on 29th November, 2019 in the Conference Room of Department of Power Nagaland Kohima Nagaland.

During public hearing the participants were given adequate opportunity to offer their views and comments on the Petition filed by the petitioner.

3.2 Minutes of the Public Hearing:

Before the public hearing commenced, a power point presentation on the proposed 2x30 MW Thermal Project was given by the Project Developer, followed by queries and replies as below:

Summary on PPT:

a. The firm proposes to set up an independent thermal power plant of 2x30 MW capacity to generate power at Tuli, Nagaland.
b. The proposed gross energy generation from the plant is 537.69 MU/year.
c. The project is designed to operate with 90:10 ratio coal & bamboo from the second year onwards with Zero waste water discharge from the plant.
d. The proposed generation tariff @ ₹ 5.65/kWh (fixed cost is ₹ 2.38/kWh and variable cost is ₹3.27/kWh).
e. Evacuation of power generated from the proposed 2x30 MW thermal project will be through the existing 66 kv Tuli Sub-station.
f. Generation of Job opportunities and increase in local economy due to demand of coal & bamboo.

1. **Query by Department of Power, Nagaland (DPN) on SO_2 emission:**

The local coal contains high amount of sulphur (2.5-4%) which leads to Acid rain causing environmental hazard. What are the preventive measures that will be initiated by the firm to control such environment hazard?

Reply by Project Developer:

Even though the sulphur content is high, it will be mitigated with dosing of Limestone found in the same region. As sulphur capture is good in a CFBC boiler, SO_2 (sulphur dioxide) level lower than 400mg/Nm^3 can be achieved which is much below the national average of SO_2 level.

From the second year of operation, 10% bamboo and 90 % coal will be fired. However, the percentage of bamboo firing will be progressively increased each year and 100% bamboo firing will be adopted from the 11th year of operation thereby creating an eco-friendly power plant in the State.

2. **Query by DPN on Environmental Clearance:**

Whether the Firm has obtained the required environmental approval/clearance from the concerned State authorities for the proposed plant?

Reply by Project Developer:

The NOCs from the appropriate authorities are under process.

3. **Query by Member on Evacuation of Generated Power:**
Whether the existing 66 kv transmission line at Tuli will be able to evacuate the entire energy generated from the proposed 60 MW Thermal Plant?

Reply by DPN:
The existing 66 kv transmission line at Tuli will not be able to evacuate the entire power of proposed 60 MW Thermal Plant.

Comment by Project Developer:
The firm clarified that initially Unit-I (30 MW) of the project will be developed/commissioned to enable evacuation of power through the existing 66 kv line/substation at Tuli. Thereafter, the Unit-II (30MW) of the project will be developed/commissioned when the existing 66 kv line/substation is upgraded to 132 kv line/substation.

Reply by DPN:
The evacuation of 30 MW power from the proposed unit-I is possible through the existing 66 kv line at Tuli.

4. **Query by Member on Connectivity cost:**
Whether the Firm intends to bear the connectivity cost at Tuli substation for power evacuation?

Reply by Project Developer:
The connectivity cost required in the 66 kv Substation Tuli will be borne by the firm as also deployment of technical personnel to assist in the said substation.

5. **Comments by DPN on Power Purchase Agreement (PPA):**
The projected Tariff @ ₹ 5.65/kwh is higher than the market rate and as such, the Department will not sign PPA unless it is reduced to an acceptable/reasonable rate since power has to be sold to the consumer at an affordable rate.

6. **Comments of the Commission:**
The public hearing is a part of the process for determination of Tariff. The Commission will determine the tariff by taking into consideration all the issues raised during the public hearing.

It will also examine the benefits of power purchase from within and outside State. The power cost may vary, but additional charges on Regional Transmission, SLDC and associated trans-losses will be applicable toward purchased cost in case of outside the State.

<u>The members present in the Public Hearing</u>:

1. Er. Imlikumzuk Ao, Chairman(NERC),
2. Er. Shikato Sema, Engineer-in-Chief, Department of Power, Nagaland.
3. Er. Indianoba Tally, Chief Engineer (D&R), Department of Power, Nagaland.
4. Er. Penrithung Yanthan, S.E (Rev), Department of Power, Nagaland.

5. Er. A. Chakrapani, CEO, Enmas EPC Power Projects Ltd, Kolkata.
6. Mr. Neeraj Padhi, Chairman, Fitzroy Energy & Minerals Ltd, Dimapur.
7. Mr. Temjenmoa Jamir, Vice Chairman, Fitzroy Energy & Minerals Ltd, Dimapur.
8. Prof. Dr. Lady Anita Singh Matharu, CEO & Managing Director, IPCC India.
9. Mr. B. Phom, Fitzroy Energy & Minerals Ltd, Dimapur.
10. Mr. W.Y. Yanthan, Secretary (NERC),
11. Mr. Limawapang Longkumer, Legal Consultant, NERC.
12. Er. Hekavi N Ayemi, Asst. Engineer (Tariff), NERC.
13. Mr. Shivito Wotsa, Accounts Officer (NERC).

4. PROJECT IMPLEMENTATION AND COST

4.1 Over View of the Project

The proposed thermal power project is to be set up within the boundary limits of the Site location near Wamaken Village, Tuli, Nagaland. The site is located at a distance of approximately 3.2 km from highway NH 61. The Power plant will have a capacity of 2x30 MW (Net) and is scheduled for commissioning in 24 months for Unit-1 and 27 months for Unit-2 from the date of issue of Notice-to-proceed by the owner to the EPC Contractor.

The proposed Power Plant will use the coal from the Nagaland coal mine and the aspect of the sulphur in the coal will be taken into account in the boiler design. The boiler will also be designed to accept other Indian coal with high ash content as a back-up plan during any exigencies. The proposed power plant will also be designed for 100% bamboo firing.

Coal required for the power plant will be brought from the pit head at a distance of 11 kilometers from the project site & moved by trucks to the power plant site. The annual coal consumption for the 60 MW (Net) power plant at 93% PLF during the first year of operation (100% coal firing) is estimated at 230,000 tonnes based on the use of Nagaland coal with average GCV of 6700 Kcal/Kg. In view of the relatively small quantity of coal required and the short distance from the coal supply point, it is proposed to transport the coal from the pit head to the site in trucks.

Bamboo required for the power plant will be brought to the site by trucks. The annual bamboo consumption for the 60 MW (Net) power plant at 93% PLF during the eleventh year of operation (100% bamboo firing) is estimated at 340,000 tonnes based on the use of bamboo with average GCV of 4500 Kcal/Kg.

Since the power plant is being provided with an air-cooled condenser system, the average consumptive water requirement of the power plant is estimated at only 40 m^3/hr which can be met from the ground water allocation to be obtained for the power plant.

The total annual ash generation from the power plant is estimated at 13,500 tonnes based on the use of Nagaland coal. The fly ash will be sent to cement manufacturers for use in cement manufacture and the bed ash will be disposed off as land fill.

4.2 Summary of Power Evacuation:

The Project Developer submitted that, the power from the generator terminal will be connected to a 132 kV switchyard in the plant premises through step-up transformers. The power available for export to the grid will be 60 MW after accounting for power consumption for the power plant auxillaries as well as transmission losses. Considering the annual plant load factor of 95% and net available power of 60 MW the energy available for the export at the power plant switchyard will be about 479 Million unit (MU) per annum.

The Power Department vide letter No PWR/MISC-10/17 dated 29th January 2019 mentioned that the existing 66 KV Transmission line at Tuli and the adjoining areas will not be able to handle the power generated from the proposed 60 MW thermal power plant as proposed by the Project Developer. It was also mentioned that the nearest 132 KV Sub-Station is in Mokokchung and these points to be noted while completing the formalities.

The Commission conducted a Public hearing on 29th November, 2019 at Kohima. The Project Developer in the Public Hearing, proposed that to enable power evacuation through existing 66 kv line the Unit-I (30MW) of its power plant will be initially developed/ commissioned followed by Unit-II when the existing 66 KV line between Tuli and Mokokchung is upgraded to 132 KV line. The proposal was agreed upon by Power Department.

Commission's Analysis:

It is observed that evacuation of entire 60 MW power from the proposed Thermal Power Plant will not be feasible through the existing 66 KV line unless it is upgraded or an alternative arrangement is made. The possibility of evacuating power to Receiving-End Sub-Station Mokokchung may be done in either of two ways:

a) One option is through upgrading the existing 66 KV line to 132 KV line between Tuli and Mokokchung.

b) The other option is by creating a new 132 KV or 220 KV double circuit line (to be ascertained) between Tuli and Mokokchung via proposed 186 MW Dikhu Hydro Electric Project (Tamlu). The proposed 186 MW Dikhu Hydro Electric Project, when developed will also be required to connect with the same Receiving-End Sub-Station Mokokchung for evacuation of its power. It may be more reasonable to have a common transmission line for both the projects.

(i) 186 MW Dikhu Hydro Electric Project (Tamlu) for which Techno-Economic Clearance is already approved by Central Electricity Authority (CEA) Govt. of India for its development.

(ii) 60 MW thermal Power Plant (Tuli) which is as per Nagaland State Power Policy 2018.

4.3 Summary of Environmental Aspects:

The project is planned to be developed by minimizing the impact of the plant on the environment through proper setting and implementation of the appropriate pollution control measures. The Central Pollution Control Board (CPCB) has developed National Standards for Effluents and Emission under the statutory Power of water (Prevention and Control of Pollution) Act 1974 and the Air (Prevention and Control of Air) Act 1981. These standards have recently been amended vide the Environment (Protection) Amendment Rule 2015 in the official Gazette on 7th December 2015 vide S.O. 3305 (E) by the Ministry of Enjoinment, Forest & Climate Change, Government of India. The Standards applicable to new power plant comes into operation on or after 1st January 2017 (which is the case with the power plant covered by this report). The pollution control measures are on Air Pollution Control, Water Consumption & Discharge, Coal Handling System, Ash Collection & Disposal and Noise Pollution etc.

The Bamboo, which is proposed to be fired from the 2nd year of operation onwards, will be progressively increased each year and 100 % bamboo firing will be adopted from the 11th year of operation onwards.

Commission's Analysis:

The project developer is to ensure that power plant is developed by adhering to all the Applicable Standards for Air and Water Pollution Act/Rules and subsequent amendments thereof and strictly maintain the emission of pollutants and effluents within the stipulated norms. To adhere to the New Environmental norms as per Environmental (Protection) Amendment Rules 2015 for Thermal Power Stations. To ensure implementation on Flue-gas desulphurization (FGD) Norms titled "Advice on FGD Technology Selection for different Unit Size".

The project developer is to obtain all necessary environmental clearances from appropriate authorities before implementation of the Project.

M/s. Fitzroy Energy and Minerals also to adopt usage of bamboo firing in a progressive increased manner each year to achieve 100% bamboo firing (instead of coal) from the 11th Year onwards of its commercial operation so that an eco-friendly power plant is created.

4.4 Summary of the Project financial:

The power plant project is proposed to be executed on EPC (Engineering, Procurement and Construction) basis through M/s. Resurgent Power Projects Limited (RPPL), Chennai.

This total capital cost includes the cost of land, EPC Cost and the preliminary and the development expenses of the plant. The EPC cost shall essentially include design, engineering, supply procurement and transport, construction, assembly and testing of equipment and materials to site.

The petitioner submitted a capital cost of ₹ 410 crores in the DPR. However, the detailed calculation of Cost & Tariff were not part of the DPR and the same was asked vide deficiency notes. The petitioner submitted cost & tariff calculation in excel. The capital cost as per the details submitted subsequently was at ₹ 419.33 crores.

The Table below presents summary of capital cost of the 2x30 MW Thermal Power Plant at Tuli, Nagaland submitted by the petitioner.

Summary of the Capital Cost showing the Item and component wise

Particulars	**Amount (₹. Cr.)**
Steam Generator island (2 Nos)	243.8
Turbo-Generator island (2 Nos)	
ACC (2 Nos)	
BTG	**243.8**
BOP Mechanical	
ACT & ACW System	
Plant Water System (DM Plant, Pre-treatment Plant)	
EOT Cranes	
Fuel oil & Storage system	
Ash Handling System	
Coal Handling Plant	
Air Compressor System	
Air Condition & Ventilation System	

Particulars	Amount (₹. Cr.)
Fire fighting system	
LP piping and miscellaneous equipment	
Misc. cranes	
Sub-total of BOP Mechanical -	
Electrical equipments	
Switchyard Package	
Other Electrical Packages	
Transformers Package	
Generator Associated items - GRP, UCP, BOP control panels	
Busducts (IPB, SPB & NSPB)	
Switchgear package (HV, LV) DC, UPS, NGR and DG sets	
Cables, Cable facilities, Illumination, Elevators, Communication, Grounding & Lightning protection, Lab equipments	
Sub-total of Electrical Equipment	
Control & Instrumentation Package	
TOTAL of BOP	**0.0**
Total Plant & Equipment	**243.8**
Erection, testing and commissioning	**20.0**
Transport, Insurance, Taxes and Duties	8.0
GST	35.1
Inland Freight, Clearance charges, Departmental charges & Forwarding included in Plant material cost	0.0
GST on E&C	2.9
Cess	1.1
Sub-Total	**47.1**
PLANT & MACHINERY TOTAL	**310.9**
Civil and Structural Works (for 2 x 150 MW)	
Main plant Building	
CW System	
Cooling Towers	
DM Water Plant	
Clarification Plant	
Chlorination Plant	
Misc. Plant Civils & bldgs.) (coal shed, Water treatment Bldg, MCCs, ACC Structure etc)	
Admin. Building	
Fuel Oil Handling and Storage System	
Coal Handling Plant	
Ash Handling System	
Ash Disposal area development	
Fire Fighting System	
Temp construction and enabling works	

Particulars	Amount (₹. Cr.)
Road and Drainage	
Chimney	
Civil Sub Total	**40.00**
Taxes and Duties	
Works contract tax on Civil works @5%	2.00
GST on 30% of supplies	2.16
CIVIL TOTAL	**44.2**
TOTAL WORKS COST	**355.11**
PLANT Cost - EPC Contractor Final Delivered Cost	**355.11**
Non PLANT works	**4.0**
Any transmission interface works	2.00
Consumables	2.00
Project cost w.o. IDC&WC	**359.11**
Interest During Construction (IDC)	49.06
Working capital Margin (WCM)	11.16
Capital cost including IDC & WCM	**419.33**

4.4.1 **Means of Finance – Petitioner submission:**

The total estimated project cost is Rs 419.33 Crore. The project cost is expected to be funded by Equity and Long Term Debt. The means of Finance submitted by the petitioner are summarized in the Table below.

Particulars	%	₹. in Crore
Debt	75%	314.50
Equity	25%	104.83
Total Project Cost	100%	419.33

4.4.2 **Commission's Analysis:**

The project cost of 2x30 MW Thermal Power Plant submitted by the petitioner is ₹ 419.33 Crores. Therefore, the per MW cost comes to ₹ 6.99 Crores.

4.4.3 *Capital Cost of the Project:*

As per the Regulation 23 of NERC MYT Regulations, the capital cost of the thermal power station is to be determined based on the prudence check of actual capital expenditure incurred. The petitioner has filed the petition for determination of capital cost & tariff based on the DPR & estimates, and the actual construction of the project is yet to be commenced. Hence, actual cost is not available to the Commission for conducting the prudence check and deciding the capital cost.

However, as per the Regulation 36.4 & 36.5 of NERC MYT Regulations, the Commission is approving the capital cost as detailed below and the petitioner is directed to submit petition for determination of final tariff based on the actual capital cost duly audited by the statutory auditors.

The Commission shall conduct the prudence check and approve the final cost & tariff.
Accordingly, the commission shall revisit the capital cost after completion of the project and the capital cost may be reduced based on the prudence check of the actual capital expenditure. No escalation in the capital cost approved herewith shall be allowed except on account of uncontrollable factor as prescribed under MYT Regulations. The petitioner shall ensure implementation of the project within the proposed schedule and cost.

The Assumptions, technical & financial parameters projected by the project developer which was considered by the Commission for determining the capital cost & tariff is provided in the Table below:

Technical & Financial Parameters		
Generation capacity:		
Generation capacity (MW)	60	MW
Installed Capacity (MW)	60	MW
No of Days Working	365	days
No of Hours	24	hours
PLF (Ist Year)	93.0%	
PLF (2nd Year)	93.0%	
Gross Power Generated(MU)	**488.81**	**MU**
Auxiliary consumption %	9.00%	
Net Power Generation	**444.82**	**MU**
Project Cost Details:		
Project Cost	396.79	₹ Crs
Debt	75.00%	
Equity	25.00%	
Debt	298	₹ Crs
Equity	99	₹ Crs
Debt Equity	3.00	
Cost Per MW	6.61	₹/MW
Coal Details		
Effective Calorific Value	**6500.0**	**Kcal/kg**
Effective Cost	**6000.0**	**₹/Ton**
Fuel Required	**0.44**	**Kg/KWh**
Term Loan		
Interest on Working capital	11.50%	MCLR+3%
Interest on Term loan	10.50%	MCLR+2%
Tax rates:		
MAT	15.60%	
Depreciation Rates SLM		
Civil Works	3.34%	

Technical & Financial Parameters		
Plant & Machinery	5.28%	
Miscellaneous Fixed Assets	5.28%	
Performance		
Boiler efficiency	85.0%	
Turbine heat rate	2404.0	kcal/kwh
Gross/Plant heat rate	2828.2	kcal/kwh
Fuel data		
Quantity of secondary fuel	0.005	ml/kwh
Cost of secondary fuel	50	₹/litre
Cost of water	10	₹/m^3
O&M Cost at average ff 36ps/kWh	0.29	Crores/MW
Make-up water	120888	m^3 /annum
Working Capital Assumptions	**Holding Period**	
Fuel Cost	60	Days
O&M Cost	30	Days
Receivables	30	Days
Spares	36	Days
Creditors	60	Days

Based on the above assumptions & parameters, the capital cost approved by the Commission in respect of the 2x30 MW Thermal Power Project at Tuli, Nagaland is provided in the table below:

Main Plant

Particulars	Amount *(₹ Cr)*
Steam Generator island (2 Nos)	87.8
Turbo-Generator island (2 Nos) including steam piping	51
Air cooled condenser (2 Nos) including condensate piping and condensate storage systems	26.6

AUXILIARY PLANT AND EQUIPMENT:

Particulars	Amount *(₹ Cr)*
Mechanical Scope	
Auxiliary Cooling Tower & Auxiliary Cooling Water Sys tem	1.48
Plant Water System (DM Plant, Pre-treatment Plant)	3.71
EOT Cranes	0.78
Fuel oil & Storage system - in boiler package	0
Ash Handling System	5.72
Coal Handling Plant	9.89

Particulars	Amount *(₹ Cr)*
Air Compressor System	0.89
Air Condition & Ventilation System	1.67
Firefighting system	2.09
LP piping and miscellaneous equipment (in piping package)	
Misc. cranes (in EOT package)	
Electrical equipment	
Switchyard Package including transmission line	5.66
Other Electrical Packages	
Transformers Package	5.06
Generator Associated items - GRP, UCP, BOP control panels	2.28
Bus ducts	2.79
Switchgear package (HV, LV) DC, UPS, NGR and DG sets	7.05
Cables, Cable facilities, Illumination, Elevators, Communication, Grounding & Lightning protection, Lab equipment	7.35

Particulars	Amount *(₹ Cr)*
Control & Instrumentation Package	6.32

Particulars	Amount *(₹ Cr)*
Erection, testing and commissioning	31.4
Transport, Insurance, Taxes and Duties	*6.6*
GST on Plant & machinery including E&C/transport	*47.898*

CIVIL WORKS:

Particulars	Amount *(₹ Cr)*
Civil works cost	35
Taxes and Duties	
GST at 18%	6.3
CIVIL TOTAL	41.30

Non- Plant Works:

Particulars	Amount *(₹ Cr)*
Non-plant works	4.00
Any transmission interface works	2.00
Consumables	2.00

Interest During Construction:

Particulars	Amount *(₹ Cr)*
Project cost w.o. IDC	359.30
Interest During Construction (IDC)	37.50
Capital cost including IDC	396.79

Summary of approved Capital Cost:

Particulars	Amount *(₹ Cr)*
PLANT & MACHINERY	314.00
CIVIL TOTAL	41.30
Non PLANT works	4.00
Interest During Construction (IDC)	37.50
Capital cost including IDC	**396.79**

The petitioner is directed to submit the schedule of implementation of project and expected date of COD. Further, the petitioner is directed to submit physical & financial progress of the project in a quarterly manner.

4.4.4 Debt Equity Ratio:

The petitioner has submitted a Debt-Equity ratio of 75:25 and has been considered as per Regulation 22 of the MYT Regulations for the purpose of calculating Interest on loan & Return on Equity. Therefore, the approved Debt & Equity is as below:

Particulars	%	INR Crore
Debt	75%	297.60
Equity	25%	99.20
Total Project Cost	100%	396.79

4.5 Annual Fixed Charges (AFC) Analysis:

As per the Regulation 37 of MYT Regulations the components of AFC and various parameters has been analysed as below.

4.5.1 Operation & Maintenance (O&M) Expenses:

As per the Regulation 35, 48 & 48.3 of MYT Regulations, the O&M expenses is approved at ₹.28.5 Lakhs/MW. Hence, O&M expenses for the project for the 1st year of commercial operation is approved at ₹.17.10 crores.

4.5.2 Depreciation:

As per the Regulation 28 of MYT Regulations, the Depreciation has been considered based on the approved capital cost as below:

Details	Cost	Pre-op & IDC	Total Cost	Rate of Depn.%	Depreciation
Land & Site Development	0.00	0.00	0.00	0%	0.00
Building & Civil works	41.30	4.31	45.61	3.34%	2.00
Plant and Machinery	314.00	32.77	346.77	5.28%	18.31
Miscellaneous Fixed Assets	4.00	0.42	4.42	5.28%	0.23
TOTAL	**359.30**	**37.50**	**396.79**		**20.54**

The depreciation for 1st year of commercial operation is approved at ₹.20.54 crores.

4.5.3 Interest on Loan Capital:

The petitioner has submitted the rate of interest on loan capital at 13% and the proposed tenure of the loan is 10 years.

Regulations 27 of the MYT Regulations provides that the rate of interest shall be the weighted average rate of interest calculated on the basis of the actual loan portfolio. The petitioner has not submitted any loan agreement or commitment letter from any bank/financial institution neither any justification/ basis for considering interest rate of 13%.

In absence of actual interest rates, the commission has considered interest rate of two hundred (200) basis points above the average State Bank of India Marginal Cost of Funds based Lending Rate (MCLR) (one year tenor) prevalent during the last available six months shall be considered.

The average State Bank of India MCLR (One Year Tenor) is 8.5%, accordingly interest on loan has been considered at 10.5% i.e 8.5% +2%.

The petitioner is directed to submit the actual loan agreement/sanction letter to justify its claim of higher interest rate.

The loan component for calculating the interest on loan has been considered on the basis of capital cost as approved earlier in para 4.3.2 & Debt-Equity ratio approved in para 4.3.3 above.

Hence, the interest on loan for the 1st year of commercial operation is approved at ₹.24.41 crores.

4.5.4 Interest on Working Capital:

As per the Regulation 29 of MYT Regulations provides for the calculation of Interest on working capital. The regulation further provides that the Interest on working capital shall be allowed at a rate equal to the State Bank Advance Rate (SBAR) as on 1st April of the financial year in which the Petition is filed.

The petitioner has projected interest rate on working capital at 13% and has submitted that it would be difficult to get working capital loan at the normative rate provided in the Regulations and has requested to consider the rate of 13% as projected in the petition. However, the petitioner has

not provided any loan agreements/communication from any bank/financial institution in this regard.

In view of the above, Commission has considered Interest on Working Capital equivalent to the normative interest rate of three hundred (300) basis points above the average State Bank of India MCLR (One Year Tenor) prevalent during the last available six months for the determination of tariff. The petitioner is directed to submit the actual loan agreement/sanction letter to justify its claim of higher interest rate than that provided by the Regulations. In case the petitioner is not able to substantiate the same, the interest shall be reworked at the the State Bank Advance Rate (SBAR) as provided in the Regulation.

The average State Bank of India MCLR (One Year Tenor) is 8.5%, accordingly interest on working capital has been considered at 11.5% i.e 8.5% +3%. The computation of interest on working capital is provided below:

Particulars	**Stocking Period**	**Amount** *(₹ in Cr.)*
	(Days)	365
Current Assets		
1. Fuel cost	60	20.98
2. O&M Expenses	30	1.41
3. Receivables	30	20.66
4.Spares Inventory	36	0.14
5. Margin on LC – 25%		10.33
Total Current Assets		**53.51**
Less: Sundry Creditors	60	41.31
Net Current Assets		**12.19**
Less: Bank Borrowings		9.14
Margin for Working Capital		3.05
Interest	11.50%	1.05

The Interest on working capital for the 1st year of commercial operation is approved as ₹.1.05 cr.

4.5.5 Return on Equity:

Regulation 22, 26 & 30 of MYT Regulations provides that if the equity employed is less than 30%, the actual equity shall be considered. The petitioner has submitted a Debt-Equity ratio of 75:25. In view of the above, the Equity has been considered at 25% of capital cost for the purpose of calculating Return on Equity. The Equity component has been arrived at on the basis of capital cost as approved earlier in para 4.3.2 above.

Further, in terms of the Regulation 26, Return on Equity shall be allowed on the amount of allowed equity capital for the assets put to use. Accordingly, if the project is implemented phase wise, the ROE shall also be allowed proportionately based on the actual COD & corresponding capital cost of the respective units.

Regulation 30 of MYT Regulations provides for reimbursement of the Income Tax based on the actual income tax paid as per latest Audited Accounts available for the applicant. However, since, the project is still to be commissioned, actual income tax details are not available. Hence, the Income tax has been considered at Minimum Alternative Tax Rate (MAT) applicable for the FY 2019-20. The MAT for the FY 2019-20 is 15.60%. The ROE rate of 15.50% has been grossed up by the MAT rate to arrive at the allowable ROE. The grossed up ROE is 18.36%. The MAT allowed along with the return on Equity is provisional and the same shall be Trued-up based on the actual Tax paid. The Variation between Income Tax actually paid and approved, if any, shall be reimbursed to/recovered from the petitioner at the time of truing up of each year.

The Return on Equity arrived as per the above provisions is provided in the table below:

Return on Equity

Particulars	**Amount** *(₹ in Cr.)*
Capital Cost	396.79
Equity%	25.00%
Equity	99.20
ROE % *(Inclusive of MAT of 15.60%)*	18.36%
ROE	18.22

The Return on Equity approved for the 1st year of commercial operation is ₹ 18.22 crores.

5 Plant Load Factor, Generation & Auxiliary consumption:

The petitioner has submitted Plant Load Factor of 93% from the 1st year of commercial operation for calculation of generation units & estimating the fuel cost.
Considering the PLF of 93%, projected gross energy generation per annum is 488.81 MUs.

The petitioner has proposed auxiliary consumption at 9%. Regulation 47(iv) provides for auxiliary consumption norm of 8.5% for 200 MW series, but the capacity of the power plant is only 60 MW, hence, proposed auxiliary consumption of 9% is considered reasonable and approved accordingly.

Net Generation: Considering the gross generation of 488.81 MUs per annum and Auxiliary consumption of 9%, the net generation per annum is calculated at 444.82 MUs.

The commission approves the PLF at 93%, Gross generation of 488.81 MUs per annum, Auxiliary consumption of 9% & Net generation of 444.82 MUs per annum as projected by the petitioner.

6 Useful Life of the Project:

Regulation 2.58 of MYT Regulations, provides that the useful life of the Coal based thermal generating station shall be 25 years. The commission accordingly, approves the useful life of the generating station as 25 years.

7 Fuel Cost:

Petitioner submission:

Nagaland Coal transported by road from nearby mines and/or other Indian Coal and bamboo has been considered as the main fuel.

However, the financial analysis has been based on Nagaland Coal and bamboo. Cost of Nagaland Coal (GCV of 6700 kcal/kg) including freight, taxes and duties as delivered to the power plant site for the first year of operation has been considered as ₹.6,000/- per tonne.

Cost of Bamboo (GCV of 4500 kcal/kg) including freight, taxes and duties as delivered to the power plant site has been considered as ₹.6,000/- per tonne.

Coal required for the power plant is linked to the government supplied coal from the pit head thereby reducing the cost of transportation and making power generation viable. Bamboo, which is proposed to be fired from the second year of operation onwards, will be procured locally. Initially, in the second year of operation, 10% bamboo and 90% coal (percentages based on heat input) will be fired. The percentage of bamboo firing will be progressively increased each year and 100% bamboo firing will be adopted from the 11 (eleventh) year of operation onwards.

Commission's Analysis

The parameters submitted for calculation of fuel cost is as below:

Particulars	**Value**	
Calorific Value - Coal	6500	kcal/Kg
Calorific Value - Bamboo	4500	kcal/Kg
Cost of Coal	6000.0	₹/Ton
Cost of Bamboo	6000.0	₹/Ton
Boiler efficiency	85.0%	
Turbine heat rate	2404.0	kcal/kwh
Gross/Plant heat rate	2828.2	kcal/kwh
Coal Requirement	0.44	Kg/kwh

Fuel cost has been calculated based on the above parameters. Further, the use of coal is proposed to be reduced by 10% every year with corresponding increase in the use of Bamboo. Therefore, the use of coal is proposed to be discontinued after 10 years and entire generation is proposed to be fueled by Bamboo. The feasibility and availability of sufficient bamboos as fuel to sustain the continuous generation is required to be examined & substantiated. Hence, the petitioner is directed to submit detailed report on the proposal for switching from coal to bamboo. The estimated per unit fuel cost calculated based on the above parameters for the period of 11 years from the COD is provided in the table below. Further, secondary fuel & water charges is proposed at ₹ 0.12 crore for the 1st year of operation.

Fuel Cost per unit

Year	1	2	3	4	5	6	7	8	9	10	11
Coal consumed kg/kWh	0.44	0.39	0.35	0.30	0.26	0.22	0.17	0.13	0.09	0.04	0.00
Biomass consumed kg/kWh	0.00	0.06	0.13	0.19	0.26	0.32	0.39	0.45	0.52	0.58	0.65
Coal Cost ₹ per ton	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Biomass ₹ per ton	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000	6000
Fuel Cost ₹/kWh	2.61	2.74	2.87	2.99	3.12	3.25	3.38	3.50	3.63	3.76	3.89

Further, no Fuel Supply Agreement has been submitted by the petitioner in support of the fuel availability and proposed cost. The commission is approving the fuel cost based on the above parameters; however, the petitioner is directed to ensure reliable supply of fuel through FSA and submit the same to the Commission at earliest.

The per unit primary fuel cost of generation is approved for the 1st year of Commercial operation is ₹.2.61 per kWh. Considering the proposed generation of 488.81 MUs, the primary Fuel cost for the 1st year of commercial operation is approved at ₹.127.61 crores. Further, secondary fuel cost & water charges is approved at Rs. 0.12 crores for the 1st year of commercial operation. The total fuel cost is ₹.127.73 crores. The net energy available for sale is 444.82 MUs (gross generation – auxiliary consumption). Hence, fuel cost per unit of energy supplied is ₹.2.87/Kwh.

8 Tariff Design:

Regulation 50 of MYT Regulations provides for the Computation and payment of capacity charge and energy charge for thermal generation stations. The provisions of the Regulation is provided below:

A. "Annual Fixed Charges

"The total Annual Fixed Charges shall be computed based on the norms specified under these Regulations and recovered on monthly basis under capacity charge. The total capacity charge payable for a generating station shall be shared by its beneficiaries as per their respective percentage share / allocation in the capacity of the generating station.

The capacity charge (inclusive of incentive) payable to a thermal generating station for a calendar month shall be calculated in accordance with the following formulae:

(a) Generating stations in commercial operation for less than ten (10) years on 1st April of the financial year:

AFC x (NDM/NDY) x (0.5 + 0.5 x PAFM/NAPAF) (in Rupees);

Provided further that in case the plant availability factor achieved during a financial year (PAFY) is less than 70%, the total capacity charge for the year shall be:
AFC x (0.5 + 35/NAPAF) x (PAFY/70) (in Rupees).

The PAFM and PAFY shall be computed in accordance with the following formula:
N PAFM or PAFY = 10000 x $\sum_{i=1}^{N} DCi$ */ {N x IC x (100 - AUX)} %*

Where,
AUX = Normative auxiliary energy consumption in percentage;
DCi = Average declared capacity (in ex-bus MW), subject to Regulation 50.4 below, for the i^{th} *day of the period, i.e., the month or the year as the case may be, as certified by the concerned load dispatch centre after the day is over;*
IC = Installed Capacity (in MW) of the generating station;
N = Number of days during the period i.e. the month or the year as the case may be.

Note: DCi and IC shall exclude the capacity of generating units not declared under commercial operation. In case of a change in IC during the concerned period, its average value shall be taken.

B. *Energy Charge:*

The energy charge shall cover the primary fuel cost and shall be payable by every beneficiary for the total energy scheduled to be supplied to such beneficiary during the calendar month on ex-power plant basis, at the energy charge rate of the month (with fuel price adjustment). Total Energy charge payable to the generating company for a month shall be:

= (Energy charge rate in Rs./kWh) x {Scheduled energy (ex-bus) for the month in kWh.}

Energy charge rate (ECR) in Rupees per kWh on ex-power plant basis shall be determined to three decimal places in accordance with the following formulae:

(i) For coal based and lignite fired stations

ECR = {(GHR – SFC x CVSF) x LPPF/CVPF + LC x LPL} x 100/(100 – AUX)

(ii) For gas and liquid fuel based stations

ECR = GHR x LPPF x 100 / {CVPF x (100 – AUX)}

Where,
AUX = Normative auxiliary energy consumption in percentage.
CVPF = Gross calorific value of primary fuel as fired, in kCal per kg, per litre or per standard cubic metre, as applicable.
CVSF = Calorific value of secondary fuel, in kCal per ml.
ECR = Energy charge rate, in Rupees per kWh sent out.
GHR = Gross station heat rate, in kCal per kWh.
LC = Normative limestone consumption in kg per kWh.
LPL = Weighted average landed price of limestone in Rupees per kg.
LPPF = Weighted average landed price of primary fuel, in Rupees per kg, per litre or per standard cubic metre, as applicable, during the month.
SFC = Specific fuel oil consumption, in ml per kWh."

The capacity charge & energy charge is required to be calculated in accordance with the above provisions and billed monthly. The tariff based on the approved Annual Fixed Charges & technical parameters is provided in the subsequent para. However, actual billing shall be based on the actual financial & technical parameters and in accordance with the above Regulation.

9 Approved Fixed and Variable Charges:

The petitioner has proposed to implement the 2x30 MW thermal power project in two phases. In the first phase unit-I i.e. 30 MW is proposed to be commissioned and the unit-II i.e. remaining 30MW would be commissioned in the second phase. The fixed and variable charges for both Units (2x30) MW shall be as under:

Fixed & Variable Charges (2x30MW)	
Particulars	**Amount** ***(₹. Crore)***
Fixed Charges	
Interest on Term Loans	24.41
Int. on Working Capital	1.05
Depreciation	20.54
Return on Equity	18.22
O&M Expenses	17.10
Total Fixed Charges	**81.32**
Variable Charges	
Fuel Cost	127.61
Secondary Fuel Charges	0.12
Total Variable Charges	**127.73**

Capacity & Energy Charges (2x30MW)	
Net saleable energy (MUs)	444.82
Monthly Capacity Charges (Crs)	6.78
Capacity Charges (₹./kwh)	1.83
Energy Charges (₹./kwh)	2.87
Total Charges (₹/kwh)	**4.70**

10 DIRECTIVES:

Directive 1. Review of final Tariff:
The Project Developer is directed to submit the Actual Capital Cost duly Audited and Certified by the statutory authority from the date of commercial operation as prescribed under MYT Regulation for determination of the Final Tariff.

Directive 2. Loan Agreements:
The Project Developer has projected interest rate on working capital at 13% but has not provided any loan agreements/communication from any nationalized bank/financial institution in this regard. Therefore, the Project Developer is directed to submit the agreement between the parties.

Directive 3. Fuel Purchase Agreement:
No Fuel Supply Agreement has been submitted by the Project Developer in support of the fuel availability and proposed cost. Therefore, the Project Developer is directed to submit the Fuel Supply Agreement to ensure reliable supply of fuel for the plant.

Sd/-
W. Y. YANTHAN
Secretary,
Nagaland Electricity Regulatory
Commission (NERC), Kohima.

Printed at : *Kohima Printing Press,*
Mato Complex, P.R. Hill Kohima (0370 2241119)