Bhutan Electricity Authority

Bhutan Power Corporation Limited

Tariff Review Report (2019-2022)

December 2019

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Executive Summary

The Bhutan Power Corporation Limited (BPC) tariff application for the period 2019/20 to 2021/22 has been reviewed and the allowed pre-tax Weighted Average Cost of Capital (WACC) is determined as 13.05% for Wheeling, based on Cost of Equity (CoE) of 13.31%, Cost of Debt (CoD) of 9.85% and gearing ratio of 65%. For High Voltage (HV) consumers the WACC was determined as 12.94%, based on CoE of 13.31%, CoD of 8.90% and gearing ratio of 60%. For the Medium Voltage (MV) the WACC was determined as 7.59%, based on CoE of 13.31%, CoD of 2.70% and gearing ratio of 70% and for Low voltage (LV) consumers, the WACC was determined as 7%, based on CoE of 13.31%, CoD of 1.85% and gearing ratio of 70%.

The Druk Green Power Corporation Limited (DGPC) and Mangdechhu Hydropower Plant (MHP) domestic generation tariffs has been reviewed and set as Nu 1.42/kWh and Nu 3.77/kWh respectively for the period 1st October 2019 to 30th June 2022. Considering which, the weighted average domestic generation tariff of Nu 1.50/kWh has been used for the determination of BPC power purchase cost.

The cost allowances such as return on assets, depreciations, operation and maintenance cost, return on working capital have been set according to the provisions of the Tariff Determination Regulation (TDR), 2016.

Based on the comprehensive review of tariff application and consideration of the comments received from the electricity consumers/licensees during the public hearing held on 30th April 2019 as well as the written comments received thereafter, the Bhutan Electricity Authority (BEA) has determined an average cost of supply of Nu.0.270/kWh for Wheeling, Nu.2.26/kWh for HV,Nu.5.15/kWh for MV and Nu.5.06/kWh for LV consumers.

In keeping with subsidy allocation principles of Domestic Electricity Tariff Policy (DETP), 2016, the Royal Government of Bhutan (RGoB) has approved the subsidy allocation of Nu. 1,478.57 million per year to LV and MV consumers with effect from 1st October 2019.

Considering the approved cost of supply for DGPC, MHP, BPC and subsidy injection by RGoB, the BEA has approved the tariff structure for the tariff period 1st October 2019 to 30th June 2022.

1 Background

The BPC submitted the proposal for the revision of electricity tariffs for the tariff period 1st July 2019 to 30th June 2022 vide letter no. 31/BPC/BEA/MD/2019/55 dated 1st March 2019.

The BPC submitted that the tariff revision application has been proposed to BEA for review and approval to cover the allowed costs in the forthcoming tariff period and to generate adequate returns. As per BPC, the application is being prepared in line with TDR 2016 and submitted to implement the work programs for capital investments, in line with the BPC's Five Year Plans (FYP) and the major projects in line with RGoB's FYP. BPC submitted that these capital investments are aimed for strengthening the network, improving reliability through network expansion, improvement and up-gradation of existing transmission and distribution system to cater and replacement of old and obsolete assets. Further, BPC submitted that they expect to incur operation and maintenance expenditures considering the significant expansion of network size due to Rural Electrification, transmission assets addition including Associated Transmission System (ATS) of 720 MW MHP when assets are transferred to BPC.

As part of the tariff review process, a public hearing was conducted on 30th April 2019 at the Natural Resources Development Corporation Limited (NRDCL) Conference Hall, Thimphu. The public hearing was attended by general public including HV and MV consumers and officials from Druk Green Power Corporation (DGPC), BPC and Association of Bhutanese Industries (ABI). The general public was provided three (3) weeks after the public hearing to submit their written comments to the BEA.

2 Regulatory parameters

2.1 Tariff period

As per the Clause 7.19 of the Domestic Electricity Tariff Policy (DETP), 2016, the tariff revision cycle shall normally be three years unless there is substantial and significant difference in the business environment and generation scenario.

The BPC had proposed a three year tariff period from 1st July 2019 to 30th June 2022 and the year 2018 has been used as the reference year.

The BEA has approved two (2) years and nine (9) months tariff period, starting from 1st October 2019 to 30th June 2022 in accordance with the subsidy allocation approval provided by the Royal Government vide letter no. 24/DHPS/HQ/Tariff/2019-20/285 dated 19th September 2019.

2.2 WACC Parameters

The WACC for each Customer Group shall be calculated as the pre-tax Weighted Average Cost of Capital in accordance with Clause 72 in the TDR.

$$WACC_C = \frac{CoE(1 - Gearing_C)}{1 - Tax} + (CoD_C \times Gearing_C)$$

Where,

- $WACC_C$ is the weighted average cost of capital for the Customer Group "C", as a percentage;
- CoE is the cost of equity, as set out in Schedule C of the TDR, as a percentage for the Licensee;
- $Gearing_C$ is the ratio of debt to total net fixed assets, as determined by the Authority for the Customer Group "C";
- CoD_C is the actual cost of debt related to assets utilized by the Customer Group "C", 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; and
- Tax is the prevailing rate of company taxation, as a percentage.

2.2.1 BPC proposal

The BPC had proposed WACC of 13.94% for Wheeling, 13.39% for HV consumers, 9.45% for MV and 9.15% for LV consumers. The proposed WACC parameters are shown in Table 1.

Table 1: Proposed WACC for Customer Categories

WACC Parameters	Wheeling	HV	MV	LV
Gearing	61 %	60 %	60 %	60 %
CoE	14.14%	14.14%	14.14%	14.14%
CoD	9.94%	8.86%	2.28%	1.79%
Tax	30%	30%	30%	30%
WACC	**13.94%**	**13.39%**	**9.45%**	**9.15%**

2.2.2 Input from Stakeholders

During the public hearing, the representative of RSA Private Limited expressed that BPC has taken the ten (10) years term loan interest rate whereas tariff period is for three (3) years and it was submitted that floating interest rate or short term loan interest rate to be considered to determine the tariff. Further, he pointed out that the BPC has taken the 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 it was submitted that either average lending rates of all sectors of the domestic financial institution or hydropower loan which has recently introduced by Bank of Bhutan be used.

The General Secretary, ABI, further submitted that BPC has proposed CoE of 14.14% considering Manufacturing/Industrial loan with tenure of five years and above while the DETP states that the "Cost of Equity shall be based on the average lending rates of the domestic financial institutions. Therefore, he submitted that the average lending rates of all sectors with the loan tenure of three years which is same as the tariff cycle duration of the domestic financial institutions should be considered in the true spirit of Clause 7.2 of DEPT and not only the manufacturing & industrial sector.

ABI also submitted that BPC has proposed an interest rate of 10% per annum for new investments at a debt equity ratio of 70% for computation of cost of debt and the actual CoD for the existing loans needs to be considered. Further, it was also submitted that BPC has availed a loan of Nu. 2 billion from National Pension and Provident Fund (NPPF) in 2018 at an interest rate of 8.85% per annum and the minimum lending rate (MLR) as prescribed by the Royal Monetary Authority (RMA) has reduced in March 2019, therefore, it should be possible for BPC to secure loans from NPPF at a rate much lower than 8.85% annually. Therefore, ABI felt that the interest rate for new investments should be lower than 8.85% per annum and not 10% per annum as proposed by BPC.

The DGPC in their written comments submitted that BPC has taken same principal loan balance of Nu. 5,501.603 million for all three years including interest during construction(IDC) for Associated Transmission System(ATS) loan for CoD calculation and requested BEA to review and consider the loan repayment schedule of ATS loan by removing IDC from the principal loan in debt schedule.

2.2.3 BEA review

As per the Clause 72 of the TDR, WACC should be computed separately for each consumer category. The WACC parameters are provided in the Schedule C of the TDR, but may be updated by the BEA from time to time. The parameters are discussed below for each customer category.

2.2.3.1 Tax

The BEA has verified that the proposed tax rate is in accordance with the rate prescribed in the Section 45, Chapter 9 of the Income Tax Act of the Kingdom of Bhutan, 2001. Therefore, BEA has used a tax rate of 30% for determination of pre-tax WACC.

2.2.3.2 Cost of Debt (CoD)

The BPC had proposed the cost of debt for the tariff period of 9.94% for wheeling, 8.86% for HV consumers, 2.28 % for MV consumers and 1.79% for LV consumer based on the provisions of the DETP and proposed allocation factor. The BPC submitted that for calculation of CoD for MV and LV, the loan availed for Rural Electrification (RE) which are for distribution system of 33 kV and below were considered.

The BPC submitted that proposed CoD for different customer categories has been calculated as the weighted average interest rate on existing loans and loans envisaged to be availed in upcoming tariff period using the loan balance at the end of each year as shown in Table 2,Table 3,Table 4, and Table 5.

Table 2: Proposed CoD for Wheeling

SL.No	Loan Particulars	Interest rate	Loan balance (Nu. Mill)				Proposed CoD
			31.12.2018	31.12.2019	31.12.2020	31.12.2021	
1	NPPF	9%	113.20	94.34	75.47	56.60	
2	MHPA loan	10%	-	5,142.12	5,142.12	5,142.12	
3	NPPF Loan (1.5 billion)	8.85%	185.62	176.86	164.66	151.43	
4	NPPF Loan (0.5 billion)	8.85%	61.14	60.38	56.42	52.12	**9.94%**
5	Future Loan	10%	-	261.57	274.65	300.81	
Total			359.97	5,735.27	5,713.32	5,703.08	
Annual cost of debt			**8.90%**	**9.94%**	**9.44%**	**9.95%**	

Table 3: Proposed CoD for HV

SL.No	Loan Particulars	Interest rate	Loan balance (Nu. Mill)				Proposed CoD
			31.12.2018	31.12.2019	31.12.2020	31.12.2021	
1	NPPF	9%	138.36	115.30	92.24	69.18	
2	MHPA loan	10%	-	359.48	359.48	359.48	
3	NPPF Loan (1.5 billion)	8.85%	1310.09	1248.21	1162.11	1068.76	
4	NPPF Loan (0.5 billion)	8.85%	431.54	426.18	398.18	367.83	**8.86%**
5	Future Loan	10%	-	342.06	359.16	393.37	
Total			**1,879.99**	**2,491.23**	**2371.18**	**2,258.63**	
Annual cost of debt			**8.20%**	**8.76%**	**8.85%**	**8.96%**	

Table 4: Proposed CoD for MV

SL.No	Loan Particulars	Interest rate	Loan balance (Nu. Mill)				Proposed CoD
			31.12.2018	31.12.2019	31.12.2020	31.12.2021	
1	RE I	6%	26.20	24.66	23.11	21.57	
2	RE II	6%	44.21	40.81	37.41	34.01	
3	RE III	6%	57.50	54.12	50.74	47.36	

4	RE JICA I	0.01%	358.55	345.97	333.39	320.81	
5	RE IV ADB	0%	196.20	187.48	178.76	161.32	
6	RE JICA II	0.01%	159.87	154.54	149.21	143.88	
7	RE V ADB	6%	151.68	148.52	142.20	135.88	
8	NPPF Loan (1.5 billion)	8.85%	58.75	55.98	52.12	47.93	**2.28%**
9	NPPF Loan (0.5 billion)	8.85%	19.35	19.11	17.86	16.50	
10	ADA LOAN	0.70%	58.26	48.55	43.70	38.84	
11	Future Loan (allocation)	10%	-	20.12	21.13	23.14	
Total			**1,130.58**	**1,099.86**	**1,049.62**	**991.23**	
Annual cost of debt			**2.14%**	**2.29%**	**2.27%**	**2.29%**	

Table 5 : Proposed CoD for LV

SL.No	Loan Particulars	Interest rate	Loan balance (Nu. Mill)				Proposed CoD
			31.12.2018	31.12.2019	31.12.2020	31.12.2021	
1	RE I	6%	114.97	108.21	101.45	94.68	
2	RE II	6%	194.03	179.10	164.18	149.25	
3	RE III	6%	252.38	237.53	222.69	207.84	
4	RE JICA I	0.01%	1,573.66	1,518.44	1,463.22	1,408.01	
5	RE IV ADB	0%	861.13	822.86	784.59	708.04	
6	RE JICA II	0.01%	701.65	678.26	654.87	631.48	
7	RE V ADB	6%	665.72	651.85	624.11	596.38	
8	NPPF Loan (1.5 billion)	8.85%	33.32	31.74	29.55	27.18	**1.79%**
9	NPPF Loan (0.5 billion)	8.85%	10.97	10.84	10.13	9.35	
10	ADA LOAN	0.70%	255.71	213.09	191.78	170.47	
11	Future Loan (allocation)	10%	-	46.95	49.30	53.99	
Total			**4,663.54**	**4,498.88**	**4,295.86**	**4,056.68**	
Annual cost of debt			**1.71%**	**1.80%**	**1.79%**	**1.80%**	

The BEA verified the proposed 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 BPC has proposed interest rates and loan balances correctly except for RE JICA I, RE JICA II, RE IV ADB, RE V ADB, ADA loan and MHPA loan.

For RE JICA I and ADA loans, BPC has reported the loan interest rates as per loan agreements. However, the RE JICA I and ADA loans are in Japanese Yen (JYP) and Euro (EUR), BPC has taken the exchange rate of EUR and JYP as of 31st December, 2018 for calculation of loan balance in Bhutanese Ngultrum (BTN). Therefore, BEA has corrected the loan balances in BTN using the exchange rates for JYP and EUR at the time of tariff review.

For the RE JICA II loan, the RGoB has received a Note Verbale from Embassy of Japan confirming the extension of loan disbursement period of RE JICA II loan and the Department of Renewable Energy, MoEA has entrusted BPC to implement the on-grid electrification of off-grid households in rural areas where the required budget shall be met from the balance fund of RE JICA II funding. BPC has reported the loan interest rates as per loan agreement and BEA has taken loan balance in BTN as recorded in the BPC account. BPC also reported in the Investment Plan proposal that the contract for the procurement of materials has already been awarded in September 2018 for the conversion of off-grid households to on-grid in rural areas and works to be completed by 2020. Considering that the works are expected to be completed by 2020 only and the RE JICA II loan repayment is not expected to commence during this tariff period and thus the loan balance is kept same for all three years.

For RE IV ADB and RE V ADB loans, BPC has reported the loan interest rates correctly but BEA has corrected the loan balances as per the loan agreements.

BPC had also included loan worth Nu. 5501.60 million each year for 720 MW MHP Associated Transmission System (ATS) based on the similar transfer modality of THP ATS with 70:30 percent loan and equity. BEA verified the total MHP ATS cost as per the Financial Audit Report of 400kV Mangdechu Transmission Line Project (MTLP) and calculated the loan balances excluding IDC based on the agreement executed between Government of the Republic of India and RGoB.

The BPC has proposed new loan worth of Nu. 837.04 million for Wheeling, Nu. 1,094.59 million for HV consumers, Nu. 64.39 million for MV and Nu. 150.24 million for LV consumers for construction of transmission lines or ring system and related infrastructures for the four Special Economic Zones (Jigmeling, Motonga, Dhamdum and Bongdeyma). The BPC expected to finance these investments through a mix of debt and equity with gearing ratio of 70 % and an interest rate of 10%. When estimating the future loan balances, BPC has adjusted the capital drawdown amount of each year for selected project and allocated 70% of capital drawdown to debt for the investments that are to be financed through both equity and debt. Further, BPC had calculated an annual interest during construction (IDC) using 10% interest rate and added to the outstanding loan balance for the tariff period. Since IDC is included in the investment schedule when capitalized and added to the asset values, it is not included in the loan balance.

During the review, the BEA visited the proposed investment sites and conducted consultations with officials of Department of Hydropower and Power Systems (DHPS), Department of Industry (DoI), MoEA along with BPC officials to seek the views on the proposed investment

plan submitted by BPC in the Special Economic Zones (SEZ) and to ascertain the realistic schedule for the implementation of the investments in the SEZs. Based on the above, BEA has reduced the expected loan balance for the tariff period based on the approved investments. Further, BEA considered loan interest rate of 10% as proposed by BPC based on the current MHP loan interest rate of 10% provided by Government of India and the Manufacturing-Hydropower loan interest rate of 10.28% offered by BoB.

BPC had collected energy security deposit of amount of Nu. 275.24 million from HV, MV and LV consumers. The BEA has considered the security deposit collected from the consumers as loan with 0% interest rate while calculating the CoD for each consumer category.

The CoD for the tariff period is calculated as the weighted average of the interest rates, using the energy security deposits and loan balances per year as weights. The BEA reviewed CoD and the loan details of Wheeling, HV, MV & LV consumers are as shown in Table 6, Table 7, Table 8, and Table 9.

Table 6: Reviewed CoD for Wheeling

SL.No	Loan Particulars	Interest rate	Loan balance (Nu. Mil) 31.12.2018	31.12.2019	31.12.2020	31.12.2021	Reviewed CoD
1	NPPF	9 %	106.01	88.34	70.68	53.01	
2	MHPA loan	10%	-	4,413.69	4,012.44	3,611.20	
3	NPPF Loan (1.5 billion)	8.85%	475.09	452.65	421.43	387.58	
4	NPPF Loan (0.5 billion)	8.85%	156.49	154.55	144.40	133.39	**9.85%**
5	Future Loan	10%	-	1.24	1.24	22.17	
6	Energy Security Deposit	0%	-	-	-	-	
Total			**737.60**	**5,110.47**	**4,650.18**	**4,207.34**	
Annual cost of debt			**8.87%**	**9.85%**	**9.84%**	**9.85%**	

Table 7: Reviewed CoD for HV

SL.No	Loan Particulars	Interest rate	Loan balance (Nu. Mil) 31.12.2018	31.12.2019	31.12.2020	31.12.2021	Reviewed CoD
1	NPPF	9%	145.55	121.29	97.03	72.78	
2	NPPF Loan (1.5 billion)	8.85%	836.90	797.37	742.37	682.74	
3	NPPF Loan (0.5 billion)	8.85%	275.67	272.25	254.37	234.98	
4	MHPA loan	10%	-	293.66	266.96	240.27	
5	Future Loan	10%	-	4.23	19.87	107.03	**8.90%**
6	Energy	0%	34.33	34.33	34.33	34.33	

	Security Deposit						
Total			**1,292.45**	**1,523.13**	**1,414.93**	**1,372.11**	
Annual cost of debt			**8.63%**	**8.89%**	**8.88%**	**8.93%**	

Table 8 : Reviewed CoD for MV

SL.No	Loan Particulars	Interest rate	Loan balance (Nu. Mil)				Reviewed CoD
			31.12.2018	31.12.2019	31.12.2020	31.12.2021	
1	RE I	6%	20.08	18.89	17.71	16.53	**2.70%**
2	RE II	6%	33.88	31.27	28.67	26.06	
3	RE III	6%	44.07	41.48	38.88	36.29	
4	RE JICA I	0.01%	279.21	269.41	259.62	249.82	
5	RE IV ADB	0%	147.02	140.34	133.66	126.97	
6	RE JICA II	0.01%	122.52	122.52	122.52	122.52	
7	RE V ADB	6%	116.24	111.40	106.56	101.71	
8	NPPF Loan (1.5 billion)	8.85%	106.90	101.85	94.83	87.21	
9	NPPF Loan (0.5 billion)	8.85%	35.21	34.78	32.49	30.02	
10	ADA LOAN	0.70%	44.65	40.24	36.58	32.92	
11	Future Loan	10%	-	0.35	6.53	18.68	
12	Energy Security Deposit	0%	6.88	6.88	6.88	6.88	
Total			**956.66**	**919.42**	**884.93**	**855.62**	
Annual cost of debt			**2.70%**	**2.68%**	**2.68%**	**2.73%**	

Table 9: Reviewed CoD for LV

SL.No	Loan Particulars	Interest rate	Loan balance (Nu. Mil)				Reviewed CoD
			31.12.2018	31.12.2019	31.12.2020	31.12.2021	
1	RE I	6%	121.09	113.97	106.85	99.72	**1.85%**
2	RE II	6%	204.36	188.64	172.92	157.20	
3	RE III	6%	265.81	250.18	234.54	218.90	
4	RE JICA I	0.01%	1,684.16	1,625.06	1,565.97	1,506.88	
5	RE IV ADB	0%	886.82	846.51	806.20	765.89	
6	RE JICA II	0.01%	739.00	739.00	739.00	739.00	
7	RE V ADB	6%	701.16	671.95	642.73	613.52	
8	NPPF Loan (1.5 billion)	8.85%	168.89	160.91	149.81	137.78	
9	NPPF Loan (0.5 billion)	8.85%	55.63	54.94	51.33	47.42	
10	ADA	0.70%	269.32	242.72	220.66	198.59	

	LOAN						
11	Future Loan	10%	-	1.18	21.35	61.42	
12	Energy Security Deposit	0%	234.03	234.03	234.03	234.03	
Total			**5,330.27**	**5,129.08**	**4,945.39**	**4,780.35**	
Annual cost of debt			**1.87%**	**1.85%**	**1.84%**	**1.87%**	

The BEA reviewed Cost of Debt is 9.85% for Wheeling, 8.90% for HV and 2.70% for MV and 1.85% for LV consumers for the purpose of determining the WACC.

2.2.3.3 Cost of Equity(CoE)

The BPC proposed CoE of 14.14% for Wheeling, HV, MV and LV consumers and submitted that the proposed CoE is based on the average interest rate of 11.64% for Industrial/Manufacturing loan as shown in Table 10 and adding 250 basis point on the average interest rates.

Table 10: Proposed average lending rate

Financial Institution	Type of Loan	Interest Rate	Term (Years)
Bank of Bhutan	Manufacturing-Hydropower/Renewable energy	11.86%	20
Bhutan National Bank	Manufacturing & Industry Loan	11.50%	10
Druk Punjab National Bank	Services-Others	11.50%	15
T Bank	Manufacturing and Industry	11.00%	10
Bhutan Development Bank	Manufacturing/Industrial loan	12.33%	Above 5-10 years
Average interest rate	**11.64%**		

As per the Clause 7.2 of DETP, the CoE shall be based on the average lending rate of the domestic financial institutions and BEA may allow a reasonable premium up to a maximum of 250 basis points on the average lending rates of the financial institutions depending on the domestic market situation and gearing ratio applied.

The ABI submitted that the average lending rates of all sectors with the loan tenure of three years as the tariff cycle is only for three years of the domestic financial institutions should be considered in the true spirit of Clause 7.2 of DEPT and not only the manufacturing & industrial sector since the interest rates for the manufacturing & industrial sector is the highest amongst all the sectors.

Based on the submission, the BEA sought clarification on the interpretation of Clause 7.2 of DETP from DHPS, MoEA as it is the final Authority to interpret the various provisions of the

policy. 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 considered the long term average lending rates of three (3) non-bank institutions and five (5) banks for all sectors during the tariff review as shown in Table 11.

Table 11: 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 (BNB)	12.17 %
4	Bank of Bhutan (BoB)	11.66 %
5	Druk Punjab National Bank (DrukPNB)	11.48 %
6	National Pension & Provident Fund (NPPF)	9.63 %
7	Royal Insurance Corporation of Bhutan Ltd. (RICBL)	12.14 %
8	T Bank	9.85 %
	Average Rate	**11.31 %**

While BPC had proposed addition of 250 basis point on the average lending rate of 11.64%, the BEA approved addition of 200 basis point since the gearing ratio has been maintained at 60% for HV and 70% for MV and LV customers as approved during the last tariff period in line with the DETP.

While the gearing ratio for wheeling has been increased to 65% due to increase in the actual gearing ratio for the wheeling category, 200 basis points has been used to ensure that the same cost of equity is applied across Licensees in the electricity industry of Bhutan.

Based on the above, the BEA approved CoE of 13.31% for all consumer categories by considering the long-term average lending rate of 11.31% and 200 basis points.

2.2.3.4 Gearing ratio

The BPC had submitted that the actual gearing is 40.30% for 2018. However, as per the requirements of the DETP, BPC has proposed the following gearing ratio for individual consumer category as shown in the Table 12.

Table 12: BPC proposed gearing ratio

Gearing	Customer Category			
	Export	HV	MV	LV
Actual	61%	39%	39%	43%
Proposed	61%	60%	60%	60%

As per the Clause 72 of the TDR, Gearing ratio is the ratio of debt to total net fixed assets, as determined by the Authority for the Consumer Group.

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%.

Based on above, the BEA approved the gearing ratio of 65% for Wheeling, 60% for HV and 70% for MV and LV consumers which are higher than the actual gearing ratios and to ensure that the gearing ratio gradually increases to achieve the optimal gearing ratio of 70%.

2.2.3.5 The WACC

Based on the reviewed CoD, CoE, tax rate and gearing ratio, the BEA approved WACC of 13.05% for Wheeling, 12.94% for HV customer and 7.59% for MV and 7% for LV consumers as shown in the Table 13.

Table 13: Reviewed WACC

Parameters	Export	HV	MV	LV
Gearing	65 %	60 %	70 %	70 %
CoE	13.31%	13.31%	13.31%	13.31%
CoD	9.85%	8.90%	2.70%	1.85%
Tax	30%	30%	30%	30%
WACC	**13.05%**	**12.94%**	**7.59%**	**7.00%**

2.3 Inflation

The historical inflation rates are used for calculation of historical O&M costs in 2018 price levels, which is the reference year for this tariff review. The forecasted inflation rate is used for the calculation of the forecasted O&M allowances in each of the years in 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).

2.3.1 BPC proposal

The BPC had proposed the inflation rate of 2.53 % which was submitted based on average historical inflation rates from National Statistics Bureau (NSB) for 2016 – 2018 of the non-food as shown in the Table 14.

Table 14: Proposed historical inflation rate

Year	2016	2017	2018	Average
Inflation figures	2.80%	3.57%	1.23%	2.53%

2.3.2 BEA review

The BPC had proposed an inflation rate of 2.53% which the monthly average inflation rate for the period 2016-2018 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 of 2016 until 2018 and found that the average historical inflation rate for the period 2016-2018 was 2.44 % as shown in

the Table 15 which is calculated as the arithmetic average of the year on year inflation rates published by NSB. Therefore, BEA has approved inflation rate of 2.44%.

Table 15: Reviewed historical inflation rate

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

2.4 Other Regulatory Parameters

The other regulatory parameters are determined in the Schedules of the TDR, but may be updated by the BEA from time to time. The technical loss allowances, commercial loss allowance and collection rates are discussed in Clause 2.4.1 to 2.4.3 of this report. The O&M benchmark is discussed in Clause 4.1.1.3 and Clause 4.1.2.2 and O&M efficiency gain is discussed in Clause 4.1.1.2 and Clause 4.1.2.3 in this report.

2.4.1 Technical Transmission and Distribution Losses

The technical transmission and distribution losses are losses due to resistance in the network lines, cables and transformers and cannot be fully avoided. Since these losses are requiring the BPC to purchase more energy than they sell, they have an impact on the tariffs. The higher the technical losses, the more energy must be purchased per unit sold, and hence the tariff will increase.

2.4.1.1 BPC proposal

The BPC had proposed technical losses of 10.5 % for LV as part of efficiency gain since BPC endeavours to reduce the technical losses. The other allowances for Wheeling, HV and MV, BPC proposed as per the Schedule E of the TDR, which is as per the prevailing rates.

2.4.1.2 BEA review

The BEA has maintained the existing technical loss allowances of 2% for HV and 2.5% for MV. However, the loss allowances for LV has been reduced to 9% from 12% based on the actual distribution loss for year 2018 which has been reported as 9.71% by BPC.

2.4.2 Commercial Losses

The commercial losses are mainly due to low metering efficiency and electricity theft. According to the Clause 57 and 59 of the TDR, the commercial losses shall be taken into consideration when determining the tariffs.

2.4.2.1 BPC proposal

The BPC has proposed commercial losses based on 5% of LV sales to the total sales as per Schedule E of the TDR.

2.4.2.2 BEA review

As of date, no historical cases of electricity theft from any voltage level had been reported. Therefore, the commercial loss factors were calculated considering 0% for HV and MV sales and 5% for LV sales as per the TDR Schedule E. Based on the above, the BEA approved commercial loss factors are provided in the Table 16.

Table 16: Reviewed commercial loss factors

	2019/20	2020/21	2021/22
Commercial Losses	1.13%	1.14%	1.15%

2.4.3 Collection Rates

The collection rate is the rate of billed energy sales that is actually paid by the consumers. In case of any non-recovery of the bills, the expected losses are borne by the other consumers, as determined in Clauses 61 and 87 of the TDR.

2.4.3.1 BPC proposal

The BPC has proposed a collection rate of 100% for all customer categories.

2.4.3.2 BEA review

As proposed, BEA has approved a collection rate of 100%.

3 Cost of supply

According to the Clause 86 of the TDR, the cost of supply for a Customer Group in a particular year shall be determined as the sum of energy purchase costs, import price, network costs, the cost of Working Capital, System Operator cost less any Non-Tariff Revenue from that Customer Group, as follows:

$$COST_C = (1 + LOSS_C) \times PPP \times SALES_C + IP \times IMPORT \times IMALLOC_C + NETWORK_C + RoWC_C + SOC_C - NTR_C$$

Where,

- $COST_C$ is the cost of supply for Customer Group "C", in million Ngultrum;
- $LOSS_C$ is the sum of technical and commercial losses allocated to Customer Group "C" as set out in Schedule E of the TDR, as a percentage;
- PPP is the domestic Power Purchase Price, determined in accordance with Clause 85 of the TDR, in Ngultrum per kWh;
- $SALES_C$ is the sales for the year attributed to Customer Group "C", in GWh;
- IP is the average import price in Ngultrum per KWh;

- IMPORT is the volume of electricity imported by the Transmission and Distribution Utility, in GWh;
- $IMALLOC_C$ is the allocation of import costs to Customer Groups, where $IMALLOC_C$ for the high voltage Customer Group equals one (1), and $IMALLOC_C$ for other Customer Groups equals zero;
- $NETWORK_C$ is the network costs allocated to Customer Group "C", determined in accordance with Clause 74 of the TDR, in million Ngultrum;
- $RoWC_C$ is the return on Working Capital allocated to Customer Group "C", determined in accordance with Clause 76 of the TDR, in million Ngultrum;
- SOC_C is the cost of System Operator allocated to Customer Group "C", determined in accordance with Clause 80 of the TDR, in million Ngultrum; and
- NTR_C is the estimated Non-Tariff Revenue for the year arising from Customer Group "C", in million Ngultrum.

3.1 Energy purchase cost

The Energy cost is the cost incurred by the BPC for purchasing the energy from DGPC, MHP and India for supply to the consumers which is determined as per the following equation:

$$\text{Energy Purchase Cost}_C = (1 + LOSS_C) \times PPP \times SALES_C + IP \times IMPORT \times IMALLOC_C$$

Where;

- Energy Purchase $Cost_C$ is the cost for Customer Group "C", in million Ngultrum;
- $LOSS_C$ is the sum of technical and commercial losses allocated to Customer Group "C", as a percentage;
- PPP is the Power Purchase Price, which is the Additional Price determined for the DGPC, in Ngultrum per kWh;
- $SALES_C$ is the sales for the year attributed to Customer Group "C", in GWh.
- IP is the average import price in Ngultrum per kWh;
- IMPORT is the volume of electricity imported, in GWh;
- $IMALLOC_C$ is the allocation of import costs to Customer Groups, for which the high voltage customer group equals one (100 %) and for other customer groups equals zero (0 %).

3.1.1 Power purchase from DGPC and MHP

The power purchase cost for a specific consumer group is the sales adjusted for the loss factor multiplied with the power purchase price.

3.1.1.1 Power purchase price

For the purchase of power from the DGPC's various generating plants, the BPC had proposed energy price of Nu.1.59/kWh. However, BPC submitted that as permitted by Regulation, any revisions of the prevailing generation tariffs needs to be factored in while determining the final domestic tariffs.

3.1.1.2 Sales Forecast

The sales forecast is used to estimate the power purchase costs of the BPC and also for estimating the average cost of supply per unit sold. Therefore, the sales forecast has a large impact on the determined tariffs.

3.1.1.2.1 *BPC proposal*

The BPC had forecasted the domestic sales volumes for each customer category and wheeling energy volume as shown in Table 17.

Table 17: Proposed sales forecast per customer category

Sales forecast (GWh)	2019	2020	2021	2022
LV	545	577	609	635
MV	118	162	162	162
HV	1688	2460.	2810	2810
Wheeling*	5370	7,923	7,470	7,084

*The energy wheeled from DGPC, DHPC and MHP are considered.

3.1.1.2.2 BEA review

3.1.1.2.2.1 LV, MV and HV sales

For LV consumers, BPC has projected the sales based on linear trend method using historical data from 2004 to 2018. The LV Block wise sale was projected based on average percentage contribution of block wise energy for the past five years (2014-2018).

The sales forecast for the existing MV industries was projected using the average load factor for the period 2017 to June 2018 which was 21% and with power factor of 0.9. BPC has included 36 upcoming industries of SEZs with 10% of load to be drawn in 2019 and 100% of load drawl from 2020 onwards. The BPC also used average load factor of past two years for the energy projection of upcoming industries.

The sales forecast for the existing HV industries was projected using the load factor of 2018. The energy sale forecasts of upcoming industries of SEZs are based on assumption of 10% of load to be drawn in 2019, 50% of load to be drawn in 2020 and 100% of load drawl from 2021 onwards.

Considering BPC's concern on the status of the upcoming industries in the four SEZs, a meeting was held amongst officials of Department of Industry (DoI), DHPS, BEA and BPC to discuss the

realistic schedule for implementation of SEZs and likelihood of power drawl by upcoming industries in the tariff period.

During the meeting, DoI informed that majority of the promoters in SEZs are in the process of getting environment clearance and project approval and only two (2) industries in Jigmeling SEZ have been issued final land allotment order and two (2) industries in Motonga SEZ has started their construction of site infrastructures. Considering the current status of the proposed industries and realistic time schedule for these industries to be come online, BPC resubmitted the sales forecast as shown in Table 18.

Table 18: Reviewed LV, MV and HV sales

Customer	2019/20	2020/21	2021/22
LV	559	585	610
MV	126	128	143
HV	1784	1851	1905

3.1.1.2.2.2 Wheeling

The BPC has forecasted the energy to be wheeled considering the energy generation from DGPC, DHPC and MHP.

The energy to be wheeled from DGPC is calculated based on the historical average generation of DGPC of the past three years adjusted for transmission losses after deducting auxiliary losses and the BPC's HV, MV and LV sales forecasts adjusted for losses. The energy to be wheeled from Dagachhu Hydro Power Corporation Limited (DHPC) is calculated based on the historical average generation less auxiliary and transmission loss. The energy to be wheeled from MHP is calculated based on the generation projection of MHP less auxiliary and transmission losses and domestic consumption during lean season. The BEA reviewed net wheeling forecast is as shown in Table 19.

Table 19: Reviewed Wheeling forecast (GWh)

Wheeling forecast (GWh)	2019/20	2020/21	2021/22
Export Wheeled(DGPC)	5272	5222	5191
Export wheeled (DHPC)	292	288	284
Export wheeled (MHP)	2119	2073	2009
Total	**7,683**	**7,583**	**7,484**

3.1.2 Import Costs

As per Clause 88 of the TDR any net monthly import cost to meet the shortfall of domestic supply shall be allocated to HV consumers on a monthly basis as follows:

$$IC_{i,n} = IMPORT_n \times \frac{SALES_{i,n}}{SUMSALES_n}$$

Where

- $IC_{i,n}$ is the monthly import cost allocated to the HV Consumers "i" in a month "n", in Ngultrum;
- $IMPORT_n$ is the cost of net electricity imported by generation licensee in a month "n", in Ngultrum;
- $SALES_{i,n}$ is the volumes of electricity sales attributed to the HV consumers "i" in a month "n ", in GWh; and
- $SUMSALES_n$ is the sum of electricity sales to all HV consumers in a month "n", in GWh

3.1.1.1 BPC proposal

The BPC proposed an energy import volume of 1 GWh from WBSEB and ASEB, India for each year of the tariff period, at the prevailing average import price of Nu 2.46/kWh.

The BPC submitted that as per provisions of TDR, any net monthly import cost to meet the shortfall of domestic supply shall be allocated to HV consumers on a monthly basis. BPC also submitted that if there is net monthly import, the costs of import will be allocated to the HV consumers as per prevailing practice.

3.1.2.2BEA review

The reviewed import volume from WBSEBL and ASEBL is 0.10 GWh excluding the free royalty energy of 1.703 GWh from WBSEBL, as per the Minutes of Understanding (MoU) of Jaldakha Power Project, India. The import volume is calculated considering the energy consumption from WBSEBL (including royalty) and ASEBL of years 2017 & 2018.

Based on the above, losses of 12% and wheeling charge of Nu.0.20/kWh are verified from the electricity bills of WBSEBL and ASEBL, the reviewed average import price is Nu 2.70/kWh.

3.1.3 Total Energy Cost

The BPC had proposed to meet the power requirement through purchase from the DGPC, BPC's mini and micro hydro, wind generation and through imports as shown in Table 20 .

Table 20: Proposed power purchase in GWh

	2019	2020	2021	2022
Own generation	18	18	24	21
Imports	1	1	1	1
Royalty Energy	0	0	0	0
Additional Energy	2820	3506	3887	3922
Total energy purchase forecast	**2,839**	**3,525**	**3,912**	**3,944**

The embedded generation is forecasted including generation from the Rubesa Wind Power Plant at Wangdue as internal generation. During the tariff review, the BPC had submitted the revised forecast of embedded generation. The review has resulted in amendments of the import and purchase from the DGPC which is shown in the Table 21.

Table 21: Reviewed power purchase in GWh

	2019/20	2020/21	2021/22
Own generation	20	21	21
BPC Imports*	2	2	2
Purchase from DGPC and MHP	2,749	2,849	2,948
Total energy purchase forecast	**2,771**	**2,872**	**2,971**

**Including the free royalty energy of 1.703 GWh from WSBEBL*

3.2 Network Cost

The annual network costs allocated to each Customer Group shall comprise a share of each element of the total annual network costs, where the sum of allocations across all Customer Groups shall equal the total annual network costs referred to in Sub Clause 74 of the TDR.

$$NETWORK_C = \mathrm{WACC_C} \times \sum_i [\mathrm{ASSET_i} \times \mathrm{AALLOC_{i,c}}] + \sum_i [\mathrm{DEP_i} \times \mathrm{AALLOC_{i,c}}] + \sum_i [\mathrm{OM_i} \times \mathrm{AALLOC_{i,c}}] + \mathrm{FEES} \times \mathrm{FALLOC_C}$$

Where,

- $\mathrm{NETWORK_C}$ is the network cost allocated to Customer Group "C", in million Ngultrum;
- $\mathrm{WACC_C}$ is the Weighted Average Cost of Capital for Customer Group "C" for the Licensee, determined in accordance with Clause 72 of the TDR, as a percentage;
- $\mathrm{ASSET_i}$ is the net historical value of assets in asset category "i", in million Ngultrum;
- $\mathrm{DEP_i}$ is the depreciation allowance for assets in asset category "i", in million Ngultrum;
- $\mathrm{OM_i}$ is operating and maintenance allowance for cost category "i" , in million Ngultrum;
- FEES is the allowance for regulatory fees and levies, in million Ngultrum;
- $\mathrm{AALLOC_{i,C}}$ is the allocation factor to Customer Category "C" for asset-related costs in asset category "i", as a percentage, where $\sum_c \mathrm{AALLOC}_{i,c}=1$;
- $\mathrm{OMALLOC_{i,C}}$ is the allocation factor to Customer Category "C" for operating and maintenance costs in cost category "i", as a percentage, where $\sum_c \mathrm{OMALLOC}_{i,c}=1$; and

- $FALLOC_C$ is the allocation factor for fees, as a percentage, where $\sum_c FALLOC_{i,c}=1$

3.2.1 Allowance for depreciations and return on fixed assets

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.

As per Clause 49 of the TDR, the allowance for depreciations shall be 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 consideration of asset additions and retirements over the tariff period.

As per Clause 53 of the TDR, the return on assets shall be determined as the product of the WACC and the net asset values at the start of any year.

3.2.1.1 Asset Schedule at the end of 2018

3.2.1.1.1 BPC proposal

The asset values at the end of 2018 were submitted in Schedule A in the application and the aggregate figures are shown in Table 22. The BPC submitted in the application that they have calculated the asset values and depreciation using BPC's depreciation rates which is same as that specified by the TDR. Also, BPC mentioned that the asset values are based on the figures of final accounts for the year 2018.

Table 22: Proposed Asset Schedule at end of 2018(Nu. Mill)

Fixed Asset	Gross Value	Acc. Dep	Net Value	Dep
Building and Land	2,996	734	2,262	94
Generation	1,145	555	590	46
Transmission	11,976	3,373	8,603	349
Distribution	10,795	2,928	7,866	329
Others	1,934	1,183	751	74
Total	**28,846**	**8,773**	**20,072**	**892**

3.2.1.1.2 BEA review

The BPC asset schedule has been proposed as per the 2018 audited financial statements and the depreciation rates used are as per the Schedule B of the TDR.

The BEA deducted the following assets from the proposed asset schedule:

i) BPC land which is to be transferred to Druk Holding and Investments(DHI) in accordance with the DHI Land Lease Policy 2017;
ii) Buildings such as guest houses, recreational buildings, multipurpose halls and trainee quarters which are not required to deliver the core O&M services of BPC. A few staff colonies located in urban areas where private rental building are available were also deducted from the asset schedule; and
iii) Mini/Micro Hydropower Plants which do not have any projected generation during the tariff period 2019-2022 and assumed to be not used during the period.

The BEA reviewed asset schedule of BPC is shown in the Table 23.

Table 23: Reviewed asset schedule at the end of 2018 (Nu. Mill)

Fixed Asset	Gross Value	Acc. Dep	Net Value	Dep
Building	2,045	525	1,521	68
Generation	957	393	564	37
Transmission	11,976	3,373	8,603	349
Distribution	10,795	2,928	7,866	329
Others	1,933	1,183	751	74
Total	**27,706**	**8,401**	**19,305**	**858**

3.2.1.2 Investment

3.2.1.2.1 BPC proposal

As per the Clause 12 of the TDR, the Licensees are required to submit their investment plans for upcoming tariff period to the Authority, at least nine months prior to the expiry of the current tariff period.

Based on the TDR provision, BPC submitted their draft Investment Plan to BEA in October 2019 and the Final Investment Plan proposal 2019-2022 on November 2, 2018 after the endorsement of their Board. The proposed capitalized investment schedule (Nu. Mill) is shown in Table 24.

Table 24: Proposed capitalized investment schedule (Nu. Mill)

Sl.No.	Activity	2019	2020	2021	2022	Total
1	Transmission Construction	1112	2056	964	0	4132
2	Transmission	163	308	250	94	815
3	Distribution & Customer Services	1138	638	380	314	2470
4	Bhutan Power System Operator	0	7	0	357	364
5	Renewable Energy	33	15	10	7	65
6	Information & Communication	23	9	152	153	336
7	System Utility Implementation Team	0	120	0	0	120
8	Others Assets	86	100	63	80	329

9	Capital Work in Progress	246.25	166.9	0	0	413
10	MHP ATS	7423.6	0	0	0	7424
	Total	**10,224**	**3,419**	**1,820**	**1,005**	**16,467**

According to BPC, above works are required to be carried out for business expansion (new addition to the existing network system) for replacement and rehabilitation of the existing assets. The expenditure on capital works are expected to be financed through 70 % loan and 30 % equity and grants.

3.2.1.2.2 Input from the stakeholders

During the public hearing, the President of ABI expressed that the investment plays critical role in the increase of tariff. He also expressed that the BPC proposed long list of investments and customer are paying based on investment to be made for the tariff period. Therefore, he requested BEA to look into it and make necessary adjustments if BPC has not achieved the investments approved by the BEA in the coming tariff period.

The ABI, in their written comments submitted that there has been under achievement of the investments by BPC in past years and it was recommended that only 75% of the proposed investment to be considered for this tariff period.

3.2.1.2.3 BEA review

Upon receipt of the BPC Investment Plan Proposal 2019-2022, the BEA conducted a preliminary screening of the proposal and requested BPC for required additional information. BPC presented the BPC Investment Plan Proposal 2019-2022 to BEA Secretariat and during the meeting the proposed investments were discussed in detail.

As a part of review, BEA officials visited Electricity Services Divisions (ESD) of Samtse, Phuntsholing, Mongar, Bumthang, Samdrup Jongkhar, Trongsa, Gelephu, Wangdue, Tsirang, Dagapela, Haa and Paro, Substation Maintenance Division & Transmission Maintenance Division of Phuntsholing, BPC to ascertain the need and review the site status of the proposed investments.

The BEA also conducted a consultation meeting with DHPS and Licensees (BPC and DGPC) to seek the views of the DHPS on the proposed investment plan submitted by BPC. Further, a consultation meeting with Department of Industry, MoEA along with BPC officials on the status of the four SEZs was also held.

The BEA scrutinized the investment plan, projects wise considering the capitalization schedule, current status of the projects as of 2018, priority level of the projects, the expected risk level for delay of the projects and BPC's investment performance in the past. Further, the investments

which are crucial to accommodate new consumers or upgrade and replace/rehabilitate existing assets to meet the load growth and improve reliability, enhance business operation & efficiency and improve customer services are considered in the tariff determination.

During the 2016 tariff review, the BEA found that the BPC's actual capital expenditure in 2013 to 2015 was 53% of the proposed investment figure and 97 % of the BEA approved investment figure. During this review, it has been found that BPC's actual capitalized amount in 2016 to 2019 was 60% of the BPC's proposed investment figures and around 145% of the BEA reviewed investment as shown in Table 25.

Table 25: Capitalization investments compared to BPC proposals and BEA's review in 2016

	2016	2017	2018	Total	Performances
Building & Land (Nu. Mil)					
BPC Proposal	219	274	213	706	93%
BEA Review	138	176	120	434	152%
Annual accounts	197	182	280	659	
Generation (Nu. Mil)					
BPC Proposal	70	189	176	434	88%
BEA Review	70	14	237	321	119%
Annual accounts	181	36	164	381	
Transmission (Nu. Mil)					
BPC Proposal	240	803	4318	5361	49%
BEA Review	86	280	407	773	338%
Annual accounts	14	403	2194	2611	
Distribution (Nu. Mil)					
BPC Proposal	1293	749	492	2534	69%
BEA Review	1210	595	346	2151	81%
Annual accounts	932	401	414	1747	
Vehicles, office equipment and tools (Nu. Mil)					
BPC Proposal	312	362	243	918	60%
BEA Review	80	92	244	415	133%
Annual accounts	121	109	323	553	
Total (Nu. Mil)					
BPC Proposal	2133	2378	5441	9953	60%
BEA Review	1583	1157	1354	4094	145%
Annual accounts	1444	1132	3375	5951	

The BEA verified the capitalization schedule and the current status of works to categorize investment as high, medium and low risk. The investment in high risk category was deferred to next tariff period, the investment with medium risk was deferred by a year or two depending on the status of the works and the investment with low risk are accepted as proposed.

BEA deducted few staff colonies proposed in urban areas where private rental building are available and guest houses, recreational buildings, multipurpose halls and trainee quarters which are not required to deliver the core O&M services of BPC

The BEA sought clarifications on the commissioning date of MHP and actual date of the transfer of MHP Associated Transmission System (ATS) Assets to BPC. On this, the Director, DHPS clarified that the MHP is scheduled to commission fully by mid-July, 2019 and the MHP ATS is to be transferred before July, 2019.

The BEA also reviewed the proposed Capital Work in Progress (CWIP) and considered those works which were left out in the proposed investment plan 2019-2022.

Based on the above, the reviewed total investment worth Nu.14,016 million for the Tariff period 2019-2022 as shown in Table 26.

Table 26: Reviewed capitalized investment schedule in Nu. Mill

Sl.No.	Program	2019	2020	2021	2022	Total
1	Building and Civil structure	91	42	5	-	138
2	Generation	26	15	8	5	53
3	Transmission	8,115	2,188	482	576	11,362
4	Distribution	644	515	299	258	1,715
5	Vehicle	16	32	4	12	64
6	Office equipment	29	283	39	156	507
7	Tools	43	45	46	42	176
Total		**8,965**	**3,120**	**883**	**1,048**	**14,016**

3.2.1.3 Return on assets(RoA) and depreciation

3.2.1.3.1 BPC proposal

The net asset value for each year has been calculated as gross asset value less the accumulated depreciation. The proposed return on assets allowance is calculated as the product of the proposed WACC (Wheeling of 13.94%, HV of 13.39%, MV of 9.45% and LV of 9.15%) and the expected net asset values at the start of each tariff year. The depreciation allowances are proposed according to their expected depreciation during the next tariff period. The BPC proposed figures are shown in Table 27, Table 28, Table 29 and Table 30.

Table 27: Proposed RoA and depreciation for Wheeling (Nu. Mill)

	2019/20	2020/21	2021/22
Gross asset values	9,682	13,256	13,730
Accumulated depreciation	2,211	2,581	3,024
Net asset value	7,470	10,675	10,706
Return on Assets (RoA)	1,041	1,488	1,493
Depreciation(DEP)	370	443	464

Table 28: Proposed RoA and depreciation for HV (Nu. Mill)

	2019/20	2020/21	2021/22
Gross asset values	7,120	8,581	9,505
Accumulated depreciation	1,878	2,116	2,400
Net asset value	5,243	6,465	7,105
Return on Assets (RoA)	702	866	952
Depreciation(DEP)	238	284	315

Table 29: Proposed RoA and depreciation for MV (Nu. Mill)

	2019/20	2020/21	2021/22
Gross asset values	3,593	3,995	4,266
Accumulated depreciation	1,107	1,239	1,388
Net asset value	2,487	2,757	2,878
Return on Assets (RoA)	235	260	272
Depreciation(DEP)	132	149	162

Table 30: Proposed RoA and depreciation for LV (Nu. Mill)

	2019/20	2020/21	2021/22
Gross asset values	13,503	14,805	15,727
Accumulated depreciation	4,222	4,711	5,263
Net asset value	9,281	10,094	10,464
Return on Assets (RoA)	850	924	958
Depreciation(DEP)	489	552	603

3.2.1.3.2 BEA review

Based on the reviewed asset schedule of 2018, the investment plan of 2019-2022 and the approved WACC, the approved return on assets and depreciation allowances for the next tariff period are as shown in Table 31, Table 32, Table 33 and Table 34.

Table 31: Reviewed RoA and depreciation for Wheeling (Nu. Mill)

	2019/20	2020/21	2021/22
Gross asset values	8,855	12,433	12,827
Accumulated depreciation	1,945	2,287	2,698
Net asset value	6,910	10,146	10,129
Return on Assets (RoA)	902	1,324	1,322
Depreciation(DEP)	342	411	423

Table 32: Reviewed RoA and depreciation for HV (Nu. Mill)

	2019/20	2020/21	2021/22
Gross asset values	6,860	8,036	8,779
Accumulated depreciation	1,953	2,181	2,444
Net asset value	4,907	5,855	6,335
Return on Assets (RoA)	635	758	820

Depreciation(DEP)	228	263	284

Table 33: Reviewed RoA and depreciation for MV (Nu. Mill)

	2019/20	2020/21	2021/22
Gross asset values	3,046	3,337	3,522
Accumulated depreciation	931	1,035	1,151
Net asset value	2,115	2,301	2,372
Return on Assets (RoA)	161	175	180
Depreciation(DEP)	105	116	123

Table 34: Reviewed RoA and depreciation for LV (Nu. Mill)

	2019/20	2020/21	2021/22
Gross asset values	13,437	14,430	15,109
Accumulated depreciation	4,156	4,606	5,101
Net asset value	9,281	9,823	10,008
Return on Assets (RoA)	650	688	700
Depreciation(DEP)	450	494	525

4 Cost Allowances

4.1 O&M Allowance

The determination of operating and maintenance costs is described in Clause 34 - 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.

4.1.1 BPC proposal

4.1.1.1Historical O&M Cost

The proposed historical O&M allowances figures for the period 2016-2019 are shown in Table 35.

Table 35: Proposed total O&M allowances (Nu.Mill)

	2016	2017	2018	Average
Generation	5.2	18.6	17.4	14.1
Transmission	378.9	400.4	394.3	404.2
Distribution	712.7	741.4	756.4	761.0
Other	359.9	378.0	383.8	386.2
Total	**1456.7**	**1538.4**	**1551.9**	**1,565.4**

The BPC has proposed O&M allowances of Nu. 1,565.40 million which is the average historical O&M cost of past three years adjusted for inflation. BPC submitted that the proposed historical O&M costs are after deducting non-allowable costs such as Corporate Social Responsibility, License fee to BEA, Fines and Penalties and Management Holding fee.

Further, BPC submitted that the O&M cost of the Infocom Division has proposed for only six(6) fibres since the O&M budget was provided by Department of Information Technology and Telecom (DITT), Ministry of Information and Communication (MOIC) for 18 fibres out of 24 fibres (75%). The remaining six (6) fibres (4 fibres for Bhutan Power System Operator and 2 fibres for IT) are being used by BPC.

4.1.1.2 O&M Efficiency Gain

BPC proposed an O&M efficiency gain target of 0.5 % in the tariff period due to ageing transmission and distribution infrastructures, expanding costs (increased consumers base and geographical coverage and asset addition) and expected to increase O&M expenses. BPC submitted that they are taking various initiatives to reduce O&M cost in the area of controllable costs by setting performance targets.

4.1.1.3 Benchmark O&M Cost

BPC proposed total CRC of assets as on 31st December 2018 of Nu 35,949 million based on capital expenditure adjusted for inflation. BPC submitted that CRC of assets is severely underestimated by using the net asset values for the pre-corporatization assets in the absence of gross asset values.

BPC also submitted that the benchmark O&M costs determined using the CRC are substantially lower than the actual O&M costs as shown in Table 36

Table 36: Proposed O&M Benchmark and CRC

Benchmark O&M			Replacement Cost (Nu. Mil)	Calculated O&M (Nu. Mil)
Micro hydel	2.50%	of capex	2,097	52.4
Diesel generation	10.00%	of capex	0	-
Transmission	1.00%	of capex	17,206	172.1
Distribution	3.00%	of capex	10,356	310.7
Other	2.00%	of capex	6,290	125.8
			35,949	**660.96**

BPC requested to consider actual BPC costs while setting the benchmarks to ensure the O&M benchmarks for adequate O&M costs of BPC to provide the desired level of service delivery.

The O&M allowances figures for the period 2019-2021 proposed by the BPC are calculated based on the allowances for the reference year, adding annual allowances for the investment schedule in each year (2019-2022) using the proposed benchmarks in Table 36. The breakup of the proposed O&M allowances proposed by BPC is as shown in the Table 37.

Table 37: Breakup of O&M allowances proposed by BPC

	2018(Average)	2019	2020	2021	2022
O&M 2018 allowances	1,565	1,597	1,630	1,663	1697
O&M additions 2019 investments		124	126	129	131
O&M additions 2020 investments			50.84	52	53
O&M additions 2021 investments				29	29
O&M additions 2022 investments					22
Total O&M allowances	**1,565**	**1,721**	**1,807**	**1,872**	**1,932**

4.1.2 BEA review

4.1.2.1 Historical O&M Cost

The BEA verified the historical O&M costs for the past years 2016 to 2018 from the audited annual accounts submitted by BPC and found that most of cost has been reported correctly. Therefore, BEA has corrected some of historical O&M costs as per the audited annual accounts submitted by BPC.

As per the provisions of TDR, non-allowable O&M expenses such as license and registration fees, CSR, management fee for holding company, loss on disposal of property, plant and equipment, provision/write-back of provision on obsolescence of material and contribution from DITT which do not relate directly to the licensed activities of BPC have been deducted from the total O&M costs.

BEA has determined the O&M allowance based on the average historical O&M costs adjusted for inflation on above deductions. The nominal O&M values of 2016 and 2017 are adjusted for inflation to 2018 values. Based on the above, the BEA reviewed an O&M allowance of Nu.1430 as in shown in Table 38.

Table 38: BEA reviewed historical O&M costs (Nu. Mill)

	2016	2017	2018
Employee benefit Expenses	961	1011	1009
Operation and Maintenance	407	427	455
Other Expenses	194	218	205
Total	1562	1656	1669
Deduction	230	229	213
Nominal O&M costs	**1,332**	**1,427**	**1,456**
O&M costs in 2018 values	**1394**	**1440**	**1456**
O&M allowance	**1430**		

4.1.2.2 O&M benchmarks

The O&M benchmarks for various asset categories for the tariff period have been retained as per the TDR. The BEA approved O&M benchmarks are as shown in the Table 39.

Table 39: Reviewed O&M benchmarks

	O&M Benchmarks
Micro Hydel	2.5%
Diesel Generation	10%
Transmission	1%
Distribution	3%
Others	2%

4.1.2.3 Efficiency gains

BPC proposed an O&M efficiency gain target of 0.5 % in the tariff period due to ageing transmission and distribution infrastructures and anticipating increase in O&M expenses because of increased in consumers base and geographical coverage and asset addition

The BEA is of the view that there should be possibilities of achieving efficiency gain in the operation and maintenance of the transmission and distribution system since several investments in BPC's investment plan such as Distribution Management System and installment of Ring Main Unit, Auto-reclosure circuit breaker, fault passage indicator, etc proposed to increase efficiency. Further, BPC submitted that they are taking various initiatives to reduce O&M cost in the area of controllable costs by setting performance targets. Based on above, BEA fixed an annual O&M efficiency target to 2%.

4.2 Regulatory fees allowances

As per the Fees and Charges, Schedule 1 of the Regulatory Fees Regulation, 2006, the license fee for transmission or system operation and distribution is calculated as 0.2 % of revenues from electricity tariff. Provided that the annual License fee shall be payable in advance, at the commencement of the financial year based on estimated revenue for the ensuing financial year as determined by the Authority.

4.2.1 BPC proposal

The BPC has proposed regulatory fees as shown in Table 40, according to the "Regulatory Fees Regulations of 2006". BPC submitted that the regulatory fee has been proposed based on the revenue from the proposed tariff.

Table 40: Proposed regulatory fees (Nu. Mill)

	2019/20	2020/21	2021/22
Regulatory fees	20.56	24.77	26.64

4.2.2 BEA review

The Regulatory Fees is calculated as 0.2% of revenues from the electricity tariff as per Schedule 1 of Regulatory Fees Regulation, 2006 as shown in Table 41.

Table 41: Reviewed regulatory fees (Nu. Mill)

Customer Category	2019/20	2020/21	2021/22	2019/20	2020/21	2021/22
	Forecasted volume (GWh)			Average tariff(Nu/kWh)		
LV	559	585	610	5.05	5.09	5.05
MV	126	128	143	5.14	5.30	5.03
HV	1784	1851	1905	2.21	2.28	2.31
Wheeling	7683	7583	7484	0.23	0.30	0.30
	2019/20		2020/21		2021/22	
Total revenue (Nu. Mill)	9153.4663		10124.3790		10445.5007	
Regulatory Fees (Ngultrum)	**18,306,933**		**20,248,758**		**20,891,001**	

4.3 The Return on Working Capital allowance

The allowance for Return on Working Capital is regulated in the Clause 76 of the TDR. The allowance is calculated as:

$$RoWC_C = I * \left[REV_C \times \frac{ARREARS_C}{365} + INVENTORIES \times IALLOC_C\right]$$

Where,

- $RoWC_C$ is the return on working capital allocated to Customer Group "C" in million Ngultrum;
- I is the interest rate for working capital as determined in Clause 55 of the TDR;
- $REV_C = OM_C + DEP_C + RoA_C$

  Where,

  - ✓ OM_C is the allowance for operating and maintenance costs for the Customer Group "C", in million Ngultrum;
  - ✓ DEP_C is the allowance for depreciation of assets for the Customer Group "C", in million Ngultrum and
  - ✓ RoA_C is the return on fixed assets for the Customer Group "C", in million Ngultrum, determined as:

$$RoA_C = WACC_C \times NA_C$$

Where,

- $WACC_C$ is the weighted average cost of capital for the Customer Group "C", as determined in accordance with Clause 72 of the TDR, as a percentage and
- NA_C is the net value of all fixed assets at the start of the year for the Customer Group "C", in million Ngultrum.

- $ARREARS_C$ is the allowed days receivables for the Customer Group "C", in days;
- $INVENTORIES_C$ is the allowance for the value of inventories, in million Ngultrum and
- $IALLOC_C$ is the allocation factor to Customer Group "C" for inventories, as a percentage, where $\sum_c IALLOC_{i,c}=1$.

The purpose of the Working Capital allowances is to compensate for the loss of revenues caused by the lag between the time of costs incurred and the time of receivables from the consumers, and to allow a return on capital for inventories.

4.3.1 BPC proposal

The BPC proposed the allowances for Working Capital as shown in Table 42.

Table 42: Proposed allowances on RoWC (Nu. Mill)

	2019/20	2020/21	2021/22
Wheeling	24	31	31
HV	15	18	19
MV	12	13	13
LV	47	50	52
Total	**98**	**112**	**115**

The BPC had proposed arrears of 45 days for HV, MV, and LV category of consumers and 50 days for the Wheeling, which are the same figures as approved by Authority for the Tariff period 2016-2019.

Also, BPC had proposed an inventory of Nu.320 million and 9.98% as interest rate on working capital.

4.3.2 Input from Stakeholders

The ABI in their written comments submitted that as per the Clause 7.7 of DEPT, the interest on working capital shall be determined based on the prevailing short term lending rate of financial institution of Bhutan. Therefore, the lowest short term lending rates of 8% (Manufacturing-Hydropower term loan at a floating rate of BoB) need to be considered.

4.3.3 BEA review

4.3.3.1 Arrears

The BPC had confirmed that there are no changes in MoU on bulk sale and purchase of electrical energy amongst Tala Hydroelectric Project Authority (THPA), Chhukha Hydro Power Corporation Limited (CHPC), Basochhu Hydro Power Corporation Limited (BHPC) and Bhutan Power Corporation Limited (BPC).

BEA is of the view that current bill payment duration of 30 days is too long and increases the cost of working capital for the consumers. Therefore, BEA upon discussion with BPC and DGPC reduced the bill payment duration to 20 days and approved the arrears as shown in Table 43.

Table 43: Reviewed arrears

Arrears (No of Days)	Wheeling	HV	MV	LV
Average consumption duration	15	15	15	15
Bill delivery duration	5	0	0	0
Bill payment duration	20	20	20	20
Arrears	**40**	**35**	**35**	**35**

4.3.3.2 Inventories

The BPC had proposed an inventory of Nu.320 million, which is the value reported as per the accounts of 31st December 2018.

Based on the proposed inventory, BEA deducted spare of infocom worth Nu. 4.2 million since it was provided by DITT, MoIC. Therefore, the reviewed inventories allowance is set as Nu. 316 million.

4.3.3.3 Allowance for Return on Working Capital (RoWC)

BPC proposed 9.98% as interest rate for working capital, which is the prevailing rate of the Bank of Bhutan to calculate the return on working capital.

As per the Clause 76 of TDR, the RoWC shall be calculated as the product of interest on working capital based on the prevailing lowest short term lending rate of financial institution in Bhutan at the time of tariff review.

The BEA sought clarification from the BoB whether the long term manufacturing loan-Hydropower the rate of one year floating interest rate of 8% can be availed for working capital purposes. The BOB clarified that since the aforementioned loan is for long term Hydropower construction and it cannot be availed for working capital. They informed that for short term working capital their loan interest rate of 9.97% will be applicable.

Accordingly, the BEA applied the lowest prevailing working capital loan interest rate of 9.97% to calculate the return on working capital. The BEA reviewed allowances for RoWC as shown in Table 44.

Table 44: Reviewed allowances for RoWC (Nu. Mill)

	2019/20	2020/21	2021/22
Wheeling	23	28	29
HV	19	21	22
MV	8	8	8
LV	32	33	34
Total	**82**	**90**	**93**

4.4 Non-Tariff Revenues

The Non-Tariff Revenue is the revenue collected from consumers that does not arise from the sale of electricity, such as application fees, connection fees and meter test fees etc. According to the Clause 86 of the TDR, the non-tariff revenues (NTR) shall be deducted from the cost of supply before calculating the tariffs.

4.4.1 BPC proposal

The BPC had proposed the non-tariff revenue for the next three tariff years based on the consolidated average historical non-tariff revenue for past three years (2016-2018) which is allocated to each customer category based on the number of consumers in the category. The proposed Non-tariff revenues are as shown in Table 45.

Table 45: Proposed Non-Tariff Revenues (Nu. Mill)

Non-Tariff Revenue	2016	2017	2018	2019	2020	2021
LV consumers	117.61	119.56	83.34	118	118	118
MV consumers	0.04	0.04	0.03	0.03	0.03	0.02
HV consumers	0.01	0.01	0.01	0.01	0.01	0.01
Total	**117.66**	**119.61**	**83.38**	**118.04**	**118.04**	**118.03**

Further, BPC had proposed the upward revision of the miscellaneous charges based on following:

i) Increased rural electrification and number of consumers has significantly increased the work load of BPC;

ii) Introduction of 100 units free electricity and subsidy to many other categories has made electricity relatively affordable for the consumers;

iii) Change in electricity consumption patterns and increased consumer expectation requires improvement in consumer services;

iv) Increase in cost of services owing to a general inflation since 2010;

v) Bad debts due to inadequate miscellaneous charges and their application methodology;

vi) Affordability of the existing charges; and

vii) Issues with the existing charges

4.4.2 BEA review

4.4.2.1 Non-Tariff Revenue

BPC reported that the Miscellaneous charges was not revised since 2010 except the energy security charges were revised in 2017. BPC submitted that since the current amount charged for services and deposits are low as compared to the cost of such services and there is a need to revise the rates to ensure the cost of services and the penalties are adequate to deter consumers from carrying out illegal activities such as stealing of electricity and connecting the lines disconnected by BPC. Further, BPC submitted that few charges are not clear and there is a need to revise the rates in a manner that shall bring clarity and ensure proper implementation within all Electricity Services Divisions.

Since there is a need to carry out detailed review of the proposed BPC miscellaneous charges to assess if the proposed charges are reasonable. There is also a need to conduct site visits and seek feedback from the various consumer categories on their proposed charges to come or a conclusion on the need to revise the prevailing charges. However, during the current review, there wasn't adequate time to conduct the review. Therefore, BEA is in the process of reviewing the Miscellaneous Charges proposal, BPC is requested to continue with the present miscellaneous charges until approval of new miscellaneous charges by BEA.

The BEA verified the consolidated historical non-tariff revenue and number of customer in each customer category submitted by BPC. Based on the consolidated historical non-tariff revenue and number of customer provided by BPC, the BEA adjusted the average historical non-tariff revenue to 2018 figures. The BEA then took the average of non-tariff revenue and apportioned it to the customer categories based on the number of consumers. The non-tariff revenues deducted from the cost of supply before calculating the tariffs are shown in Table 46.

Table 46: Reviewed Non-tariff revenue (Nu. Mill)

Non-Tariff Revenue	2019/20	2020/21	2021/22
Low Voltage	117.58	117.58	117.58
Medium Voltage	0.06	0.06	0.06
High Voltage	0.01	0.01	0.01
Total	**117.65**	**117.65**	**117.65**

5 Cost Allocation and Subsidies

5.1 Cost Allocation

The costs of supply for each customer group have to be determined. The assets, O&M and import costs, as well as fees and inventories, must be allocated across consumer groups. According to the TDR, this shall be done using allocation factors. The allocation factors for assets and associated costs like O&M, inventories, fees and levies for the consumer categories are to be updated based on the following provisions of TDR.

i) Where assets and associated costs are exclusively used by a particular Customer Group, the same shall be allocated fully to this Customer Group.

ii) Where assets and associated costs are for export purpose, the entire cost shall be allocated to that Customer Category.

iii) Where generation, transmission and distribution assets and their associated costs are meant for joint usage by different Customer Groups, the allocation factors shall be based on capacity demand in MW.

iv) From the above Clauses i), ii) and iii) of the TDR, weighted average allocation factors for all the Customer Groups shall be determined for allocating assets and associated costs that do not fall under the above three items including fees and levies of the Authority.

5.1.1 BPC Proposal

In keeping the provisions of DETP, BPC proposed revision of allocation factors for substation, civil structures, meters and O&M under transmission due to capitalization of Singyegaon Substation and 400kV GIS Substation, Jigmeling. BPC submitted that for Singyegaon Substation, the peak load of the substation was allocated to HV and MV and for 400kV GIS at Jigmeling, the factor was calculated using the transmission capacity at different voltage levels. The 500kVA, 400/220 kV is allocated to Export and 160kVA, 220/132 kV is allocated to HV. Finally, the allocation factor for transmission substation has been calculated using weighted average of the cost of the new substations and existing transmission substation. By using weighted average of the revised allocation under transmission, BPC proposed for the revision of allocation factors of meters, civil structures and O&M.

For distribution assets, BPC proposed revision of allocation factors for 33kV line, 11 kV line, meters, other assets and O&M based on the contract demand of MV for the year 2018 at 54 MW.

The allocation factors for rest of the assets, BPC proposed to retain the existing allocation factor. The proposed asset allocation factor is shown in Table 47.

Table 47: Proposed allocation factors

Items	Category		Export	HV	MV	LV
AALLOC $_{i,c}$ Allocation of Asset related Costs	Building & land		20%	21%	11%	48%
	Generation	Mini/micro hydels	0%	0%	30%	70%
	Transmission	Civil structures	54%	34%	3%	9%
		400+kV lines	99.5%	0.5%	0%	0%
		220kV lines	45%	55%	0%	0%
		132kV lines	39%	51%	3%	7%
		66kV lines	0%	45%	14%	41%
		Substations	35%	55%	5%	6%
		Meters	54%	34%	3%	9%
	Distribution	Civil structures	0%	0%	19%	81%
		33kV lines	0%	0%	48%	52%
		11kV lines	0%	0%	48%	52%
		6.6kV lines	0%	0%	0%	100%
		LV lines	0%	0%	0%	100%
		Substations/trans-formers	0%	0%	0%	100%
		Meters	0%	0%	19%	81%
	Others		20%	21%	11%	48%
OM AALLOC $_{i,c}$ Allocation of O&M Costs	Generation		0%	0%	30%	70%
	Transmission		54%	34%	3%	9%
	Distribution		0%	0%	19%	81%
	Others		20%	21%	11%	48%
IAALLOC i,c, Allocation of inventories			20%	21%	11%	48%
FAALLOC i,c, Allocation of Fees & Levies			20%	21%	11%	48%

5.1.2 Inputs from Stakeholders

The DGPC in their written comments submitted that the asset allocation factors used by BPC for allocation of assets to Wheeling needs to be reviewed. DGPC submitted that the BPC's proposed 2019 asset allocation to wheeling when compared to the allowable allocation factor as per TDR 2016 has increased in transmission (civil structures, smart grid hardware and software and meters) and operational and maintenance cost allocated to wheeling.

5.1.3 BEA review

As per Clause 62 of the TDR, BEA reviewed the proposed asset allocation factors for the tariff period as follows:

i) The assets and associated costs which are exclusively used by a particular Customer Group such as 6.6 kV lines, LV lines and distribution substations were allocated fully to LV consumers.

ii) The generation, transmission and distribution assets and their associated costs are meant for joint usage by Export, HV, MV and LV consumers were allocated based on capacity demand in MW.

iii) The Assets such as civil structures and meters under 'Transmission' and 'Distribution' assets category are allocated based on the weighted average of the costs and allocation factors within each asset category respectively. The allocation of O&M costs for the transmission assets is also based on this approach.

iv) The assets categorized as 'Building and Land' and 'Others' are allocated to various Customer Groups considering weighted average of generation, transmission and distribution assets allocation factors. The allocation of O&M costs for assets categorized as 'Others', allocation of inventories and allocation of fees and levies are also worked out using this approach.

The BEA reviewed asset allocation factors for the tariff period as shown in the Table 48.

Table 48: Reviewed asset allocation factors

Items	Category		Export	HV	MV	LV
AALLOC $_{i,c}$ Allocation of Asset related Costs	Building		20%	26%	10%	44%
	Generation	Mini/micro hydels	0%	0%	30%	70%
	Transmission	Civil structures	36%	46%	6%	12%
		400+kV lines	99%	1%	0%	0.0%
		220kV lines	42%	58%	0%	0%
		132kV lines	18%	63%	4%	15%
		66kV lines	0%	37%	15%	48%
		Substations	33%	51%	7%	9%
		Meters	36%	46%	6%	12%
	Distribution	Civil structures	0%	0%	14%	86%
		33kV lines	0%	0%	36%	64%
		11kV lines	0%	0%	36%	64%
		6.6kV lines	0%	0%	0%	100%
		LV lines	0%	0%	0%	100%
		Substations/trans-formers	0%	0%	0%	100%
		Meters	0%	0%	14%	86%
	Others		20%	26%	10%	44%
OM AALLOC $_{i,c}$ Allocation of O&M Costs	Generation		0%	0%	30%	70%
	Transmission		36%	46%	6%	12%

	Distribution	0%	0%	14%	86%
	Others	20%	26%	10%	44%
IAALLOC i,c, Allocation of inventories		20%	26%	10%	44%
FAALLOC i,c, Allocation of Fees & Levies		20%	26%	10%	44%

5.2 Cost of supply per customer group

Like in the past, in this tariff period also the asset related cost, O&M and RoWC of the BPSO has been considered with the BPC cost since the BPSO costs are incurred in carrying out the functions of system operation which is one of the BPC's licensed activities in addition to transmission, distribution, generation and supply activities.

The allocation factors in Table 48 allocate the asset related cost, O&M cost, working capital (fees and inventories) to the different consumer groups. Energy costs, including cost of losses are allocated according to the sales and loss factors for each consumer group. Non-Tariff Revenues are deducted directly from the relevant customer groups cost of supply. The reviewed cost of supply for Wheeling, HV, MV and LV are shown in Table 49,Table 50,Table 51 and Table 52.

Table 49: Reviewed cost of supply to Wheeling (Nu. Mill)

	2019/20	2020/21	2021/22
Energy costs	230	227	225
Network costs	1,481	1,983	1,996
Working capital	23	28	29
Other revenue	(0)	(0)	(0)
Unsubsidized cost of supply	**1,734**	**2,238**	**2,249**

Table 50: Reviewed cost of supply to HV consumers (Nu. Mill)

	2019/20	2020/21	2021/22
Energy costs	2,758	2,862	2,946
Network costs	1,170	1,342	1,430
Working capital	19	21	22
Other revenue	(0)	(0)	(0)
Unsubsidized cost of supply	3,948	4,225	4,398

Table 51: Reviewed cost of supply to MV consumers (Nu. Mill)

	2019/20	2020/21	2021/22
Energy costs	199	204	227
Network costs	439	469	485
Working capital	8	8	8
Other revenue	(0)	(0)	(0)
Unsubsidized cost of supply	646	681	720

Table 52: Reviewed cost of supply to LV consumers (Nu. Mill)

	2019/20	2020/21	2021/22
Energy costs	966	1,011	1,055
Network costs	1,945	2,052	2,108
Working capital	32	33	34
Other revenue	(118)	(118)	(118)
Unsubsidized cost of supply	2,826	2,978	3,079

6 Average price per customer group

As per Clause 87 of the TDR, the Average Price for a Customer Group shall be determined as the ratio of the discounted costs of supply for that Customer Group to the discounted electricity sales to that Customer Group, where sales are adjusted for an allowed collection rate, and where discounting occurs over the Tariff Period at the WACC applicable to the Customers.

$$AP_C = \frac{\sum_{n=1}^{TP} COST_{C,n} \Big/ (1 + WACC_C)^n}{\sum_{n=1}^{TP} (SALES_{C,n} \times COLL) \Big/ (1 + WACC_C)^n}$$

Where,

- AP_C is the Average Price for Customer Group "C", in Ngultrum per kWh;
- TP is the number of years in the Tariff Period;
- $COST_{C,n}$ is the cost of supply allocated to Customer Group "C" in year "n", as determined in accordance with Clause 86 of the TDR in million Ngultrum;
- $SALES_{C,n}$ is the volumes of electricity sales expected from Customer Group "C" in year "n", in GWh;
- COLL is the target collection rate set by the Authority for the Licensee, as a percentage; and
- $WACC_C$ is the Weighted Average Cost of Capital for the Customer Group "C", as determined in accordance with Clause 72 of the TDR, as a percentage.

6.1 *BPC proposal*

BPC had proposed the unsubsidized cost of supply as shown in Table 53.

Table 53: Proposed unsubsidized cost supply

Consumer	Unsubsidized cost supply(Nu/kWh)
Wheeling	0.316
High Voltage	2.24
Medium Voltage	5.82
Low Voltage	5.89

6.2 *BEA review*

Considering the approved domestic generation cost of supply, WACC, sales forecast, and cost allowances for each customer category the unsubsidized cost of supply for the period 2019/20 to 2021/22 for each customer group is as shown in Table 54.

Table 54: Approved Cost of Supply

Consumer	Unsubsidized Cost (Nu/kWh)
Wheeling	0.270
High Voltage	2.26
Medium Voltage	5.15
Low Voltage	5.06

6.3 Subsidies

In line with the DETP, the BEA upon determination of the Cost of Supply submitted the tariff subsidy allocation proposal to Minister through the DHPS for consideration.

The RGoB, in keeping with subsidy allocation principles of DETP, approved the annual subsidy allocation of Nu.1,478.57 million to the LV and MV consumers with effect from 1st October 2019. The per unit subsidy approved by the RGoB to LV and MV consumers are as shown in the Table 55.

Table 55: Per Unit Subsidy to LV and MV consumers

Customer Category	RGoB subsidy per unit (Nu.)		
	1st October 2019 to 30th June 2020	1st July 2020 to 30th June 2021	1st July 2021 to 30th June 2022
Low Voltage			
LV Block I (Rural) 0-100 kWh	5.06	5.06	5.06
LV Block I (High landers) 0-200 kWh	5.06	5.06	5.06
LV Block I(Others) 0-100 kWh	3.78	3.78	3.78
LV Block II(All)	2.38	2.38	2.38

101-500 kWh			
LV Block III(All) >500 kWh	1.49	1.46	1.42
LV Bulk	1.00	0.96	0.92
Medium Voltage	0.86	0.65	0.45

7 Tariff structures

The DETP provides the following guidelines on the tariff structure for the LV, MV and HV consumers:

i. The tariff structure for general LV consumers shall comprise of only energy charges with progressive blocks and tariff starting with a lifeline block to ensure that the energy is provided at minimal rate for meeting the basic energy requirements. The tariff structure for other LV consumers such as commercial, industrial, institutes, street lightings, temporary connections etc. shall consist of single tier energy charge.

ii. The tariff structure for MV and HV consumers shall consist of fixed and variable charges. The fixed charge shall be to recover the network cost and variable charge shall be the generation cost.

iii. The wheeling charge shall consist of common single charge levied per unit energy wheeled through the network including export. In order to optimize the transmission infrastructure, common corridors are being constructed for exporting of electricity from several generating stations.

7.1 BPC proposal

The BPC submitted that the tariff structure of LV, MV, HV and wheeling to be retained as mentioned in the guidelines of the tariff structure in the DEPT. BPC also submitted that MV and HV tariff was proposed to maintain the variable costs as pass through generation cost and the fixed charge as demand charges based on the Nu/kVA/month as in the existing tariff. The BPC's proposed block wise billing data for LV, MV and HV forecast are shown in Table 56.

Table 56: Proposed billing assumption

Customer Group	Unit	2019	2020	2021
Low Voltage				
0-100	GWh	61	59	61
100-300	GWh	87	90	94
300+	GWh	238	256	272
Total		386	404	428
LV bulk	GWh	73	84	88
LV Total		459	488	515

Medium Voltage				
Energy	GWh	119	162	162
Demand	MVA	74	78	78
High Voltage				
Energy	GWh	1,689	2,460	2,810
Demand	MVA	314	463	463
Wheeling	GWh	7,923.17	7,718.21	7,387.83

The BPC submitted that tariff structure for LV is dependent on the subsidy available and LV Block tariff structure to be maintained. The tariff structure for MV and HV are calculated using the billing assumptions as shown in Table 57.

Table 57: Proposed tariff structure

Customer Group	Unit	2018	2019	2020	2021
Low Voltage					
0-100	Nu./kWh	**1.28**	Depends on the subsidy		
100-300	Nu./kWh	**2.68**			
300+	Nu./kWh	**3.53**			
LV Bulk		**4.02**			
Medium Voltage					
Energy Charge	Nu/kWh	**2.16**	2.48	2.86	2.95
Demand Charge	Nu/kVA/month	**300**	448.49	495.00	495.00
High Voltage					
Energy Charge	Nu/kWh	**1.59**	1.59	1.59	1.59
Demand Charge	Nu/kVA/month	**262**	290	290	290
Wheeling	Nu/kWh	**0.195**	0.316	0.316	0.316

BPC states that for MV Consumers, the subsidy being removed and there will be substantial rise in demand charge from year 2019 onwards.

7.2 The approved tariff structure

Based on the reviewed sales forecast for LV, MV and HV consumers, the BEA approved the billing assumption for the tariff period 2019/20 to 2021/22 as shown in Table 58

Table 58: Reviewed billing assumptions

Consumer Group	Unit	2019/20	2020/21	2021/22
Low Voltage (LV)				
0 – 100 kWh (Rural)	GWh	86	91	97
0 – 200 kWh (Highlander)	GWh	0.77	0.89	1.02
0 – 100 kWh (Others)	GWh	57	60	64
101– 500 kWh	GWh	111	118	125
500 + kWh	GWh	222	233	243
LV Bulk	GWh	81	82	81

Medium Voltage (MV)				
Energy	GWh	126	128	143
Demand	MVA	62	65	82
High Voltage (HV)				
Energy	GWh	1,784	1,851	1,905
Demand	MVA	365	405	447
Wheeling	GWh	7,683	7,583	7,484

In keeping with provisions of DETP, BEA approved the tariff structure for a general LV customer only energy charges with progressive blocks. The rural LV Block I (0-100 kWh) includes the rural domestic households, the rural cooperatives, community Lhakhangs and micro trade activities. However, for consumption beyond hundred (100) Units per month, LV Block II & III (All) tariff shall be applicable.

The Government has approved the introduction of new LV Block I (Highlanders) for providing fully subsidized 200 units per month for rural consumers living in Laya, Lingshi, Merak and Sakteng. The Government has also approved the provision of LV Block II tariff and above to the Small and Cottage Industries.

The LV consumers such as street lighting, temporary connections for non-residential purpose, institutions and all other non-residential LV consumers including commercial and industrial consumers shall be charged at LV Block III tariff.

The BEA also approved tariff structure for MV and HV consumers consisting of fixed and variable charges. The fixed charge shall be to recover the network cost and variable charge shall be the generation cost for HV consumers. The BEA approved wheeling charge consisting of common single charge levied per unit energy wheeled.

Based on the approved cost of supply for DGPC, MHP and BPC, subsidy injection by RGoB and the billing assumptions, the approved tariffs structure for the period 1st October 2019 to 30th June 2022 is shown in Table 59.

Table 59: The approved tariff structure for 1st October 2019 to 30th June 2022

Customer Category	Unit	Existing	1st October 2019- 30th June 2020	1st July 2020 - 30th June 2021	1st July 2021 - 30th June 2022
Low Voltage					
LV Block I (Rural) 0-100 kWh	Nu./kWh	0	0	0	0
LV Block I (High landers) 0-200 kWh	Nu./kWh		0	0	0
LV Block I(Others) 0-100 kWh	Nu./kWh	1.28	1.28	1.28	1.28
LV Block II(All) 101-500 kWh	Nu./kWh	2.68	2.68	2.68	2.68
LV Block III(All) >500 kWh	Nu./kWh	3.53	3.57	3.60	3.64
LV Bulk	Nu./kWh	4.02	4.06	4.10	4.14
Medium Voltage					
Energy Charge	Nu./kWh	2.16	2.24	2.45	2.65
Demand Charge	Nu./kVA/M	300	325	325	325
High Voltage					
Energy Charge	Nu./kWh	1.59	1.50	1.50	1.50
Demand Charge	Nu./kVA/M	262	292	292	292
Wheeling Charges	Nu/kWh	0.195	0.270	0.270	0.270