

**ARUNACHAL PRADESH STATE ELECTRICITY REGULATORY  
COMMISSION (APSERC)**

**Determination of Tariff for 24 MW Dikshi Small Hydro- Electric Projects**

**For**

**Devi Energies Private Limited**

**351, Rupa Village & Town PO & PS Rupa, West Kameng District,**

**Arunachal Pradesh**

**Issued on 20/12/2019**

**Arunachal Pradesh State Electricity Regulatory Commission**

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Secretary

**Abbreviations**

<b>Abbreviation</b>	<b>Description</b>
ACT	Electricity Act, 2003
APSERC	Arunachal Pradesh State Electricity Regulatory Commission
CEA	Central Electricity Authority
CERC	Central Electricity Regulatory Commission
Cr./ Crs	Crore/ Crores
DEPL	Devi Energies Pvt.Ltd
D/E	Debt Equity
DOP, AP	Department of Power, Govt. of Arunachal Pradesh
E&M	Electro-Mechanical
FC	Financial Charges
FY	Financial Year
HEP	Hydro Electric Project
IDC	Interest During Construction
kV	Kilovolt
kVA	Kilo Volt Amps
kWh	Kilo Watt Hour
MU	Million Units
MVA	Million Volt Amps
MW	Mega Watt
O&M	Operation & Maintenance
ROE	Return on Equity
Rs.	Rupees
SS	Sub Station
SBI	State Bank of India
SBI-PLR	State Bank of India- Prime Lending Rate (Short Term)



SBI-MCLR	State Bank of India- Marginal Cost Lending Rate
SHP	Small Hydro Plant
SERC	State Electricity Regulatory Commission
TEC	Techno Economic Clearance





**Before**

**The Arunachal Pradesh State Electricity Regulatory Commission (APSERC)**

**Itanagar, Arunachal Pradesh**

**Petition No. TP – 06 of 2018**

**In the matter of:**

**Determination of Tariff for Dikshi Small Hydro- Electric Projects of 24 MW from proposed date of commercial operation (COD) as per Arunachal Pradesh state electricity regulatory Commission (Terms and Conditions for tariff determination from Renewable energy source) Regulation, 2018 for a period of 35 years.**

**AND**

**M/s Devi Energies Pvt. Ltd. (DEPL)**

**351, Rupa Village & Town PO & PS Rupa,**

**West Kameng District,**

**Arunachal Pradesh-----Petitioner**

**VS**

**Department of Power (DOP),**

**Govt. of Arunachal Pradesh. Itanagar -----Respondent**

**Present:**

**R. P. Singh, Chairman**

**ORDER**

**(Passed on 20-12-2019)**

The Commission in exercise of the powers vested in it under section 62 (1) (a) read with Section 62 (3) and Section 64 (3) (a) of the Electricity Act, 2003 and Arunachal Pradesh State Electricity Regulatory Commission (APSERC) RE Regulations, 2018 and other enabling provisions in this behalf, hereby issues this order, approval of capital cost of the projects

and determination of generation tariff for 35 years for supply of power to Department of Power, Govt. of Arunachal Pradesh for distribution in the State of Arunachal Pradesh. The relevant Regulation of the Commission requires that the generating company shall file tariff with the Commission for approval of capital cost and fixation of tariff complete in all respects, along with requisite fee as prescribed in the Commission's Fee, Regulations, (1st amendments) 2017 3 month in advance of date of Commissioning of the project or Commissioning of the 1<sup>st</sup> unit in case of multiple unit or one month after the date of issuance of these Regulation, whichever is later. Accordingly, the tariff petition have been filed by the DEPL (the deemed generating company) on 2<sup>nd</sup> December 2018.

This order consists of four chapters, which include detailed analysis of the capital cost, approved Generation Tariff for 35 years.

This order shall be effective from COD i.e. 19<sup>th</sup> September 2019 and shall remain in force for 35 years.

Date: 20/12/2019

Place: Itanagar



(R. P. SINGH)

Chairperson, APSERC

## **1. INTRODUCTION**

### **1.1 ARUNACHAL PRADESH STATE ELECTRICITY REGULATORY COMMISSION**

In exercise of the powers conferred by the Electricity Act, 2003, (hereinafter referred to as Act) the Government of Arunachal Pradesh constituted the Electricity Regulatory Commission for the State of Arunachal Pradesh to be known as "Arunachal Pradesh State Electricity Regulatory Commission" (APSERC) as notified on 07.05.2010 (hereinafter referred to as Commission). The Commission so constituted is a one-member body to function as an autonomous authority responsible for Regulation of the power sector in the State of Arunachal Pradesh. The powers and functions of the Commission are such as prescribed in the Act. The office of the Commission is presently located at Itanagar, Arunachal Pradesh. The Commission started functioning with effect from 02.03.2011 with the objectives and purposes for which it has been established.

**In accordance with the provisions of the Act, the Commission discharges the following functions:**

- a) Determines the Tariff for generation, supply, transmission and wheeling of electricity, wholesale, bulk or retail, as the case may be, within the State; provided that where open access has been permitted to a category of consumers under Section 42, the State Commission shall determine only the wheeling charges and surcharge thereon, if any, for the said category of consumers.
- b) Regulates Electricity purchase and procurement process of distribution licensees including the price at which electricity shall be procured from the generating companies or licensees or from other sources through agreements for purchase of power for distribution and supply within the State.
- c) Facilitates Intra-State transmission and wheeling of electricity.
- d) Issues licenses to persons seeking to act as transmission licensees, distribution licensees and electricity traders with respect to their operations within the State.
- e) Promotes co-generation and generation of electricity from renewable sources of energy by providing suitable measures for connectivity with the grid and sale of electricity to any person, and specify, for purchase of electricity from such sources, a percentage of the total consumption of electricity in the area of a distribution licensee.

- f) Adjudicates upon the disputes between the licensees and generating companies; and to refer any dispute for arbitration.
  - g) Levies fee for the purpose of the Act.
  - h) Specifies State Grid Code consistent with the Indian Electricity Grid Code (IEGC) standards specified under clause (h) of sub-section (1) section 79 of EA-2003.
  - i) Specifies and enforce standards with respect to quality, continuity, and reliability of services by licensees.
  - j) Fixes the trading margin in the Intra-State trading of electricity, if considered, necessary.
  - k) Discharges such other functions as may be assigned to it under the EA-2003.
  - l) Under takes promotion of energy efficiency.
- (1) **Further, the Commission also advises the State Government on all or any of the following matters namely:**
- a) Promotion of competition, efficiency, and economy in activities of the electricity industry.
  - b) Promotion of investment in electricity industry.
  - c) Reorganization and restructuring of electricity industry in the State.
  - d) Matters concerning generation, transmission, distribution and trading of electricity or any other matter referred to the State Commission by the State Government.
- (2) **The Commission ensures transparency while exercising its powers and discharging its functions.**
- (3) **In discharge of its functions, the Commission is guided by the National Tariff Policy (NTP) brought out by GOI in compliance with Section 3 of the Act. The objectives of the NTP are to:**
- a) Ensure availability of electricity to consumers at reasonable and competitive rates.
  - b) Ensure financial viability of the sector and attract investments.
  - c) Promote transparency, consistency, and predictability in regulatory approaches across jurisdictions and minimize perceptions of regulatory risks.
  - d) Promote competition, efficiency in operation and improvement in quality of supply.
- (4) **The Commission has so far notified the following Regulations to facilitate its functioning.**
1. State Advisory Committee (SAC) Notification – 2011.

2. Conduct of Business Regulations- 2011.
3. Redressal of Grievances and Ombudsman Regulations – 2011.
4. Fee Regulations-2011.
5. Grant of Intra State Trading License Regulations-2011.
6. Terms and Conditions for Determining of Tariff and Formats for Tariff Filing Regulations – 2011.
7. Renewable Power Purchase Obligations and its Compliance Regulations 2012. (Repealed).
8. Renewable Power Purchase Obligation and Its Compliance Regulations – 2012.
9. Redressal of Grievances & Ombudsman Regulation (1st Amendment) – 2012.
10. State Grid Code Regulations – 2012.
11. Terms and Conditions of Intra-State Open Access Regulations-2012.
12. Electricity Supply Code Regulation-2013.
13. Reconstitution of the State Advisory Committee-2013.
14. Multi Year Tariff Regulation – 2013.
15. Service Conditions of Staff Regulations-2015.
16. Consumer Grievances Redressal Forum and Ombudsman Regulation, 2015.
17. Standards of Performance for the Distribution Licensee Regulation-2016.
18. Renewable Power Purchase Obligation and its Compliance Regulation (1<sup>st</sup>Amendment) 2016.
19. Renewable Power Purchase Obligation and its Compliance Regulation (2<sup>nd</sup>Amendment) 2016.
20. Rooftop Solar Grid Interactive Based on Net Metering Regulation -2016.
21. Appointment of Consultants Regulations-2017.
22. Terms and Conditions for Tariff Determination from Renewable Energy Sources Regulation - 2012 (1stAmendment) 2017(Repealed).
23. Payment of Fees Regulation (1st Amendment) 2017.
24. Procedure, Terms and Conditions for grant of Transmission Licence and other related matters Regulations, 2017.
25. Terms and Conditions for Tariff Determination from Renewable Energy Sources Regulations-2018.
26. Appointment of Consultants Regulations, 2018.

27. State Grid Code Regulations, 2018.
28. Service Conditions of Staff Regulations, 2018.
29. Consumer Grievances Redressal Forum and Ombudsman Regulations (First Amendment)-2018.
30. Multi Year Tariff Regulations-2018.

## **1.2 ARUNACHAL PRADESH - GEOGRAPHICAL REALITY**

The total area of the State of Arunachal Pradesh is 83573 sq.kms. The State is having a population of around 13.82 lakhs (2011 Census). The State of Arunachal Pradesh is bounded by Assam in South, Bhutan in West, China in North, and Nagaland and Myanmar in East. It's Capital, Itanagar is about 380 kms from Guwahati.

## **1.3 DEVI ENERGIES PRIVATE LIMITED (DEPL)**

Devi Energies Private Limited is a company having registered office at Rupa village & Town PO & PS Rupa, West Kameng District, Arunachal Pradesh is specialized in development of Hydroelectric Power projects.

Devi Energies Private Limited entered into Memorandum of Agreement (MoA) with Government of Arunachal Pradesh on 11.03.2011 for execution of Dikshi SHEP (24MW) on BOOT basis. Dikshi Small Hydro Electric Project (24 MW) located in West Kameng district of Arunachal Pradesh, envisages utilization of waters of the river Phudung, a tributary of Tenga river. The project envisages utilization of 24.16 cumec discharge and maximum gross head of 121 m (Net head 113.53 m) corresponding to an installed capacity of 24 MW.

Devi Energies Private Limited has successfully Commissioned 24 MW Dikshi SHEP on 19.09.2019.

## **1.4 TARIFF PETITION: FILING**

Devi Energies Private Limited has filed the tariff Petition for 24 MW Dikshi SHEP for 35 years on dated 02.12.2018.

In the petition, DEPL has proposed following as levelized Tariff of Rs 6.35/ kWh based on cost of project of Rs 35196.96 Lakhs and net generation 93.66 MUs of the hydro plant for 35 years.

### **1.5 ADMISSION OF PETITION AND PUBLIC HEARING PROCESS**

The Commission observed that:

- (1) The Petition was submitted in line with APSERC (Terms and Conditions for Tariff Determination from Renewable Energy Source) Regulation 2018, Notified on 21<sup>st</sup> May, 2018.
- (2) The Petitioner has deposited the requisite Petition fee in line with Schedule of the Fees prescribed under the Commission's Fee Regulations 1<sup>st</sup> amendment 2017, No. APSERC/NOTIFICATION/24/2017 dated 31<sup>st</sup> March, 2017.
- (3) The Petition filed by the Petitioner lacked in many requisite data. The Commission however admitted the Petition on dated 18/12/2018 and numbered it as Petition no TP-06 of 2018 in line with Regulation 16(13) "Presentation, Scrutiny and Admission of the Petitions" of the Arunachal Pradesh State Electricity Regulatory Commission (Conduct of Business Regulations 2011).

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Secretary

## **2. PETITION'S SUMMARY FOR APPROVAL OF CAPITAL COST & TARIFF DETERMINATION**

### **2.1 BACKGROUND**

DEPL has filed the tariff petition of 24 MW Dikshi SHEP along with it has submitted the details of various expenses that constitute the fixed cost for determination of tariff. The details are given in the following paras in this chapter.

### **2.2 CAPITAL COST - PETITIONER'S SUBMISSION**

The Petitioner submitted the Capital cost of the Hydro power plants as per Regulation 12 of APSERC (Terms & Conditions for Tariff Determination from Renewable Energy Sources) Regulations, 2018.

The Petitioner has submitted capital cost of Rs 35196.96 lakhs including Interest during construction and financing charges till COD i.e 19<sup>th</sup> September 2019.

### **2.3 INTEREST ON LOAN-PETITIONER'S SUBMISSION**

The Petitioner submitted that the Project cost of the HEPs has been funded by the Financial Institutes. In view of the above, interest on loan has been claimed. DEPL submits that it will claim interest on loan in accordance with the APSERC RE Regulation, 2018.

As per Regulation 14 of APSERC RE Regulation 2018, the following parameters are considered.

1. Loan amount: - 70 % of the project
2. Loan period: - 13 years
3. Moratorium period: - 0 months
4. Rate of interest:- 10.41 %

Interest rate considered is 200 basis points above the average State Bank of India MCLR (marginal cost lending rate- one year tenor) prevalent during the last available 6 months.

### **2.4 DEPRECIATION- PETITIONER'S SUBMISSION**

The Petitioner has submitted that depreciation for the project has been considered @ 5.28% for first 13 years and @ 0.97% from 14<sup>th</sup> year till 35<sup>th</sup> year, considering salvage value as 10 % as per Regulation 15 of APSERC RE Regulation, 2018.

## **2.5 RETURN ON EQUITY (ROE) - PETITIONER'S SUBMISSION**

The Petitioner submitted ROE as per provision under Regulation 16 of APSERC RE Regulations, 2018 considered @ 14% per annum grossed up by MAT as on 1st April of previous year. Accordingly, ROE has been considered @ 17.56%.

The equity for the purpose of calculation of ROE has been computed as per Regulation 13 of APSERC RE Regulations, 2018.

Accordingly, Debt-Equity ratio of 70:30 has been considered as per Regulation 13 of APSERC RE Regulations, 2018 for determination of tariff.

## **2.6 O&M EXPENSES – PETITIONER'S SUBMISSION**

The Petitioner submitted O&M expenses as per Regulation 19 of APSERC RE Regulations, 2018 that provides normative O&M for SHPs as Rs. 28.54 Lakh/MW for the base year of 2018-19. The Regulation further provides an escalation @ 5.72% per annum on the above normative O&M for subsequent years.

## **2.7 INTEREST ON WORKING CAPITAL - PETITIONER'S SUBMISSION**

The Petitioner submitted interest on Working Capital as per Regulation 17 of APSERC RE Regulations, 2018. Interest @ 11.41 % per annum on working capital has been considered as 300 basis points above the SBI MCLR (One year tenor) for last six months.

1. Operation & Maintenance expenses for one month;
2. Receivables equivalent to 2 months of energy charges for sale of electricity;
3. Maintenance spares @ 15% of O &M expense .

## **2.8 SUBSIDY & INCENTIVE BY CENTRAL/ STATE GOVT- PETITIONER'S SUBMISSION**

As per MNRE circular dated 02.07.2014, a capital subsidy @ Rs 1.5 Crores per MW with ceiling of Rs 5 Crore will be granted for small hydro projects upto 25 MW. The amount has been reduced in debt for calculations of tariff for the project.

## **2.9 AUXILIARY CONSUMPTION- PETITIONER'S SUBMISSION**

As per Regulation 28 of APSERC Regulation 2018, normative auxiliary consumption factor is taken @ 1% of net CUF.

## **2.10 FIXED COSTS CLAIMED - PETITIONER'S SUBMISSION**

Summary of Petitioner is provided in **Annexure-A**

### **2.11 INDICATIVE TARIFF - PETITIONER'S SUBMISSION**

The Petitioner submitted levelized tariff considering 45 % CUF net of free power as Rs 6.35/Kwh.

### **2.12 PETITIONER'S PRAYER**

The Petitioner requested the Commission to:

1. Approve the capital cost of the project;
2. Approve the proposed levelised tariff;
3. Elaborate Must Run clause so as to avoid future dispute, if any.

## **3. COMMISSION ANALYSIS: APPROVAL OF CAPITAL COST & TARIFF**

### **3.1 GENERAL**

DEPL has filed the petition dated 02.12.2018 for determination of Tariff of their 24 MW Dikshi Generating Stations as per APSERC (Terms and condition for determination of Tariff from Renewable Energy Source), 2018 from the date of Commissioning for 35 years.

The petition was published in abridged form on dated 23.03.2019 in local newspapers and also placed on Commission's website for public response and suggestions. The Commission did not receive any comments/suggestions so far.

The Commission has found discrepancies in the data provided and asked for the clarification and additional documents during the scrutiny for approval of capital cost and tariff determination.

In the meantime, the petitioner had requested the Commission for the grant of provisional tariff till all the documents/ information are furnished. The Commission has granted provisional tariff vide order dated 30.09.2019 based on records/ information available with it. Considering the CERC norms, the Commission has granted a provisional tariff of Rs 4.41 kWh which will be applicable till the determination of final tariff.

The petitioner has submitted additional data and confirmed the commercial date of operation to be 19.09.2019 vide certificate no. CE (P)/ WEZ/ COM-3 (4)/PPA/PP/2019-20/4854-65 dated 30.09.2019.

On 18.11.2019, hearing was held in the Commission court room where members of Devi Energies and Department of Power, Govt. of Arunachal Pradesh were present.

The respondent, Department of power Vide letter no. CEP/WEZ/ COM 3(4)/2019-20/7092-96 dated 15.11.2019 has requested the Commission to extend the date of hearing due to absence of documents with them.

As per the request made by respondent, the Commission decided for next hearing and fixed the next date of hearing on 11.12.2019. The Commission also directed Respondent that no further extension of dates shall be allowed and suo-motu order will be issued.

The Commission has approved capital cost and determined tariff as per Regulation (7) & (8) of APSERC RE Regulation, 2018 as amended from time to time after detailed scrutiny and considering reasonable, logical, acceptable facts presented by petitioner.

### 3.2 ASSUMPTIONS FOR TARIFF PETITION ANALYSIS.

The Commission considered the following assumption for tariff analysis.

**Table 1: The Assumptions considered for Tariff Petition Analysis**

Sl. No.	Particulars	Unit	Value	Remarks
1	<b>Auxiliary Consumption</b>	%	1	As per APSERC RE Regulation, 2018
2	<b>O&amp;M Expenses</b>	Lakhs/ MW	28.54	Escalation @5.72% as per APSERC RE Regulation, 2018
3	<b>Depreciation</b>	%	5.28%	For 13 years as per APSERC RE Regulation, 2018
4	<b>Plant Life</b>	Years	35	As per APSERC RE Regulation, 2018
5	<b>Salvage value</b>	%	10	As per APSERC RE Regulation, 2018
6	<b>Capacity Utilization Factor</b>	%	45	As per APSERC RE Regulation, 2018
7	<b>RoE</b>	%	14	As per APSERC RE Regulation, 2018 and gross up post tax @ 20.46%

8	Interest on working capital	%	11.41	300 base point above SBI MCLR as per APSERC RE Regulation, 2018
10	Interest on Loan	%	10.41	200 base point above SBI MCLR as per APSERC Regulation, 2018
11	Spares(% of O&M)	%	15	As per APSERC RE Regulation, 2018
12	O&M expenses	Months	1	As per APSERC RE Regulation, 2018
13	Receivables	Months	2	As per APSERC RE Regulation, 2018
14	Debt	%	70	As per APSERC RE Regulation, 2018
15	Equity	%	30	As per APSERC RE Regulation, 2018
16	Loan Period	Years	13	As per APSERC RE Regulation, 2018

### 3.3 CAPITAL COST – COMMISSION ANALYSIS

The Petitioner has taken the capital expenditure on the project as Rs. 351.96 Crore on the date of commercial operation, i.e., 19.09.2019 which has been supported by the certificate of the Chartered Accountant dated 28.10.2019 for audited actual expenditure, against the TEC approved cost of Rs. 185.40 Crore with Commissioning schedule of 42 months. It is clear that there has been substantial time and cost overrun in the project. The Petitioner has also got additional term loan to meet a part of the cost overrun. The actual capital cost per MW works out to Rs. 14.66 Crore/MW. The details of capital expenditure is as follows:

**Table 2: Detailed capital expenditure claimed**

Sl. No.	Head of Expense	Claimed as per BOQ/ breakup by Petitioner (Rs Crores)
1	Land	3.67
2	Civil cost	235.91
3	E&M cost	37.09
4	Construction and Pre Commissioning expense	5.99
5	Infrastructure, T&P, Establishment, Etc.	6.69
6	Overheads	8.12
7	<b>Capital cost w/o IDC and FC</b>	<b>297.51</b>
8	Interest During Construction (IDC)	52.63

9	Financing charges (FC)	1.86
<b>10</b>	<b>Capital cost with IDC and FC</b>	<b>351.96</b>

Commission during scrutiny of the petition has found that project components was changed, trench weir from barrage, free flow head race tunnel from pressurized head race tunnel forebay from surge shaft, partial tail race channel & tail race tunnel from tail race channel.

There was change in size of head race tunnel and penstock. Also location of trench weir, head race tunnel and penstock and powerhouse was changed.

Revised TEC has not been obtained for the change of components nor was geological surprise committee formed for consideration of geological surprises as per the condition of TEC.

There was a major increase in quantities and rates in head race tunnel, forebay, penstock and powerhouse according to the final executed BOQ submitted by the petitioner.

Further, in scrutiny of E&M aspects, switchyard equipment especially transformer was found of higher capacity. Also there was an increase in E&M cost for which breakup was not submitted.

Petitioner during the hearing and through his letters for clarification on comments raised by Commission, gave a briefing on the project background and the difficulties in construction of the project in terms of technical, economical as well as social concerns. According to the petitioner, due to the issues raised by the locals of the area on religious ground the construction of the barrage was not permitted in the Phudung river. In this regard, the developer explained that the barrage had to be abandoned and diversion had to be a trench type weir which doesn't entail any pondage. In order to overcome the loss of head, the location of the trench weir was suitably shifted upstream.

Petitioner also added that similar problem was faced for powerhouse, again on local resistance for the originally conceived location resulting in relocation of the powerhouse and corresponding changes in the tail race structure. Also, 250 m long tunnel plus open channel had to be constructed to release the water back into the river, instead of the 75 m long open channel only.

The tunnel size originally envisaged was D type of 3.7m x 3.3m which had to be increased for ease of construction to 5.10 m x 4.6 m. There was huge over break during the tunnelling due to weak geology of the area. He further added that instead of 10 % over break generally allowed in the contract, the actual over break was about 37 %. This resulted into increase of cost and completion time of the project.

In justification of the increase in completion cost of the project amounting to Rs. 351.96 Crores i.e Rs 14.66 Crore per MW, the factor such as weak geology of the area, landslides, floods and also unfortunate death in the tunnelling process, a major crown collapse during excavation. This also resulted into increase in completion time of the project as per petitioner.

According to the developer they had to construct 20 km road for access to the site and also arrange construction power from DG sets due to non-availability of electric supply from the state grid. The cost of diesel power comes to around Rs.20 per unit, which is almost 5 times the cost of electricity. Also non-availability of skilled labours in the area was a factor in cost escalation. Remoteness (the nearest markets located at Guwahati, Silliguri and Kolkata) factor also affected the cost of completion and also in time for completion much more than what was anticipated at planning stage.

Delay in grant of clearance from NEEPCO to DOP for allowing connectivity for 132-KV Dikshi-Tenga-Nechipu line to connect to NEEPCO line. Though transmission line and switching station are ready for synchronization and Commissioning by 1<sup>st</sup> week of May 2019, permission for connectivity to NEEPCO line has been accorded in last week of Aug'19.

The Commissioner (Power) informed the Hon'ble Commission that the tariff sought as Rs. 6.34 per unit is very high. In support of his plea, he informed the Commission that DOP is charging at an average rate of Rs.3.35 per unit from its consumers and Arunachal Pradesh doesn't have internal revenues to cover this gap. He further submitted that the approved TEC was of Rs.185 Crores and revised approval for the same was not sought by the developer.

The Commissioner (Power) commented that the reason for increase in cost such as floods, landslides, remoteness availability of skilled labour are not maintained as these factor should have been known and accounted for at the planning stage itself.

The Commission after considering the petitioner's submissions, briefing during hearing and respondent's submissions has approved the capital cost of the 24 MW Dikshi SHEP as Rs 231.42 Crores without IDC and FC on following basis:

1. The Commission considered the reasons given for changes in components and their location and finds the reasons given technically and logically acceptable.
2. Project was monitored by Chief Engineer (Monitoring) through AE, Civil- DHPD and no observations on changes were made.
3. There was no observation by the Commissioner (Power) on the letter submitted by petitioner on change of scope and cost of the project components in February 2018.
4. According to petitioner, senior Geological experts were not readily available to visit such remote locations therefore; no geological surprise committee can be formed. Petitioner's explanation on this point seems logical in practice.
5. The Commission has considered the contract awarded rates and subsequently negotiated rates and accepted the lower of the two.
6. Also, Commission has allowed a price variation of 2.7 % on the rates with respect to the increase in labour rates. The Commission has found that during the construction period rates has increased approx. 9 % and they approximately comprises 30 % of the rate.
7. Fuel charges have not gone up during the period of construction, hence no variation is allowed for the fuel charges.
8. The quantities varying unreasonably with the construction drawings have been limited to the extent those are reasonable and acceptable. Quantities of excavation and lining has been adjusted as per drawings submitted and granted.
9. An over break of 25 % allowed keeping in view of the rock strata- class IV and class V. This is 15 % in addition to standard norms and TEC permitted overbreak due to poor geological conditions.
10. As per petitioner increase in cost is also due to increase in price of steel, cement and aggregate. This has been accepted and price variation in cement, steel and aggregates has been allowed Rs. 7.01 Crores as claimed. However, allowing for price variation rules out escalation in the contract agreement rates for steel, cement and aggregates.

11. Difference amount in restoration of flood damage works (1, 2 and 3) and insurance claim settled (1 & 2) has been disallowed as it might have been considered unrelated or infructuous to the restoration by the insurance company. The developer claimed Rs 9.28 Crores against the damages and received Rs 2.76 Crores against the claim from the insurance company. No further details in support of his claim having being reasonable and yet rejected by insurance company is submitted, hence cannot be granted.

<b>Flood Details</b>	<b>Claimed ( Rs.in lacs)</b>	<b>Received(Rs. in lacs)</b>
Flood-1	195.28	115.18
Flood-2	395.57	161.46
Flood-3	337.42	0
<b>Total</b>	<b>928.27</b>	<b>276.64</b>

12. E&M cost as submitted vide original petition Rs 31.87 Crore is considered and accepted as per documents (tender and cost breakup) submitted. As no details are provided for the increased cost of Rs 37.09 Crores.

**The detailed costing of civil works is tabulated at Annexure-B.**

**The detailed costing of E&M works is tabulated at Annexure-C**

### **3.3.1 TIME OVER RUN- COMMISSION ANALYSIS**

TEC for the project was given on date 10.06.2013, date of signing of agreement for civil and HM works is 06.08.2014. A period of one year has been given in TEC for pre - construction activities and other clearances. However, the time taken by the developer for award of contract since TEC is 14 months, which is more than the 12 months' pre-construction period.

The financial sanctions of the project from IREDA was partly done on 04.08.2014. Actual date submitted to Commission is July 2015 for full sanction.

Considering Zero date of project execution as July 2015, the anticipated date of completion shall be December 2017, considering a 30 months of execution period. Actual completion is in 1<sup>st</sup> week of May 2019. Thus total delay in the project is 20 Months.

Considering the effect of climatic conditions, floods, geological reasons, local factors and other logistical factors and connectivity approval, a period of 13 months as claimed seems to be justified and can be considered for time over run.

However, certain factors affecting delay stated during the hearing dated 11.12.2019 by DEPL team were submitted which the Commission finds acceptable for additional time overrun of 7 months. These factors are:

1. Cavity formation- A period of 2 months is allowed as a reasonable time for overcoming these events of cavity formation at multiple locations.
2. Huge overbreak- 37 %- This has resulted in increase in backfill quantities and time extension. Though we have allowed time extension for overbreak but excess quantities could have been controlled and therefore 15 % of the overbreak in excess of 10 % has been considered against 37 % claimed, a period of 2 months is allowed.
3. The change in location of the weir and powerhouse based on social and religious concerns have resulted in delay of construction activity by 3 months has been allowed.

Thus, Commission does not find any reason for penalizing developer on ground of time over run.

### **3.3.2 FINANCING CHARGES- COMMISSION ANALYSIS**

Combined loan was taken for HEP and Transmission system. Financial Charges for entire loan is Rs. 186.29 Lakhs or Rs 1.86 Crores. Thus Rs 1.86 Crores should be apportion between HEP & Transmission. The Financial Charges for the project comes out to be Rs 1.63 Crores, considering the Financing charges of Rs 0.23 Crores claimed for the transmission system.

### **3.3.3 INTEREST DURING CONSTRUCTION- COMMISSION ANALYSIS**

1. Actual IDC is calculated on prorata basis as combined loan is disbursed for the HEP and transmission.
2. IDC claimed till March 2018- Rs 33.05 Crores.
3. IDC claimed from April 2018 to Dec 2018- Rs 3.99 Crores.
4. IDC claimed from Jan 2019 till COD- Rs 15.59 Crores.
5. Total IDC is Rs 52.63 Crores.

6. IDC acceptable is Rs 41.78 Crores (77.79 % of IDC claimed- percentage of the hard cost Rs 231.42 Crores accepted).
7. The IDC accepted by Commission has been restricted to the hard cost admitted and not as claimed.

### 3.3.4 DETAIL OF CAPITAL EXPENDITURE APPROVED IS AS FOLLOWS:

*Table 3 : Detail of capital expenditure approved*

Sl. No.	Head of Expense	Claimed as per BOQ/ breakup by Petitioner (Rs Crores)	Cost allowed by APSERC (Rs Crores)	Remarks
1	Land	3.67	3.67	As per documents submitted
2	Civil cost	235.91	182.78	As per comments above and Annexure B
3	E&M cost	37.09	31.87	As per comments above and Annexure C
4	Construction and Pre Commissioning expense	5.99	-	Already included in E&M cost as they are part of E&M cost- Annexure C
5	Infrastructure, T&P, Establishment, Etc.	6.69	6.55	These expenses are shared by the developer & contractor in the total cost of the project. The owner generally takes cares of licenses, communication system, office and office equipment, etc. which justifies allocation of 3 % of the project cost for this head
6	Overheads	8.12	6.55	The overhead expenses are shared by the developer & contractor in the total cost of the project. The owner generally takes cares statutory visits, design experts &

				owner supervision which justifies allocation of 3 % of the project cost for this head
7	<b>Capital cost w/o IDC and FC</b>	<b>297.51</b>	<b>231.42</b>	
8	Interest During Construction (IDC)	52.63	41.78	(77.79% of IDC claimed- percentage of the hard cost Rs 274.831 accepted)
9	Financing charges (FC)	1.86	1.63	Rs 0.23 Crs is claimed in transmission cost
10	<b>Capital cost with IDC and FC</b>	<b>351.96</b>	<b>274.831</b>	

### 3.4. DEPRECIATION - COMMISSION ANALYSIS

The Commission has considered the rate of depreciation @ 5.28 % for 13 years and @ 0.97 % from 14<sup>th</sup> year till 35<sup>th</sup> year (as per APSERC RE Regulation, 2018). Salvage value is considered as 10 %. The total depreciation allowed during the project life comes out to be Rs. 242.85 Crores.

The seven months has been considered in the first year for calculation of depreciation amount.

**The Commission has estimated the year wise depreciation in Annexure D.**

### 3.5. O&M EXPENSES – COMMISSION ANALYSIS

The Commission allowed the operation and maintenance costs considering the normative rate as Rs 28.54 Lakhs per MW with per annum escalation @ 5.72 % (for plants above 5 MW upto 25 MW ) as per APSERC (Terms and Conditions for Tariff Determination from Renewable Energy Sources) Regulations-2018.

The generator has calculated O&M expense for the first year by considering seven months of FY 2019-2020 & 5 months of FY 2020-2021.

The Commission in a view to allow O&M costs for seven months for FY 2019-2020 considering FY 2019-2020 as first year of operations in accordance with APSERC RE Regulation, 2018 and **hence approved the O&M cost during the project life as shown in Annexure D.**

### 3.6. RETURN ON EQUITY – COMMISSION ANALYSIS

DEPL has submitted the ROE considering normative capital cost and Debt: Equity ratio as 70:30 that comes out to be:

Total Project Cost (Rs Crores)	351.96
Equity @ 30% (Rs Crores)	105.99
Debt @ 70% (Rs Crores)	241.37
Subsidy (deducted in debt) (Rs Crores)	5

The Commission however allowed the ROE as per the capital cost allowed i.e Rs 274.83 Crores that comes out to be:

Total Project Cost (Rs Crores)	274.83
Equity @ 30% (Rs Crores)	82.449
Debt @ 70% (Rs Crores)	187.38
Subsidy (deducted in debt) (Rs Crores)	5

The Commission has not considered any addition of equity for capitalized works, and therefore, approved the Return on Equity in accordance with APSERC RE Regulation, 2018 @ 17.60 % (considering MAT as on 1<sup>st</sup> April 2018).

The seven months has been considered in the first year for calculation of ROE amount. **Hence approved the ROE during the project life as shown in Annexure D.**

### 3.7. INTEREST ON LOAN CAPITAL – COMMISSION ANALYSIS

The Commission has considered following norms as per the APSERC RE Regulation 2018 for computation of interest on loan capital:

1. Loan amount: 70% of the project cost
2. Loan period: 12 years
3. Moratorium: 0 months

4. Rate of interest-10.41%

Rate of interest is 200 basis points above the average State Bank of India MCLR (marginal cost lending rate- one year tenor) prevalent during the last available 6 months.

The seven months has been considered in the first year for calculation of Interest on loan amount.

**Hence approved the interest on loan during the project life as shown in annexure D.**

**3.8. INTEREST ON WORKING CAPITAL – COMMISSION ANALYSIS**

The Commission has computed Interest on working capital as per APSERC RE Regulations, 2018 according to which the working capital for SHPs would be sum total of:

1. O&M expenses for one month.
2. Maintenance spares @15% of O&M expenses.
3. Receivables equivalent to two months of energy charges for sale of electricity calculated on the normative Capacity Utilization Factor

Interest on Working Capital shall be at interest rate 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 seven months has been considered in the first year for calculation of Interest on working capital amount.

**The Commission approved Interest on Working Capital during the project life as shown in annexure D.**

**3.9. DISCOUNTING FACTOR**

The discounting factor considered is equal to the post tax weighted average cost of capital on basis of normative debt: equity ratio as per Regulation 2018. The discount rate works out to be 9.37 %, considering corporate tax of 25 % with 4 % educational and health cess and 12 % surcharge.

#### 4. HYDRO POWER GENERATION TARIFF - COMMISSION'S ANALYSIS

Regulation 28 of the APSERC Regulation on "The Terms and Conditions for Determining of Tariff Determination from Renewable Energy Sources – 2018" dated 21.05.2018 specifies the Auxiliary Energy Consumptions Norms of Operation in respect of the Hydro Plants at 1 % for SHPs.

The Commission in its tariff order has reasonably considered CUF of 45% net of free power to the state for SHP as per the APSERC RE Regulation 2018.

The net saleable energy after considering CUF and auxiliary consumption comes out to be 93.66 MUs.

Hence, the Commission approves the generation levellized tariff for Dikshi Small Hydro Electric Plant for 35 years at **5.25 (Rs/kWh)**.

The detailed calculation is attached as **annexure D**.

- **The tariff allowed in this order shall be applicable from the date of commercial operations of 24 MW Dikshi SHP.**
- **The tariff allowed in the provisional order shall be subject to adjustment.**
- **The plant shall be on MUST Run basis.**
- **This order disposed of petition no TP-06 of 2018.**

Date: 20/12/2019

Place: Itanagar

  
(R. P. SINGH)

Chairperson, APSERC

## 5. Annexures

### Annexure - A: ASSUMPTIONS By DEPL

Date of Commissioning of the Project				19th September, 2019	
S. No.	Assumption Head	Sub-Head	Unit	Values	Remarks
1	Power Generation	Installed Power Generation Capacity	MW	24	Project Capacity
		Gross Capacity Utilization Factor	%	45%	As per Regulation
		Auxiliary Consumption	%	1%	As per Regulation
		Gross Annual Generation in 1st Year	%	94.61	As calculated
		Useful Life Years	Years	35	As per Regulation
2a	Project Cost	Power Plant Cost	Rs. Lacs	35196.96	As per details submitted in Petition
2b		Cost per MW	Rs. Lacs / MW	1466.54	As calculated
3	Period	Tariff Period	Years	35	As per Regulation
4	Source of Fund	Debt: Equity			
		Debt	%	69.24%	As per Regulation
		Equity	%	30.76%	As per Regulation
		Total Debt Amount	Rs Lacs	24370.46	As calculated
		Total Equity Amount	Rs Lacs	10826.50	As calculated
		Govt Subsidy	Rs Lacs	500.00	Max as per GOI available post COD
		Loan Amount (net of subsidy)	Rs Lacs	23870.46	As calculated
		Moratorium Period	years	0	As per Regulation
		Repayment Period (incl. Moratorium)	years	13	As per Regulation
		Interest Rate	% p.a	10.41%	SBI Base Rate (Av of 6 months) + 200, As per Regulation
		Normative Equity amount @30%	Rs Lacs	10559.09	As calculated
		Return on Equity, Normative	Rs Lacs	14%	As per Regulation
		Return on Equity, Grossed up by MAT	% p.a	17.56%	As per Regulation
5	Financial Assumptions	Discount Rate	%	9.42%	As per Regulation
		Income Tax	%	29.12%	GOI
		Depreciation			
		Allowed Depreciation	%	90%	As per Regulation
		Depreciation Rate for first 13 years	%	5.28%	As per Regulation
		Depreciation Rate 14th year onwards	%	0.97%	As per Regulation
6	Working Capital	O&M Charges	Months	1	As per Regulation
		Maintenance Spare (% of O&M expenses)		15%	As per Regulation
		Receivables for Debtors	Months	2	As per Regulation
		Interest On Working Capital	% p.a	11.41%	SBI Base Rate (Av of 6 months) + 300, As per Regulation
7	Operation & Maintenance	O&M Expenses Per MW ( 2019-20)	Rs. Lacs	30.17	As per Regulation for FY 2018-19 (28.54 +escalation)
		O&M Expenses Per MW, 1st Year of operations	Rs. Lacs	31.025	O&M expenses calculated as 194 days for FY 2019-20 and 172 days of FY 2020-21
		Total O&M Expenses for first year	Rs. Lacs	744.591	As calculated
		Annual Escalation	%	5.72%	As per Regulation

<b>Levelised Tariff for 35 Years</b>	<b>Rs/kWh</b>	<b>6.34</b>
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### Financial Calculations

Units Generation	Unit	Year--> 1	2	3	4	5	6	7	8
Installed Capacity	MW	24	24	24	24	24	24	24	24
Gross Generation	MU	94.61	94.61	94.61	94.61	94.61	94.61	94.61	94.61
Auxiliary Consumption	MU	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Net Generation	MU	93.66	93.66	93.66	93.66	93.66	93.66	93.66	93.66
Fixed Cost	Unit	Year--> 1	2	3	4	5	6	7	8
O&M Expenses	Rs Lakh	744.59	787.18	832.21	879.81	930.14	983.34	1039.59	1099.05
Depreciation	Rs La	1832.00	1832.00	1832.00	1832.00	1832.00	1832.00	1832.00	1832.00
Interest on term loan	Rs Lakh	2,416.70	2,223.37	2,030.03	1,836.70	1,643.36	1,450.02	1,256.69	1,063.35
Interest on working Capital	Rs La	152.62	150.82	149.13	147.55	146.10	144.79	143.61	142.59
Return on Equity	Rs Lakh	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18
Total Fixed Cost	Rs Lakh	7032.96	6877.78	6725.15	6575.21	6428.12	6284.05	6143.15	6005.63
Per Unit Cost of Generation	Unit	Year--> 1	2	3	4	5	6	7	8
O&M expn	Rs/kWh	0.79	0.84	0.89	0.94	0.99	1.05	1.11	1.17
Depreciation	Rs/kWh	1.96	1.96	1.96	1.96	1.96	1.96	1.96	1.96
Int. on term loan	Rs/kWh	2.58	2.37	2.17	1.96	1.75	1.55	1.34	1.14
Int. on working capital	Rs/kWh	0.16	0.16	0.16	0.16	0.16	0.15	0.15	0.15
RoE	Rs/kWh	1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98
Total COG	Rs/kWh	7.51	7.34	7.18	7.02	6.86	6.71	6.56	6.41
Discount Rate	%	9.42%							
Discount Factor		1	0.906	0.821	0.743	0.673	0.610	0.552	0.500
Discounted Tariff		7.51	6.65	5.90	5.22	4.63	4.10	3.63	3.22
Levelling Tariff for 35 years	Rs/kWh	6.34							

Units Generation	Unit	Year--->	9	10	11	12	13	14	15	16	17
Installed Capacity	MW		24	24	24	24	24	24	24	24	24
Gross Generation	MU		94.61	94.61	94.61	94.61	94.61	94.61	94.61	94.61	94.61
Auxiliary Consumption	MU		0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Net Generation	MU		93.66	93.66	93.66	93.66	93.66	93.66	93.66	93.66	93.66
Fixed Cost	Unit	Year--->	9	10	11	12	13	14	15	16	17
O&M Expenses	Rs Lakh		1161.92	1228.38	1298.64	1372.92	1451.45	1534.48	1622.25	1715.04	1813.14
Depreciation	Rs La		1832.00	1832.00	1832.00	1832.00	1832.00	336.88	336.88	336.88	336.88
Interest on term loan	Rs Lakh		870.01	676.68	483.34	290.00	96.67	-	-	-	-
Interest on working Capital	Rs La		141.72	141.02	140.49	140.15	140.00	113.15	117.21	121.50	126.04
Return on Equity	Rs Lakh		1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18
Total Fixed Cost	Rs Lakh		5871.66	5741.45	5615.22	5493.20	5375.62	3838.68	3930.51	4027.60	4130.23
Per Unit Cost of Generation	Unit	Year--->	9	10	11	12	13	14	15	16	17
O&M expn	Rs/kWh		1.24	1.31	1.39	1.47	1.55	1.64	1.73	1.83	1.94
Depreciation	Rs/kWh		1.96	1.96	1.96	1.96	1.96	0.36	0.36	0.36	0.36
Int. on term loan	Rs/kWh		0.93	0.72	0.52	0.31	0.10	0.00	0.00	0.00	0.00
Int. on working capital	Rs/kWh		0.15	0.15	0.15	0.15	0.15	0.12	0.13	0.13	0.13
RoE	Rs/kWh		1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98
Total COG	Rs/kWh		6.27	6.13	6.00	5.86	5.74	4.10	4.20	4.30	4.41
Discount Rate	%	9.42%									
Discount Factor			0.453	0.411	0.372	0.337	0.305	0.276	0.250	0.227	0.205
Discounted Tariff			2.85	2.53	2.24	1.98	1.76	1.14	1.06	0.98	0.91
Levelling Tariff for 35 years	Rs/kWh	6.34									

Units Generation	Unit	Year--->	18	19	20	21	22	23	24	25	26
Installed Capacity	MW		24	24	24	24	24	24	24	24	24
Gross Generation	MU		94.61	94.61	94.61	94.61	94.61	94.61	94.61	94.61	94.61
Auxiliary Consumption	MU		0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Net Generation	MU		93.66	93.66	93.66	93.66	93.66	93.66	93.66	93.66	93.66
Fixed Cost	Unit	Year--->	18	19	20	21	22	23	24	25	26
O&M Expenses	Rs Lakh		1916.86	2026.50	2142.42	2264.96	2394.52	2531.48	2676.28	2829.37	2991.21
Depreciation	Rs La		336.88	336.88	336.88	336.88	336.88	336.88	336.88	336.88	336.88
Interest on term loan	Rs Lakh		-	-	-	-	-	-	-	-	-
Interest on working Capital	Rs La		130.83	135.90	141.26	146.93	152.92	159.25	165.94	173.02	180.50
Return on Equity	Rs Lakh		1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18
Total Fixed Cost	Rs Lakh		4238.74	4353.45	4474.73	4602.94	4738.49	4881.78	5033.28	5193.44	5362.76
Per Unit Cost of Generation	Unit	Year--->	18	19	20	21	22	23	24	25	26
O&M expn	Rs/kWh		2.05	2.16	2.29	2.42	2.56	2.70	2.86	3.02	3.19
Depreciation	Rs/kWh		0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Int. on term loan	Rs/kWh		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capital	Rs/kWh		0.14	0.15	0.15	0.16	0.16	0.17	0.18	0.18	0.19
RoE	Rs/kWh		1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98
Total COG	Rs/kWh		4.53	4.65	4.78	4.91	5.06	5.21	5.37	5.54	5.73
Discount Rate	%	9.42%									
Discount Factor			0.186	0.169	0.153	0.138	0.125	0.114	0.103	0.093	0.084
Discounted Tariff			0.85	0.79	0.74	0.69	0.64	0.60	0.56	0.52	0.49
Levellers Tariff for 35 years	Rs/kWh	6.34									

Units Generation	Unit	Year--->	18	19	20	21	22	23	24	25	26
Installed Capacity	MW		24	24	24	24	24	24	24	24	24
Gross Generation	MU		94.61	94.61	94.61	94.61	94.61	94.61	94.61	94.61	94.61
Auxiliary Consumption	MU		0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Net Generation	MU		93.66	93.66	93.66	93.66	93.66	93.66	93.66	93.66	93.66
Fixed Cost	Unit	Year--->	18	19	20	21	22	23	24	25	26
O&M Expenses	Rs Lakh		1916.86	2026.50	2142.42	2264.96	2394.52	2531.48	2676.28	2829.37	2991.21
Depreciation	Rs La		336.88	336.88	336.88	336.88	336.88	336.88	336.88	336.88	336.88
Interest on term loan	Rs Lakh		-	-	-	-	-	-	-	-	-
Interest on working Capital	Rs La		130.83	135.90	141.26	146.93	152.92	159.25	165.94	173.02	180.50
Return on Equity	Rs Lakh		1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18
Total Fixed Cost	Rs Lakh		4238.74	4353.45	4474.73	4602.94	4738.49	4881.78	5033.28	5193.44	5362.76
Per Unit Cost of Generation	Unit	Year--->	18	19	20	21	22	23	24	25	26
O&M expn	Rs/kWh		2.05	2.16	2.29	2.42	2.56	2.70	2.86	3.02	3.19
Depreciation	Rs/kWh		0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Int. on term loan	Rs/kWh		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capital	Rs/kWh		0.14	0.15	0.15	0.16	0.16	0.17	0.18	0.18	0.19
RoE	Rs/kWh		1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98
Total COG	Rs/kWh		4.53	4.65	4.78	4.91	5.06	5.21	5.37	5.54	5.73
Discount Rate	%	9.42%									
Discount Factor			0.186	0.169	0.153	0.138	0.125	0.114	0.103	0.093	0.084
Discounted Tariff			0.85	0.79	0.74	0.69	0.64	0.60	0.56	0.52	0.49
Levelling Tariff for 35 years	Rs/kWh	6.34									

*Signature*  
Secretary

State Electricity Regulatory Commission  
Arunachal Pradesh


Units Generation	Unit	Year--->	27	28	29	30	31	32	33	34	35
Installed Capacity	MW		24	24	24	24	24	24	24	24	24
Gross Generation	MU		94.61	94.61	94.61	94.61	94.61	94.61	94.61	94.61	94.61
Auxiliary Consumption	MU		0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95	0.95
Net Generation	MU		93.66	93.66	93.66	93.66	93.66	93.66	93.66	93.66	93.66
<b>Fixed Cost</b>	<b>Unit</b>	<b>Year---&gt;</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>
O&M Expenses	Rs Lakh		3162.30	3343.19	3534.42	3736.59	3950.32	4176.28	4415.16	4667.71	4934.70
Depreciation	Rs La		336.88	336.88	336.88	336.88	336.88	336.88	336.88	336.88	336.88
Interest on term loan	Rs Lakh		-	-	-	-	-	-	-	-	-
Interest on working Capital	Rs La		188.41	196.78	205.62	214.97	224.85	235.29	246.34	258.01	270.36
Return on Equity	Rs Lakh		1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18	1854.18
<b>Total Fixed Cost</b>	<b>Rs Lakh</b>		<b>5541.77</b>	<b>5731.02</b>	<b>5931.09</b>	<b>6142.61</b>	<b>6366.22</b>	<b>6602.62</b>	<b>6852.55</b>	<b>7116.78</b>	<b>7396.11</b>
<b>Per Unit Cost of Generation</b>	<b>Unit</b>	<b>Year---&gt;</b>	<b>27</b>	<b>28</b>	<b>29</b>	<b>30</b>	<b>31</b>	<b>32</b>	<b>33</b>	<b>34</b>	<b>35</b>
O&M expn	Rs/kWh		3.38	3.57	3.77	3.99	4.22	4.46	4.71	4.98	5.27
Depreciation	Rs/kWh		0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36	0.36
Int. on term loan	Rs/kWh		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Int. on working capital	Rs/kWh		0.20	0.21	0.22	0.23	0.24	0.25	0.26	0.28	0.29
RoE	Rs/kWh		1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98	1.98
<b>Total COG</b>	<b>Rs/kWh</b>		<b>5.92</b>	<b>6.12</b>	<b>6.33</b>	<b>6.56</b>	<b>6.80</b>	<b>7.05</b>	<b>7.32</b>	<b>7.60</b>	<b>7.90</b>
Discount Rate	%	9.42%									
Discount Factor			0.076	0.069	0.063	0.057	0.051	0.047	0.042	0.038	0.035
Discounted Tariff			0.46	0.43	0.40	0.38	0.35	0.33	0.31	0.29	0.28
<b>Levelled Tariff for 35 years</b>	<b>Rs/kWh</b>	<b>6.34</b>									

*D. Dikshi*

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## Annexure - B: REVIEW OF PROJECT COST (CIVIL WORKS)

Sl. No.	Components of the Project	Unit	Rates negotiated with Contractor Postaward in Rs.	Contract rates per agreement Rs	Rates recommended for acceptance By APSERC (including price variation (2.7%) for labour & fuel, etc.) Rs.	Quantity as per actual construction of HEP by Petitioner Rs.	Quantities recommended for acceptance by APSERC Rs.	Cost recommended for acceptance by APSERC Rs.	Cost as per Petitioner Rs.
<b>1</b>	<b>Up stream Works</b>								
<b>A.</b>	<b>River Diversion Works</b>								
1	Excavation*	m <sup>3</sup>	400	300	308.1	18000	18000	5,545,800.00	7,200,000.00
2	Earth Filling*	m <sup>3</sup>	500	500	500	22000	22000	11,000,000.00	11,000,000.00
3	Gabion wall with wire crate	m <sup>3</sup>	2500	1800	1848.6	3500	3500	6,470,100.00	8,750,000.00
<b>B</b>	<b>Diversion Structure</b>								
1	Excavation	m <sup>3</sup>	500	300	308.1	18800	18800	5,792,280.00	9,400,000.00
2	Earth Filling	m <sup>3</sup>	400	500	400	12000	12000	4,800,000.00	4,800,000.00
3	Reinforcement steel **	MT	48000	80000	48000	72	72	3,456,000.00	3,456,000.00
4	Reinforced cement concrete**	m <sup>3</sup>	10200	6100	6264.7	1926	1926	12,065,812.20	19,645,200.00
5	Regulating Gates-Supply	Nos.	LS			3	3	6,000,000.00	6,000,000.00
6	Regulating Gates-Erection	Nos.	LS			3	3	4,000,000.00	4,000,000.00
7	Steel Trash Racks	No.	LS			1	1	3,800,000.00	3,800,000.00
<b>C</b>	<b>Desilting Arrangement &amp; Conveyance channel</b>								
1	Excavation	m <sup>3</sup>	550	300	308.1	15896	15896	4,897,557.60	8,742,800.00
2	Reinforced cement concrete	m <sup>3</sup>	10200	7500	7702.5	3897	3897	30,016,642.50	39,749,400.00
3	Reinforcement steel	MT	48000	80000	48000	321	321	15,408,000.00	15,408,000.00
4	PCC M10	m <sup>3</sup>	7000	5000	5135	2024	2024	10,392,572.45	14,167,090.00
5	Spillway Gate Supply	No.	LS			1	1	600,000.00	600,000.00
6	Spillway Gate Erection	No.	LS			1	1	400,000.00	400,000.00
7	Flushing pipe 450 dia with 500 mtrs length Supply	MT	80000		80000	62	62	4,960,000.00	4,960,000.00
8	Flushing pipe 450 dia with 500 mtrs length Erection	MT	30000		30000	62	62	1,860,000.00	1,860,000.00
9	Flushing pipe 600 dia with 500 mtrs length *Supply	MT	65000		65000	91	91	5,915,000.00	5,915,000.00
10	Flushing pipe 600 dia with 500 mtrs length Erection	MT	25000		25000	91	91	2,275,000.00	2,275,000.00
11	Steel Pipeline 3.5 m dia with 200 mtrs length to be laid in the	MT	65000		65000	209	209	13,585,000.00	13,585,000.00
12	Steel Pipeline 3.5 m dia with 200 mtrs length to be laid in the	MT	25000		25000	209	209	5,225,000.00	5,225,000.00
13	Water Stop Type A	m	400		400	10000	10000	4,000,000.00	4,000,000.00
14	Water Stop Type B	m	300		300	6500	6500	1,950,000.00	1,950,000.00
15	Dewatering	Kwh	12		12	1000000	1000000	12,000,000.00	12,000,000.00
<b>D</b>	<b>Tunnel Intake</b>								
1	Excavation	m <sup>3</sup>	550	1100	550	1447	1447	795,850.00	795,850.00

  
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2	Reinforced cement concrete	m <sup>3</sup>	10200	7500	7702.5	291	2,241,427.50	2,968,200.00
3	Reinforcement steel	MT	48000	80000	48000	22	1,078,080.00	1,078,080.00
<b>2 HEAD RACE TUNNEL</b>								
<b>A. HRT (Head Race Tunnel) including Adits</b>								
1	Open Excavation	m <sup>3</sup>	550	1100	550	15000	8,250,000.00	8,250,000.00
2	Underground excavation	m <sup>3</sup>	2900	3100	2900	104131	277,115,300.00	301,979,900.00
3	Underground excavation (fissured)	m <sup>3</sup>	3650	2200	2259.4	16150	36,489,310.00	58,947,500.00
4	Concrete-lining	m <sup>3</sup>	8000	5700	5853.9	50207	101,301,739.50	401,656,000.00
5	Back fill and cavity	0	0	5700	5853.9	24880	145,645,032.00	-
6	Reinforcement steel	MT	65000	60000	61620	331	20,396,220.00	21,515,000.00
7	Structural steel Ribs	MT	80000	80000	80000	1110	88,800,000.00	88,800,000.00
8	Rock bolts 25mm dia	RMT	1500	950	975.65	13668	13,335,184.20	20,502,000.00
9	Rock bolts 20mm dia for fore poling & Anchoring for Ribs	RMT	1400	950	975.65	9374	9,145,743.10	13,123,600.00
10	Grouting Works for Adit-1 & Adit-2 Areas	Per bags	750	1400	750	120000	90,000,000.00	90,000,000.00
11	Shotcrete	m <sup>3</sup>	1200	8000	1200	5420	6,504,000.00	6,504,000.00

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<b>B Cut &amp; Cover Channel between Adit - 1 &amp; Adit - 2</b>									
1	Excavation	m <sup>3</sup>	550	550	550	237405	237405	130,572,750.00	130,572,750.00
2	Reinforced cement concrete	m <sup>3</sup>	10500	6100	6264.7	13366	13366	83,733,980.20	140,343,000.00
3	Reinforcement steel	MT	48000	80000	48000	1491	1491	71,568,000.00	71,568,000.00
4	MS Pipe 16mm Supply	MT	59944		59944	97	97	5,814,568.00	5,814,568.00
5	Ms Pipe 16 mm Erection	MT	16000		16000	97	97	1,552,000.00	1,552,000.00
<b>C Forebay / Surge Shaft</b>									
1	Excavation	m <sup>3</sup>	550	550	550	11300	11300	6,215,000.00	6,215,000.00
2	Excavation for widening of forebay in fissured rock	m <sup>3</sup>	3650	2200	2259.4	7170	7170	16,199,898.00	26,170,500.00
3	Concrete	m <sup>3</sup>	8400	5700	5853.9	2569	2569	15,038,669.10	21,579,600.00
4	Rock bolts 25mm dia	RMT	1000	1000	1000	4225	4225	4,225,000.00	4,225,000.00
5	Reinforcement steel	MT	65000	80000	65000	48	48	3,120,000.00	3,120,000.00
6	Structural steel Ribs	MT	80000	80000	80000	151	151	12,080,000.00	12,080,000.00
7	Regulation Gate Supply	LS	1200000		1200000	1	1	1,200,000.00	1,200,000.00
8	Regulation Gate Erection	LS	800000		800000	1	1	800,000.00	800,000.00
9	Escape Pipeline & Spilling Arrangement	LS						13,635,624.00	13,635,624.00

  
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Sl. No.	Components of the Project	Unit	Rates negotiated with Contractor Postaward in Rs.	Contract rates per agreement Rs	Rates recommended for acceptance By APSERC (including price variation (2.7%) for labour & fuel, etc.) Rs.	Quantity as per actual construction of HEP by Petitioner Rs.	Quantities recommended for acceptance by APSERC Rs.	Cost recommended for acceptance by APSERC Rs.	Cost as per Petitioner Rs.
2	Concrete	m <sup>3</sup>	8000	5700	5853.9	631	631	3,693,810.90	5,048,000.00
	Reinforcement steel	MT	48000	80000	48000	105	105	5,040,000.00	5,040,000.00


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**Annexure - C: REVIEW OF PROJECT COST (E&M WORKS)**

<b>S.No</b>	<b>E&amp;M Expense Heads</b>	<b>Cost Recommended by APSERC(Rs. Cr)</b>
<b>1</b>	<b>E&amp;M cost</b>	<b>21.9377</b>
<b>2</b>	<b>Taxes &amp; Duties</b>	<b>3.94</b>
<b>3</b>	<b>Erection,testing and commissioning, site supervision and insurance</b>	<b>5.99</b>
<b>4</b>	<b>Total E&amp;M cost</b>	<b>31.8677</b>

**Annexure - D: COMMISSIONS ANALYSIS – TARIFF CALCULATION**

DIKSHI HEP					
Small Hydro: Assumptions Parameters					
S. No.	Assumption Head	Sub-Head	Sub-Head (2)	Unit	
1	Power Generation	Capacity	Installed Power Generation Capacity	MW	24
			Capacity Utilization Factor	%	45%
			Auxiliary Consumption	%	1%
			Useful Life	Years	35
2	Project Cost	Capital Cost/MW	Power Plant Cost	Rs Lacs/MW	27483.00
3	Period		Tariff Period	Years	35
4	Sources of Fund	<u>Debt: Equity</u>	Subsidy		500
			Debt	%	70%
			Equity	%	30%
			Total Debt Amount	Rs Lacs	18738.100
			Total Equity Amount	Rs Lacs	8244.900
		<u>Debt Component</u>	Loan Amount	Rs Lacs	18738.10
			Moratorium Period	years	0
			Repayment Period(incl'd Moratorium)	years	13
			Intrest Rate	%	10.43%
		<u>Equity Component</u>	Equity amount	Rs Lacs	8244.90
			Return on Equity for first Project Life	% p.a	17.60%
			Discount Rate		9.38%
			Income Tax	%	29.120%
5	Financial Assumptions	<u>Depreciation</u>			
			Allowed Depreciation	%	90%
			Depreciation Rate for first 13 years	%	5.28%
			Depreciation Rate 14th year onwards	%	As per RE Regulation 2018
6	Working Capital	O&M Charges		Months	1
		Maintenance Spare	(% of O&M exepenses)		15%
		Receivables for Debtors		Months	2
		Intrest On Working Capital		%	11.43%
7	Operation & Maintenance	O&M Expenses (2019-20)		Rs Lacs	30.17
		<u>Total O &amp; M Expenses Escalation</u>		%	5.72%
8	<b>Generation and Sale Of Energy</b>				
		Total No. of Hours		Hrs	8766

  
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**Interest rate:**

Month	1 year Tenor-wise MCLR Rates (Source: SBI Monthly Press Releases)
Mar-19	8.55%
Apr-19	8.50%
May-19	8.45%
Jun-19	8.45%
Jul-19	8.40%
Aug-19	8.25%
<b>Avg. for last Available 6 months</b>	<b>8.43%</b>
<b>Interest on loan</b> Interest Rate of two hundred (200) basis points above the average State Bank of India MCLR (One year Tenor) prevalent during the last available six months of the relevant year of the Control Period for the determination of tariff.	10.43%
<b>Interest on Working Capital</b> shall be computed at rate 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”.	11.43%

**Mat rate :**

1st April 2018 mat rate	18.50%	
category		
< 1cr	19.24	4% cess
1-10 cr	20.59	4% cess + 7% surcharge
>10 cr	21.55	4% cess + 12% surcharge
Avg	20.46	

Smulha.

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# Annexure – E: ATTENDANCE FOR THE HEARING ON DATED 11/12/2019 AT APERC, COURT ROOM

Attendance for the hearing on dated 11/12/2019 at APERC, Court Room

Sl.no	Name	Department/Designation	Email id	Mobile no.	Signature
01	S. ELANGOAN	DIRECTOR MIS. DEPL	BHAGYAN SUBRAM@GMAIL.COM	9739396262	
02	D.K THONGDOK	DIRECTOR MIS. DEPL		9436258742	
03	V.K GUPTA	Consultant MIS DEPL		9829216464 9829216464	
04	C.M. JAIN	Consultant PEZ, Delhi	info@parad energysolutions.com	9312262795	
05	A.K. MAGGU	Advisor MIS DEPL	akmaggu@ gmail.com	9650995995	
06	A.L. NAGARAJU	MANAGING DIRECTOR MIS. DEPL	md @davi energies.com	900812227	
07	N.N. Pande	C.BIP	nnpander @yahoo.com	9958 555 357	
08	D. Mishra	Secretary, APERC	secy.aperc.aas @gov.in	9421820335	
9	G.S Meena	Com power			
10	Bar Tekum	Chief Engineer(P)			
11	Hage Mirna	SE, Disang	mirnahage@ yahoo.co.in	9436041594	
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14	Tasso Hindu	SE(P) Sub	sejassub@ gmail.com	940269288	
15	P.T. Khimay	Public attendee	pkhmay@ gmail.com	8974693740	
16	S.S. Thangchi	Public attendee		34102810403	
17	Nima Tashi	Public attendee	nima.tashi@ gmail.com	825092753	
18	Penpa Phuntso	"	penpa.phuntso @gmail.com	7008065503	
19	Jamun Taying	EE(E) NBN		9402670337	
20	D. Bengupta	Staff Consultant, APERC			
21	Rohit Kumar	APERC			

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