Tariff Review Report of 200 kW Ground-Mounted Solar Project at Tamzhing, Bumthang

Electricity Regulatory Authority

Ministry of Energy and Natural Resources

December 2025

Contents

Executive Summary

The Ecoluxe Private Limited submitted a Tariff proposal for the 200kW ground-mounted solar PV Plant vide letter No. KPL/BUM/TECH-04/2025/80 dated 7th December 2025 located at Tamzhing, Bumthang. The Project has been financed at a cost of Nu 5.734 million with an equity injection of 30% from the company shareholders.

The Electricity Regulatory Authority has reviewed the tariff proposal based on the National Energy Policy 2025, Guideline for Determination of Domestic Electricity Tariff 2025 and Tariff Determination Regulation (TDR) 2025. The analysis and recommendations on the tariff determination methodology, Weighted Average Cost of Capital, Cost of Equity, Cost of Debt, gearing ratio, return on assets, depreciation, operation and maintenance cost, return on working capital, Capacity Utilization Factor, auxiliary consumption, degradation factor and tariff.

The detailed review of the application is as outlined in the report below.

1. Background

Ecoluxe Private Limited has submitted a Tariff proposal for the development of a photovoltaic (PV) solar plant, as outlined in their letter No. KPL/BUM/TECH-04/2025/80 dated 7th December 2025. The tariff proposal of **Nu 4.87 per unit** aims to establish a 200kW ground-mounted solar project at Tamzhing, Choekhor Gewog, under Bumthang Dzongkhag, with potential for future expansion.

The solar project is part of a broader initiative focused on achieving sustainability and self-sufficiency for the company, as well as generating additional income for the company's mineral water plant located in Tamzhing. In line with the TDR 2025, the company formally submitted their application for Tariff. The key goal is to enhance economic diversity, productive capacity, and contribute to carbon neutrality while encouraging climate-resilient development.

Ecoluxe Private Limited's proposal aligns with national goals to explore and promote solar PV technology as a viable alternative energy source. The expected outcomes of this project include demonstrating the feasibility of grid-connected utility-scale solar PV, promoting energy supply diversification, enhancing energy security, and building institutional capacity in solar PV technology. The proposal also acknowledges recent revisions to legal, regulatory, and policy frameworks to encourage greater private sector investment in renewable energy projects, including grid-connected solar PV systems.

Based on the review of the tariff proposal for the solar project, the final recommendations on the tariff parameters and tariff are presented in this report.

2. Regulatory Parameters

2.1 Tariff Period

ERAS Review

As per the TDR 2025, "*The Tariff Period for all categories of solar power projects of this Regulation shall be 25 years from the date of commissioning.*" Moreover, the useful life of the solar is 25 years.

In line with the provision of the TDR 2025, tariff period of 25 years is approved.

2.2 WACC Parameters

The pre-tax weighted average cost of capital (WACC) is calculated in accordance with the Section 96 of TDR 2025 as follows:

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

Where:

1. $WACC_g$ is the weighted average cost of capital for the Generation Licensee "g", as a percentage;
2. CoE_g is the cost of 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

ERA Review

The Clause 6.4 of Guideline for Determination of Domestic Electricity Tariff states, "*To ensure competitive and efficient pricing through an optimal capital structure, the gearing ratio for the computation of WACC shall be higher than actual gearing ratio and up to maximum of 70:30.*"

As per section 77 of TDR 2025, "*If the actual equity deployed is less than 30% of the Capital Cost, the actual equity shall be used for the purpose of tariff determination. Conversely, if the actual equity deployed exceeds 30% of the capital cost, the excess amount shall be considered as debt, and the maximum gearing ratio shall be maintained at 70:30.*"

According to the proposal submitted by the company, the debt-to-equity ratio is stated as 70:30,

resulting in a gearing ratio of 70%, which is in alignment with the aforementioned clause.
In line with TDR 2025 and the actual gearing ratio, the gearing ratio of 70% is approved.

2.2.2 Cost of Equity

ERA Review

In line with clause 6.2 of 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. The value of equity at the time of commissioning of the renewable project shall be maintained throughout the project concession period for the determination of the Return on Equity*." According to section 79 of TDR 2025, "*The cost of equity shall be 13% to 16% for Solar Generation Licensee*."

The developer has proposed a Return on Equity (RoE) of 18.7% to achieve a payback period of 10 years. ERAS reviewed all project parameters and observed that the plant meets all benchmark requirements except for the O&M cost benchmark of 1.5%, indicating that the plant will be performing efficiently. Moreover, as per the TDR 2025, the allowable CoE for solar projects is in the range of 13% to 16%.

Therefore, in line with the TDR 2025 and the efficiency of the developer, CoE of 16% is approved.

2.2.3 Cost of Debt

ERA Review

As per the TDR 2025, "*For Solar Generation Licensee, the actual cost of debt for the Tariff Period shall be considered provided that it shall not exceed 9.45%.*"

The developer has availed the Economic Stimulus Plan (ESP) loan from Bhutan Development Bank Limited (BDBL) at 4% interest rate with loan tenure of 20 years and the loan drawdown schedule is provided in the table below:

Table 1: Drawdown Schedule of Loan

No. of Withdrawals	Loan	Interest Rate
1	1.545	4%
2	1.545	4%
3	1.545	4%
4	1.545	4%
5	1.545	4%
6	1.545	4%

Based on the review, COD of 4% is approved.

2.2.4 Tax

ERA Review

As per the TDR 2025, "*Tax is the prevailing rate of company taxation, as a percentage*." Moreover, as per the 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*;"

Based on the review, payment of tax for a period of ten years from the date of commercial operation of the projects is considered to be exempted.

2.3 Inflation

As per Clause 6.5 of Guideline for Determination of Domestic Electricity Tariff, inflation for O&M expenses should be based on historical average inflation rates published by the National Statistics Bureau (NSB).

ERA Review

In line with the Guideline, the average historical inflation rate works out to 3.46% for the years 2022 to 2024 as shown in table 2 below:

Table 2: Reviewed Inflation Rate on Non-food Items

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

Based on the review, an inflation rate of 3.46% for determination of tariff is approved.

3 Allowances, Cost of Supply and Energy Volumes

1. As per TDR 2025, The total cost of supply for a Solar Generation Licensee in any year shall be determined as:

$$TC_{sg} = OM_{sg} + DEP_{sg} + CoE_{sg} + +CoD_{sg} + CoWC_{sg} + Fees_{sg} + SO_{sg}$$

Where;

(1) TC_{sg} is the total cost of supply of the Solar Generation Licensee "sg", in million Ngultrum;

(2) $O\&M_{sg}$ is the allowance for operating and maintenance costs of the solar Generation Licensee "sg", in million Ngultrum;

(3) DEP_{sg} is the allowance for depreciation of assets for the Solar Generation Licensee "sg", in million Ngultrum;

(4) CoE_{sg} is the cost of equity as set out in Section 79 (2) of this Regulation for the Solar Generation Licensee "sg" in million Ngultrum;

(5) CoD_{sg} is the actual interest of the loan as set out in Section 82 of this Regulation for the Solar Generation Licensee "hg" in million Ngultrum;

(6) SO_{sg} is the System Operator charges payable by the Solar Generation Licensee "hg", in million Ngultrum;

(7) $CoWC_{sg}$ is the Cost of Working Capital for the Solar Generation Licensee "sg", in million Ngultrum.

3.1 Allowances

As per section TDR 2025, "*The Capital Cost of solar projects shall be inclusive of land cost, pre-development expenses, all capital works including plant and machinery, civil works, erection and commissioning, financing cost, interest during construction, and evacuation infrastructure up to the interconnection point.*"

3.1.1 Assets

ERA Review

ERA reviewed the capital cost of the project submitted by the developer as shown in table below.

Table 3: Capital Cost Submitted by the Developers

Sl no	Particulars	Amount (Nu mill)
1	Plant and Machinery (Asset)	8.890
2	Preliminary Cost	0.205
3	Vehicle	-
4	IDC	0.192
5	Total	**9.287**

ERA further reviewed the tender which was floated for the installation of the 200kW solar power plant. Accordingly, DD Solar was awarded the tender with a quoted price of Nu. 8.602 million. The cost breakdown, as outlined in the bid document, is provided in the Table below:

Table 4: Bid Amount

Sl #	Particulars	Unit	Qty	Unit Rate (Nu)	Total Amount (Nu)
1	Supply & delivery of 723 kWp TRINA, Mono- crystalline Solar PV Module, 41.3 Vmp, 17.44 Imp complete with all accessories including installation, testing and commissioning	Set	280	11,000.00	3,080,000.00
2	Supply & delivery of inverter, MAX 100 KTL3- XLV with 98.8% efficiency suitable for 50Hz, output voltage range 400-440, 3-phase, provide with IP65 (outdoor), MPPT, AFCI, Set surge coordinate with communication system complete with all accessories including installation, testing and commissioning	Nos	2	687,500.00	1,375,000.00
3	Ground mounting Structure with galvanized channel and angles including fabrication, welding, fitting, installation, etc complete with all accessories.	Set	1	1,225,000.00	1,225,000.00
4	DCDB (AJB) - as per drawing	Nos	2	52,500.00	105,000.00
5	LT Panel including all connection and other accessories- as per drawing	Nos	1	127,500.00	127,500.00
6	DC Cable (Red / Black)	Mtr	1,000.00	131.25	131,250.00
7	AC Cable for inverter to Solar LT Panel	Mtr	300	593.75	178,125.00
8	AC Cable for Solar LT Panel to Main LT Panel	Mtr	0	593.75	0.00
9	Earthing cable (Single core 16 Sqmm)	Mtr	200	168.75	33,750.00
10	40 mm HDPE Pipe	Mtr	1,200.00	23.09	27,708.00
11	Lightning Arrestor complete with all accessories	Set	1	13,850.00	13,850.00
12	Earthing	Nos	6	10,711.25	64,267.50
13	Online Monitoring Device (RMD) complete with all accessories	Nos	1	53,552.50	53,552.50
14	Installation & Commissioning	LS	1	1,125,000.00	1,125,000.00

15	Transportation / Services	LS	1	500,000.00	500,000.00
16	Miscellaneous (MC4, Lugs etc)	LS	1	562,500.00	562,500.00
	Total				**8,602,503.00**

Additionally, the developer has constructed a 157-meter chain link fencing around the perimeter of the plant to ensure the safety of both the installation and the surrounding habitats incurring a cost of Nu 0.288 million. Therefore, the total cost of the project was found to be Nu 46,435 per kW which falls within the benchmark cost of Nu 47,500 per kW for the category 2 (Small ground mounted projects of capacity below 3000kWp) as mentioned in TDR 2025.

Based on the review, the actual capital cost of the project i.e., Nu 9.287 million is approved.

3.1.2 Depreciation

ERA Review

According to the TDR 2025, the allowance for depreciation is based on the economic lifetime of the assets and straight-line method is used for calculation of depreciation. The return on assets is to be determined as the product of WACC and the net asset values. Accelerated depreciation is allowed as the section 75 of TDR 2025 under circumstances when difficulty is faced in meeting the debt service obligation during the initial debt serving period. The proposed loan tenure according to the proposal is 20 years, hence according to the debt servicing period the depreciation shall be 3.5% for first 10 years and 4% thereafter till the end of the tariff period.

Based on the review, accelerated depreciation with depreciation rate of 3.5% for first 20 years and 4% thereafter is approved.

3.2 O&M Allowance

ERA Review

ERAS reviewed the O&M allowance as per the section 51 of the TDR 2025, "*The operation and maintenance allowances for Solar Generation Licensee shall be up to a maximum of 1.5% of the capital cost.*"

The detailed breakdown of these computations is provided in the table below:

Table 5: O&M cost

Expenses Type	Amount (Nu)
Technician's Salary (Nu 25,000 / month)	300,000
Spare Parts (Nu 2000/month)	24,000

Broadband lease lines (Tcell & Bmobile), Nu 2000/month	24,000
Total	348,000

For the project, Ecoluxe Pvt. Ltd. proposed an O&M allowance computing to 3.75% of the capital cost. Based on the provision of TDR 2025, maximum O&M allowance of 1.5% of the capital cost for the plant is approved.

3.3 O&M efficiency gain

ERA Review

There is no O&M efficiency gain target taken into account as the project is small scale.

3.4 Cost of Working Capital

ERA Review

3.4.1.1 Inventories

As per the section 84 of TDR 2025, "*The allowance for inventories shall be as a percentage of operation and maintenance expenses or Capital Costs based on best industry practice or applicable benchmarks*". As practiced in the regional markets, 15% of the O&M annual expense as an inventories is approved.

3.4.1.2 Arrears

Arrears of 40 days is approved at par with other solar plants and DGPC.

3.4.1.3 Interest on Working Capital

The Guideline for determination of domestic electricity tariff, "*The interest on working capital shall be determined based on the prevailing lowest short-term lending rate of financial institution of Bhutan*".

The interest on working capital of 9.23 % which is currently the lowest short term lending rate of banks is approved in line with the Guideline.

3.4.1.4 Regulatory Fees

According to the Licensing Regulation for Solar Power Plant 2024, the proposed 200kW ground-mounted solar plant fall under category- 2A, which are exempted from license. Moreover, the project was issued License Exemption on July 31, 2025 during 131st Commission Meeting. According to the Regulatory Fees Regulation 2006, the developer has paid the Tariff Application Fees of Nu 500 (Nu 2500 per MW) on December 15, 2025.

4 Energy Volumes

ERA Review

The developer submitted the forecasted annual generation of the plant as 344,880 units. ERA computed the Capacity Utilization Factor (CUF) using the known parameters and it resulted to 19.68% of the gross generation. The benchmark CUF as per the TDR 2025 for this category is 17%, while the CUF proposed by the developer is higher than the benchmark. ERA further conducted simulation on the site in PVWatts which provided the CUF of 16.45%, which is much lower than the CUF proposed by the developer.

The Section 100 of TDR 2025 states that the energy generation shall be adjusted with the auxiliary consumption.

As per the TDR 2025, "*For the Solar Generation Licensees, the determination of tariffs shall provide for an allowance for auxiliary consumption of 0% for rooftop projects and 0.5% of gross energy generation for ground-mounted projects*." The auxiliary consumption is 0.5% for solar plants is recommended.

It is observed that, normally a degradation rate 0.5% throughout for new technologies has been observed.

Based on the review, as the project is the first project being developed by a private entity, the CUF as per the benchmark CUF in the TDR 2025 of 17%, auxiliary consumption of 0.5% and degradation factor of 0.5% per annum throughout its useful life is approved.

5 Tariff Determination

As per TDR 2025, the average cost of supply is to be taken as the ratio of the annual costs of supply to the net energy volumes, with discounting applied over the Tariff Period.

5.1 Levelized Cost of Electricity

For the determination of LCoE of the project, the actual cost of the Solar PV project of Ecoluxe Pvt. Ltd, O&M allowance and the actual gearing ratio are considered with other parameters as shown in the table below.

Table 6: Project Specific Tariff

Sl. No.	Parameters	Tariff for 25 years
1	Capital cost	Nu 46,435/kW
2	O&M Cost	1.5% of the capital cost
3	Depreciation	3.5% for first 20 years and 4% thereafter with salvage value of 10%
4	Capacity Utilization Factor	17% of gross generation

5	Auxiliary consumption	0.5 % of gross generation
6	Degradation Factor	0.5% per annum for 25 years
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	16%
13	Cost of Debt	4%
14	Tax	0% for first 10 years
15	Regulatory fees	Tariff Application Fees of Nu 500
	LCOE	**Nu 4.10/ unit**

6 Conclusion

The tariff review for the proposed 200 kW ground-mounted solar project by Ecoluxe Private Limited has been thoroughly evaluated using relevant frameworks, including the National Energy Policy 2025, Guideline for Determination of Domestic Electricity Tariff 2025, and Tariff Determination Regulation 2025. 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 16%, and a cost of debt at 4%. 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.

Operational costs, particularly for maintenance and working capital, were carefully assessed and benchmarked according to the TDR 2025. The review recommended an O&M cost of 1.5% of the capital cost. The CUF, auxiliary consumption, and degradation factors were also evaluated, leading to recommendations that ensure efficient operation over the 25-year tariff period. The review emphasized the importance of monitoring these factors to maintain efficiency and cost-effectiveness throughout the project's lifecycle.

Overall, the recommended Levelized Cost of Energy (LCOE) for the project stands at **Nu 4.10 per unit** over the 25-year tariff period with gross metering scheme. 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.