

# **Bhutan Electricity Authority**



## **Druk Green Power Corporation Limited Tariff Review Report 2019 to 2022**

**December 2019**

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## Executive Summary

The Druk Green Power Corporation Limited (DGPC) proposed revision of the generation tariff from Nu. 1.59/kWh to Nu. 1.70/kWh for the tariff period from 1<sup>st</sup> July 2019 to 30<sup>th</sup> June 2022. The DGPC tariff application has been reviewed and the BEA has approved an allowed pre-tax weighted average cost of capital (WACC) as 12.69% based on 13.31% after-tax cost of equity, 8.47% cost of debt and 60% gearing ratio.

The cost allowances such as return on assets, depreciation, operation and maintenance cost and return on working capital have been set according to the provisions of the Tariff Determination Regulation 2016 (hereinafter referred to as TDR). The investments during the tariff period is largely driven by new investments in installation and up-gradation of power house facilities, installation of equipment in the dam complex and maintenance and construction of buildings.

The annual energy generation was calculated as the mean annual energy generation of the past three years based on 98% water utilization factor less 15% royalty energy. Considering the approved regulatory parameters, cost allowances and annual energy volume, the DGPC generation tariff was set to Nu. 1.42/kWh for the tariff period 1<sup>st</sup> October 2019 to 30<sup>th</sup> June 2022 based on the subsidy approval provided by the Royal Government of Bhutan vide letter no. 24/DHPS/HQ/Tariff/2019-20/285 dated 19<sup>th</sup> September 2019.

As per the provision of Domestic Electricity Tariff Policy (DETP), all generation plants under DGPC will have to remit the proceeds from sale of royalty energy at the highest off take rate(s) to the Ministry of Finance (MoF).

# 1 Background

The DGPC submitted their proposal for revision of domestic generation tariff vide letter no. 08/DGPC/BEA/MD/2019/433 dated 28<sup>th</sup> February, 2019 for the period 1<sup>st</sup> July 2019 to 30<sup>th</sup> June 2020. The DGPC submitted that an increase in the domestic generation tariff would help in ensuring a steady revenue stream to the RGoB from the hydropower sector and enable DGPC to earn permissible returns and to sustain satisfactory levels of profitability in their organization.

The DGPC had also submitted that the tariff proposal was prepared in line with the DETP and the TDR reflecting their actual cost of efficient business operation and considering the following principles for the tariff determination:

- Fairness to both service customers and service providers;
- No unjust discrimination against service providers or those who wish to use the services;
- Reflect the actual cost of efficient business operation;
- Conducive to efficiency improvement in business operation;
- Enhance efficient and adequate supply to satisfy the domestic demand; and
- Transparency in the determination and presentation of tariffs.

The DGPC had proposed to increase the generation tariff from the current level of Nu. 1.59/kWh to Nu. 1.70/kWh, which was based on the recovery of their cost of generation through efficient cost of business operation.

As part of the tariff review process, a public hearing was conducted on 30<sup>th</sup> April 2019 at the Natural Resources Development Corporation Limited (NRDCL) Conference Hall, Thimphu. The public hearing was also attended by the High Voltage (HV) and the Medium Voltage (MV) customers and the two Licensees (DGPC and BPC). The general public was provided three (3) weeks after the public hearing to submit their written comments on the tariff proposal to the BEA.

## 2 Regulatory parameters

### 2.1 Tariff period

As per the Clause 7.19 of the DETP, the tariff revision cycle shall be normally three years unless there is substantial and significant difference in the business environment and generation scenario.

The DGPC had proposed a three years tariff period from 1<sup>st</sup> July 2019 to 30<sup>th</sup> June 2022, with the year 2018 as the reference year.

The BEA approved two (2) years and nine (9) months tariff period, starting from 1<sup>st</sup> October 2019 to 30<sup>th</sup> June 2022 based on the approval of subsidy allocation for domestic electricity tariff provided by Department of Hydropower and Power Systems (DHPS), Ministry of Economic Affairs (MoEA) vide letter no. 24/DHPS/HQ/Tariff/2019-20/285 dated 19<sup>th</sup> September 2019.

**2.2 WACC Parameters**

The WACC shall be calculated as the pre-tax Weighted Average Cost of Capital in accordance with Clause 66 in the TDR:

$$WACC_g = \frac{CoE_g(1 - Gearing_g)}{1 - Tax} + (CoD_g \times Gearing_g)$$

Where,

- WACC<sub>g</sub> is the weighted average cost of capital for the Generation Licensee “g”, as a percentage;
- CoE<sub>g</sub> is the cost of equity, as a percentage; as determined by the Authority for the Generation Licensee “g”;
- Gearing<sub>g</sub> is the ratio of debt to total net fixed assets, as determined by the Authority for the Generation Licensee “g”;
- CoD<sub>g</sub> is the actual cost of debt for the tariff period for the Generation Licensee “g”, as a percentage, being the weighted average interest rate of the Licensee’s loans with suitable allowance made for currency risk of any loans not made in local currency, provided that the cost of debt should not exceed reasonable benchmarks;
- Tax is the prevailing rate of company taxation, as a percentage.

*2.2.1 DGPC proposal*

The DGPC had proposed a pre-tax WACC of 15.28%, based on a gearing ratio of 50%, CoE of 14.18%, CoD of 10.31% and a tax rate of 30%. The details of the parameters are discussed in the subsection below.

*2.2.1.1 Gearing ratio*

The DGPC had proposed a gearing ratio of 50% for the purpose of tariff determination. However, the DGPC had submitted that with the completion of the loan repayment of Tala Hydropower Plant (THP) and Kurichhu Hydropower Plant (KHP) the actual average gearing ratio is 1.73% for the period 2019-2021 and with the proposed loans for the new institutional investments, their actual average gearing ratio will increase to 8.56% from 2019 onwards.

*2.2.1.2 Cost of Equity*

The DGPC submits that the CoE has been proposed by referring to the DETP, which states that the CoE shall be based on the average lending rates of the domestic financial institutions and BEA may allow a reasonable premium up to a maximum of 250 basis points on the above rates depending on the domestic market situation and gearing ratio applied. In proposing the average lending rate of 11.68%, DGPC took the industrial/manufacturing loan interest rate of four domestic financial institutions as shown in Table1 below.

**Table1: Proposed average lending rate**

Sl. No.	Institutions	Loan Type	Interest Rate
1	Bank of Bhutan	Manufacturing – Hydro Power Term Loan	11.86 %
2	Bhutan National Bank	Manufacturing and Industry Loan	11.75 %
3	T Bank	Manufacturing and Industry Loan	11.00 %
4	Bhutan Development Bank Ltd	Industry Loan	12.10 %
<b>Average Interest Rate</b>			<b>11.68 %</b>

Accordingly, the DGPC had proposed a post-tax CoE of 14.18% based on the average lending rates of 11.68% and the maximum premium of 250 basis points.

#### *2.2.1.3 Cost of debt*

The DGPC had proposed CoD of 10.31% and submitted that the proposed CoD was calculated as a weighted average of the interest rates on the loan balance amount of existing DGPC power plants and the additional future loan balance for the tariff period 1st July 2019 to 30<sup>th</sup> June 2022. The DGPC had proposed the future loan worth of Nu. 7.95 billion at interest rate of 11.68% to finance the new institutional investments for the tariff period 1<sup>st</sup> July 2019 to 30<sup>th</sup> June 2022.

#### *2.2.2 Inputs from stakeholders*

During the public hearing, a representative from RSA Pvt Ltd., a medium voltage customer expressed that DGPC has taken a ten years term loan interest rate whereas tariff period is only for three years. He submitted that the floating interest rate or short-term loan interest rate be considered to determine the tariff. Further, he pointed out that the DGPC has considered manufacturing loan for the calculation of CoE whereas the DETP states that the CoE shall be based on average lending rate of domestic financial institutions and said that either average lending rates of all sectors be used or hydropower loan which has recently introduced by Bank of Bhutan to be used.

In the written comments to BEA, Association of Bhutanese Industries (ABI) submitted that either an average lending rates of all sectors of the domestic financial institutions or the Bank of Bhutan hydropower loan at 8% interest rate with 1 year floating to be used as the average lending rate.

#### *2.2.3 BEA review*

The WACC parameters are determined in the TDR Schedule C and may be updated by the BEA from time to time in accordance with Clause 6 of the TDR. The parameters are discussed in the subsections below.

##### *2.2.3.1 Tax*

The BEA has verified that the proposed tax rate of 30% is in accordance with the rate prescribed in the Income Tax Act of the Kingdom of Bhutan 2001. Therefore, a tax rate of 30% is used for the determination of pre-tax WACC.

##### *2.2.3.2 Gearing*

As per the Clause 66 of TDR, Gearing is the ratio of debt to total net fixed assets, as determined by the Authority for the Generation Licensee.

The DETP states that the gearing ratio for computation of WACC shall be higher than the actual gearing ratio and up to a maximum of 70%.

The actual average gearing ratio of DGPC calculated using the debt to total net fixed assets during the tariff period is 8.56%.

The BEA during the tariff period 2010 to 2013 and 2013 to 2016 had approved a gearing ratio of 40% which was increased to 60% during the 2016 to 2019 tariff review. As per the DETP, the gearing ratio is to be gradually increased to reach an optimal gearing ratio of 70%. Therefore, the BEA has approved a gearing ratio of 60% for this tariff period based on the provision of the DETP to gradually increase the gearing ratio to optimal ratio in the long run.

### 2.2.3.3 Cost of Debt

The Cost of Debt (CoD) proposed by the DGPC was 10.31%, which was calculated as the weighted average of the interest rates on their existing and future loan balance amount for the tariff period 1<sup>st</sup> July 2019 to 30<sup>th</sup> June 2022. The DGPC has proposed the future loan worth of Nu. 7.95 billion at interest rate of 11.68% same as the proposed average lending rate to finance the new institutional investments for the tariff period 1<sup>st</sup> July 2019 to 30<sup>th</sup> June 2022. The proposed CoD calculated is as shown in Table 2 below.

**Table 2: Proposed Cost of Debt**

Sl. No.	Loan Details	Loan Disburse-ments	Principal Amt (Mill. Nu.)	Interest Rate (%)	Repayment Period (Years)	Loan balance as on 31.12.19 (Mill. Nu.)	Loan balance as on 31.12.20 (Mill. Nu.)	Loan balance as on 31.12.21 (Mill. Nu.)
1	BHP Lower Stage	2 April 2002 to 17 June 2005	1,648.87	6	15	549.62	439.69	329.77
2	BHP Upper Stage	30 Dec. 1997 to 14 Oct. 2007	708.00	6	20	247.80	212.40	177.00
3	Proposed loan	2019	1,114.24	11.68	10	1,114.23	1,049.75	977.74
4	Proposed loan	2020	2,880.60	11.68	10	-	1,766.38	1,664.15
5	Proposed loan	2021	3,955.28	11.68	10	-	-	1,074.67
	<b>Total</b>		<b>10,307.01</b>			<b>1,911.66</b>	<b>3,468.23</b>	<b>4,223.34</b>

The BEA had verified the principal loan amount, interest rate, repayment period and the loan balance as of 31.12.2019, 31.12.2020 and 31.12.2021 and found that the loan balance of Basochhu Hydropower Plant (BHP) upper stage had been proposed incorrectly. Therefore, BEA had corrected the loan balance of BHP upper stage.

DGPC had proposed new loans at the lending rate of 11.68% to finance the new investments for the year 2019 to 2022. The proposed lending rate of 11.68% is the average lending rates of four domestic financial institutions namely Bank of Bhutan Limited (BoBL), Bhutan National Bank Limited (BNBL), Tashi Bank Limited (T Bank Ltd) and Bhutan Development Bank Limited (BDBL) for Industrial/Manufacturing loan as reflected earlier. However, the proposed lending rate of 11.68% is for individuals and it is assumed that the lending rate for DGPC will

be much lower. Therefore, a lending rate of 10% has been considered for new investments proposed by DGPC considering the Manufacturing – Hydropower loan interest rate of 10.28% offered by BoBL and the current Mangdechhu Hydropower Project (MHP) loan of 10% from the Government of India.

The BEA found that the proposed approach of estimating the CoD as the weighted average interest of existing loans and new loans to be taken using the loan balance at the end of 2019 to 2021 as weights to be appropriate. The BEA has considered the loan for new investments after deducting the investments which are not relevant for electricity generation and those which may not going to be capitalized before 1<sup>st</sup> July 2022. The reviewed Cost of Debt is calculated as 8.47% which is the weighted average interest rate of existing loans and new loans using the loan balance at the end of 2019 to 2021 as weights as shown below in Table 3 below.

**Table 3: Reviewed Cost of Debt**

<b>Loan particulars</b>	<b>Principal Amt (Mill Nu.)</b>	<b>Interest Rate (%)</b>	<b>Loan balance as on 31.12.19 (Million Nu.)</b>	<b>Loan balance as 31.12.20 (Million Nu.)</b>	<b>Loan balance as on 31.12.21 (Million Nu.)</b>
BHP Lower Stage	1,648.87	6	549.62	439.69	329.77
BHP Upper Stage	708.00	6	212.40	177.00	141.60
New Loans	1,745.10	10	513.81	1,291.11	1,626.60
<b>Total</b>	<b>4,101.97</b>		<b>1,275.83</b>	<b>1,907.81</b>	<b>2,097.98</b>
<b>Annual CoD</b>			<b>7.61 %</b>	<b>8.71 %</b>	<b>9.10 %</b>
<b>Average CoD</b>			<b>8.47 %</b>		

#### 2.2.3.4 Cost of Equity

The DGPC had proposed for a CoE of 14.18% based on the average lending rate of the financial institutions for industrial/manufacturing loan of 11.68% and premium of 250 basis points on the above rate. The DGPC states that as per DETP, BEA could allow a premium up to a maximum of 250 basis points on the average lending rates of the financial institutions.

Based on the submissions on the average lending rate calculation during the public hearing, the BEA sought clarification on the correct interpretation of Clause 7.2 of DETP from DHPS, MoEA as it is the final Authority to interpret the various provisions of the policy.

Upon seeking clarification on the interpretation of policy provision, the DHPS recommended applying the “long term average lending rates of the domestic financial institutions for all sectors for determining CoE”.

In line with the above clarification, the BEA has considered the long-term average lending rates for all sectors provided by the domestic financial institutions including five (5) banks and three (3) non-bank institutions.

Accordingly, BEA calculated the average lending rate of the domestic financial and non-bank institutions for all sectors as shown in Table 4 below.



**Table 4: Average long term average lending rate of Financial Institutions in Bhutan**

Sl. No.	Banks	Interest Rate
1	Bhutan Development Bank Limited (BDBL)	11.24 %
2	Bhutan Insurance Limited (BIL)	12.33 %
3	Bhutan National Bank Limited (BNBL)	12.17 %
4	Bank of Bhutan Limited (BoBL)	11.66 %
5	Druk Punjab National Bank (Druk PNB)	11.48 %
6	National Pension & Provident Fund (NPPF)	9.63 %
7	Royal Insurance Corporation of Bhutan Limited (RICBL)	12.14 %
8	Tashi Bank Limited (T Bank Ltd)	9.85 %
	<b>Average Rate</b>	<b>11.31 %</b>

In line with the DETP, the BEA allowed a premium of 200 basis points since the gearing ratio has been maintained at 60% as in the earlier tariff period.

Based on the long-term average lending rate of 11.31% and 200 basis points, the Cost of Equity was set at 13.31%.

#### 2.2.3.5 The WACC

Based on the approved gearing ratio of 60%, CoE of 13.31%, CoD of 8.47% and tax rate of 30%, BEA has approved a WACC of 12.69% for the DGPC as shown in Table 5 below.

**Table 5: Proposed and reviewed WACC**

	DGPC	BEA
<b>Gearing:</b>	50 %	60 %
<b>CoE:</b>	14.18 %	13.31 %
<b>CoD:</b>	10.31 %	8.47 %
<b>Tax:</b>	30 %	30 %
<b>WACC:</b>	15.28 %	12.69 %

## 2.3 Inflation

The historical average inflation rate is used to escalate the historical O&M costs to 2018 price levels and to escalate the O&M allowance over the tariff period. As per Clause 7.4 of DETP, inflation to be used for the O&M expenses shall be based on historical average inflation rates published by the National Statistics Bureau (NSB).

The DGPC had used the historical inflation figures for the year 2016, 2017 and 2018 from the Consumer Price Index (CPI) Bulletin of NSB for non-food items as shown in the Table 6 below.

**Table 6: Proposed historical inflation rates**

Year	2016	2017	2018	Average
<b>Inflation figures</b>	2.80 %	3.57 %	1.23 %	2.53 %

The DGPC had proposed an average annual inflation rate of 2.53% to be used to calculate the historical O&M average cost and to escalate the yearly O&M allowance over the tariff period.

The BEA has verified the proposed historical inflation rates for the years 2016 until 2018 and found that DGPC had calculated the historical inflation rate of a particular year by taking average of the monthly inflation rate of non-food items. Therefore, the BEA has re-calculated the average inflation rate for non -food items as the year on year inflation rate for the period 2016 to 2018.

Based on the above methodology, the average historical inflation rate for the period 2016 to 2018 is 2.44% as shown in the Table 7 below.

**Table 7: Reviewed historical inflation rates**

Inflation	2016	2017	2018	Average
Year on year inflation	3.73 %	0.93 %	2.65 %	2.44 %

Therefore, BEA has approved average historical inflation rate of 2.44% to be used as both historical inflation rates and forecasted inflation rate for this tariff period.

**2.4 Other regulatory parameters**

The O&M benchmark and O&M efficiency gain parameters are discussed in Section 3.2 of this review report. Any other amendments to the regulatory parameters had not been proposed by the DGPC and therefore not discussed in this review report.

**3 Allowances, Cost of Supply and Energy Volumes**

The total cost of supply for the DGPC in any tariff year shall be determined in accordance with Clause 67 of TDR,

$$TC_g = OM_g + DEP_g + RoA_g + RoWC_g + FEES_g$$

Where

- $TC_g$  is the total cost of supply of the Generation Licensee “g” in million Ngultrum;
- $OM_g$  is the allowance for operating and maintenance costs of the Generation Licensee “g” in million Ngultrum, including any regulatory and other fees;
- $DEP_g$  is the allowance for depreciation of assets for the Generation Licensee “g” in million Ngultrum;
- $RoA_g$  is the return on fixed assets of the Generation Licensee “g” in million Ngultrum, determined as,

$$RoA_g = WACC_g \times NA_g , \text{ where}$$

- $WACC_g$  is the weighted average cost of capital for the Generation Licensee “g”, as determined in accordance to Clause 66 of TDR
- $NA_g$  is the net value of all fixed assets at the start of the year for the Generation Licensee “g”, in million Ngultrum

- $RoWC_g$  is the return on working capital for the Generation Licensee “g” in million Ngultrum

### 3.1 Allowances for depreciations (DEP) and return on fixed assets (RoA)

As per Clause 41 to 48 of TDR, asset values are to be based on historical asset values and licensees are allowed to include the interest during construction (IDC) and associated labour costs to be capitalized. The regulation also allows the allowance for asset additions and asset disposals and other asset value adjustments over the course of the tariff period. However, assets which are not in use and/or not used for generation of electricity or licensed activities are not considered for tariff determination.

The allowance for depreciation is based on the economic lifetime of the assets, in accordance with Schedule B of the TDR, which may be updated by the BEA from time to time. The allowance for depreciation allows taking asset additions and removals over the tariff period into consideration. The return on assets is to be determined as the product of the WACC and the net asset values.

#### 3.1.1 DGPC proposal

##### 3.1.1.1 Assets schedule at the end of 2018

The DGPC had proposed gross asset values, accumulated depreciations and net asset values based on the audited financial statement of 2018. The DGPC submitted that the asset schedule as of December 2018 is derived as per the depreciation rates given in Schedule B of TDR. The asset schedule submitted by the DGPC is shown in Table 8 below.

**Table 8: Proposed asset schedule as of 2018**

<b>Fixed assets (Mill. Nu.)</b>	<b>Gross value</b>	<b>Acc. Dep.</b>	<b>Net value</b>	<b>Depreciation</b>
Land	114.85	-	114.85	-
Buildings	2,599.31	825.02	1,774.29	114.89
Civil structures	3,235.88	968.05	2,267.83	107.32
Dam complex	12,021.77	4,665.79	7,355.99	397.84
Water conductor	23,563.55	7,868.09	15,695.46	784.68
Power house	20,868.13	9,728.34	11,139.79	782.86
Transmission equipment	351.02	169.72	181.30	11.55
Equipment	967.32	752.07	215.25	50.14
Office equipment	616.88	492.50	124.38	52.40
<b>Total</b>	<b>64,338.71</b>	<b>25,469.57</b>	<b>38,869.14</b>	<b>2,301.68</b>

##### 3.1.1.2 Investments – Asset additions 2019 - 2022

The DGPC submitted that the investment schedule was prepared using the approved DGPC investment plan 2019 to 2022 and revised according to the approved DGPC Budget 2019. It was also submitted that the proposed investment plan included only the institutional investments pertaining to the existing power plants and does not include investments envisaged for the other Druk Green projects. The proposed investment schedule for 2019 to 2022 prepared as per year of capitalization is provided in the Table 9 below.

**Table 9 : Proposed investment capitalization schedule**

<b>Fixed assets (Mill. Nu.)</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
Land	-	-	-	-	-
Buildings	237.28	519.25	199.51	566.16	1522.2
Civil structures	50.47	33.72	29.62	3.24	117.05
Dam complex	164.08	69.61	64.00	-	297.69
Water conductor	-	1.00	20.10	-	21.1
Power house	445.86	946.45	351.18	1,368.37	3,111.86
Transmission equipment	14.03	-	185.00	-	199.03
Equipment	142.17	149.28	156.74	164.58	612.77
Office equipment	60.34	47.07	68.52	39.02	214.95
<b>Total</b>	<b>1,114.24</b>	<b>1,766.38</b>	<b>1,074.67</b>	<b>2,141.37</b>	<b>6,096.66</b>

### 3.1.1.3 Proposed return on assets and depreciations

The proposed return on asset is calculated as the product of the proposed WACC (15.28%) and the calculated net asset value at the end of each year. The depreciation allowance calculated in Table 10 below are as per the depreciation rates in Schedule B of the TDR.

**Table 10: Proposed allowances for return on assets and depreciations**

<b>RoA and DEP (Mill. Nu.)</b>	<b>2019/20</b>	<b>2020/21</b>	<b>2021/22</b>
Gross asset values	64,896	66,336	67,757
Accumulated depreciations	26,651	29,068	31,579
Net asset value	38,245	37,268	36,177
<b>Return on asset (RoA)</b>	<b>5,845</b>	<b>5,695</b>	<b>5,529</b>
<b>Depreciation (DEP)</b>	<b>2,417</b>	<b>2,511</b>	<b>2,591</b>

### 3.1.2 BEA review

#### 3.1.2.1 Assets schedule at the end of 2018

The BEA had verified the proposed DGPC's gross assets values, accumulated depreciation and net assets values with the audited financial statement of 2018 and found that it had been reported correctly.

Upon verification of assets schedule, it was found that the assets worth of Nu. 1,272.72 million consisting of buildings handed over to Gedu College of Business Studies, Gedu Middle Secondary School, Bhutan Telecom, Royal Bhutan Police, Gedu Hospital and the Liason Office building handed over to Ministry of Economic Affairs are still in the DGPC books of accounts. Therefore, these assets which are no longer used by DGPC are deducted from their assets schedule. Further, the buildings like guesthouses, schools, BHUs, Lhakhangs, recreational facilities which are not essential for core business of generation have also been deducted from the assets schedule.

The BEA also reviewed the list of residential buildings owned by DGPC and allowed those buildings required to house the core O&M staff of the licensee who need to be stationed near

the power plant. The residential buildings which are used to house other non O&M staff in places where private buildings are available for rent in the close vicinity are deducted from the assets schedule.

The DGPC had submitted that with no new hydropower projects studies in the pipeline, the entire O&M cost of the Corporate Office (CO) be allocated to existing power plants in this tariff period unlike the last tariff period. Based on the number of staff working in areas related to new projects under CO, the BEA allowed 80% of CO assets for the tariff calculation.

The land worth of Nu. 105.14 million had been removed from the DGPC assets base as it is to be transferred to Druk Holding and Investments Limited (DHI) and DGPC will be leasing the land from DHI. Therefore, BEA has included the lease charges payable to DHI as per DHI Land Lease policy 2017. Considering the above review, BEA reviewed asset schedule as shown in Table 11 below.

**Table 11: Reviewed Asset schedule (Nu. mill.) as of 2018**

<b>Fixed assets (Mill. Nu.)</b>	<b>Gross value</b>	<b>Acc. Dep.</b>	<b>Net value</b>	<b>Depreciation</b>
Land	-	-	-	-
Buildings	602.84	202.62	400.22	19.60
Civil structures	3,235.42	967.91	2,267.51	107.69
Dam complex	12,021.77	4,665.79	7,355.99	397.84
Water conductor	23,563.55	7,868.09	15,695.46	784.78
Power house	20,867.97	9,728.29	11,139.68	782.86
Transmission equipment	341.59	164.11	177.48	12.32
Equipment	882.87	691.93	190.94	44.20
Office equipment	572.49	457.48	115.01	48.38
<b>Total</b>	<b>62,088.49</b>	<b>24,746.21</b>	<b>37,342.28</b>	<b>2197.67</b>

### 3.1.2.2 Investments – Asset additions 2019 to 2022

The BEA reviewed the proposed investment plan (2019 to 2022) which was submitted based on the year of capitalization. During the detailed review of the investment plan, a team of BEA officials from the Economic and Technical Department visited the Chukha Hydropower Plant (CHP), THP, KHP and the construction site of the Corporate Office building to ascertain the need of the proposed investments and status of the works.

Further, the proposed investment plan was scrutinized considering risks associated with the projects, approved budget for 2019 and based on which the realistic schedule for the completion of the prudent investments was estimated. Mainly the investments which are crucial for the operation and maintenance of the existing power plants and which will have a direct implication on the energy generation are considered in the tariff determination.

During the public hearing, the President of ABI expressed that the DGPC has been benefited by higher return on investment although the investment allowed by BEA has not been achieved for the past tariff periods. He also pointed out that the proposed investments need to be prudent and not over estimated by Licensees and the BEA needs to look into it and adjust it according to the capitalization.

In order to assess the past performance, the BEA compared the actual capitalization for the past three years of 2016, 2017 and 2018 against the DGPC proposal and BEA approved figures for the period 2016 to 2019 which is as shown in the Table 12 below.

**Table 12: DGPC historical investment capitalization (Mill. Nu.)**

<b>Year</b>	<b>DGPC Proposed (2016 to 2019)</b>	<b>BEA Approved (2016 to 2019)</b>	<b>Capitalization from Audited Accounts</b>
2016	811.75	621.46	299.25
2017	470.84	408.35	230.7
2018	1,111.12	877.62	557.95
<b>Total</b>	<b>2,393.71</b>	<b>1,907.43</b>	<b>1,087.90</b>
<b>% Achieved/ Capitalized</b>	<b>45.45 %</b>	<b>57.03 %</b>	

From the table, it can be seen that during the period 2016 to 2018, DGPC capitalized only 57% of BEA allowed amount and 45% of DGPC proposed Investment Plan. BEA also found that the DGPC proposed investment for 2019-2022 tariff period is around 29% higher than the last tariff period (2016 to 2019) which could have an impact on the capitalization achievement.

BEA allocated only 80% of CO investments to the existing plants since some of the CO investments are not directly linked to any specific plant. Based on the number of staff working in areas related to new projects under CO, the BEA allowed 80% of CO investments for the tariff calculation.

Considering the detailed review of the proposed investment plan, the BEA approved an investment plan of Nu. 2.721 billion which is 45% of the proposed investment plan for period 2019 to 2022 as shown in the Table 13 below.

**Table 13: Reviewed investment schedule (Mill. Nu.)**

<b>Fixed assets</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>2022</b>	<b>Total</b>
Land	-	-	-	-	-
Buildings	151.81	9.60	44.41	342.36	548.18
Civil structures	43.42	33.72	3.12	23.75	104.01
Dam complex	-	179.32	-	23.00	202.32
Water conductor	-	-	-	-	-
Power house	230.00	492.34	103.00	448.79	1274.13
Transmission equipment	14.03	-	185.00	-	199.03
Office equipment	74.54	94.56	86.22	138.08	393.4
<b>Total</b>	<b>513.81</b>	<b>809.54</b>	<b>421.75</b>	<b>975.97</b>	<b>2721.07</b>

### 3.1.3 Summary on Depreciations and Return on Assets

The annual depreciation as per the book of accounts 2018 has been used after deducting the depreciation values of the assets which are not in use and/or utilized for the generation.

80% of the Corporate Office asset, accumulated depreciations and depreciations of 2018 have been included in the reviewed DGPC asset schedule.

80% of the Corporate Office investments are included in the reviewed investment schedule for 2019 to 2022.

A total investment outlay of Nu. 2.721 billion has been considered for the period 2019 to 2022 against investment of Nu. 6.096 billion proposed by DGPC.

Based on the review of the assets of 2018, the planned investments for 2019 to 2022 and the approved pre-tax WACC, the BEA had approved the allowances for return on assets and depreciations as shown in the Table 14 below.

**Table 14: Approved allowances for return on assets and depreciations**

<b>RoA and DEP (Mill. Nu.)</b>	<b>2019/20</b>	<b>2020/21</b>	<b>2021/22</b>
Gross asset values	62,345	63,007	63,623
Accumulated depreciations	25,860	28,117	30,422
Net asset value	36,485	34,890	33,201
Return on Asset (RoA)	4,630	4,428	4,213
<b>Depreciation (DEP)</b>	<b>2,256</b>	<b>2,306</b>	<b>2,355</b>

### 3.2 O&M allowances

The determination of operating and maintenance costs is described in Clause 34 to 40 of the TDR. The allowance for O&M costs is calculated each tariff year. The O&M allowance is determined for the reference year 2018 which will be increased by inflation less efficiency gain targets through the tariff period. For each year in the tariff period an additional O&M allowance is added for new assets as per the investment schedule using benchmarks as set out in the TDR Schedule A. The annual regulatory fees are added to the O&M costs.

#### 3.2.1 DGPC proposal

##### 3.2.1.1 Historical O&M Cost

The proposed historical O&M allowance figures for the period 2016 to 2018 are given in the Table 15 below.

**Table 15: Proposed total O&M allowances (Mill. Nu.)**

<b>Total Expenses</b>	<b>2016</b>	<b>2017</b>	<b>2018</b>
O&M Costs	424.09	556.70	500.66
Employee Costs	812.92	847.62	858.02
Other Expenses	292.08	293.10	444.85
<b>Total</b>	<b>1,529.09</b>	<b>1,697.42</b>	<b>1,803.53</b>

The DGPC submitted that the proposed O&M allowances of Nu. 1,596.01 million comprises of operations and maintenance costs, employee costs and other expenses which is based on the historical average O&M costs for the past three years adjusted for inflation. DGPC also submitted that as per the provisions of the DETP, the costs related to Corporate Social Responsibility (CSR), foreign exchange loss and income from rental and hire charges are deducted from the O&M allowances as shown in the Table 16 below.

**Table 16: Proposed deductions from O&M allowances (Mill. Nu.)**

Expenses	2016	2017	2018
Corporate Social Responsibility (CSR)	10.86	39.53	17.67
Foreign Exchange Loss	40.28	-	197.73
House Rent Income	13.65	15.02	14.75
License Fee	14.80	14.80	14.80
<b>Total</b>	<b>79.59</b>	<b>69.35</b>	<b>244.95</b>

### 3.2.1.2 O&M Efficiency Gain

The DGPC had proposed 0% efficiency gains on O&M costs during the tariff period from 2019 to 2022 and submitted that it is to recover the O&M cost increased at proposed inflation rate of 2.53%. Further, the DGPC stated that there is an average increase of 3.90% in the historical O&M costs over the past three years from 2015 to 2018 which is higher than the proposed inflation rate of 2.53% of O&M escalation from 2019 to 2022 as shown in Table 17 below.

**Table 17 : Proposed Historical O&M Costs**

Year	2015	2016	2017	2018	Average Increase
O&M Costs (Mill. Nu.)	1,398.40	1,449.49	1,628.08	1,558.57	
% Increase		3.65 %	12.32 %	-4.27 %	<b>3.90 %</b>
Inflation		2.80 %	3.57 %	1.23 %	<b>2.53 %</b>

The DGPC had submitted that the proposed annual O&M cost escalation of 2.53% is reasonable compared to the 2014 Central Electricity Regulatory Commission (CERC) norms, which allows an annual O&M cost escalation of 6.64%.

### 3.2.1.3 Benchmark O&M Cost

The DGPC had proposed O&M cost allowance of 1% for new investments to be capitalized during the tariff period. The DGPC stated that O&M benchmark of 1% is much lower compared to benchmarks set by the Indian CERC, which allows an O&M allowance of 4% for projects with installed capacity of less than 200 MW and 2.5% for projects with installed capacity of more than 200 MW. DGPC also submitted that the proposed O&M benchmark of 1% is as per the DETP which states that the O&M benchmarks for the new investments shall be maintained lower than that of older assets where the proposed average O&M allowance of Nu. 1,596.01 million is 1.21% of the total current replacement value of DGPC assets.

The DGPC had submitted that the revalued assets costs of the DGPC power plants were valued by Mack Insurance Surveyors and Loss Assessors Pvt. Ltd. for the year 2017 to 2018 and the revalued assets costs during the tariff period is Nu. 132,178.31 million as shown in Table 18 below.



**Table 18: Proposed New Replacement Cost (2018)**

Plants	New Replacement Value (Mill. Nu.)
Basochhu Hydropower Plant	6,927.34
Chhukha Hydropower Plant	28,533.34
Tala Hydropower Plant	83,028.53
Kurichhu Hydropower Plant	13,644.10
<b>Total Assets (Replacement Cost)</b>	<b>132,178.31</b>
O&M Allowance	1,596.01
O&M Benchmark Cost	1.21 %

The DGPC submitted that the regulatory fees of Nu.14.80 million per year for the tariff period has been added separately in the tariff model.

The breakup of the proposed O&M allowances is as shown in Table 19 below.

**Table 19: Proposed break up of O&M allowances (Mill. Nu.)**

O&M allowances (Nu. Mill.)	2018	2019	2020	2021	2022
O&M 2018 allowance	1,596.01	16,36.45	1,677.90	1,720.41	1,763.99
O&M additions 2019 investments		11.14	11.42	11.71	12.01
O&M additions 2020 investments			17.66	18.11	18.57
O&M additions 2021 investments				10.75	11.02
O&M additions 2022 investments					21.41
<b>O&amp;M allowances</b>	<b>1,596.01</b>	<b>1,647.59</b>	<b>1,706.99</b>	<b>1,760.98</b>	<b>1,827.01</b>

### 3.2.2 BEA review

The BEA has verified that the historical O&M costs for the past year 2016 to 2018 from the audited annual accounts submitted by DGPC and found the historical O&M is reported correctly.

#### 3.2.2.1 Deduction of profit on sale/discard of assets

The BEA had found that the profit on sale/discard of assets of Nu. 1.85 million in 2017 and Nu. 7.16 million in 2018 had been included in the tariff calculation. In BEA's opinion, to avoid double recovery of the sold/discarded assets costs, the profit on sale/discard of assets should be deducted before the allowances are calculated. Further, the income gained from the profit on sale/discard of assets should not be socialized in the tariffs. Therefore, BEA has deducted the profit on sale/discard of assets from the historical O&M costs for the year 2017 and 2018.

#### 3.2.2.2 Inclusion of Corporate Office (CO) Expenses

The BEA had verified the O&M expenses of DGPC and found that remuneration and benefits and other expenses for employees working for the new projects are met from the budget of the new projects. Therefore, the BEA has allowed entire O&M expenses of the CO in the tariff period 2019 to 2022 to be included in the O&M expenses.

### 3.2.2.3 Inclusion of House Rent Recovered and deduction of O&M allowance of buildings not used for generation licensed activities

The BEA had reviewed the list of residential buildings owned by DGPC and allowed those buildings required to house the core O&M staff of DGPC. However, the BEA has deducted the residential buildings which are used to house the other non-core O&M staff in places where private buildings are available for rent in the close vicinity. Therefore, BEA has allowed house rent recovered for the past years of 2016 to 2018 to be included in the O&M expenses.

However, the O&M allowance for the buildings which are not used for delivering the core business of electricity generation have been deducted from the O&M cost which will be covered from the rental income.

### 3.2.2.4 Allowance of land lease

An annual lease charge of Nu. 10.09 million has been added to the O&M cost from 2019 onwards as lease charges payable to DHI as per the DHI Land Lease Policy 2017. The BEA has verified the area and location of the land submitted by the DGPC to calculate an annual lease charges to be paid by DGPC.

Based on the review, the BEA approved O&M allowance of Nu 1,561.05 million as shown in Table 20 below.

**Table 20: Reviewed historical O&M costs (Mill. Nu.)**

O&M costs	2016	2017	2018
O&M Costs	456.15	556.70	500.66
Employee Costs	762.49	847.62	858.02
Other Expenses	262.77	293.10	445.37
<b>Total O&amp;M</b>	<b>1,481.41</b>	<b>1,697.42</b>	<b>1,804.05</b>
Corporate Social Responsibility	(10.86)	(39.53)	(17.67)
Foreign Exchange Gain/Loss	(40.28)	(0.00)	(197.73)
License Fee	(14.8)	(14.8)	(14.8)
Profit on sale/discard of assets		(1.85)	(7.16)
O&M allowance for the buildings not used for generation licensed activities	(7.23)	(7.23)	(7.23)
<b>BEA reviewed</b>	<b>1,408.24</b>	<b>1,634.01</b>	<b>1,559.45</b>
<b>BEA reviewed O&amp;M costs on 2018 values</b>	<b>1,474.35</b>	<b>1,649.20</b>	<b>1,559.45</b>
<b>O&amp;M allowance</b>			<b>1,561.05</b>

### 3.2.2.5 O&M benchmarks

The DGPC had proposed the re-valued assets cost of BHP, CHP, KHP and THP to be Nu. 132,178.31 million based on the valuation conducted by Mack Insurance Surveyors and Loss Assessors Pvt. Ltd. for the year 2017 to 2018. The methodology of valuation was based on the fixed asset register and reinstatement value where depreciation was not adjusted and the settlement of insurance claims were considered on "New for Old" basis which reflects the cost of replacing the existing assets by a new assets of similar type, capacity and utility. From the fixed assets register, assets as per the commodities in different sections were categorised and applied the indices generated by the government sites and updated on regular basis. Based on the replacement value of Nu. 132,178.31 million, DGPC had worked out the benchmark O&M

cost as Nu. 1,321.78 million, based on 1.00% of the total replacement value as shown in Table 21 below.

**Table 21: O&M based on Current Replacement Cost (CRC)**

<b>Plants</b>	<b>New Replacement Cost (Mill. Nu.)</b>	<b>O&amp;M Benchmark of 1.00 %</b>
Basochhu Hydropower Plant	6,927.34	69.72
Chhukha Hydropower Plant	28,533.34	285.33
Tala Hydropower Plant	83,028.73	830.28
Kurichhu Hydropower Plant	13,644.10	136.44
<b>Total</b>	<b>132,178.31</b>	<b>1,321.78</b>

The DGPC had further submitted that the proposed average O&M allowance of Nu. 1,596.01 million is 1.21% of the capital cost (replacement value) of Nu. 132,178.31 million. However, DGPC had proposed O&M benchmark of 1.00% considering the provision of TDR and DETP. Accordingly, BEA approved the O&M benchmark of 1.00% to be used in this tariff considering that it is lower than the O&M allowance of the existing assets.

*3.2.2.6 O&M Efficiency gains*

The DGPC had proposed 0% O&M efficiency gains to be used during the tariff period considering that the actual average historical increases in O&M costs are higher than the O&M cost increase at average historical inflation rate. The DGPC also anticipates an increase of O&M costs due to increase in employee remuneration costs with a likelihood of pay revision.

The BEA does not regard the comparison of the historical O&M costs with the inflation rate for the period 2016 to 2018 as relevant when setting the regulatory efficiency targets for the next period. Considering the investments proposed by DGPC like establishment of R&D centre, upgradation of LAN network and SAP system, upgradation of computerised control system to SCADA, replacement of equipment with better technology is expected to improve the efficiency of DGPC. Thus, BEA has decided to use an annual O&M efficiency gain target of 2%.

*3.2.3 Conclusions on O&M allowances*

The DGPC had deducted the other incomes such as corporate social responsibility, foreign exchange gain/loss, license fees and house rent. However, BEA allowed house rent recovered and land lease charge to be included in the O&M expenses. The BEA further deducted the profit on sale/discard of assets and O&M allowance for the buildings not used for generation licensed activities from the calculation of the 2018 O&M allowances.

The BEA has decided to use the amount of Nu. 1,561.05million, which is the average of the O&M costs in 2016 to 2018 after deductions and adjustments and to use an O&M benchmark of 1% for new investments and an annual O&M efficiency gain target of 2% in this tariff period.

### 3.3 RoWC Allowances

The RoWC is the allowances for Return on Working Capital in million Ngultrum, in the TDR Clause 67 (5) which is determined as:

$$RoWC_g = I \times \left[ REV_g \times \frac{ARREARS_g}{365} + INVENTORIES_g \right]$$

Where

- I is the interest rate for working capital as determined in Clause 55 of TDR 2016;
- $REV_g = OM_g + DEP_g + RoA_g$  where DEP, RoA and OM is as described in Section 3.1 and 3.2 in this review;
- $ARREARS_g$  is the allowed days receivables for the Generation Licensee “g”, in days;
- $INVENTORIES_g$  is the allowance for inventories for the Generation Licensee “g”, in million Ngultrum.

The purpose of the RoWC allowances is to compensate for the loss of revenues caused by the lag between the time, the costs occurs and the time of receivables from the customers.

#### 3.3.1 DGPC proposal

The DGPC proposed allowances for RoWC per year is as shown in Table 22 below.

**Table 22: Proposed allowances for RoWC**

	2019/20	2020/21	2021/22
RoWC (Mill. Nu.)	228	230	321

The proposal is based on arrears of 55 days, inventories of Nu.562.56 million which is average inventories for the past three years of 2016, 2017 and 2018, interest on working capital of 11% and DEP, RoA and OM allowances as described under the DGPC proposals in Section 3.1 and 3.2 and of this review report.

#### 3.3.2 BEA review

##### 3.3.2.1 Arrears

The DGPC had proposed arrears of 55 days. According to the DGPC, the proposal is based on the agreement signed between DGPC and BPC for the sale and purchase of electrical energy which was signed on 12<sup>th</sup> May, 2017. The DGPC had added the number of days of average energy consumption duration, bill preparation and delivery duration and bill payment due date to arrive the arrears of 55 days as shown in Table 23 below.

**Table 23: Proposed arrears**

Arrears	No. of days
Average energy consumption duration	15
Bill preparation and delivery duration	10
Bill payment due date	30
<b>Total Arrears</b>	<b>55</b>

The BEA has verified the agreement signed between DGPC and BPC for sale and purchase of electrical energy which was signed on 12<sup>th</sup> May, 2017 and found the information submitted is correct. However, BEA is of the view that bill preparation and delivery duration of 10 days for its four plants are not justifiable especially considering the availability of upgraded SAP/ERP software system.

Therefore, in order to avoid passing on of such inefficiencies to the customers, BEA in consultation with BPC and DGPC reduced the bill preparation and delivery duration to five (5) days, bill payment duration to twenty (20) days and maintaining the same number of days for average consumption duration.

Based on the above, BEA has approved arrears of 40 days as shown in the Table 24 below.

**Table 24: Proposed and reviewed arrears**

<b>Arrears (Days)</b>	<b>DGPC</b>	<b>BEA</b>
Average energy consumption duration	15	15
Bill preparation and delivery duration	10	5
Bill payment due date	30	20
<b>Total Arrears</b>	<b>55</b>	<b>40</b>

*3.3.2.2 Inventories*

The DGPC proposed total inventories of Nu. 562.56 million which is the average inventories for the past three years of 2016, 2017 and 2018. The BEA verified the inventories of DGPC and found that the proposed inventories are reported correctly.

*3.3.2.3 Return on Working Capital (RoWC)*

The DGPC had calculated the proposed RoWC as the product of interest of working capital and the amount of working capital in line with Clause 56 of TDR. Clause 7.7 of DETP states that the interest on working capital need to be determined based on the prevailing lowest short-term lending rate of financial institution of Bhutan.

The BEA reviewed the working capital interest rates offered by the seven (7) financial institutions of Bhutan and found that the lowest working capital rate of 9.97% is offered by Bank of Bhutan. Accordingly, the BEA applied the lowest prevailing lowest short-term lending rate of 9.97% to calculate the return on working capital. The BEA reviewed allowances for RoWC per year is as shown in Table 25.

**Table 25: Reviewed RoWC allowances**

	<b>2019/20</b>	<b>2020/21</b>	<b>2021/22</b>
RoWC (Mill. Nu.)	150.15	150.06	149.93

*3.3.3 Conclusions on the Return on Working Capital*

The BEA had decided to reduce the arrears from 55 days to 40 days, to use inventories of Nu. 562.56 million and to apply the lowest prevailing short-term working capital interest rate of

9.97% when calculating the return on working capital. Table 26 below shows the proposed and approved arrears, inventories and rates used to calculate the RoWC allowances.

**Table 26: Proposed and reviewed arrears, inventories and rates**

	DGPC	BEA
Arrears (days)	55	40
Inventories (Mill. Nu.)	562.56	562.56
WACC/Interest Rate	11 %	9.97 %

### 3.4 Energy Volumes

The annual energy volumes are used to calculate the average cost of supply per unit per year, which will be the approved generation tariff. The average cost of supply is calculated by dividing the discounted total cost of supply on the discounted annual energy.

As per Clause 68 of the TDR, the annual energy volumes shall be determined as the mean annual energy generation of the past three years based on 98% water utilization factor to the extent of generation capacity less royalty energy adjusted for auxiliary consumption as:

$$ENERGY = \sum_i ENERGY_i \times (1 - AUX_i) \times (1 - ROYALTY_i)$$

Where,

- ENERGY is the annual energy volume in any year, in GWh;
- ENERGY<sub>i</sub> is the average historical mean annual energy generation of the past three years for plant “i”, in GWh;
- AUX<sub>i</sub> is the allowance for auxiliary consumption at plant “i”, as set out in Schedule D of TDR, 2016, as a percentage; and
- ROYALTY<sub>i</sub> is the free energy which is made available to RGoB by plant “i”, as a percentage.

#### 3.4.1 DGPC proposal

##### 3.4.1.1 Forecasted generation

The DGPC proposed the forecast generation of 7,132 GWh per annum which is based on the average of the past three years from four plants (BHP, CHP, KHP and THP) as shown in Table 27 below.

**Table 27: Proposed historical generation (GWh)**

Plants	2016	2017	2018	Average
BHP	328.67	330.65	305.57	<b>320.96</b>
CHP	1,929.68	1,883.18	1,703.95	<b>1,838.94</b>
KHP	390.75	389.56	380.03	<b>386.78</b>
THP	4,924.75	4,645.53	4,184.44	<b>4,584.91</b>
<b>Average Generation</b>	<b>7,573.84</b>	<b>7,248.92</b>	<b>6,573.98</b>	<b>7,131.58</b>

The DGPC had proposed the forecasted generation of each plant based on the average of the past three years as shown in the table 28 below.

**Table 28: Proposed forecast generation (GWh) for the year 2019 to 2022**

<b>Plants</b>	<b>BHP</b>	<b>CHP</b>	<b>KHP</b>	<b>THP</b>	<b>Total</b>
Energy Generation	320.96	1,838.94	386.78	4,584.91	<b>7,131.58</b>

### 3.4.1.2 Annual Energy Volumes

The DGPC submitted that as per the provision of the TDR and DETP an average annual generation of 5,994 GWh had been used to calculate the energy volumes after netting off auxiliary losses of 1.12% and 15% royalty energy volumes from the four power plants. The DGPC submitted that 15% of royalty energy corresponds to an energy volume of 1,058 GWh and 1.12% of auxiliary losses corresponds to an energy volume of 80 GWh annually during the tariff period. The proposed energy volume is as shown in Table 29 below.

**Table 29: Proposed energy volumes (GWh)**

<b>Year</b>	<b>2019/20</b>	<b>2020/21</b>	<b>2021/22</b>
<b>Energy (GWh)</b>	<b>5,994</b>	<b>5,994</b>	<b>5,994</b>

### 3.4.2 BEA review

Since the Clause 68 of the TDR states that the annual energy volumes shall be determined as the mean annual energy generation of the past three years based on 98% water utilization factor to the extent of generation capacity less royalty energy adjusted for auxiliary consumption, the BEA reviewed the proposed calculation of 98% of water utilization factor of all plants and found that the water utilization factor for all plants are above 99%. Therefore, BEA viewed that the proposed annual energy generation forecast of 7,131.58 GWh as proposed by DGPC is in line with the TDR.

Upon detailed review of actual auxiliary consumption of the power plants for the past three years of 2016 to 2018, BEA found that average auxiliary consumption of all the plants for the past three years is 1.00%. Therefore, 1.00% of auxiliary losses is used for the tariff period.

As per Clause 7.18 of DETP, all existing generation plants (Basochhu, Chukha, Kurichhu and Tala) fully owned by the RGoB have to provide 15% of an annual generation as Royalty Energy to RGoB.

Accordingly, the BEA calculated an annual energy volumes as the mean annual energy generation of the past three years based on 98% water utilization factor to the extent of generation capacity less royalty energy of 15% adjusted for reviewed auxiliary consumption of 1.00% as shown in the Table 30 below.

**Table 30: Reviewed Energy volume (GWh)**

<b>Year</b>	<b>2019/20</b>	<b>2020/21</b>	<b>2021/22</b>
Forecast Generation (A)	7,132	7,132	7,132
Auxiliary Losses (B)	71.32	71.32	71.32
Royalty Energy (C)	1,059	1,059	1,059
<b>Energy Volume (A-B-C)</b>	<b>6,002</b>	<b>6,002</b>	<b>6,002</b>

## 4 Tariff determination

As per Clause 69 of the TDR, the average cost of supply shall be taken as the ratio of the discounted annual costs of supply to the discounted energy volumes, with discounting applied over the Tariff Period using the  $WACC_g$ , as follows:

$$AC_g = \frac{\sum_{n=1}^{TP} TC_{g,n} / (1 + WACC_g)^n}{\sum_{n=1}^{TP} ENERGY_n / (1 + WACC_g)^n}$$

Where,

- $AC_g$  is the average cost of supply for the Generation Licensee “g”, in Ngultrum per kWh;
- TP is the number of years in the Tariff Period;
- $TC_{g,n}$  is the total cost of supply of Generation Licensee “g” in year “n” in million Ngultrum, as determined in accordance with clause 67 of TDR, 2016;
- $ENERGY_n$  is the energy volume in year “n” in GWh, as determined in accordance with Clause 68 of TDR, 2016; and
- $WACC_g$  is the weighted average cost of capital for the Generation Licensee “g”, as determined in Clause 66 of TDR, 2016.

The BEA’s review has resulted in the allowances for this tariff period as shown in Table 31.

**Table 31: Reviewed allowances (Mill. Nu.)**

	2019/20	2020/21	2021/22
OM	1,597.9	1,614.9	1,636.2
DEP	2,256.4	2,305.6	2,354.9
RoA	4,629.8	4,427.4	4,213.0
RoWC	150.2	150.1	149.9
<b>Total Cost</b>	<b>8,634.3</b>	<b>8,498.0</b>	<b>8,354.1</b>
<b>Energy</b>	<b>6,002</b>	<b>6,002</b>	<b>6,002</b>

By discounting the Total Cost of Supply (TC) and the Energy using a pre-tax WACC of 12.69%, the BEA has determined the DGPC generation tariff to be Nu.1.42/kWh.

### 4.1.1 Subsidies

In keeping with subsidy allocation principles of DETP, the RGoB has approved the valuation of 15% royalty energy (generation less 1.00% auxiliary consumption) at the export tariffs and allocated Nu. 1,478.57 million per annum to LV and MV customers for the tariff period 2019 to 2022 with effect from 1<sup>st</sup> October 2019.