Tariff Review Report of 22.38 MWp Sephu Solar Project

Electricity Regulatory Authority

Ministry of Energy and Natural Resources

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Contents

Executive Summary

The Electricity Regulatory Authority (ERA) conducted a detailed review of the domestic generation tariff proposal for the 22.38 MWp Sephu Solar Project submitted by Druk Green Power Corporation (DGPC) for the tariff period June 2025–2028. Developed by the Department of Energy under the Ministry of Energy and Natural Resources, the project is being implemented in two phases and funded through a mix of grant and concessional loan from the Asian Development Bank. Using a levelized tariff methodology and applying parameters such as a proposed 70:30 debt-equity ratio, a cost of equity of 13.66%, and cost of debt at 2.19%, DGPC proposed a tariff of Nu. 4.44 per unit for three years. The review aligned key inputs; tariff period, financial structure, depreciation, and inflation and with national regulations and international best practices to ensure transparency, financial viability, and policy consistency.

Based on the comprehensive assessment, the ERAS recommended a 3-year tariff period, tax exemption for ten years as per the Fiscal Incentives Act 2021, and use of capital cost and operational benchmarks. The capacity utilization factor was revised to 18%, and the recommended levelized cost of energy (LCOE) was determined at Nu 3.88 per unit for the three-year period. These recommendations aim to strike a balance between affordability and investor confidence, while supporting Bhutan's renewable energy goals and promoting sustainable development within the power sector.

1. Background

The domestic generation tariff of Sephu Solar Project was submitted by Druk Green Power Corporation Limited (DGPC) for the tariff period June 2025-28 on 14th May 2025 vide Letter No. 02/DGPC/ERA/CSD/2025/03. The Sephu Solar Project, which is being developed by the Department of Energy (DoE), Ministry of Energy and Natural Resources (MoENR), is a 22.38 MWp solar power plant that is being developed in two stages. Phase I, with an installed capacity of 17.38 MWp, commissioned in July 2025, and Phase II, with an installed capacity of 5 MWp, expected to be commissioned by September 2025. The project will be funded by the Asian Development Bank (ADB) with a grant of USD 10 million and a loan of USD 8.26 million.

The project will generate 33.08 GWh of electricity based on a Capacity Utilization Factor (CUF) of 17%. On the request of MoENR, operation and maintenance of the plant has been handed over to DGPC and a domestic generation tariff proposal has been put forward by it. The proposed tariff of **Nu. 4.44 per unit** has been arrived at on a levelized tariff mechanism for 3 years taking into account the costs and financial parameters of the project. This setting allows for the analysis and assessment of a suitable domestic generation tariff for the Sephu Solar Project.

The proposed parameters by DGPC are provided in the Table below:

Table 1: DGPC Proposed

SN	Parameters	Values
1	Proposed Gearing	70%
2	Cost of Equity	13.66%
3	Cost of Debt	2.19%
4	Corporate Tax	30%
5	WACC	5.17%
6	Net Energy GWh	33.08
	LCOE for 3 years	**Nu 4.44 per unit**

2. Regulatory Parameters

2.1 Tariff Period

2.1.1 DGPC Proposal

DGPC has proposed the tariff period as 3 years which is in line with the tariff period of the hydropower plants.

2.1.2 ERAS Review

In line with the proposed tariff period and the Guideline for Determination of Domestic Electricity Tariff 2025, tariff period of 3 years was considered.

2.2 WACC Parameters

The pre-tax weighted average cost of capital (WACC) is calculated in accordance with the Clause 69 of TDR 2022 as follows:

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

Where:

1. $WACC_g$ is the weighted average cost of capital for the Generation Licensee "g", as a percentage;
2. RoE_g is the Return on equity, as a percentage for the Generation Licensee "g";
3. $Gearing_g$ is the ratio of debt to total net fixed assets,
4. CoD_g is the actual cost of debt for the tariff period for the Generation Licensee "g", as a percentage, being the weighted average interest rate of the Licensee's loans with suitable allowance made for currency risk of any loans not made in local currency, provided that the cost of debt should not exceed reasonable benchmarks; and
5. Tax is the prevailing rate of company taxation, as a percentage.

2.2.1 Gearing Ratio

2.2.1.1 DGPC Proposal

According to the proposal submitted, the debt-to-equity ratio proposed is 70%, which is planned to be achieved during the tariff cycle. The DGPC proposed that the actual gearing ratio was 45.24%, however, to ensure the tariff affordability and in the view of the grant provided by the ADB, gearing ratio of 70% is proposed.

2.2.1.2 ERA Review

According to the Guideline for Determination of Domestic Electricity Tariff, "*To ensure competitive and efficient pricing through an optimal capital structure, the gearing ratio shall be higher than the actual gearing ratio and up to a maximum of 70:30*".

2.2.1.3 Recommendation

In line with Guideline and the gearing ratio proposed, the gearing ratio of 70:30 was considered.

2.2.2 Rate of Return on Equity

2.2.2.1 DGPC Proposal

The Cost of Equity proposed by DGPC is 13.66%. The average lending rates of the domestic financial institutions (Interest rates as of February 2025) were taken into account with 250 basis point.

Table 2: Average Longterm Lending Rates of the Domestic Financial Institutions of Bhutan

Sl. No.	Banks	Interest Rate (%)
1	Bank of Bhutan Limited (BOBL)	11.58
2	Bhutan National Bank Limited (BNBL)	12.10
3	Bhutan Development Bank Limited (BDBL)	10.75
4	Bhutan Insurance Limited (BIL)	12.23
5	National Pension & Provident Fund (NPPF)	9.83
6	Druk Punjab National Bank (Druk PNB)	10.73
7	Royal Insurance Corporation of Bhutan Limited (RICBL)	11.33
8	Tashi Bank Limited (T Bank Ltd)	10.72
	Average Rate	11.16

2.2.2.2 ERA Review

In line with the Guideline for Determination of Domestic Electricity Tariff, "*The Rate of Return on Equity should be comparable to that of regional power market and industrial benchmark to attract and sustain investments*". Some of the regional practices referred are provided in the table below:

Table 3: Regional Practices of Return on Equity

States in India	RoE for Solar	ROE for Hydro
Himachal Pradesh	14%	15.5%
Odisha	14%	15.5%
Uttarkhand	16%	20%
Bihar	14%	14%
Arunachal Pradesh	14%	14.5% for run-off-river type 15.5% for storage

2.2.2.3 Recommendation

The regional states of India that was referred mostly allows RoE of 14%, however, as DGPC has proposed 13.66%, the CoE of 13.66% was considered.

2.2.3 Interest on Debt

2.2.3.1 DGPC Proposal

COD of 2.19% was submitted considering grace period of 6 years with interest rate of 1% and payback period of 24 years with interest rate of 1.5%. The annual foreign exchange rate escalation of 3.25% was also factored in the cost of debt of 2.19%.

2.2.3.3 ERA Review

Considering the loan tenure of 30 years, grace period of 6 years with interest rate of 1% and payback period of 24 years with interest rate of 1.5%, the weighted average interest evaluates to 1.4%. According to the subsidiary agreement signed between The Royal Government of Bhutan and DGPC, the clause stated that the foreign exchange risk has to be borne by DGPC. Therefore, the foreign exchange rate escalation of 3.55% was also taken into account. The annual foreign exchange rate escalation was computed as shown below:

Table 4: Annual Foreign Exchange Rate Escalation

Year	2019	2020	2021	2022	2023	2024
Average USD/BTN	70.36	74.069	73.876	78.585	82.4709	83.6507
Min USD/BTN	68.33	70.677	72.208	73.852	80.749	82.3726
Max USD/BTN	72.33	76.911	76.354	83.098	83.392	85.6581
% increase	2.90%	5.27%	-0.26%	6.37%	4.94%	1.43%
Average	**3.55%**					

2.2.3.3 Recommendation

COD of 2.19% as proposed was considered for the tariff computation.

2.2.4 Tax

2.2.4.1 ERA Review

As per Section 8 of Fiscal Incentive Act of Bhutan 2021, '*The qualifying income derived by an Approved Business (regardless of its date of commencement of commercial operation) from any qualifying activity in the following High Priority Sectors carried out in Bhutan shall, subject to any conditions prescribed in the Rules and any conditions specified in the certificate of approval of the Approved Business, be exempt from tax for a qualifying period not exceeding 10 years: (6) Energy, excluding hydroelectric projects;*'

2.2.4.2 Recommendation

Based on the review, as per the Act, 10 years of tax exemption is recommended as solar falls under the Energy, excluding hydroelectric projects.

2.3 Inflation

Inflation for O&M expenses should be based on historical average inflation rates published by the National Statistics Bureau (NSB).

2.3.1 DGPC Proposal / ERA Review

The average historical inflation rate works out to 3.46% for the years 2022 to 2024 is as shown below:

Table 5: Reviewed Inflation

Inflation	2022	2023	2024	Average
Overall inflation	7.01%	3.96%	-0.60%	3.46%

2.3.2 Recommendation

Based on the review, an inflation rate of 3.46% was considered for determining tariff for the solar projects.

3. Allowances, Cost of Supply and Energy Volumes

The total cost of supply for Sephu Solar Project in accordance with TDR, 2022.

$$TC_g = OM_g + DEP_g + CODg + ROE + CoWC_g + Regulatory\ Fees$$

Where:

1) TC_g is the total cost of supply of the Generation Licensee "g" in million Ngultrum;
2) OM_g is the allowance for operating and maintenance costs of the Generation Licensee "g" in million Ngultrum;
3) DEP_g is the allowance for depreciation of assets for the Generation Licensee "g" in million Ngultrum;
4) COD is the Cost of Debt incurred by the Developer
5) $CoWC_g$ is the Cost of Working Capital for the Generation Licensee "g" in million Ngultrum.

3.1 Allowances for Depreciations (DEP)

As per TDR, 2022, asset values are to be based on historical asset values and licensees are allowed to include the interest during construction (IDC) and associated labor 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.

The allowance for depreciation is based on the economic lifetime of the assets and straight-line method is used for calculation of depreciation. Accelerated depreciation is allowed as the Clause

7.5 of DETP under circumstances when difficulty is faced in meeting the debt service obligation during the initial debt serving period. The return on assets is to be determined as the product of WACC and the net asset values.

3.1.1 Assets

3.1.1.1 DGPC Proposal

DGPC proposed the Hard Cost of the project to be Nu 1414.13 million which considered the foreign exchange rate during the disbursed amount and anticipated disbursement, the total project cost computed by the DGPC is provided in the Table below.

Table 6: Capital Cost Breakdown Submitted by DGPC

SN	Particulars	Values
1	Generation Hard Cost (MNu)	1402.02
2	Generation- Interest During Construction (IDC) (MNu)	12.11
3	**Total Project Cost Including IDC (MNu)**	**1414.13**

3.1.1.2 ERA Review

ERA reviewed the capital cost based on the hard cost incurred by the developer during the time of disbursement as provided by DGPC.

3.1.1.3 Recommendation

Based on the review, the capital cost of the project of Nu 1,414.13 million as proposed by DGPC was considered for the computation of tariff.

3.1.2 Depreciation

3.1.2.2 ERA Review and Recommendation

Since the loan tenure is 30 years, the straight-line depreciation for 30 years was taken into consideration.

3.2 O&M Allowance

3.2.1 DGPC Proposal

DGPC submitted the O&M charge of 0.5% of asset value.

ERA Review

The ERAS conducted a thorough review of the O&M expense projections of other ground-mounted projects constructed by the Desuung Solar Project Phase I and II. The total O&M cost computed was 0.97% of the capital cost of the projection. Other country practices were also reviewed as shown in the table below:

Table 7: Other Country Practices of O&M cost

SN	Country/ State	Value

1	Bangladesh	1% of capital cost
2	Bihar	2.36% of the capital cost
3	Himachal Pradesh	2.79% of the capital cost
4	Sikkim	1.1% of the capital cost

3.2.2 Recommendation

Based on the review, it is recommended to use 0.5% of the capital cost. As Sephu Solar Project is a Utility Scale project, the O&M cost would be much efficient compared to the existing small-scale ground mounted projects of DSP.

3.3 Cost of Working Capital

3.3.1 DGPC Proposed / ERA Review

3.3.1.1 Inventories

As per DPR, DGPC proposed 15% of O&M cost as the Inventories. Similarly, ERAS reviewed the practices in Indian States and found that 15% of annual O&M expense as an inventory was considered.

3.3.1.2 Arrears

Arrears of 40 days was considered which is at par with other solar plants and DGPC.

3.3.1.3 Interest on Working Capital

The interest on working capital of 9.23 % which is currently the lowest short term lending rate was considered.

3.3.1.4 Regulatory Fees

The License Application fee for the 2 phases of the project equated to Nu 80,000 and Tariff application fee of Nu 55,950. The project also has to pay an annual license fee of Nu 29,380.

4. Capacity Utilization Factor

4.1 DGPC Proposal

DGPC proposed the consideration of Capacity Utilization Factor (CUF) to be 17%, it was proposed based on the DPR of the project.

4.2 ERA Review

The CUF of the 180 kW Rubesa Solar plant as per the DPR was also considered as 17%. However, the ERA while reviewing the data of the actual generation for 2022 and 2023 (two years), observed the actual CUF to be 17.97%. Therefore, CUF for Sephu Solar Project was considered as 18% of gross generation.

The Clause 71 of TDR 2022 states that the energy generation shall be adjusted with the auxiliary consumption.

As per the Tariff Determination Regulation for Renewable energy resources of CERC, India, the allowed auxiliary consumption is 0.75% for solar plants. However, Himachal Pradesh Electricity Regulatory Commission, India has adopted 1.45% to cover auxiliary consumption, transformation losses and project line losses up to interconnection point. DGPC has proposed the auxiliary losses to be 0.2% of the gross generation.

Similarly, it is was also observed that, normally a degradation rate in the range of 1% to 2.5% during its first year of the operation and 0.5% thereafter for remaining years of the project life is considered in India. The higher degradation rate in the first year of operation is mainly caused due to light induced degradation where in the efficiency of the solar cells temporarily drops when initially exposed to sunlight and after its initial period, the performance of cells stabilizes to some extent but still degrades to a limited extent.

4.3 Recommendation

Based on the above, ERAS has considered 18% as the CUF, 0.2% as the auxiliary consumption (as proposed) and 2% degradation for first year and 0.5% thereafter throughout its life.

5. Tariff Determination

As per TDR 2022, the average cost of supply is to be taken as the ratio of the discounted annual costs of supply to the discounted energy volumes, with discounting applied over the Tariff Period using $WACC_g$ as follows:

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

Where:

1) ACg is the average cost of supply for the Generation Licensee "g", in Ngultrum per kWh;
2) TP is the number of years in the Tariff Period;
3) TCg,n is the total cost of supply of Generation Licensee "g" in year "n" in million Ngultrum, as determined in accordance with Clause 70 of TDR, 2022;
4) ENERGYn is the energy volume in year "n" in GWh, as determined in accordance with Clause 71 of TDR, 2022; and
5) WACCg is the weighted average cost of capital for the Generation Licensee "g", as determined in Clause 69(1) of TDR, 2022.

5.1 Tariff

For the determination of the tariff, the actual cost of the Solar PV project, actual O&M cost that is expected to incur and the gearing ratio are considered with other parameters as shown below:

Table 8: Tariff with Inflation 3.46%

Sl. No.	Parameters	Tariff for 3 years
1	Capital Cost	Nu 67,856/ kW
2	O&M Cost	0.5% of the capital cost
3	Depreciation	3.33% throughout the tariff period
4	Capacity Utilization Factor	18%
5	Auxiliary consumption	0.2%
6	Degradation Factor	2% for the first year and 0.5% thereafter annually
7	Inflation Rate	3.46%
8	Interest on Working Capital	9.23%
9	Inventories	15% of O&M cost
10	Arrears	40 days
11	Gearing	70%
12	Cost of Equity	13.66%
13	Cost of Debt	2.19%
14	Tax	0%
15	Regulatory fees	Annual License fee: Nu 29,380
	LCOE	**Nu 3.88 /unit**

6. Conclusion

In conclusion, the tariff review for the proposed 22.38MW Sephu Solar Power Plant has been thoroughly evaluated using relevant frameworks, including New National Energy Policy 2025, Guideline for Determination of Domestic Electricity Tariff and Tariff Determination Regulation 2022. Moreover, existing solar projects were also referred for the benchmarking of parameters. The review considered the financial viability of the project, accounting for various economic, technical, and regulatory parameters to ensure an optimal balance between sustainability and cost efficiency. The project aligns with Bhutan's broader goal of promoting renewable energy sources, particularly solar, to diversify its energy mix and enhance energy security.

Key financial metrics, such as the Weighted Average Cost of Capital (WACC), cost of equity, cost of debt, and gearing ratios, were carefully calculated to reflect both national policies and international benchmarks. The review recommended a 70:30 debt-to-equity ratio, a cost of equity of 13.66%, and a cost of debt at 2.19%. These parameters ensure that the financing structure is sustainable over the tariff period while encouraging investment in renewable energy. The tax exemption for ten years further supports the project's financial sustainability, while inflation and depreciation rates were also accounted for to maintain long-term profitability.

Overall, the recommended Levelized Cost of Energy (LCOE) using RoE Model for the project stands at **Nu 3.88/unit** for the three years. These figures reflect a competitive pricing structure that balances the need for affordability, financial sustainability, and the promotion of renewable energy in Bhutan. The project is set to contribute significantly to Bhutan's renewable energy targets while promoting private-sector participation in the energy sector.