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**DrukGreen**

**PROPOSAL FOR REVISION OF DOMESTIC GENERATION TARIFF  
(July 2022-June 2025)**

February 2022



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## 1. Executive Summary

This proposal is prepared for the tariff period July 2022 - June 2025 in accordance with the Tariff Determination Regulation 2016 (hereinafter referred to as TDR) and the Domestic Electricity Tariff Policy 2016 (hereinafter referred to as Tariff Policy) reflecting the actual cost of efficient business operation of DGPC. The tariff is calculated using Bhutan Electricity Authority's (BEA) Generation Tariff Model based on the parameters as specified in the TDR and the Tariff Policy.

The proposal consists of the consolidated weighted average generation tariff proposal for all the DGPC power plants: Basochhu, Chhukha, Kurichhu and Tala, and including the weighted average generation tariff of the embedded generation assets that will be transferred from BPC to DGPC.

In 2021, it has been agreed between DGPC and BPC that the embedded generation assets of BPC will be transferred to DGPC. This was directed with the objective to consolidate all the generation assets under DGPC and the transmission and distribution assets under BPC. The embedded generation assets comprising of mini/micro hydropower plants, solar and wind of different capacities that are connected to the electricity distribution network are to be handed over to DGPC on "as is where is basis" by end of June 2022 as the O&M costs till this period had already been considered in the domestic tariff for BPC.

The derived generation tariff for DGPC including the embedded generation assets is Nu. 1.54 per kWh. It was determined using the annual mean energy of 6,149 GWh based on the average historical generation. The derived generation tariff proposed is in keeping with the parameters as below:

Table 1: Proposed Generation Tariff

SN	Parameters	DGPC
1	Cost of Equity (CoE)	13.56%
2	Cost of Debt (CoD)	10.53%
3	Corporate Tax	30.00%
4	Proposed Gearing	60%
5	WACC	14.07%
6	Generation (GWh)	6,149
7	<b>Tariff (Nu. per kWh)</b>	<b>1.54</b>

The proposed DGPC tariff of Nu. 1.54 per kWh is a reasonable increase of 8.45% from the current tariff of 1.42 kWh. The proposed upward revision has considered the cost of generation reflecting the cost of efficient business operation, while ensuring the increase in tariff is within the permissible limits of the Tariff Policy and the regulatory framework. This will also ensure that the national revenues are safeguarded and prevent the erosion of export revenues by domestic sales and help ensure steady flow of revenues to the Royalty Government of Bhutan from the hydropower sector.

DGPC submits to the Bhutan Electricity Authority (BEA) for a favorable review of the proposal for the domestic generation tariff for the July 2022 - June 2025 tariff period.

## 2. Introduction

This proposal for the revision of domestic generation tariff has been prepared as per the provisions of the Tariff Determination Regulation 2016 (TDR), Guideline for Determination of Regulatory Asset Base 2021 (RAB) and the Domestic Electricity Tariff Policy of Bhutan 2016 (Tariff Policy) considering the following principles for tariff determination:

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

The Bhutan Electricity Authority (BEA) revised the DGPC's generation tariff from Nu. 1.59 per kWh to Nu. 1.42 kWh for the tariff period 1<sup>st</sup> October 2019 to 30<sup>th</sup> June 2022. With the expiry of the existing tariff period as on 30<sup>th</sup> June 2022, the proposal for the revision of the generation tariff has been prepared based on net asset schedule, the investment plans and the O&M costs for the tariff period July 2022 - June 2025.

In 2021, it was agreed between DGPC and BPC that the embedded generation assets of BPC will be transferred to DGPC, with the objective to consolidate all the generation assets under DGPC and the transmission and distribution assets under BPC. The embedded generation comprising of mini/micro hydropower plants, solar and wind of different capacities that are connected to the electricity distribution network are to be handed over to DGPC on "as is where is basis" by end of June 2022 till which period the O&M costs had already been considered in the domestic tariff for BPC.

The tariff revision proposal therefore considers the weighted average generation tariff of DGPC power plants including embedded generation assets.

## 3. Parameters Used for Tariff Determination

The Generation Tariff Model provided by BEA is used to calculate the average cost of supply. The average cost of supply is determined based on the cost of supply methodology and using the principles to reflect the actual cost of efficient business operation.

The various inputs used in the generation tariff model are in keeping with the TDR, RAB and the Tariff Policy and are presented below.

### 3.1 Tariff Period

The total cost and the total energy are discounted over the tariff period using the Weighted Average Cost of Capital (WACC). The tariff period is proposed as 3 (three) years as per the provisions of the Tariff Policy. The financial statements of DGPC for the year 2021 have been used as the reference year for the calculations. The 2021 audited financial statements are attached as *Annexure I*.

### 3.2 Cost Parameters

As per the clause 7 of the tariff policy on the guiding principles for tariff formulation, the total cost comprises of:

- a) Operation and Maintenance Cost;
- b) Depreciation;
- c) Return on Assets;
- d) Cost of Working Capital; and
- e) Generation licensee fee

The cost components used as input in the tariff model are as below.

### 3.2.1 Cost of Equity

The Cost of Equity (CoE) of 13.56% has been proposed in line with BEA's consideration of 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 in the last tariff review. The present average lending rates of the domestic financial institutions of all sectors is 11.06% as given in Table 2. As per the Tariff Policy, BEA could 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. Therefore, a premium of 250 basis point is considered and post-tax cost of equity of 13.56% is proposed.

Table 2: Average long term lending rates of financial institutions in Bhutan

SN	Banks	Interest Rate
1	Bhutan Development Bank Limited (BDBL)	11.24%
2	Bhutan Insurance Limited (BIL)	12.40%
3	Bhutan National Bank Limited (BNBL)	10.83%
4	Bank of Bhutan Limited (BOBL)	11.66%
5	Druk Punjab National Bank (Druk PNB)	9.94%
6	National Pension & Provident Fund (NPPF)	9.50%
7	Royal Insurance Corporation of Bhutan Limited (RICBL)	12.20%
8	Tashi Bank Limited (T Bank Ltd.)	10.69%
	<b>Average Rate</b>	<b>11.06%</b>

Source: Interest rates information available on the respective company websites (Interest rates as of January 26, 2022 and considered term loan above 10 years as long term)

The proposed cost of equity of 13.56% is reasonable compared to approved COE in the previous tariff review. Further, considering the Central Electricity Regulatory Commission (CERC) norms in India, which provides cost of equity at the base rate of 16.50% for the storage type hydro generating stations including pumped storage hydro generating stations and run of river generating station with pondage, the proposed CoE of 13.56% is very reasonable.

### 3.2.2 Cost of Debt

The weighted average Cost of Debt (CoD) of 10.53% for DGPC is proposed. This is based on the provisions of the Tariff Policy, which states that the actual cost of debt for the tariff period should be considered.

The cost of debt is calculated as a weighted average of the interest rates of the loan balance amount of the DGPC power plants and the addition of the institutional investments to be funded through new loans with the interest rate of 11.06% (average lending rates of long-term loan from domestic banks and non-bank institutions) during the tariff period. The details of debt including all the existing loans and the proposed loans for DGPC are given in Table 3.

Table 3: Debt Details

SN	Loan Details	Loan Disbursements	Principle Amount (Mill Nu.)	Interest rate (%)	Repayment period (years)	Loan balance 31.12.2022 (Mill Nu.)	Loan balance 31.12.2023 (Mill Nu.)	Loan balance 31.12.2024 (Mill Nu.)
1	BHP Lower Stage	2 Apr 2002 to 17 Jun 2005	1,648.87	6.00	15	219.849	109.924	-

2	BHP Upper Stage	30 Dec 1997 to 14 Oct 2007	708.00	6.00	20	141.600	106.200	70.800
3	Proposed Loan	2022	1,193.73	11.06	10	1,193.73	1,122.54	1,043.47
4	Proposed Loan	2023	3,286.65	11.06	10	-	2,092.92	1,968.10
5	Proposed Loan	2024	4,556.98	11.06	10	-	0.00	1,270.34
	<b>Total</b>		<b>11,394.24</b>			<b>1,555.18</b>	<b>3,431.58</b>	<b>4,352.72</b>

### 3.2.3 Gearing Ratio

The gearing ratio has been calculated as defined in the TDR using the Debt to Total Net Fixed Assets. In order to ensure competitive and efficient pricing through an optimal capital structure, the Tariff Policy provides that the gearing ratio for computation of WACC shall be higher than the actual gearing ratio and up to a maximum of 70:30.

The loans for the Tala and Kurichhu hydropower plants are already repaid and during this tariff period, BHP's loan repayment will also be completed. Therefore, DGPC's actual average gearing ratio is only about 0.66%. With the propositioned loans for the proposed institutional investments during the tariff period, the gearing ratio increases to 9.72%. In the last tariff review, BEA had approved a gearing ratio of 60%, which is on the higher side when compared to the actual gearing of DGPC. Considering the need to keep domestic generation tariff affordable, a gearing ratio of 60% for DGPC is proposed for this tariff period as well as was approved in the last tariff review.

### 3.2.4 Weighted Average Cost of Capital (WACC)

The WACC is determined using the formula set out in the TDR with cost of equity and the cost of debt as proposed above. The WACC determined and proposed for DGPC is given in Table 4 below:

Table 4. Proposed WACC for Tariff Determination

SN	Parameters	Proposed Parameters 2022-2025
1	Cost of Equity (CoE)	13.56%
2	Cost of Debt (CoD)	10.53%
3	Corporate Tax	30%
4	Proposed Gearing	60%
5	<b>WACC</b>	<b>14.07%</b>

### 3.3 Return on Assets

The return on assets is determined by the Net Assets multiplied by the WACC. The asset schedule that has been used in the tariff model is as given in Table 5.

#### 3.3.1 Fixed Assets

BEA, in the year 2021, has issued the guideline for determining the regulatory asset base to provide transparency and certainty in establishing Regulatory Asset Base of the Licensees for tariff determination. As per the relevant provisions of the guideline:

9. *The Authority shall establish the initial Regulatory Asset Base of each Licensee based on the following criterion:*

- 1) *For existing Licensees, the historical cost of assets based on audited accounts as of 31<sup>st</sup> December 2021 shall be considered; and*

- 2) For new Licensees, which come into existence after the commencement of this guideline, all capitalized cost of assets approved by the Royal Government of Bhutan shall be considered for tariff determination.

22. Any asset received free of cost by the Licensee from Government or Government owned Agency shall be included in Regulatory Asset Base and treated as equity injection of the Government.

Therefore, to establish the initial Regulatory Asset Base, DGPC's asset schedule and the embedded generation asset schedule as of 31<sup>st</sup> December 2021 derived as per the depreciation rates given in Schedule B of the TDR is used for the tariff calculation as given below.

Table 5. DGPC Power Plant's Asset Schedule including Embedded Generation Asset

Asset	Gross Value (Mill. Nu.)	Acc. Dep (Mill. Nu.)	Net Value (Mil. Nu.)	Depreciation (Mil. Nu.)
Land	3.91	-	3.91	-
Buildings	2,564.46	1,018.52	1,545.95	84.51
Civil structures	3,328.10	1,292.05	2,036.05	110.66
Dam complex	12,147.66	5,869.06	6,278.60	403.95
Water conductor	23,565.56	10,222.26	13,343.30	784.73
Power house	21,318.16	11,769.40	9,548.76	752.19
Transmission equipment	351.08	204.35	146.72	12.32
Equipment	1,089.71	841.03	248.67	36.07
Office equipment	702.15	567.49	134.66	67.56
<b>Total DGPC</b>	<b>65,070.78</b>	<b>31,784.17</b>	<b>33,286.63</b>	<b>2,251.99</b>
Mini/Micro Plants	411.45	-	411.45	50.94
<b>Total (DGPC and EG)</b>	<b>65,482.24</b>	<b>31,784.17</b>	<b>33,698.07</b>	<b>2,302.93</b>

Source: DGPC annual accounts as of 31<sup>st</sup> Dec 2021

The list of mini/micro hydropower plants, solar and wind assets to be transferred to DGPC is enclosed in **Annexure II**. The embedded generation assets will be transferred to DGPC at cost on the net asset values as per BPC's books of account. The total book value of Nu. 411.45 million with grant of Nu. 152.7 million is considered in the tariff proposal.

### 3.3.2 Investments

The Investment Schedule has been prepared using the 2021 approved DGPC Investment Plan 2022-2024. The investment schedule used for tariff calculation as given in Table 6 below was prepared based on the capitalization schedule.

Table 6. DGPC's Investment Schedule including Embedded Generation Investment

Asset	2022 (Mill Nu.)	2023 (Mill Nu.)	2024 (Mill Nu.)
Land	-	-	-
Buildings	5.00	486.63	5.00
Civil structures	26.02	22.50	14.00
Dam complex	539.47	3.78	142.21
Water conductor	-	-	-
Power house	238.70	1,088.41	587.35
Transmission equipment	-	8.00	13.75
Equipment	159.76	167.74	176.13
Office equipment	84.99	60.57	94.75
<b>Total (DGPC) Nu. 3,924.76 Million</b>	<b>1,053.94</b>	<b>1,837.63</b>	<b>1,033.19</b>
Mini/Micro Plants	139.79	255.29	237.15
<b>Total (DGPC and EG) Nu. 4,556.99 Million</b>	<b>1,193.73</b>	<b>2,092.92</b>	<b>1,270.34</b>



The Investment Plan includes only the institutional investments pertaining to the existing power plants, and does not include investments in new generation capacity addition. The investment plan for Embedded Generation is considered based on assessment study and reports prepared by BPC. The detailed investment plan for DGPC and Embedded Generation is enclosed as **Annexure III**.

### 3.4 O&M Allowance

The O&M cost comprises of operations and maintenance costs, employee costs, and other expenses. The wheeling charges and power import costs are not included. The O&M allowance of Nu. 1,935.16 million is considered for DGPC in the tariff model based on the historical average O&M costs for the past three years adjusted for inflation as detailed below.

#### 3.4.1 Historical O&M Cost

The historical O&M cost for the past three years as per the annual accounts are given in Table 7. As per the provisions of the Tariff Policy, the costs related to CSR and income from rental and hire charges are deducted for tariff calculation purposes.

Table 7. Consolidated Historical O&M costs for DGPC (Nu. Million)

<b>Total Expenses</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>
O&M Expenses	498.31	479.12	498.62
Employee Expenses	932.36	961.96	988.20
Other General Expenses	285.80	901.13	315.51
Embedded Generation	16.75	17.25	22.76
<b>Total</b>	<b>1,733.21</b>	<b>2,359.47</b>	<b>1,825.53</b>
<b>Deductible Expenses</b>			
Corporate Social Responsibility	16.10	13.35	22.27
Foreign Exchange Loss	38.18	71.05	54.60
House Rent Income	14.63	15.88	15.70
License Fee	14.80	14.80	14.80
<i>Total</i>	83.71	115.08	107.37
<b>Net Allowable Expenses</b>	<b>1,649.50</b>	<b>2,244.39</b>	<b>1,718.16</b>

Table 8. DGPC Actual and Allowed Expenses in last tariff review (Nu. Million)

<b>Total Expenses</b>	<b>2019</b>	<b>2020</b>	<b>2021</b>	<b>Total</b>
(a) Actual O&M Expenses	1,649.50	2,244.39	1,718.19	5,612.05
(b) Allowed O&M Expenses in last tariff review	1,597.9	1,614.9	1,636.2	4,849.00
<b>Difference (a)-(b)</b>	<b>51.60</b>	<b>629.49</b>	<b>81.99</b>	<b>763.05</b>

From the above it can be seen that the actual expenses for last tariff review 2019-2021 has exceeded from the approved O&M allowances by total of **Nu. 763.05 million** resulting in under recovery of the same.

In the last tariff review, BEA has allocated only 80% of the Corporate Office (CO) assets and depreciations towards the existing power plants with 20% allocated to other projects and not considered in the tariff calculations. While the entire O&M cost of CO was allowed, however on the proposed asset schedule, BEA has significantly deducted assets values in buildings in the power plants. BEA has deducted the building assets of power plants amounting to Nu. 1,374.07 Million from the tariff calculations and has considered only Nu. 400.22 Million in tariff computation from the proposed Nu. 1,774.29 Million in building assets. The corresponding O&M costs amounting to Nu. 21.69 million for the assets/buildings which BEA

believed were not used for delivering the core business of electricity generation was deducted from the total O&M cost approved. This therefore, also led to the under recovery in O&M cost.

For this tariff proposal, it is submitted that the entire asset and O&M cost of DGPC be approved in this tariff review.

### 3.4.2 Inflation

The average annual inflation rate of 3.40% based on the average inflation rate for the past three years is proposed. As per Clause 7.4 of the Tariff Policy, the inflation rate used for escalation of O&M expenses shall be based on historical average inflation rates published by the National Statistics Bureau (NSB). The historical inflation figures are based from the Consumer Price Index bulletin of the NSB for non-food items and calculated as the arithmetic average of the year on year inflation rates.

The average inflation rate is used to escalate the historical O&M cost to 2021 price levels and to escalate the O&M allowance over the tariff period. The average annual inflation rate of 3.40% for the past three years as given below in Table 9 is used for the tariff period.

Table 9. Year on Year historical Inflation on Non-Food Item

Year	2019	2020	2021	Average
<b>Inflation figures</b>	1.35%	2.02%	6.82%	<b>3.40%</b>

Source: Consumer Price Index Bulletin, National Accounts and Price Division, National Statistical Bureau

### 3.4.3 O&M Efficiency Gain

An O&M efficiency gains target of 0% is proposed. It is observed that there is an average increase of 6.15% in the O&M cost of DGPC over the period from 2019-2021 while the average inflation increase is only 3.40%. As seen from O&M cost review of the last tariff period, there is under recovery of Nu. 763.05 million in O&M cost.

Table 10. DGPC Historical O&M Costs

Year	2018	2019	2020	2021	Average Increase
O&M Cost	1,558.57	1,649.50	2,244.39	1,718.16	
% Increase		5.83%	36.06%	-23.45%	6.15%
Inflation		1.35%	2.02%	6.82%	3.40%

Therefore, the O&M efficiency gain of 0% is proposed to at least recover the O&M cost increase at inflation rate (3.40%). The proposed 3.40% annual O&M cost escalation is very reasonable even in comparison to the 2019 CERC norms, where an annual escalation of 4.77% in O&M costs for generation is allowed.

### 3.4.4 Benchmark O&M Cost

An O&M cost allowance of 1.00% has been considered for new investments capitalized during the tariff period. As per Schedule A of the TDR, a benchmark operation and maintenance (O&M) cost of 1.00% to 1.50% of the capital cost, adjusted for consumer price index since installation or the revalued capital cost, is allowed. The Tariff Policy states that the O&M benchmarks for the new investments shall be maintained lower than that of older assets.

The proposed average O&M allowance of Nu. 1,935.16 million is 1.33% of the capital cost (replacement value). The revalued asset cost of DGPC during the tariff period is Nu. 145,122.16 million. The revalued asset costs of the DGPC power plants, valued by Mack Insurance Surveyors and Loss Assessors Pvt. Ltd. are as given in Table 11. While the actual O&M benchmark indicates a 1.33% of the capital cost, and BEA allows for O&M cost allowance between 1% to 1.5%, a much lower benchmark of only 1% of the capital cost for new investments to be capitalized during the tariff period is proposed.

Table 11. New Replacement Cost (2021)

Plants	Replacement Value (Mill Nu.)
Basochhu Hydropower Plant	7,325.52
Chhukha Hydropower Plant	37,330.04
Kurichhu Hydropower Plant	13,518.50
Tala Hydropower Plant	86,948.10
<b>Total Assets (Replacement Cost)</b>	<b>145,122.16</b>
O&M Allowance	1,935.16
O&M Benchmark Cost	1.33%

This O&M allowance reasonable in comparison to benchmarks set by India's 2019 CERC norms where it allows for an allowance of 5% of original capital cost for projects with installed capacity less than 200 MW and 3.5% for projects with installed capacity more than 200 MW.

### 3.5 Cost of Working Capital

The calculation of the cost of working capital uses the annual inventories and arrears.

#### 3.5.1 Inventories

DGPC's average inventories for the years 2019 to 2021 amounting to Nu. 455.16 million, as shown in Table 12, has been used in the tariff determination.

Table 12. DGPC Historical Inventories (Mill Nu.)

Year	2019	2020	2021	Average
Inventories (Mill Nu.)	482.69	389.39	474.39	448.82
Mini/Micro Plants (Mill Nu.)				6.34
<b>Total (Mill Nu.)</b>				<b>455.16</b>

#### 3.5.2 Arrears

An arrears of 50 days is used for tariff calculations. This is as per the May 12, 2017 Agreement signed between DGPC and BPC for Sale and Purchase of Electrical Energy where a bill payment duration of 30 days is provided. A bill preparation duration of 5 days and the average consumption period of 15 days is also added to arrive at the arrears.

#### 3.5.3 Interest on Working Capital

The working capital interest rates offered by the seven (7) financial institutions of Bhutan has been reviewed and found that the lowest working capital rate of 9.97% is offered by Bank of Bhutan. Accordingly, the lowest prevailing lowest short-term lending rate of 9.97% has been applied to calculate the return on working capital.

Table 13. Arrears

Arrears	No of Days
Average Energy consumption duration	15
Bill preparation and delivery duration	5
Bill payment due date	30
<b>Total Arrears</b>	<b>50</b>

Source: Agreement signed between DGPC and BPC for Sale and Purchase of Electrical Energy on 12<sup>th</sup> May 2017

Table 14. Proposed inventories, arrears and rate

<b>Proposed Inventories, Arrears and Interest Rate</b>	<b>No of Days</b>
Inventories	455.16
Arrear (Days)	50
Interest rate	9.97%

### 3.6 Regulatory Fees

The regulatory fees to the BEA of Nu. 14.80 million (Nu. 10,000 per MW) has been added separately in the tariff model as the annual regulatory fee for DGPC. As per system operator charges regulation 2022, the system operator charges from the Generation, Transmission, Distribution Licenses and any other users is applicable from the upcoming tariff period. As per clause 37 of the regulation, the total cost of system operator shall be recovered from Generation, Distribution, and any other users as system operator charges for the service rendered by system operator and accordingly shall be allocated as follows:

- 1) Generation = Half (1/2) of total cost of System Operator
- 2) Transmission and Distribution = Half (1/2) of total cost of System Operator

The system operator cost allocated to generation shall be further allocated to individual Generation Licensee based on the installed capacity (MW).

Based on the above provisions from the regulation, the system operator charge for DGPC is calculated as following and considered in the tariff model.

Table 15. System Operator Proposed Charges (in Mill Nu.)

<b>SN</b>	<b>Parameters</b>	<b>July 2022 – June 2023</b>	<b>July 2023 – June 2024</b>	<b>July 2024 – June 2025</b>
1	Proposed O&M Cost	57.66	56.77	55.52
2	Proposed Capital Cost	140.63	270.14	70
3	Regulatory Fees	0.40	0.65	<b>0.75</b>
	<b>Total</b>	<b>198.69</b>	<b>327.57</b>	<b>126.27</b>

Table 16. System Operator Cost Allocation to Generation and DGPC

<b>SN</b>	<b>Parameters</b>	<b>July 2022 – June 2023</b>	<b>July 2023 – June 2024</b>	<b>July 2024 – June 2025</b>
1	Allocated to Generation (50%)	99.35	163.79	63.14
2	Allocated to DGPC	63.21	104.21	40.17

### 3.7 Energy Volumes

The generation forecast based on the actual generation for the past 3 years for DGPC less the 15% royalty energy volumes is used to derive energy volumes.

#### 3.7.1 Annual Energy Generation Forecast

An annual energy forecast of 7,289 GWh is proposed for DGPC as given in Table 17. This is based on the actual historical energy generated by the DGPC power plants as given in Table 18 and of the Embedded Generation assets as given in Table 19.

Table 17. Generation Forecast for DGPC

Average Annual Energy for the year 2022 to 2024 in MU					
	<b>BHP</b>	<b>CHP</b>	<b>KHP</b>	<b>THP</b>	<b>Total</b>
Energy Generation for DGPC	331.38	1,837.36	391.11	4,729.39	<b>7,289.24</b>

Table 18. Historical Energy Generation for DGPC

Year	DGPC Historical Generation 2019-2021 (GWh)				
	BHP	CHP	KHP	THP	DGPC
2019	306.47	1,687.71	395.46	4,536.58	6,926.22
2020	348.56	1,858.07	391.59	5,031.82	7,630.04
2021	339.11	1,966.31	386.29	4,619.77	7,311.47
<b>Average Generation</b>	<b>331.38</b>	<b>1,837.36</b>	<b>391.11</b>	<b>4,729.39</b>	<b>7,289.24</b>

Table 19. Historical Energy Generation for Embedded Generation (EG)

Year	EG's Historical Generation 2019-2021 (GWh)
2019	20.24
2020	25.44
2021	21.41
<b>Average Generation + 0.26 GWh for solar plant</b>	<b>22.63</b>

### 3.7.2 Annual Energy Volumes

An annual energy volume of 6,149 GWh is considered for the DGPC tariff computations. As per the provisions of the TDR and the Tariff Policy, the energy volume net of the 15% royalty energy adjusted for auxiliary losses of 1.12% is used for tariff computation as shown in Table 18. However, for the EG's generation, 15% royalty is not applicable and added directly to DGPC net annual energy volume as shown below:

Table 20. Energy Volumes for DGPC and Embedded Generation (GWh)

Year	2022	2023	2024
DGPC's Total Energy	7,289	7,289	7,289
Less: Auxiliary Losses (1.12%)	82	82	82
Less: Royalty (15%)	1,081	1,081	1,081
<b>DGPC Net Annual Energy Volumes</b>	<b>6,126</b>	<b>6,126</b>	<b>6,126</b>
Embedded Generation Total Energy	22.63	22.63	22.63
Less: Auxiliary Losses (1.12%)	0.25	0.25	0.25
<b>DGPC Net Annual Energy Volumes</b>	<b>22.37</b>	<b>22.37</b>	<b>22.37</b>
<b>Energy Used for Tariff Determination</b>	<b>6,149</b>	<b>6,149</b>	<b>6,149</b>

## 4. Proposed Generation Tariff

Based on the assumptions in the cost and energy parameters, the average cost of generation has been calculated as below:

Table 21. Cost of Generation

SN	Parameters	DGPC
1	Actual Gearing	9.70%
2	Cost of Equity (CoE)	13.56%
3	Cost of Debt (CoD)	10.53%
4	Corporate Tax	30.00%
5	Proposed Gearing	60.00%
6	WACC	14.07%
7	Generation (GWh)	6,149
<b>8</b>	<b>Tariff (Nu. per kWh)</b>	<b>1.54</b>

DGPC proposes a tariff of Nu. 1.54 per kWh as given in Table 21. This is determined based on the total cost of the existing hydropower plants: Basochhu, Kurichhu, Chhukha, Tala and embedded generation and the average annual generation. The generation tariff for DGPC for domestic supply has been arrived at by using a cost of equity as 13.56%, cost of debt of 10.53%, gearing ratio of 60%, and average annual energy of 6,149 GWh. The detailed outputs of the tariff model are given in *Annexure IV*.

## **5. Conclusion**

The tariff proposal has been prepared in line with the provisions of the TDR and the Tariff Policy. From the results, the cost of generation for the DGPC works out to Nu. 1.54 per kWh, considering cost of equity of 13.56%, cost of debt 10.53% and gearing of 60%. The proposed tariff is considered reasonable with an increase of 8.45% over the existing tariff of 1.42 per kWh. Therefore, it is proposed to consider the upward revision of the domestic generation tariff to Nu. 1.54 per kWh for the July 2022 - June 2025 tariff period.

The proposal for an upward revision is based on the recovery of the cost of generation reflecting the true cost of efficient business operation. The increase in tariff will enable DGPC to earn returns as permissible within the Tariff Policy and the regulatory framework, and to maintain satisfactory levels of profitability. This will ensure that the national revenues are safeguarded and prevent the erosion of export revenues by domestic sales and help ensure steady flow of revenues to the Royal Government of Bhutan from the hydropower sector.

## 6. Annexures

### 6.1 Annexure I: 2021 Audited Financial Statement

#### Statement of Comprehensive Income for the year ended 31<sup>st</sup> December 2021

Particulars	2021	2020
<b>Income</b>		
Electricity revenue	12,004,425,244.27	12,979,965,237.64
Interest earned	199,444,532.71	179,772,586.11
Other income	347,923,895.62	181,170,311.75
	<b>12,551,793,672.60</b>	<b>13,340,908,135.50</b>
<b>Expenditure</b>		
Wheeling charges	991,276,852.19	1,188,506,525.79
Insurance	151,135,299.49	132,334,949.16
Running and maintenance expenses	347,298,663.08	346,789,739.09
Employees' remuneration and benefits	987,168,667.30	961,964,889.78
Finance cost	245,754,101.56	218,427,833.24
Depreciation/amortization	2,251,991,228.96	2,282,088,744.55
Other expenses	317,167,349.58	901,131,410.39
	<b>5,291,792,162.16</b>	<b>6,031,244,092.00</b>
<b>Operating profit</b>	<b>7,260,001,510.44</b>	<b>7,309,664,043.50</b>
<b>Profit before tax</b>	<b>7,260,001,510.44</b>	<b>7,309,664,043.50</b>
<b>Tax expense</b>		
Current tax	2,158,448,054.08	2,262,976,902.56
Deferred tax	13,308,471.26	(11,051,943.96)
Income Tax for earlier years	-	-
	<b>2,171,756,525.34</b>	<b>2,251,924,958.60</b>
<b>Profit for the year</b>	<b>5,088,244,985.10</b>	<b>5,057,739,084.90</b>
<b>Other comprehensive income:</b>		
Remeasurements of post-employment benefit obligations	21,561,711.24	25,052,763.00
Income tax relating to these items		7,515,828.90
Total other comprehensive income for the year	<b>21,561,711.24</b>	<b>17,536,934.10</b>
<b>Comprehensive income for the year</b>	<b>5,109,806,696.34</b>	<b>5,075,276,019.00</b>

#### Statement of Financial Position as at 31<sup>st</sup> December 2021

Particulars	2021	2020
<b>ASSETS:</b>		
<b>Non- current assets</b>		
Property, plant & equipment	35,172,220,670.97	36,615,380,626.46
Intangible assets	36,829,862.94	28,736,779.98
Investment property	-	32,000,000.00
Deferred tax asset	51,080,248.40	64,388,719.65
Investments in subsidiaries and joint ventures	10,066,492,500.14	8,787,347,385.44
Long-Term Investments	4,207,248,139.43	2,769,370,399.12
Other assets	-	1,880,572.38
<b>Total non - current assets</b>	<b>49,533,871,421.88</b>	<b>48,299,104,483.03</b>
<b>Current assets</b>		
Inventories	474,387,621.85	389,388,320.62
Short Term Investments	1,312,035,068.49	3,395,053,100.34
Trade and other receivables	2,904,316,290.85	3,014,839,387.24
Prepayments and advances	124,137,520.94	36,081,893.25
Cash and cash equivalents	1,840,555,671.45	759,358,887.64

Assets classified as held for sale	6,655,432,173.58	7,594,721,589.09
<b>Total current assets</b>	134,930,791.28	134,484,949.28
<b>Total assets</b>	<b>6,790,362,964.86</b>	<b>7,729,206,538.37</b>
<b><u>EQUITY AND LIABILITIES:</u></b>	<b>56,324,234,386.74</b>	<b>56,028,311,021.40</b>
<b>Equity</b>		
Share capital	32,612,564,000.00	32,246,108,000.00
General reserves	8,712,428,011.15	9,288,009,960.48
Retained earnings	5,064,248,104.73	5,033,742,204.53
Accumulated other comprehensive income	176,016,099.94	154,454,388.70
<b>Total shareholders' equity</b>	<b>46,565,256,215.82</b>	<b>46,722,314,553.71</b>
<b>Non-current liabilities</b>		
Long-Term Borrowings	6,317,879,953.89	5,899,015,821.98
Employee benefit obligation	561,966,150.23	529,629,710.92
<b>Total non-current liabilities</b>	<b>6,879,846,104.12</b>	<b>6,428,645,532.90</b>
<b>Current liabilities</b>		
Trade and other payables	635,249,690.79	458,072,922.13
Other financial liabilities	447,996,706.68	398,456,850.98
Other current liabilities	68,859,153.15	65,293,880.97
Current tax liabilities	1,627,690,115.30	1,857,074,824.57
Employee benefit obligation	99,336,400.87	98,452,456.14
<b>Total current liabilities</b>	<b>2,879,132,066.79</b>	<b>2,877,350,934.79</b>
<b>Total liabilities</b>	<b>9,758,978,170.91</b>	<b>9,305,996,467.69</b>
<b>Total shareholders' equity &amp; liabilities</b>	<b>56,324,234,386.73</b>	<b>56,028,311,021.40</b>

#### Cash Flow Statement for the year ended 31<sup>st</sup> December 2021

Particulars	2021	2020
<b>Cash flows from operating activities</b>		
Profit before taxation	7,260,001,510.44	7,309,664,043.50
Adjustment for:		
<i>Actuarial gains (losses)</i>	21,561,711.24	25,052,763.00
<i>Depreciation / amortisation</i>	2,251,991,228.96	2,282,088,744.55
<i>Foreign exchange loss</i>	54,596,057.11	71,051,530.79
<i>Investment income</i>	(199,444,532.71)	(179,772,586.11)
<i>Dividend income</i>	(8,956,096.04)	(934,768.27)
<i>Interest expenses</i>	245,754,101.56	218,427,833.24
(Increase)/decrease in trade receivables and other receivables	110,523,096.39	189,013,674.24
(Increase)/decrease in inventories	(84,999,301.23)	93,298,342.30
(Increase)/decrease in prepayments and advances	(88,055,627.69)	147,102,987.19
(Increase)/decrease in assets classified as held for sale	(445,842.00)	(119,207,451.27)
Increase/(decrease) in trade and other payables	177,176,768.66	(112,316,149.39)
Increase/(decrease) in other current liabilities	3,565,272.18	20,061,021.01
Increase/(decrease) in employee benefit obligation	33,220,384.04	33,126,312.73
(Increase)/Decrease in other asset	1,880,572.38	(911,938.70)
<b>Cash generated from Operation</b>	<b>9,778,369,303.29</b>	<b>9,975,744,358.81</b>
Income tax paid	(2,387,832,763.33)	(1,982,493,200.38)
<b>Net cash from operating activities</b>	<b>7,390,536,539.96</b>	<b>7,993,251,158.43</b>
<b>Cash flows from investing activities</b>		
Purchase of PPE & intangibles assets	816,924,356.43	(452,083,356.15)
Sale of PPE & intangible asset	(1,321,034.23)	-



Payment for investments in subsidiaries and joint ventures	(1,279,145,114.70)	(1,052,614,162.16)
Proceeds from held-to-maturity investments	562,122,259.69	(1,530,942,646.11)
Interest received	282,462,564.56	149,247,046.23
Dividend received	8,956,096.04	934,768.27
<b>Net cash used in investing activities</b>	<b>(1,243,849,585.07)</b>	<b>(2,885,458,349.92)</b>
<b>Cash flows from financing activities</b>		
Issue of share capital	366,456,000.00	175,044,000.00
Proceeds/(Repayment) of loan	368,210,205.93	359,110,289.88
Interest paid	(200,156,376.99)	(181,790,505.72)
Dividend paid	(5,600,000,000.00)	(5,132,992,540.80)
<b>Net cash used in financing activities</b>	<b>(5,065,490,171.06)</b>	<b>(4,780,628,756.64)</b>
<b>Net increase/(decrease) in cash and cash equivalents</b>	<b>1,081,196,783.83</b>	<b>327,164,051.87</b>
<b>Cash and cash equivalents at the beginning of the period</b>	<b>759,358,887.64</b>	<b>432,194,835.78</b>
<b>Cash and cash equivalents at the end of the period</b>	<b>1,840,555,671.47</b>	<b>759,358,887.65</b>
<b>Component of cash and cash equivalents: -</b>		
<b>Cash in hand</b>	<b>392,483.78</b>	<b>699,556.78</b>
<b>Balances in current accounts with banks</b>	<b>1,840,163,187.67</b>	<b>758,659,330.86</b>
<b>Total</b>	<b>1,840,555,671.45</b>	<b>759,358,887.64</b>

## 6.2 Annexure II: List of Embedded Generation and its Book Value as of Dec 31, 2021

S N	Power Plant	Installed Capacity (KW)	COD	Status	Book Value (in Nu.)	Grant Portion (in Nu.)
1	CMTD Begana Store				785,383.50	
2	Bubja Micro Hydro Power Plant	0	1987	Decommissioned	30,010.25	
3	Thinleygang	0	1987	Decommissioned	0.95	
4	Gidakom Mini Hydro Power Plant	1250	1973	Two units Running	3,755,933.57	
5	Thimphu Mini Hydro Power Plant	360	1967	Running	28,343,271.22	
6	Hesothangkha Mini Hydro Power Plant	300	1971	2 units running	2,632,280.49	
7	Rukubji Micro Hydro Power Plant	40	1987	Shutdown	43,972.86	
8	Wind Power Plant	600	2016	1 tower running	128,510,168.29	125,774,279.17
9	Chanchey Mini Hydro Power Plant	200	1992	1 unit Running	1,662,801.16	
10	Darachu Mini Hydro Power Plant	200	1992	Running	3,122,941.79	
11	Chendebji Micro Hydro Power Plant	70	2005	Shutdown	11,714,359.24	11,446,153.62
12	Sherubling Micro Hydro Power Plant	50	1987	Running	147,871.58	
13	Tangsibji Micro Hydro Power Plant	30	1987	Shutdown	125,890.44	
14	Chumey Mini Hydro Power Plant	1737	1988	Running	121,352,539.19	
15	Tamzhing Micro Hydro Power Plant	30	1987	Shutdown	868,487.99	
16	Ura Micro Hydro Power Plant	50	1987	Running	890,472.12	
17	Tingtibi Mini Hydro Power Plant	200	1987	Running	101,993.53	

18	Kekhar Micro Power Plant	20	1987	Shutdown	-	
19	Surrey Micro Hydro Power Plant	0	1987	Decommissioned	76,944.57	
20	Khalanzi Mini Hydro Power Plant	400	1974	Running	25,664,381.65	
21	Rongchu Mini Hydro Power Plant	200	2001	Running	1,405,528.16	
22	Gangzur Mini Hydro Power Plant	120	1986	Running	9,904,871.98	
23	Rangjung Mini Hydro Power Plant	2200	1996	Running	50,419,802.91	
24	Chenary Mini Hydro Power Plant	0	1972	Abandoned	9,412,860.37	
25	Solar at Rubesa	180			15,489,999.97	15,500,000.00
	<b>TOTAL</b>				<b>416,462,767.78</b>	<b>152,720,432.79</b>
	Chenary Write Off by BPC				5,013,679.65	
	<b>Total Book Value Considered for Embedded Generation</b>				<b>411,449,088.13</b>	
	<b>Total Grant Amount</b>				152,710,432.76	
	<b>Net asset value to be transferred at cost</b>				<b>258,738,655.37</b>	

## 6.2 Annexure III: DGPC and EG Investment Capitalization Schedule

### a) DGPC's and Embedded Generation Investment Capitalization Schedule for 2022-2024

SN	Project/Activity	2022	2023	2024
<b>A</b>	<b>Land</b>			
<b>B</b>	<b>Buildings</b>	<b>5.00</b>	<b>486.63</b>	<b>5.00</b>
1	Permanent	5.00	486.63	5.00
2	Semi-Permanent	-	-	-
3	Temporary	-	-	-
<b>C</b>	<b>Civil Structures</b>	<b>26.02</b>	<b>22.50</b>	<b>14.00</b>
1	Walls and Fencing	16.02	12.50	9.00
2	Roads and Culverts	10.00	10.00	5.00
<b>D</b>	<b>Dam Complex</b>	<b>539.47</b>	<b>3.78</b>	<b>142.21</b>
1	Dam Complex-Civil	-	-	142.21
2	Dam Complex-Mechanical	539.47	3.78	-
<b>E</b>	<b>Water Conductor</b>	<b>-</b>	<b>-</b>	<b>-</b>
1	Water Conductor-Civil	-	-	-
2	Water Conductor-Mechanical	-	-	-
<b>F</b>	<b>Power House</b>	<b>238.70</b>	<b>1,088.41</b>	<b>587.35</b>
1	Power House-Civil	-	169.20	-
2	Power House-Generator	29.08	457.20	22.00
3	Power House-Plant & Machinery	49.87	326.91	292.70
4	Power House-Mechanical	159.75	135.10	272.65
<b>G</b>	<b>Transmission Equipment</b>	<b>139.79</b>	<b>277.38</b>	<b>250.90</b>
1	Mini/Micro Plants	139.79	255.29	237.15
2	LV Lines	-	-	-
3	Transmission Equipment-Civil	-	-	-
4	Sub-station	-	8.00	13.75
5	Meters	-	-	-
<b>H</b>	<b>Other Assets</b>	<b>159.76</b>	<b>167.74</b>	<b>176.13</b>
1	Vehicles	21.54	22.61	23.74
2	Fire-fighting	2.28	2.40	2.52
3	R&D equipment	-	-	-

4	Workshop machinery	59.84	62.83	65.97
5	Loose tools	76.10	79.90	83.90
6	Boat	-	-	-
<b>I</b>	<b>Office Equipment</b>	<b>84.99</b>	<b>60.57</b>	<b>94.75</b>
1	Telephone exchange	-	-	-
2	Office equipment	3.94	4.13	4.34
3	Furniture & fixtures	2.83	2.97	3.11
4	Data processing equipment	69.36	44.15	77.51
5	Other equipment	8.88	9.32	9.79
	<b>Total (Nu. Mill)</b>	<b>1,193.73</b>	<b>2,107.01</b>	<b>1,270.34</b>

b) Embedded Generation Investment Capitalization Schedule for 2022-2024

SN	Project Activities	Proposed Investment 2022 to 2024	Investment 2022-2024		
			2022	2023	2024
1	Rehabilitation Chanchey Mini Hydropower Plant (2x100 kW)	14.09	-	14.09	-
2	Rehabilitation of Gidakom Mini Hydro power plant	165.97	-	-	165.97
3	Rehabilitation of Rukubji Mini Hydro power plant	7.17	7.17	-	-
4	Rehabilitation of Tangsibji Mini Hydro power plant	4.55	4.55	-	-
5	Rehabilitation of Sherubling Mini Hydro power plant	4.34	-	4.34	-
6	Rehabilitation of Ura Mini Hydro power plant	3.60	-	3.60	-
7	Rehabilitation of Tamzhing Mini Hydro power plant	2.83	2.83	-	-
8	Rehabilitation of Tingtibi Mini Hydro power plant	14.51	-	-	14.51
9	Rehabilitation of Darachhu Mini Hydro power plant	17.61	17.61	-	-
10	Remote Monitoring and Control System of MHPP	4.55	4.55	-	-
11	Rehabilitation of Chenary Mini Hydro Power Plant (3x250 kW)	196.00	-	196.00	-
12	Rehabilitation of Khaling Mini Hydro Power Plant	56.67	-	-	56.67
13	Rehabilitation of Hesothangka Mini Hydro Power Plant	5.08	5.08	-	-
14	Replacement of Control and Protection system of 2.2 MW Rangjung Hydro Power Plant	12.00	-	12.00	-
15	Remote control and automation of intake/desilter flood control gate, installation of flood light and CCTV systems at intake of 2.2 MW Rangjung Hydro Power Plant	3.50	-	3.50	-
16	Replacement of damaged blade for Rubessa Wind Power Plant	18.00	18.00	-	-
	<b>Total (BPC EG) Nu. Mill</b>	<b>530.46</b>	<b>59.79</b>	<b>233.52</b>	<b>237.15</b>
18	DGPC Installation of Solar PV system at DGPC Power Plants (2-5MW)	101.77	80.00	21.77	-
	<b>Grand Total Investments (Nu. Mill)</b>	<b>632.23</b>	<b>139.79</b>	<b>255.29</b>	<b>237.15</b>

6.3 Annexure IV: Tariff Output

<b>Total Cost of Supply (mill Nu.)</b>			
	2022	2023	2024
OM	2,091	2,221	2,241
DEP	2,403	2,531	2,629
RoA	4,659	4,555	4,438
RoWC	184	188	268
<b>TC</b>	<b>9,338</b>	<b>9,495</b>	<b>9,576</b>
<b>Energy volumes (GWh)</b>			
	2022	2023	2024
ENERGY <sub>i</sub>	6,149	6,149	6,149
ENERGY	6,149	6,149	6,149
ROYALTY	1,093	1,093	1,093
<b>Average Cost of Supply</b>			
Tariff period	1	2	3
Discounted TC	8,186	15,484	21,936
Discounted ENERGY	5,391	10,117	14,260
<b>AC</b>	<b>1.54</b>	<b>Nu/kWh</b>	