Support to the Energy Sector Reform in Lesotho:

Transaction Advisory- Power Purchase Agreements Negotiations

EuropeAid/138849/IH/SER/LS

Final Report | 22 November/2023

This project is implemented by an HCL Consultants led consortium

This project is funded by the European Union

Table of contents

1 List of Figures

2 List of Tables

3 List of Acronyms

BW	Bid Window
CAPEX	Capital Expenditure
COD	Commercial Operation Date
DoE	Department of Energy
ESIA	Environmental Social Impact Assessment
EU	European Union
GIZ	Gesellschaft für Internationale Zusammenarbeit
IEA	International Energy Agency
IRENA	International Renewable Energy Agency
IRR	Internal Rate of Return
kWh	Kilowatt hour
LEWA	Lesotho Electricity and Water Authority
LCOE	Levelized Cost of Electricity
LSL	Lesotho Loti
MW	Megawatt
NamPower	Namibia Power Corporation
NPV	Net Present Value
NREL	National Renewable Energy Laboratory
O&M	Operating and Maintenance
OPEX	Operating Expenditure
ROI	Return on Investment
SADC	Southern African Development Community
SAPP	South African Power Pool
USD	United States Dollar
WACC	Weighted Average Cost of Capital
ZAR	South Africa Rand

4 Executive Summary

4.1 Introduction and objective of the project

The European Commission (EU) Support to Reforms in the Energy Sector in Lesotho Phase II is intended to look at large scale investments and up-scaled projects in the energy sector, along with further sector reforms where required.

This assignment of Transaction Advisory Services was to support the Government of Lesotho-owned Lesotho Electricity Company (LEC), as the off-taker, in power purchase agreements (PPAs) negotiations with two renewable energy Independent Power Producers (IPPs), Rexivista Solar Power and Hirundo Wine Power. Rexivista Solar Power IPP, will generate power using solar PV technology while, Hirundo Wind Power IPP will generate power using wind technology.

4.2 Approach and Methodology

Preparatory Activities

Kick-off meetings were held in Maseru with Department of Energy, Lesotho Electricity Company (LEC), to confirm government and LEC negotiation objectives, initial negotiation position as well as their perspective of, what in the end, a fair and reasonably affordable price (tariff) would be.

A desktop review was made to establish benchmarks of installed generation cost and tariffs for grid connected solar PV and wind projects. This review covered:

1. PPA tariffs achieved from bid window one (BW1) to bid window 6 (BW6) of the South Africa Renewable Energy Independent Power Producers Procurement Program (REIPPPP) bid window (BW) reviewed.
2. The tariffs achieved by Nam Power of Namibia for Solar PV and Wind in the years 2021 to 2023
3. The international installed costs of grid-connected solar PV and wind generation published by the International Renewable Energy Agency (IRENA) and the USA department of Energy were reviewed for current costs, trends and future outlook.
4. The existing LEC PPA tariff also considered by LEC in benchmarking solar PV tariffs.

A draft Negotiation Memoranda/Matrix was prepared to serve as a guidance of all the elements to be negotiated to achieve LEC PPA negotiation objectives vis a vis IPP viability. This Negotiation memoranda was presented to the LEC during the kick off meeting as an induction document and for concurrency by the LEC negotiation team.

Actual Negotiations

There were two rounds of negotiations with each IPP over two separate in-country missions in Maseru. The first round of negotiations happened between 30 August and 14 September 2023. The second round of negotiations happened between 9th October and 13 October 2023

Report on Negotiations

This Report was prepared with negotiations outcomes and Conditions Precedent (CPs).

4.3 Rexivista Solar Power Negotiations Summary

The following table summarizes the tariff achieved:

Element	Starting Negotiation	After Negotiations
Installed capacity	300MW$_p$ at four sites	50MW$_p$ at Thaba-Tseka
Capacity factor	Included battery storage	22.5% and no battery storage
Net energy delivered, yr1	133,152,000 kWh	93,436,480kWh
Capital cost	R2 496 269 510 (US$99million) incl transmission line	R1,601,492,543 incl transmission line
	R1,688,873,983 excluding transmission line	LSL1,133,866,115, excluding transmission line
Tariff	R1.80/kWh, incl 65km transmission line	R1.528/kWh, incl 45km transmission line
	R1.50/kWh, excl transmission line	R1.102/kWh, excl transmission line
Funding sources	Grants - 0% Debt - 100% Equity - 0%	Grants - 0% Debt - 100% Equity - 0%
Debt terms	Tenor – 20 years Annual interest rate – 6%	Tenor – 20 years Annual interest rate – 6%
Equity IRR expectations	Project 100% debt funded	Project 100% debt funded
O&M costs per annum		LSL 6,616,678
CPs		Listed in the table

The following table shows how Rexivista generation tariff compares with selected tariffs in SADC:

Benchmarks item		**Rexivista**	**Benchmarks**				
Parameter	**Units**		**Lowest**	**Average**	**Highest**	**Data Source**	**Data year**
Generation tariffs for same Gx technology in the SADC region	LSL/kWh	1.102	0.4695[1]	0.4905[2]	0.5480[3]	BW6-SA REIPPPP	Dec 2022
			0.83 revised to 1.04			One Power – LEC PPA	2023

The pending matters are:

- the geo-technical design of the transmission line by Rexivista
- concurrence by LEC on the Rexivista's specs for the transmission line
- costing of the transmission line specs by Rexivista
- review of the costing by LEC and negotiation of both parties of a transmission tariff
- all the CPs in Section 10.1

[1] Kutlwano Solar Power Plant (159MW), North-West Province, South Africa
[2] Weighted average tariff of R0.49048 achieved by the 5 solar PV projects selected in BW6
[3] Doornhoek PV (120MW), North-West Province, South Africa

4.4 Hirundo Power Negotiations Summary

No final base tariff was achieved for Hirundo. The following table summarizes the status of the negotiations.

Element	Starting Negotiation	After Negotiations
Installed capacity	100MW$_p$ at two sites (40+60MW)	55.2MW$_p$ at Mohale's Nek
Capacity factor	25% and 28%	29.73%
Net energy delivered, yr1	85GWh and 140GWh	132,472,000 to 132,804,000kWh
Capital cost	€83 million ~ LSL 1 700 million and €52 million ~ LSL 1 080 million incl transmission line	LSL 2,009,908,406 Figures shared after round 2 – shows increase from starting point Hirundo was asked to get quotes from China supplier of turbines
Tariff	R2.17/kWh, including transmission line and access road	R1.97/kWh, proposed by Hirundo, including transmission line and access road This tariff has not been agreed by LEC and the figure does not tie to Hirundo's capex
Funding sources	Grants - 0% Debt - 70% Equity - 30%	Grants - 0% Debt - 70% Equity - 30%
Debt terms	Tenor – 17 years Annual interest rate – 11.75%	Tenor – 17 years Annual interest rate – 11.75%
Equity IRR expectations	Equity IRR of 18%	LEC proposed 12% to 15% Hirundo still maintains 18% Hence, no consensus
O&M costs per annum	No breakdown per site – Second discussion =LSL38,900,000 for Mohale's Nek	Hirundo was requested to adjust down the O&M to reflect • international benchmarks for turbine service maintenance contracts in the range of US$50,000 per turbine per year • adjust the other costs to reflect Lesotho rates
CPs		Listed in the table

The following table shows how Hirundo generation tariff compares with selected tariffs in SADC:

Benchmarks item		Hirundo	Benchmarks				
Parameter	Units		Lowest	Average	Highest	Data Source	Data year
Generation tariffs for same Gx technology in the SADC region	LSL/kWh	1.97	0.34425[4]	0.4950[5]	0.61770[6]	BW5-SA REIPPPP	Oct 2021
				0.8785		NamPower	Dec 2022

[4] Dwarsrug Wind Facility (124MW)
[5] Weighted average tariff achieved by the 12 onshore wind projects selected in BW5
[6] Wolf Wind Farm (84MW)

The pending matters are:

- Hirundo needs to conduct wind measurements using standards acceptable to financiers. This is usually a period of 2 years, but data of 1 year can be used to progress the PPA negotiations. The NamPower experience in Rosh Pinah Project site emphasizes the importance of wind measurement prior to concluding the PPA.
- all the CPs in Section 10.1

4.5 Conclusion

The generation base tariff for Rexivista was determined and agreed at LSL1.102/kWh by both parties. This is a base tariff to be escalated by an annual CPI published by Lesotho Central Bank. The first escalation indexation will be one year after the Commercial Operation Date (COD). The transmission base tariff for Rexivista is still to be finalised by both parties. The latest capex estimates submitted by Rexivista are under review by LEC. Based on those latest figures, it is estimated that the transmission base tariff will range between LSL0.250/kWh and 0.426/kWh when finalised. The Rexivista generation tariff will only become effective after the transmission line has been built by Rexivista, tested and commissioned by both parties and the transmission line O&M contract signed with LEC.

The generation base tariff for Hirundo was not concluded. Hirundo needs to conduct wind measurements using standards acceptable to financiers. These are usually for over a period of 2 years, but data of 1 year can be used by both parties to progress the PPA negotiations. The NamPower experience in Rosh Pinah Project site emphasizes the importance of wind measurement prior to concluding the PPA. Also, there is inconsistency between the tariff applied for and the Capex costs provided by Hirundo. We note that Hirundo is seeking a tariff of LSL1.97/kWh, but the costs data provided gives a tariff of LSL2.73/kWh or LCOE of 1.99/kWh. More work is needed by Hirundo to refine the costs.

5 Introduction

The European Commission (EU) Support to Reforms in the Energy Sector in Lesotho Phase II is intended to look at large scale investments and up-scaled projects in the energy sector, along with further sector reforms where required. Under the new European External Investment Plan, bankable energy projects will be targeted, co-financing with financing institutions through blending operations.

The overall objective of this Support to Reforms in the Energy Sector in Lesotho is improved access for the people of Lesotho and the private sector to modern, clean, affordable and reliable energy supply, better enabling environment for large up-scaling, energy access for the rural areas and energy efficiency improvement in various economic sectors.

6 IPP Negotiations Transaction Advisory Objectives and Activities

6.1 Project Objectives

The specific objective of this transaction advisory services was to assist the government of Lesotho-owned Lesotho Electricity Company (LEC), as the off-taker, in Power Purchase Agreements (PPAs) negotiations with two renewable energy Independent Power Producers (IPPs). The first IPP, Rexivista Solar, will generate power using solar PV technology while second, Hirundo Wind Power, will generate power using wind technology.

The transaction advisory focused on the commercial aspects of the PPA, with the ultimate goal to successfully conclude PPA that delivers affordable clean energy to the end-consumers while at the same time ensuring commercial viability of the IPP.

6.2 Project Scope

Support LEC with the PPA negotiations taking into account the following:

1. Policy maker's objective – to create positive sentiments to attract investors into the energy sector, but also have an affordable tariff to the consumers as well as energy costs that are competitive for manufacturers.

2. From the Off-taker LEC perspective – to achieve affordable tariffs for the end-consumers, based on prudent investment and efficiency of operations:

    a. Plant installed system capacity and performance – installed capacity, capacity factors, availability, optimization of plant performance, technical losses

    b. The EPC contract costs - The IPP/developers normally comes to negotiate for PPA based on EPC estimate costs, as they don't build the plant before they get a PPA signed to enable them close financing. These EPC estimate costs tend to be on the higher side as they are padded with contingencies. More often than not the actual costs come lower than the estimates used in the PPA negotiation. But, by then, the tariff is already locked in the PPA and the savings accrue to the developer. The off-taker wants to reduce this EPC contract estimates to as close to reality as possible.

c. Take of pay/deemed energy generated payments if the off-taker curtails the power plant. This has been a major issue of late as it is seen to be a major contributor to higher tariffs. The IPP sees this as necessary to meet fixed costs of the plant. A push for "take and pay" arrangements has so far not succeeded in Africa, but is common in liberalized markets like the USA

d. Operating costs - the off-taker pushes for efficiencies reflective of current newer technologies. IPPs want to use historical costs that have embedded in-efficiencies

e. Development costs – reasonableness of these costs - IPPs argue that it is difficult and a lengthy process to develop energy projects in some of the African countries

f. Corporate Social Responsibility (CSR) - IPPs want to pass through these costs to the consumers in higher tariffs. But CSR are supposed to come from the bottom line.

3. From the IPP (developer) perspective - assure they achieve the target return on investment, considering:

    a. Quantum of Return on Equity and Internal Rate of Returns (IRR) commensurate with the risk

    b. Capacity payments to the IPP to ensure fixed costs are met. This is same discussion under "take or pay" above

    c. The capital structure - target debt ratios set by regulator - IPPs argue are not achievable in practice

    d. The IPPs will want to be satisfied that there is an enabling environment in place for their viability. This enabling environment should have:

        i. a legal regime that

            1) allows for an enforceable contract, including mechanisms to resolve disputes swiftly through an objective court system or arbitration;

            2) provides for private sector ownership of power generation assets;

            3) empowers a state-owned utility to enter into power purchase agreements with IPPs;

            4) offers assurances of ownership rights to the stream of revenues;

        ii. a satisfactory track record of adequate tariffs for commercial viability;

        iii. policies that encourage local as well as foreign private investment of independent power producers/developers in the energy sector;

        iv. clearly defined and delineated roles and responsibilities for inter-ministerial coordination with respect to permits, clearances, and approvals; and

        v. clarity of tax laws, import duties, and incentives applicable to both state-owned power utilities and IPPs.

7 Approach and Methodology

A number of kick-off meetings were held in Maseru with Department of Energy, Lesotho Electricity Company (LEC), and Project Team Leader during the first in-country mission in Maseru between 30 August 2023 and 15 September 2023.

The kick-off meetings were used to confirm government and LEC negotiation objectives, initial negotiation position as well as their perspective of, what in the end, a fair and reasonably affordable price would be. To complement these expectations, a desktop review was made to establish benchmarks of installed generation cost and tariffs for grid connected solar PV and wind projects. In this regard, the PPA tariffs achieved from bid window one (BW1) to bid window 6 (BW6) of the South Africa Renewable Energy Independent Power Producers Procurement Program (REIPPPP) bid window (BW) reviewed. The tariffs achieved by Nam Power of Namibia for Solar PV and Wind in the years 2021 to 2023 were also reviewed. The international installed costs of grid-connected solar PV and wind generation published by the International Renewable Energy Agency (IRENA) and the USA department of Energy were reviewed for current costs, trends and future outlook. The existing LEC PPA tariff also considered by LEC in benchmarking solar PV tariffs.

A draft Negotiation Memoranda/Matrix was prepared to serve as a guidance of all the elements to be negotiated to achieve LEC PPA negotiation objectives vis a vis IPP viability. This Negotiation memoranda was presented to the LEC during the kick off meeting as an induction document and for concurrency by the LEC negotiation team.

There were two rounds of negotiations with each IPP over two separate in-country missions in Maseru. The first round of negotiations happened between 30 August and 14 September 2023. The second round of negotiations happened between 9th October and 13 October 2023. In each occasion, separate negotiations were held with each IPP's representatives. Each negotiation round lasted about two days for each IPP. Concluded matters were documented in the matrix. Outstanding matters were isolated and summarised for the respective IPP to follow-up. LEC team would debrief after every negotiation session to summarise the key observations, conclusions, and follow-up action items.

After the first round of negotiations, a meeting was held with the Department of Energy and a presentation was made on the progress, observations, matters arising. Items requiring the Department of Energy's intervention (e.g., issues around the Masite Nek proposed wind site, ESIA, site allocation framework) were picked up by the Department for action.

8 Desktop review of installed costs and tariffs of grid-tied solar/wind projects

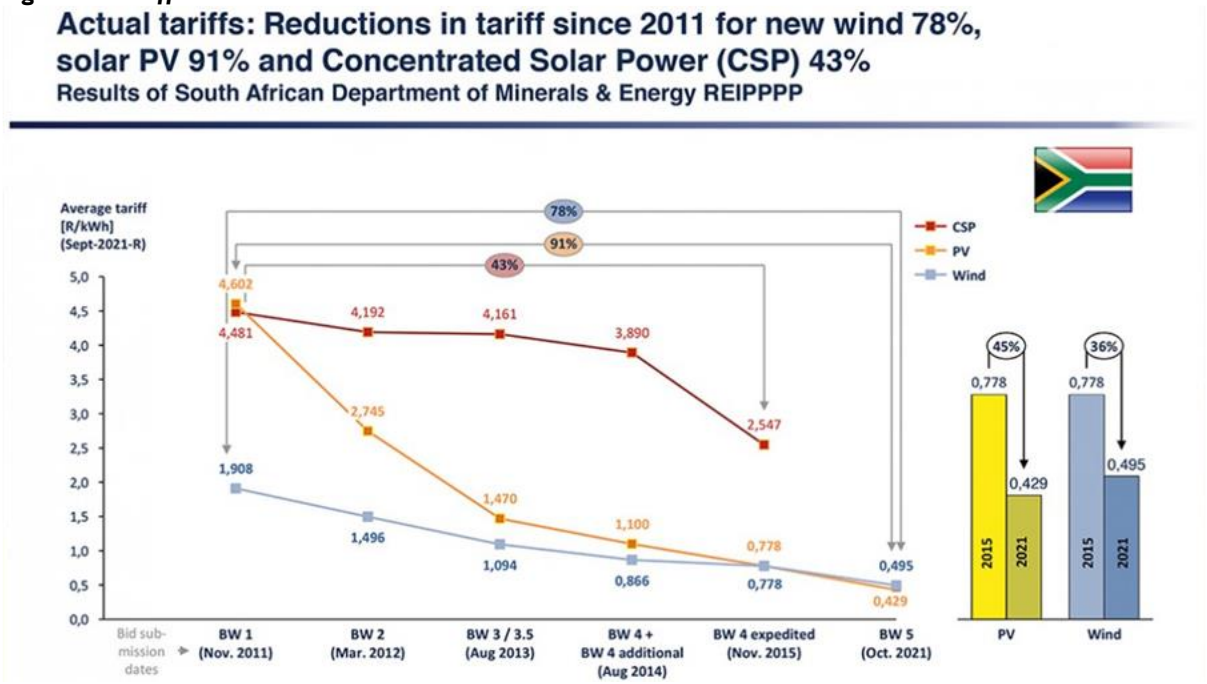
8.1 South Africa REIPPPP Tariffs

Bid Window 1 to 5

- Between the first bidding window in 2011 and Bid Window 5 of the REIPPPP announced in October 2021 the tariffs have decreased by:
    - 78% for wind projects, from R1.90/kWh to 49.5c/kWh
    - 91% for solar PV, from R4.60/kWh to 42.9c/kWh.

- The following graphs illustrate this trend:

Figure 1: Tariffs BW1 to BW5



Source: https://www.engineeringnews.co.za/article/csir-says-fall-in-renewables-tariffs-points-to-need-for-higher-deployments-2021-11-12

BW 5 Projects Struggling to reach Financial Close

But, as of July 2023, the twenty-five (25) BW5 projects are facing challenges to reach financial close owing to the low tariffs and the adverse change in macro-economic conditions. This is illustrated in the following table:

- Out of the twenty-five projects from 2021 bidding round, only thirteen to come online
- Six projects of Ikamva Consortium failed to raise finances
- Six others never signed agreements

Table 1: BW5 Financial Closure

Govt's fifth renewable power bidding round

Just over a third of the 25 projects awarded under the cheapest ever bidding round in South Africa have achieved financial closure

Companies	Average tariff (R/kWhr)	TOTAL no. of projects	Capacity (MW)	Financial closure
Ikamva Consortium	0.40	12	1,274	Failed
Scatec	0.49	3	225	Achieved
Engie	0.48	3	225	Awaiting
Mulilo	0.48	1	75	Awaiting
Red Rocket	0.54	3	420	Achieved
EDF	0.58	3	364	Achieved
TOTAL	0.46	25	2,583	One-third achieved so far

Source: Govt data, companies

Source: https://www.reuters.com/business/energy/south-africas-green-power-push-falters-projects-fail-2023-07-18/

Bid Window 6

In BW6, all the capacity was awarded to solar PV projects. The off-taker national utility confirmed there was no grid capacity available for any of proposed wind project sites in Eastern Cape and Western Cape hence none of the wind projects were selected.

The weighted average price for the six solar PV projects was 49.05c/kWh, which represents an 8% tariff increase compared with the 42c/kWh achieved under BW5. The lowest bid was 46.95c/kWh and the highest 54.8c/kWh. The tariff increase is indicative of the global macro-economic challenges leading to installed costs.

The following table shows the tariffs for the 6 projects:

Table 2: BW6 Tariffs

Project Name	Contracted Capacity (MW)	Price	Province
Kutlwano Solar Power Plant	150,00	469,50	North West
Boitumelo Solar Power Plant	150,00	469,50	North West
Virginia Solar Park	240,00	486,50	Free State
Good Hope Solar Park	200,00	498,90	Free State
Doornhoek PV	120,00	540,00	North West

(Source: https://taiyangnews.info/south-africa-disappointing-6th-re-round-for-onshore-wind/

8.2 NamPower

Lüderitz Wind Project

NamPower invited bids via an open international bidding process for the development of a 50 MW Lüderitz Wind IPP Power Plant on a build-own-operate on 4 March 2022. The successful bidder, Cerim Lüderitz Energy, an IPP, signed a 25-year power purchase agreement (PPA) and the transmission connection agreement (TCA) NamPower in May 2023. The investment cost of the 50 MW wind farm will be N$1.4 billion (US$ 74,287,700.20), which is about US$1,485,754 per MW. With an estimated capacity factor (P50) of 50%, the base electricity tariff is N$0.8785/kWh (ZAR0.88/kWh) and a Fixed Annual Escalation Rate of 0.5%. The development of the wind farm will be completed within 27 months from the PPA signature date, thus commercial operation is expected by July 2025[7].

Rosh Pinah Solar PV Power Project

In November 2022, NamPower embarked on the development of the Rosh Pinah 70 MW Solar PV Power Project. Previously, Rosh Pinah was a 40 MW wind energy project but it was discontinued in late 2022 following an unfavourable 18-month wind Energy Yield Assessment (EYA) that established that the site had insufficient wind energy resources to make the project commercially viable. NamPower made a change to PV technology at the same Rosh Pinah site and advertised for an EPC contractor in August 2023. The 70MW will be built at a cost of N$1.2billion (US$63,675,171.60) or US$909,645 per MW. Estimated capacity factor at ≥35%

[7]https://www.nampower.com.na/public/docs/projects/luderitz/Luderitz%20Wind%20Project%20Fact%20Sheet_18May21_v3.pdf)

from 1-axis tracking N-S, array PV mounting structure. The planned commissioning date is October 2025[8].

8.3 LEC Power Purchases Tariffs

8.3.1 IPP Solar PV generation PPA tariffs

The procurement of IPP in Lesotho is largely not competitive, except for one solar PV IPP. As a result, the main reference that Lesotho uses is the South Africa REIPPPP tariffs, which as indicated above the latest BW6 is about cents 49.05 of a Rand. But it is unlikely the developers in Lesotho will accept those REIPPPP tariffs levels under the current macro-economic environment. Therefore, a customized balanced model is required for Lesotho to give the IPP investors a reasonable return as an incentive to make the investments in Lesotho.

The only solar PV plant procured competitively in Lesotho had an initial base tariff of 83 cents of a Rand. There was a proviso in the PPA to adjust the tariff at financial close to reflect the prevailing ZAR-USD exchange rate at financial close. It is estimated that once that foreign exchange adjustment is made the tariff will go up to around Rands 1.04.

8.3.2 LEC Baseload Electricity Imports Tariffs

Currently, LEC imports baseload electricity from Eskom South Africa and EDM Mozambique. The average tariffs paid are as follows:

- Eskom on average normal tariff is Rands 1.69
- Eskom Time of Use (ToU) is >= Rands 5.00
- EDM average tariff bout Rands 2.00
- Marginal cost of supply is R1.89

8.4 Installed Costs of grid-tied solar PV projects

The average installed cost of solar PV project in USA range between US$960,000 and US$1,160,000[9]. This cost is based on a 100MWdc solar PV project without storage.

8.5 Installed costs of grid-tied wind power projects

The average installed cost of wind projects in USA in 2021 ranged between US$1.3million and US$1.6 million per MW, with wind turbine prices averaging $800,000-$950,000 per MW. Installed costs (per megawatt) generally decline with project size due to economies of scale with lowest cost per MW being for projects over 200 MW[10].

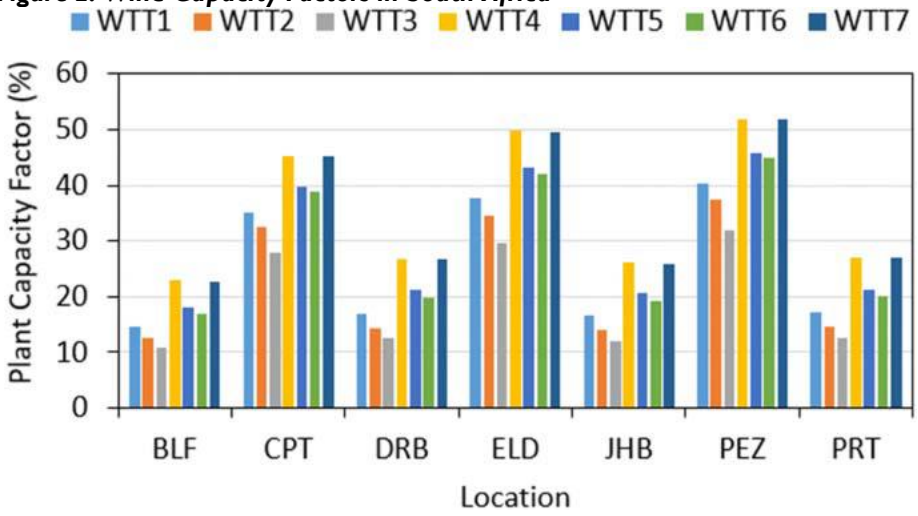
8.6 Capacity factors

8.6.1 South Africa wind capacity factors

The wind plant capacity at inland sites (Bloemfontein, Johannesburg and Pretoria) varies between 10.0 and 28.0%, while at coastal sites, it varies between 30.0 and 52.0%. The following figure illustrates these:

[8] https://www.nampower.com.na/public/docs/projects/Rosh%20Pinah%20PV%20Power%20Plant/RPPV_PF_Rosh%20Pinah%20PV%20Project%20Fact%20Sheet_19Jun2023_v1.0.pdf
[9] https://www.nrel.gov/docs/fy23osti/87303.pdf
[10] https://www.energy.gov/eere/wind/articles/land-based-wind-market-report-2022-edition

Figure 2: Wind Capacity Factors in South Africa



Source: Page 16, Wind and wind power characteristics of the eastern and southern coastal and northern inland regions, South Africa, 2022

8.6.2 Namibia wind capacity factors

The estimated capacity factor Rosh Pinah Solar PV Power Project is ≥35% due to use of 1-axis tracking N-S, array PV mounting structure.

The estimated (P50) capacity factor of Lüderitz Wind Project is 50%

8.6.3 Global wind capacity factors

Wind global average capacity factor is about 27% - 42%

(Source: IRENA, Fig 1.3, page 42 https://mc-cd8320d4-36a1-40ac-83cc-3389-cdn-endpoint.azureedge.net/-/media/Files/IRENA/Agency/Publication/2023/Aug/IRENA_Renewable_power_generation_costs_in_2022.pdf?rev=cccb713bf8294cc5bec3f870e1fa15c2)

8.7 IEA future outlook of installed costs and LCOE of wind and solar projects

"…In 2023, the commodity prices remain above the 2020 levels. Equipment manufacturers may attempt to recover their increased costs by raising prices in upcoming years, leading to higher investment costs. In addition, macroeconomic risks in the global economy, associated with rising inflation and higher interest rates lead to a higher cost of capital, including for renewable energy projects. The Weighted Average Cost of Capital (WACC) is expected to increase in most large solar PV and wind markets. The higher cost of capital could offset most of the cost decreases resulting from lower commodity prices and further technology innovation in the next two years. Consequently, the average LCOE for utility-scale PV and wind could be 10-15% higher in 2024 than it was in 2020…"[11].

In the African countries, the LCOE increases could even be higher due to the depreciation of local currencies against the international currencies for equipment purchases.

[11]https://www.iea.org/reports/renewable-energy-market-update-june-2023/will-solar-pv-and-wind-costs-finally-begin-to-fall-again-in-2023-and-2024

9 PPA Negotiations

Ordinarily, the PPA negotiations process starts with the project ready to be built. Such a project will have a size/capacity, location, net energy output and a pre-agreed connection to the electricity grid. For unsolicited procurement, the sequencing of the process should be:

1. Expression of interest to Department of energy to develop the project and get approval
2. Detailed feasibility studies, which is also approved by the Department of Energy
3. Most developers tend to acquire land even before the PPA and they also get ESIA when doing the detailed feasibility study
4. Negotiate PPA with offtaker which goes to the Regulator for approval
5. Once PPA is approved, the IPP should then proceed to meet the PPA conditions precedent, such as
    a. Getting generation licenses - When applying for the license, they must submit ESIA approval and proof of land ownership rights/lease agreements
    b. Letter of support from GoL, if they need it
    c. CPs to include all obligations as would have been specified in the PPA

10 Rexivista Solar Power PPA Negotiations

10.1 Key negotiation points, issues and consensus

Negotiation point	Consensus Reached/Conclusion
1. Site location	Thaba Tseka
2. Generation technology	Solar PV Non-dispatchable power
3. Size/capacity	$50MW_p$[12]
4. Detailed feasibility studies	The IPP indicated that it has completed and submitted to a detailed feasibility study to the Ministry of Natural Resources. GoL to have a feedback loop with LEC on its approval
5. ESIA	The IPP indicated it has completed the ESIA and submitted the report to the Ministry of Environment. GoL to have a feedback loop with LEC on its approval
6. Land acquisition	The IPP will obtain all land rights and resettlement compensation for the generation and transmission line ways leaves. LEC will not be involved in grant of land and will not provide any assistance towards obtaining land. The IPP indicated it has completed acquiring the land rights acquisition for the generation plant, but not for the transmission line. (This is a CP)
7. Permits/Licenses	The IPP will permits and licenses required for the generation and transmission projects. LEC will not be involved in assisting with securing the permits/licenses The IPP indicated it has started engagements with LEWA generation license (This is a CP)
8. Generation plant	The IPP will secure the financing, build, own and operate the generation plant and deliver the agreed energy amount. LEC will off-taker all the net energy output and make payment for the net energy output.
9. Transmission line	• The IPP to secure financing, construct a 66kV line from Thaba-Tseka to Katse • The construction of the transmission line is a condition precedent (CP) in the PPA to enable LEC evacuate the power generated by the IPP. • There will be a transmission tariff for the IPP to recoup the transmission line investment.

[12] the IPP want a concessionary PPA for 300MW for four sites starting with Thaba-Tseka. But LEC will want to work on a site-by-site basis to align with demand growth. Moreover, the IPP indicated that they have not secured land in the other three sites (Katse, Maseru and Butha Buthe

<table>
<tr><th>Negotiation point</th><th>Consensus Reached/Conclusion</th></tr>
<tr><td></td><td>• The transmission line tariff to be added to the IPP generation tariff
• The 66kV transmission line is to be constructed to LEC specification
• The O&M of the transmission line will be taken over by LEC and the O&M costs are excluded from the IPP costs for purposes of tariffs determination</td></tr>
<tr><td>10. Transmission grid interconnection</td><td>A transmission interconnection agreement (TCA) will be signed by the parties, LEC and the IPP, after the 66kV construction is completed and commissioned (This is a CP)
LEC to undertake the independent engineering study for interconnection using a competent engineer. Informed by this study, the parties, LEC and the IPP, will agree on the delivery point. LEC will then take transmission line risk from and the delivery point</td></tr>
<tr><td>11. Site infrastructure and access</td><td>The IPP is responsible to build and/or repair the site infrastructure including roads
Access rights should be extended to LEC to do inspections under PPA terms</td></tr>
<tr><td>12. Related agreements</td><td>(These are CPs)
<table>
<tr><th>Agreement</th><th>Signatory</th></tr>
<tr><td>1) Implementation Agreement</td><td>LEC will need sight of it, but is not a signatory</td></tr>
<tr><td>2) Grid Interconnection Agreement</td><td>LEC will be a signatory with IPP</td></tr>
<tr><td>3) Land Lease/Concession Agreement</td><td>LEC will need sight of it, but is not a signatory</td></tr>
<tr><td>4) EPC contracts</td><td>LEC will need sight of it, but is not a signatory</td></tr>
<tr><td>5) O&M Contract</td><td>LEC will need sight of it, but is not a signatory</td></tr>
<tr><td>6) Long Term Service Agreement (LTSA)</td><td>Agreement</td></tr>
<tr><td>7) Loan Agreement</td><td>Agreement</td></tr>
<tr><td>8) Direct Agreement</td><td>LEC will be a signatory with the Financier</td></tr>
<tr><td>9) Equity Contribution Agreement</td><td>LEC will need sight of it, but is not a signatory</td></tr>
<tr><td></td><td></td></tr>
</table></td></tr>
<tr><td>13. Performance Security/ Payment Security</td><td>The IPP will put in place requisite performance security (This is a CP).
The IPP does not require LEC to fund an Escrow Account</td></tr>
<tr><td>14. Insurance</td><td>Each party to have standard insurance cover for Force majeure, Business interruption, necessary to meet their respective obligations in the PPA</td></tr>
<tr><td>15. Take and pay obligation</td><td>LEC has the obligation to take and pay for all energy actually generated by the power plant.</td></tr>
<tr><td>16. Deemed energy after COD</td><td>If either the LEC or the transmission system operator, if different from LEC may curtail the production of energy at the generation plant due to constraints on the grid, emergencies, or for other reasons, the LEC will cover curtailment losses as part of the tariff - this is limited to curtailment losses above a pre-determined threshold.
The method for calculating deemed generation quantities for compensation shall be agreed between the parties, LEC and the IPP (This is a CP)</td></tr>
<tr><td>17. Liquidated damages</td><td>The IPP will provide the LEC with project milestones with completion dates that will set the COD. The IPP will pay liquidated damages to LEC for failure to achieve COD by the scheduled date.
The method for calculating liquidated damages for compensation shall be agreed between the parties, LEC and the IPP (This is a CP)</td></tr>
<tr><td>18. Milestones</td><td>The milestones with completion dates should include the following:
<table>
<tr><td>Resource measurement</td></tr>
<tr><td>Detailed feasibility study completion and approval</td></tr>
<tr><td>ESIA completion and approval</td></tr>
<tr><td>Land acquisition/leases agreement</td></tr>
<tr><td>Permits/licenses application</td></tr>
<tr><td>Permits/licenses receipt</td></tr>
<tr><td>Financial close</td></tr>
<tr><td>Signing EPC/ issuing notice to proceed</td></tr>
<tr><td>Commencement of construction</td></tr>
<tr><td>Testing and commissioning</td></tr>
<tr><td>Commercial operation date (COD)</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Negotiation point</th><th>Consensus Reached/Conclusion</th></tr>
<tr><td></td><td>The parties, LEC and IPP, to agree on the milestones from this list whose late satisfaction would terminate the PPA (This is a CP)</td></tr>
<tr><td>19. Tariff currency</td><td>The Lesotho Loti will be the tariff currency as long as the Loti and Rand are pegged one to one. But if unpegged, the fall back will be the South African Rand to compensate for the Loti and Rands exchange rate differential</td></tr>
<tr><td>20. Tariff for generation</td><td>A generation energy charge of LSL1.102/kWh was established and agreed upon LSL1.102/kWh is a base tariff in the first year of full 50MW plant operation to be adjusted annually with an escalation index described below</td></tr>
<tr><td>21. Tariff for transmission</td><td>A transmission base tariff is still to be finalized. It is estimated that transmission base tariff will range between LSL0.250/kWh and 0.426/kWh when finalised. The transmission base tariff in the first year of full transmission line operation is to be adjusted annually with an escalation index described below</td></tr>
<tr><td>22. Tariff build-up</td><td>
<table>
<tr><th>Element</th><th>Quantum</th></tr>
<tr><td>Installed capacity</td><td>50MW$_p$</td></tr>
<tr><td>Capacity factor</td><td>22.5%</td></tr>
<tr><td>Net energy delivered, yr1</td><td>93,436,480kWh</td></tr>
<tr><td>Capital cost - generation</td><td>LSL 1,133,866,115</td></tr>
<tr><td>Capital cost-transmission grid (45km)</td><td>Estimates still being reviewed by LEC</td></tr>
<tr><td>Sub-station intake step-up</td><td>Estimates still being reviewed by LEC</td></tr>
<tr><td>Interconnection at Katse Dam</td><td>Estimates still being reviewed by LEC</td></tr>
<tr><td>Funding sources</td><td>Grants - 0%
Debt - 100%
Equity - 0%</td></tr>
<tr><td>O&M costs per annum (Gx only)[13]</td><td>LSL 6,616,678</td></tr>
<tr><td>Debt terms</td><td>Tenor – 20 years
Annual interest rate – 6%</td></tr>
</table>
</td></tr>
<tr><td>23. Construction costs over-runs</td><td>The IPP is responsible for cost overruns and will not be passed through to the tariff</td></tr>
<tr><td>24. Testing and commissioning</td><td>The IPP is responsible for testing and commissioning of the power plant before COD using suitable experts and suitable test equipment
Sufficient notice must be given to the LEC to engage its own experts to witness the testing along with the experts of IPP. Also, sufficient notice must be given to LEC to prepare to receive that energy from the testing and commissioning.
If the testing shows that plant will fail to meet contracted capacity the IPP will rectify the plant to meet contracted energy output. If such rectification results in delays in achieving COD, liquidated damages shall apply as above.</td></tr>
<tr><td>25. Metering</td><td>The LEC and the IPP (the parties) will agree on the meters (a main meter and a backup meter/check-meter) to be used for measurements, and the delivery points for those measurements (This is a CP)</td></tr>
<tr><td>26. Invoicing</td><td>• Invoicing will be for a monthly period
• Invoices will be reviewed within 10 business days of receipt by LEC</td></tr>
<tr><td>27. Payment</td><td>• Payment by wire transfer/swift/EFT in Lesotho Loti
• Payment is made within 30 days of receipt of invoice by LEC
• Late payment interest rate will be a pass-through of interest rate charged by the lender – term sheets must be shared by the IPP for proof
• Withheld payment on contested invoice will accrue interest, unless they become the resolution is such that the invoice is ineligible for payment</td></tr>
<tr><td>28. Tariff indexation</td><td>Indexation is based on an annual CPI calculation as per Lesotho Central Bank</td></tr>
<tr><td>29. Drafting the PPA</td><td>• LEC will take the lead in the PPA drafting using the existing solar PV generation IPP PPA as a starting point
• There are drafting costs of the PPA and whoever takes the lead in drafting the PPA (i.e., LEC) will bear the cost
• Any of the of unresolved matters will be CPs</td></tr>
</table>

[13] O&M costs for the transmission line will be taken up by directly LEC and as the O&M contractor

Negotiation point	Consensus Reached/Conclusion
30. PPA term	25 years from COD
31. Governing law	Lesotho law; Arbitration (not discussed) – Lesotho

10.2 Rexivista solar PV project tariffs elements compared against benchmarks

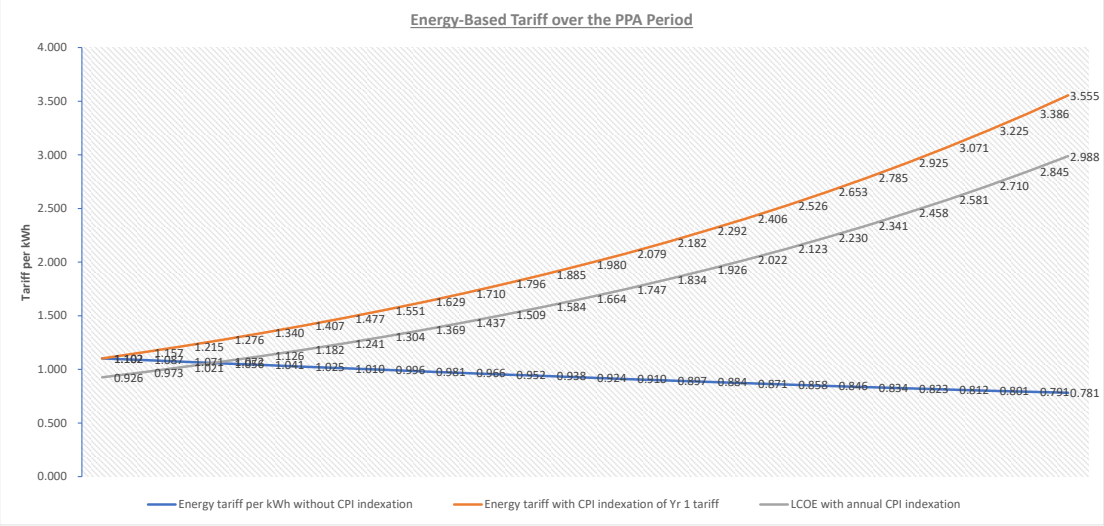
Table 3: Rexivista project costs versus benchmarks

Benchmarks item		Rexivista	Benchmarks				
Parameter	Units		Lowest	Average	Highest	Data Source	Data year
Capacity factor	%	22.5%		17.0%		IRENA	2022
Technical losses (kWh generated - kWh sold)/kWh generated) %	%						
Total capex per MW	US$/MW	$1,193,543	$960,000	$1,060,000		NREL	2023
Generation Capex per MW	US$/MW	$1,175,905	$909,645			Nam Power	Aug 2023
Transmission line Capex per km	US$/km						
O&M as a % of capex annually	%	0.6%		2.0%		LEC	2023
O&M kWdc/yr (utility-scale, single-axis tracking)	US$/$KW_{dc}$	$6.96	$16.12	$16.58		NREL	2023
Generation tariffs for same Gx technology in the SADC region	LSL/kWh	1.102	0.4695	0.4905	0.5480	BW6-SA REIPPPP	Dec 2022
			0.83 revised to 1.04			One Power – LEC PPA	2023
Transmission tariff	LSL/kWh	LSL0.250-0.426/kWh					

10.3 Price path over the 25 years PPA term

Three scenarios assuming indexation of the base tariff by a CPI of 5%

Figure 3: Price path over the 25 years PPA period



The three scenarios shown on the graph are:

- The generation base tariff of LSL 1.102/Wh indexed annually with 5% CPI
- The base LCOE of LSL 0.926/kWh indexed annually with 5% CPI
- The base tariff of LSL 1.102/kWh is not indexed, and annual price is recalibrated using asset values at historical costs balances

- The transmission base tariff will range between LSL0.250 and 0.426/kWh when finalised. The transmission base tariff will also be indexed with annual CPI published by Lesotho Central Bank

10.4 Gaps/pending matters

The pending matters are:

- the geo-technical design of the transmission line by Rexivista and
- concurrence by LEC on the Rexivista's specs for the transmission line
- costing of the transmission line specs by Rexivista
- review of the costing by LEC and negotiation of both parties of a transmission tariff
- all the CPs in Section 10.1

10.5 Conclusion

The generation base tariff for Rexivista was determined and agreed at LSL1.102/kWh by both parties. The transmission line base tariff for Rexivista was determined and agreed at LSLxxx/kWh by both parties. The base tariffs will be escalated by an annual CPI published Lesotho Central Bank. The first escalation indexation will be one year after the COD.

The generation tariff will only become effective after the transmission line has been built by Rexivista, tested and commissioned by both parties and the transmission line O&M contract signed with LEC. All other CPs to the PPA are shown in the negotiation matrix in Section 10.1 for action by the responsible respective parties.

11 Hirundo Wind Energy PPA Negotiations

11.1 Key negotiation points, issues and consensus

<table>
<tr><th>Negotiation point</th><th>Consensus Reached/Conclusion</th></tr>
<tr><td>1. Site location</td><td>Mohale's Hoek</td></tr>
<tr><td>2. Generation technology</td><td>Wind
Non-dispatchable power</td></tr>
<tr><td>3. Size/capacity</td><td>55.2MW$_p$[14]</td></tr>
<tr><td>4. Detailed feasibility studies</td><td>The IPP has NOT completed a detailed feasibility and wind measurements (This is a CP)</td></tr>
<tr><td>5. ESIA</td><td>The IPP indicated it has completed the ESIA, submitted the report to the Ministry of Environment and gotten feedback on areas to address.
Ministry of Environment to have a feedback loop with LEC on its approval</td></tr>
<tr><td>6. Land acquisition</td><td>The IPP to re-visit and provide for adequate compensation and resettlement in the capex costs-plate site, road and way leave. LEC will not be involved in grant of land rights/acquisition and will not provide any assistance towards obtaining land. (This is a CP)</td></tr>
<tr><td>7. Permits/Licenses</td><td>The IPP will secure permits and licenses required for the generation and transmission projects. LEC will not be involved in securing the permits/licenses (This is a CP)</td></tr>
<tr><td>8. Generation plant</td><td>The IPP will secure the financing, build, own and operate the generation plant and deliver the agreed energy amount. LEC will take and pay all the net energy output from the plant</td></tr>
<tr><td>9. Transmission line</td><td>• The IPP to secure financing, construct a 10km transmission line - 33kV line from the project site to the delivery point
• The construction of the transmission line is a condition precedent (CP) in the PPA to evacuate the power generated by the IPP.
• There will be a transmission line cost is included in the tariff for the IPP to recoup the transmission line investment.
• The transmission line tariff to be added to the IPP generation tariff
• The 33kV transmission line is to be constructed to LEC specification
• The O&M of the transmission line will be taken over by LEC and the O&M costs are excluded from the IPP costs for purposes of tariffs determination</td></tr>
<tr><td>10. Transmission grid interconnection</td><td>A transmission interconnection agreement (TCA) will be signed by the parties, LEC and the IPP, after the transmission line construction is completed and commissioned (This is a CP)
LEC to undertake the independent engineering study for interconnection using a competent engineer to inform the delivery point
The parties will agree on the delivery point. LEC will then take transmission line risk from and the delivery point
LEC will accelerate the variable renewable energy grid integration study incorporating all potential renewable energy projects to assess maximum intermittent renewable energy that can be absorbed into the grid</td></tr>
<tr><td>11. Site infrastructure and access</td><td>The IPP is responsible to build and maintain the site infrastructure including roads. The cost of the road is included in the capex for the tariff
Access rights should be extended to LEC to do inspections under PPA terms</td></tr>
<tr><td>12. Related agreements</td><td>(These are CPs)
<table>
<tr><th>Agreement</th><th>Signatory</th></tr>
<tr><td>1) Implementation Agreement</td><td>LEC will need sight of it, but is not a signatory</td></tr>
<tr><td>2) Grid Interconnection Agreement</td><td>LEC will be a signatory with IPP</td></tr>
<tr><td>3) Land Lease/Concession Agreement</td><td>LEC will need sight of it, but is not a signatory</td></tr>
<tr><td>4) EPC contracts</td><td>LEC will need sight of it, but is not a signatory</td></tr>
</table></td></tr>
</table>

[14] the IPP wanted a PPA for 100MW for two sites – Mohale's Hoek (60MW) and Masite Nek (40MW). But LEC will want to work on a site-by-site basis to align with demand growth. The IPP will start with Mohale's Hoek, where ESIA has already been done and submitted to the GoL.

<table>
<tr><th>Negotiation point</th><th>Consensus Reached/Conclusion</th></tr>
<tr><td></td><td>
<table>
<tr><td>5) O&M Contract</td><td>LEC will need sight of it, but is not a signatory</td></tr>
<tr><td>6) Long Term Service Agreement (LTSA)</td><td>Agreement</td></tr>
<tr><td>7) Loan Agreement</td><td>Agreement</td></tr>
<tr><td>8) Direct Agreement</td><td>LEC will be a signatory with the Financier</td></tr>
<tr><td>9) Equity Contribution Agreement</td><td>LEC will need sight of it, but is not a signatory</td></tr>
<tr><td>10) Comfort letter</td><td>LEC will need sight of it, but is not a signatory</td></tr>
<tr><td>11) Escrow Agreement</td><td>LEC will be a signatory</td></tr>
</table>
</td></tr>
<tr><td>13. Performance Security/ Payment Security</td><td>The IPP will put in place requisite performance security.
LEC will fund an Escrow Account covering 3 months' worth on billing (This is a CP)</td></tr>
<tr><td>14. Insurance</td><td>Each party to have standard insurance cover for Force majeure, Business interruption, necessary to meet their respective obligations in the PPA</td></tr>
<tr><td>15. Take and pay obligation</td><td>LEC has the obligation to take and pay for all energy generated by the power plant.</td></tr>
<tr><td>16. Deemed energy after COD</td><td>If either the LEC or the transmission system operator, if different from LEC, curtail the production of energy at the generation plant due to constraints on the grid, emergencies, or for other reasons, the LEC will cover curtailment losses as part of the tariff - this is limited to curtailment losses above a pre-determined threshold.
The method for calculating deemed generation quantities for compensation shall be agreed between the parties, LEC and the IPP (This is a CP)</td></tr>
<tr><td>17. Liquidated damages</td><td>The IPP will provide the LEC with project milestones with completion dates that will set the COD.
The IPP will pay liquidated damages to LEC for failure to achieve COD by the scheduled date.
The method for calculating liquidated damages for compensation shall be agreed between the parties, LEC and the IPP (This is a CP)</td></tr>
<tr><td>18. Milestones and Termination</td><td>The milestones with completion dates should include the following:
<table>
<tr><td>Wind resource measurement</td></tr>
<tr><td>Detailed feasibility study completion and approval</td></tr>
<tr><td>ESIA completion and approval</td></tr>
<tr><td>Land acquisition/leases agreement</td></tr>
<tr><td>Permits/licenses application</td></tr>
<tr><td>Permits/licenses receipt</td></tr>
<tr><td>Financial close</td></tr>
<tr><td>Signing EPC/ issuing notice to proceed</td></tr>
<tr><td>Commencement of construction</td></tr>
<tr><td>Testing and commissioning</td></tr>
<tr><td>Commercial operation date (COD)</td></tr>
</table>
Termination clauses to be based on standard PPA practice
The parties, LEC and IPP, to agree on the milestones from this list whose late satisfaction would terminate the PPA (This is a CP)</td></tr>
<tr><td>19. Tariff currency</td><td>The Lesotho Loti will be the tariff currency as long as the Loti and Rand are pegged one to one. But if unpegged, the fall back will be the South African Rand to compensate for the Loti and Rands exchange rate differential</td></tr>
<tr><td>20. Tariff for generation</td><td>The generation energy base tariff was not established due to lack of wind measurements data to confirm the site potential for the 55.2MW plant</td></tr>
<tr><td>21. Tariff for transmission</td><td>This is to be determined and rolled into the generation tariff, once the delivery point is agreed upon by both parties and IPP constructs the line. (This is a CP)</td></tr>
<tr><td>22. Tariff build-up</td><td>
<table>
<tr><td>Element</td><td>Quantum</td></tr>
<tr><td>Installed capacity</td><td>55.2 MW_p</td></tr>
<tr><td>Capacity factor</td><td>29.73%</td></tr>
<tr><td>Net energy delivered, yr1</td><td>132,472,995kWh</td></tr>
<tr><td>Installed capital cost</td><td>LSL 2,009,908,406
The IPP was requested to
• provide detailed breakdown of costs
• show transmission line cost separately</td></tr>
</table>
</td></tr>
</table>

<table>
<tr><th>Negotiation point</th><th>Consensus Reached/Conclusion</th></tr>
<tr><td></td><td>
<table>
<tr><td></td><td>• show road construction costs separately
• Show import taxes/import duties separately</td></tr>
<tr><td>Funding sources</td><td>Grants - 0%
Debt - 70%
Equity - 30%</td></tr>
<tr><td>Debt terms</td><td>Tenor –17 years
Interest rate – 11.75%
Fee – 1%
Commitment fee–30% (no specifics)
IPP will share the Debt Term Sheet with the LEC</td></tr>
<tr><td>Equity IRR expected</td><td>18%
The IPP was requested to consider the 12% to 15% range in local terms</td></tr>
<tr><td>O&M costs per annum</td><td>LSL 38,900,000
The IPP was requested to adjust down the O&M to reflect local labour costs</td></tr>
</table>
</td></tr>
<tr><td>23. Foreign Exchange Rate at Financial Close</td><td>The final base tariff will be adjusted on financial close for any movement in exchange rate between the LSL (ZAR) and USD.</td></tr>
<tr><td>24. Construction costs over-runs</td><td>The IPP is responsible for cost overruns and will not be passed through to the tariff</td></tr>
<tr><td>25. Testing and commissioning</td><td>The IPP is responsible for testing and commissioning of the power plant before COD using suitable experts and suitable test equipment
Sufficient notice must be given to the LEC to engage its own experts to witness the testing along with the experts of IPP. Also, sufficient notice must be given to LEC to prepare to receive that energy from the testing and commissioning.
If the testing shows that plant will fail to meet contracted capacity the IPP will rectify the plant to meet contracted energy output. If such rectification results in delays in achieving COD, liquidated damages shall apply as above.</td></tr>
<tr><td>26. Metering</td><td>The LEC and the IPP (the parties) will agree on the meters (a main meter and a backup meter/check-meter) to be used for measurements, and the delivery points for those measurements (This is a CP)</td></tr>
<tr><td>27. Invoicing</td><td>• Invoicing will be for a monthly period
• Invoices will be reviewed within 10 business days of receipt by LEC</td></tr>
<tr><td>28. Payment</td><td>• Payment by wire transfer/swift/EFT in Lesotho Loti
• Payment is made within 30 days of receipt of invoice by LEC
• Late payment interest rate will be a pass-through of interest rate charged by the lender – term sheets must be shared by the IPP for proof
• Withheld payment on contested invoice will accrue interest, unless they become the resolution is such that the invoice is ineligible for payment</td></tr>
<tr><td>29. Tariff indexation</td><td>Indexation is based on an annual CPI calculation as per Lesotho Central Bank</td></tr>
<tr><td>30. Drafting the PPA</td><td>• LEC will take the lead in the PPA drafting using the existing solar PV generation IPP PPA as a starting point
• There are drafting costs of the PPA and whoever takes the lead in drafting the PPA (i.e., LEC) will bear the cost
• Any of the of unresolved matters will be CPs</td></tr>
<tr><td>31. PPA term</td><td>25 years from COD</td></tr>
<tr><td>32. Governing law</td><td>Lesotho law; Arbitration (not discussed) – Lesotho</td></tr>
</table>

11.2 Hirundo wind power project tariffs elements compared against benchmarks

The following table shows how Hirundo Wind Power Project costs compares with benchmarks in the region, specifically South Africa and Namibia as well as international installed costs.

Table 4: Hirundo Wind project costs versus benchmarks

Benchmarks item		Hirundo	Benchmarks				
Parameter	Units		Lowest	Average	Highest	Data Source	Data year
Capacity factor - vs global average	%	29.7%	27.0%		42.0%	IRENA	2022
Capacity factor - vs SA inland sites[15]	%	29.7%	10.0%		28.0%	University of Pretoria	2022
Capacity factor - vs SA coastal sites[16]	%	29.7%	30.0%		52.0%	University of Pretoria	2022
Capacity factor - vs Namibia Lüderitz Wind Project	%	29.7%		50.0%		Nam Power	2022
Technical losses (kWh generated - kWh sold)/kWh generated) %	%	3.0%					
Total capex - installed cost of wind projects - per MW	US$/MW	1,916,389	1,300,000	1,500,000	1,600,000	www.energy.gov	2021
Turbine costs	US$/MW		800,000		950,000	www.energy.gov	2021
Total capex - installed cost of wind projects - per MW	US$/MW	$1,916,389	$0	$1,485,754	$0	Nam Power	Aug 2023
Transmission line Capex per km	US$/km						
O&M as a % of capex annually	%	1.9%					
O&M per turbine per year	US$/WT/ year	$170,614	$42,000	$	$48,000	NREL	2023
Generation tariffs for same Gx technology in the SADC region	LSL/kWh	1.97	0.34425	0.4950	0.6177	BW5-SA REIPPPP	Oct 2021
				0.8785		NamPower	Dec 2022

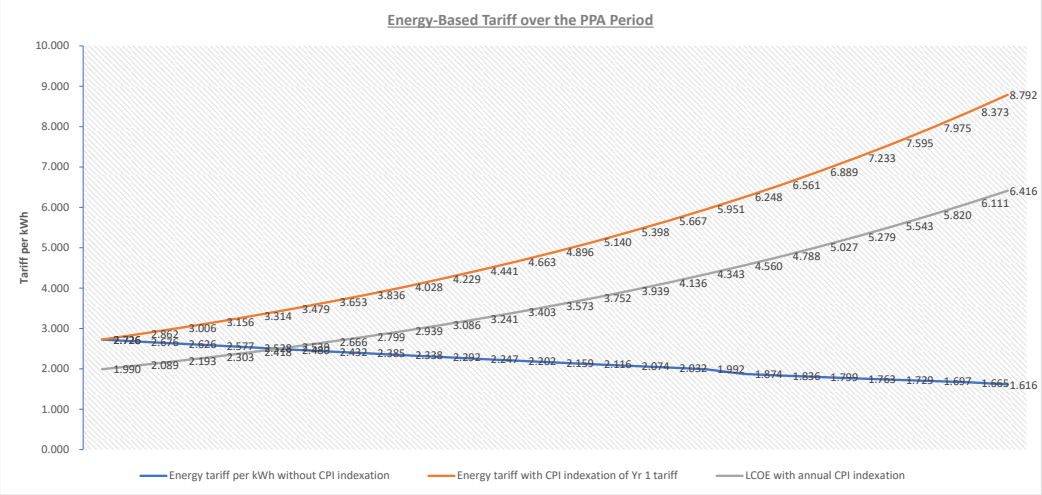
The above shows that is still potential to negotiate down the Hirundo tariffs in line with the USD benchmarks which will then be translated to local currency, as well as providing for Lesotho/LEC specific risks.

11.3 Price path over the 25 years PPA term

Three scenarios assuming indexation of the base tariff by a CPI of 5%. But Hirundo is using a CPI of 6.5%

Also, we note that Hirundo is seeking a tariff of LSL1.97/kWh, but the data provides gives a tariff of LSL2.779/kWh or LCOE of2.006/kWh

Figure 4: Price path over the 25 years PPA period



[15] Bloemfontein, Johannesburg and Pretoria
[16] Durban, East London and Port Elizabeth on the east coast and Cape Town

The three scenarios shown on the graph are:

- The base tariff of LSL2.779/kWh indexed annually with 5% CPI
- The base LCOE of LSL2.006/kWh indexed annually with 5% CPI
- The base tariff of LSL2.779/kWh is not indexed, and annual price is recalibrated using asset values at historical costs balances

11.4 Gaps/pending matters

The pending matters are:

- Hirundo needs to conduct wind measurements using standards acceptable to financiers. This is usually a period of 2 years, but data of 1 year can be used to progress the PPA negotiations. The NamPower experience in Rosh Pinah Project site emphasizes the importance of wind measurement prior to concluding the PPA.
- all the CPs in Section 10.1

11.5 Conclusion

The generation base tariff for Hirundo was not concluded as there are no wind measurements as well as the request to Hirundo to start with the Mohale's Hoek instead of Masite Nek. Masite Nek has issues around aviation, cultural site and the ESIA has not be completed.

Hirundo needs to conduct wind measurements using standards acceptable to financiers. These are usually for over a period of 2 years, but data of 1 year can be used by both parties to progress the PPA negotiations. The NamPower experience in Rosh Pinah Project site emphasizes the importance of wind measurement prior to concluding the PPA.

The 10km transmission line (33kV) is to be determined and rolled into the generation tariff, once the delivery point is agreed upon by both parties. The IPP will construct the transmission line. The generation tariff will only become effective after the transmission line has been built by Hirundo, tested and commissioned by both parties and the transmission line O&M contract signed with LEC. All other CPs to the PPA are shown in the negotiation matrix in Section 10.1 for action by the responsible respective parties.

12 References

1. Understanding Power Purchase Agreements, 2nd Edition, Power Africa
2. Renewable Power Generation Costs in 2022, IRENA 2023
3. Department of Minerals and Energy, Media Statement on REIPPP BW6 Winners Announcement, 8 December 2022
4. Equator Principles (EP4), A financial industry benchmark for determining, assessing and managing environmental and social risk in projects, July 2020
5. South Africa Integrated Resource Plan (IRP 2019), Department of Energy Republic of South Africa, October 2019
6. Power Generation Technology Data for Integrated Resource Plan of South Africa, Electric Power Research Institute (EPRI) Technical Update, April 2017
7. Environmental, Health, and Safety Guidelines for Wind Energy, IFC/World Bank, 2015
8. https://www.iea.org/reports/renewable-energy-market-update-june-2023/will-solar-pv-and-wind-costs-finally-begin-to-fall-again-in-2023-and-2024
9. https://www.energy.gov/eere/wind/articles/land-based-wind-market-report-2022-edition
10. https://mc-cd8320d4-36a1-40ac-83cc-3389-cdn-endpoint.azureedge.net/-/media/Files/IRENA/Agency/Publication/2023/Aug/IRENA_Renewable_power_generation_costs_in_2022.pdf?rev=cccb713bf8294cc5bec3f870e1fa15c2
11. https://www.nampower.com.na/public/docs/projects/luderitz/Luderitz%20Wind%20Project%20Fact%20Sheet_18May21_v3.pdf
12. https://www.nampower.com.na/public/docs/projects/Rosh%20Pinah%20PV%20Power%20Plant/RPPV_PF_Rosh%20Pinah%20PV%20Project%20Fact%20Sheet_19Jun2023_v1.0.pdf
13. https://www.africa-energy.com/live-data/article/namibia-nampower-replaces-rosh-pinah-wind-farm-solar-power-project
14. : https://taiyangnews.info/south-africa-disappointing-6th-re-round-for-onshore-wind/
15. https://www.reuters.com/business/energy/south-africas-green-power-push-falters-projects-fail-2023-07-18/
16. https://www.engineeringnews.co.za/article/csir-says-fall-in-renewables-tariffs-points-to-need-for-higher-deployments-2021-11-12
17. https://www.pfie.com/story/3861499/bid-window-5-and-the-future-of-financing-sa-renewables-tgwdkpd4ls