MPUMALANGA
GREEN CLUSTER
AGENCY

2023

Mpumalanga **Energy**
Market Intelligence Opportunity Brief

Mpumalanga Green Cluster Agency

Disclaimer
While every attempt has been made to ensure that the information published in this report is accurate, no responsibility is accepted for any loss or damage to any person or entity relying on any of the information contained in this report.

Copyright © Mpumalanga Green Cluster Agency 2023

This document may be downloaded at no charge from https://mpumalangagreencluster.co.za/resources
All rights reserved.

Subscribe to receive e-mail alerts or MGCA news, events, and publications by registering as a member on our website: http://www.mpumalangagreencluster.co.za/

Middelburg, South Africa

Author: Collins Nyamadzawo
Editorial and review: Jack Radmore, Reshmi Wolvers, Lauren Basson, Cilnette Pienaar, Thula Zondi and Nicholas Fordyce

Images: Supplied

Layout and design: TwoRedPens Marketing Agency

CONTENTS

LIST OF FIGURES

LIST OF TABLES

LIST OF ABBREVIATIONS AND ACRONYMS

BESS	Battery Energy Storage Systems
BOPC	Business Operations Performance Committee
BW	Bid Window
CSP	Concentrated Solar Power
DFFE	Department of Forestry, Fisheries and the Environment
DMRE	Department of Mineral Resources and Energy
EA	Environmental authorisation
EAF	Energy Availability Factor
EIA	Environmental impact assessment
EIU	Energy Intensive Users
EJETP	Eskom Just Energy Transition Project
GCCA	Generation Connection Capacity Assessment
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GW	Gigawatt
IPG	International Partners Group
IPPs	Independent Power Producers
IRP	Integrated Resource Plan
JETIP	Just Energy Transition Investment Plan
JETP	Just Energy Transition Partnership
MWh	Megawatt hours
NERSA	National Energy Regulator of South Africa
PGM	Platinum Group Metals
PV	Photovoltaic
NDC	Nationally Determined Contribution
NEMA	National Environmental Management Act
RE	Renewable Energy
REDZ	Renewable Energy Development Zone
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
SARS	South African Revenue Service
SSEG	Small-scale embedded generation
UNFCCC	United Nations Framework Convention on Climate Change
WWTW	Wastewater treatment works


© Freepik

EXECUTIVE SUMMARY

This market opportunity brief is part of an annually updated series of reports that highlight investment opportunities in the green economy in Mpumalanga. It is written for investors who want to understand the opportunities for investment and job creation in green economy sectors in the province.

The decarbonisation of the power sector presents investment opportunities if South Africa is to meet its increased Nationally Determined Contribution (NDC). Coal still dominates the South African energy mix, providing 81.6% (184 568GWh of the 226 226GWh) of the total system load in 2022 with the majority of coal-fired power stations located in Mpumalanga province.

The share of renewable energy technologies (wind, solar PV and concentrated solar power (CSP)) continues to grow. By 2022, it reached a total of 6.3 GW installed capacity (IPP Office, 2023) and 11% of the country's total installed capacity.

The Mpumalanga provincial government has been proactive in exploring opportunities in the green economy. The province has driven the establishment of the Mpumalanga Green Cluster Agency which works to advance a sustainable and inclusive green economy and create shared value in the Mpumalanga province. The priority areas listed by the province include energy security, green economy, industrialisation through localisation and export promotion, agriculture and food security, rollout of infrastructure, employment stimulus, tourism, cultural and creative industries.

The provincial government's opportunity-focused approach has the potential to unlock the job creation and investment potential of the South African just energy transition. **At the heart of this transition will be the growth of the renewable energy market.** There are a host of enabling factors that are expected to be key to locating key renewable energy projects in the province, including:

- **Eskom transmission grid capacity:** Mpumalanga currently has 3.3GW of grid capacity to be connected to the grid on a first ready, first served basis. This presents an exciting driver for large-scale renewable energy projects in the province to take advantage of the existing transmission assets in the region.

- **Renewable Energy Development Zone (REDZ):** Emalahleni is expected to benefit from the announcement that it has been designated as a REDZ as this enables revenue streams other than those that rely on coal mining and coal power generation activities. Renewable energy projects, particularly solar PV will be able to get an environmental assessment completed in 57 days, for land that has already been pre-assessed.

- **Solar irradiation:** Global horizontal irradiation in Mpumalanga ranges between a long-term average of 1 752 kWh/m2/year and 2 044 kWh/m2/ year (only ~16% lower than the Northern Cape, which has the highest irradiation in the country). This is because of the relatively long duration of sunshine in. Mpumalanga with approximately 2 576 hours of sunshine throughout the year.

- **Wind resources:** As technologies become more efficient, Mpumalanga's wind resources enable attractive investment opportunities. The wind speed in the province ranges between 4 m/s and 7 m/s at 100 m above ground level.

However, there are also a number of barriers to large scale renewable energy generation and small scale embedded generation that need to be addressed by relevant stakeholders. These barriers include:

- **Section 53 applications:** In Mpumalanga, where there is a demand for large-scale renewable energy sites, the existing mining rights, prioritized over above-ground activities, have posed a significant obstacle to renewable energy projects. The Section 53 of the Mineral and Petroleum Resources Development Act of 2002, which requires approval for land use contrary to the Act's objectives, has been a persistent barrier, leading to prolonged delays and increased complexity in large-scale renewable energy initiatives due to uncertain approval processes and lack of defined time frames.

- **Bird migration routes and environmental regulatory landscape:** The migratory routes of endangered large bird species in Mpumalanga are insufficiently documented, leading to conflicts with potential wind energy sites due to the lack of clearly defined flight paths. In contrast, solar projects benefit from a government initiative exempting them from environmental authorization requirements in regions with medium to low environmental sensitivity, acknowledging the lower environmental impact of solar technologies and prompting a shift in regulatory oversight.

- **Municipal SSEG Guidelines:** Lack of municipal regulations as absence of clear regulations and policies supporting SSEG can create uncertainty for investors. Some financial institutions' insistence on SSEG approval for long-term investment security has created hesitation among potential investors in some of the 11 local municipalities with no SSEG framework.

If these barriers can be addressed, there are renewable energy opportunities that can attract investment to the areas and create decent jobs in the Mpumalanga transition. These opportunities are detailed in the **Table 1** on the next page.

Table 1: Summary of investment opportunities in renewable energy in Mpumalanga

Opportunity	Key Drivers	Risks & Barriers	Expected Timeframe	Targeted Stakeholder
Utility scale renewable energy (RE) 250 MW/year and up to 2 GW by 2030 **Market size R21.1 billion**	• The cap for setting up power generation systems without a licence was removed in 2022. • The current 3.3GW grid availability in Mpumalanga. • Declining renewable energy prices globally. • Mining companies' commitment to install renewable energy has boosted the energy market in the province. • Expected grid capacity following 35 GW of decommissioned coal power plants by 2050.	• Delay in the process to obtain consent for above ground development on areas with mining rights, due to delays in the process of obtaining ministerial approval in line with Section 53 of the Mineral and Petroleum Resources Development Act, 28 of 2002. • The migratory routes of endangered large bird species in Mpumalanga are insufficiently documented, leading to conflicts with potential wind energy sites due to the lack of clearly defined flight paths.	Medium to long term (3 -10 years)	• Department of Minerals Resources and Energy • Independent Power Producers • Eskom • Financial Service Providers
Small-scale embedded generation 40 MW/year growth **Market size up to R3.2 billion by 2030**	• Continued loadshedding and the need for energy security. • Strong business case for solar PV as prices per kWh are competitive with utility rates. • Flexible financing and procurement options of energy solutions from finance houses and developers. • Supportive energy policies and regulations by some local municipalities allowing for small-scale embedded generation. • Solar panel tax incentive pegged at 25% for individuals and 125% for businesses between March 2023 and February 2024.	• Only six out of 17 municipalities in Mpumalanga have defined SSEG. • Misalignment of local SSEG to national SSEG framework as some municipalities have different standards for approval. This leads to some financial institutions not funding PV projects in those municipalities • Technical expertise and skilled workforce for PV system design and installation as the demand for skills has surpassed the supply.	Immediate	• Commercial and Industrial clients • Energy Services Companies • Financial Service Providers
Battery energy storage systems 48 MWh/year growth up to 336MWh market by 2030 **Market size R2 billion**	• Continued loadshedding and the need for energy security. • Technology cost per kWh has been dropping year-on-year and is now cheaper than conventional back up energy sources like diesel generators. • Increased financial returns from storage investments. • Batteries provide energy security during loadshedding. • Enabling the delaying or postponing of planned expansions or enhancements to an infrastructure's power or resource capacity. • The stacked benefit of time of use tariff management and demand charge reduction.	• Upfront cost per kWh is still relatively higher than conventional sources of emergency power like diesel generators. • Limited awareness and understanding: Businesses not aware of the cost-saving opportunities, energy resilience benefits, and load management capabilities that battery storage systems can provide in the commercial and industrial sector.	Immediate	• Commercial and Industrial clients • Energy Services Companies • Financial Service Providers

WHAT'S NEW?

The following events of significance for the renewable energy market in the country of relevance to Mpumalanga have happened since the publication of the 2022 Renewable Energy Opportunity Brief.

October 2022

- Eskom entered into land lease agreements with independent clean power producers, allowing them to secure land parcels surrounding the Majuba and Tutuka power stations.

November 2022

- World Bank granted Eskom a concessional loan facility of R9 billion to support the repurposing of the Komati power station in alignment with a Just Energy Transition.

December 2022

- DMRE made an announcement regarding the preferred bidder status for the BW6 bids. Only five of the projects received this status despite this round garnering a total generation capacity of 9 666 MW, consisting of 4 116 MW from onshore wind projects and 5 550 MW from solar PV initiatives.
- The amendment to the Electricity Regulation Act, 2006 (ERA), which eliminated generation licensing requirements, officially became effective.

May 2023

- An announcement from the DMRE about the forthcoming release of bid window 7 and bid window 8 at the end of 2023, which will encompass a combined total of 5 GW in renewable energy projects.

June 2023

- Eskom provided industry stakeholders with a briefing on new grid allocation rules.

July 2023

- The Energy One Stop Shop and the Energy Resilience Fund, both aimed at mitigating the effects of the ongoing energy crisis were launched.

November 2023

- Agora and Danish Embassy host a multi-stakeholder dialogue in Emalahleni to discuss the comprehensive process of launching large-scale renewable projects in Mpumalanga and devising strategies to overcome associated barriers.
- Eskom releases the 2025 GCCA report that indicates an almost 50% drop in available grid capacity in Mpumalanga

Additionally, there has been a slight change from the last edition with the following iterations:

- Electric Mobility has been excluded in this year's opportunity brief and will be presented as an energy brief due to the lack of significant momentum in the industry since the last edition.
- Projects earmarked for REIPPPP have also been excluded in this year's edition as most of the large scale projects have been earmarked for private off-take and not lined up for REIPPPP submission.

1

THE MPUMALANGA GREEN ECONOMY CLUSTER AGENCY

The Mpumalanga province of SA faces socio-economic and environmental challenges arising from its resource intensive economic activities that contribute to climate change. Carbon intensive industries like mining, power generation and petro-chemicals are the core economic drivers in the Province. The region is also currently navigating high levels of unemployment, inequality and poverty, even as pressure mounts to transition away from its current coal based economy.

The Mpumalanga Green Cluster Agency's mission is to stimulate a vibrant green economy for communities in the Mpumalanga province, underpinned by a collaboration between government, business and academia. The vision is a vibrant, green and sustainable economy in the Mpumalanga province, that leverages the province's rich natural resources and heritage to create a legacy for SA low carbon economic growth. The Mpumalanga Green Cluster Agency is registered as a not-for-profit organisation in SA, with an appointed board of directors. The Cluster uses the triple helix cluster model with representation from government, business and academia as part of its design set up.

Independent clusters can create the context to build trust between sector players, and work to unlock new mechanisms to enhance competitiveness and resilience. The green economy, in particular, lends itself to collaborative ecosystem building approaches. Set in this system of rapidly changing technology, and the economics surrounding that technology, are commitments to social inclusion, and greater equality. Collaboration through clustering on a local scale to build competitiveness on a global scale will support the growth of the green economy in Mpumalanga, and determine the green cluster in Mpumalanga's success.

The Cluster has made significant progress to date, in particular to systematically engage with businesses and local government in the province to identify and highlight opportunities and barriers for green economy projects in Mpumalanga. The Cluster has had several hundred engagements with the private sector to understand barriers and opportunities and it has launched several capacity building programs and technical support interventions in Mpumalanga.

VISIT THE WEBSITE


© Freepik

2

SECTOR OVERVIEW AND CONTEXT

2.1 SOUTH AFRICA'S ELECTRICITY LANDSCAPE

2.1.1 ELECTRICITY MIX

Approximately 73% of the nation's installed electricity capacity is coal-fired power stations owned and operated by Eskom. Eskom's available dispatchable capacity is ~48 GW across its 30 power stations in its wholesale/public energy generation infrastructure according to its weekly status reports (Eskom, 2023). Coal is expected to continue to provide the majority of South Africa's power for the next decade, although the share from renewables will grow rapidly.
Large scale renewable energy technologies (wind, solar PV and concentrated solar power (CSP)) amounted to a total of 6.3 GW in installed capacity in 2022 through large-scale private sector built public procurement projects (IPP Office, 2023). The market is set for expansion, influenced by the Integrated Resource Plan (IRP), which details allocations for renewable energy generation totalling 30.6 GW (excluding hydro power). This includes an expected growth of 20.3 GW (excluding distributed generation of at least 4 GW), with 6.3 GW already secured through procurement initiatives.

This growth in renewable energy is consistent with commitments under the country's updated

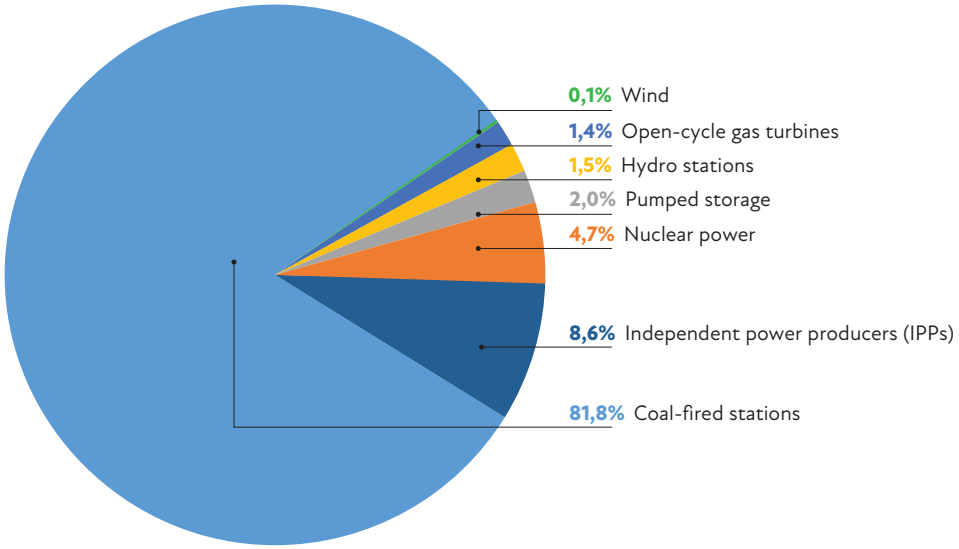


Figure 1: Figure 1: Energy generation profile of South Africa
(Source: (ESKOM, 2023))

Nationally Determined Contribution (NDCs) to a mitigation range of between 398-510 $MtCO^2e$ by 2025, and to between 350-420 MtCO2e by 2030. Figure 1 shows the various energy sources and their share of the total electricity mix in 2022.

The initial target of embedded generation in the IRP 2019 was 4GW by 2030 growing at a steady 500MW/year, however the energy crisis over the last couple of years resulted in adoption of RE and that 2030 target has already been met by 2023. There is an estimated 4.9GW already installed by 2023 and it is expected to grow beyond that (Eskom, 2023). Various industry sources estimate the total capacity to be installed to be between 6-14GW by 2030 amongst the following sectors:

- Residential
- Commercial and industrial
- Agriculture
- Mining

The diversification of the South African electricity sector presents a number of opportunities including increased electricity reliability, reduced carbon emissions and ultimately the creation of investment and job creation opportunities as the electricity sector transitions.

2.1.2 ENERGY AVAILABILITY FACTOR

A crucial metric employed in the power sector to evaluate the dependability and accessibility of infrastructure for the production of electricity is the Energy Availability Factor (EAF). The EAF is essentially a measure of the percentage of time that a power generation unit or a fleet of units is available and capable of producing electricity. The Eskom installed fleet's EAF has declined over the last five years. (see **Figure 2**) from 66.64% in 2020 to 62.02% in 2022 and at the time of writing in August 2023, Eskom has managed to only achieve an EAF of 60% from 58% during the first half of the year.

As a result of this decreasing EAF, the South African economy has continued to experience frequent loadshedding (the local term for rolling blackouts)[1] which has negatively impacted local industry and economic growth.

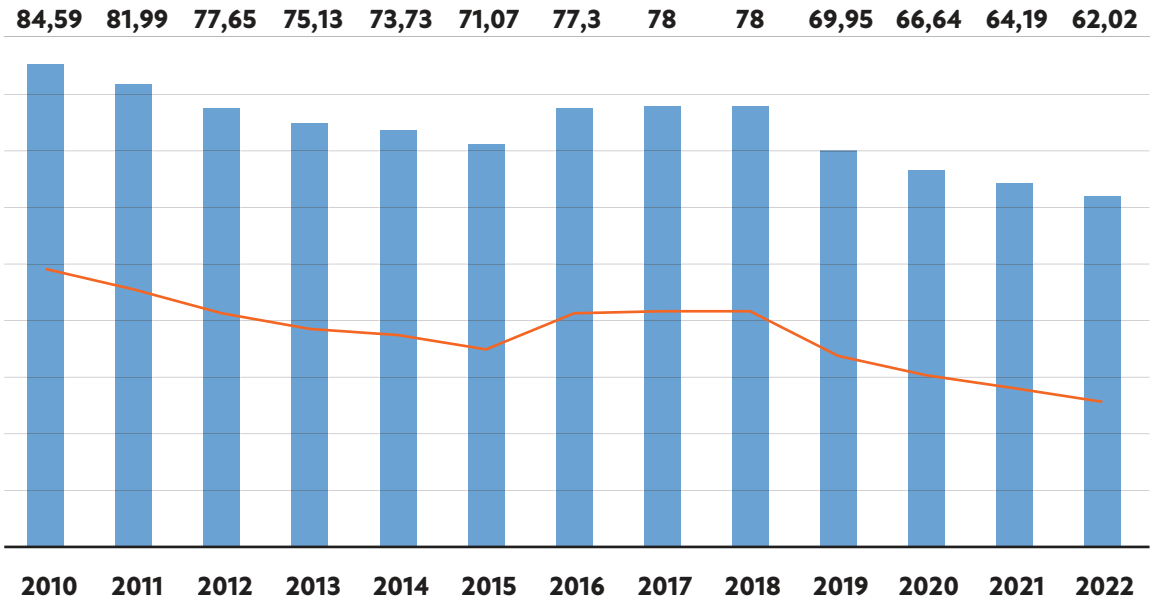
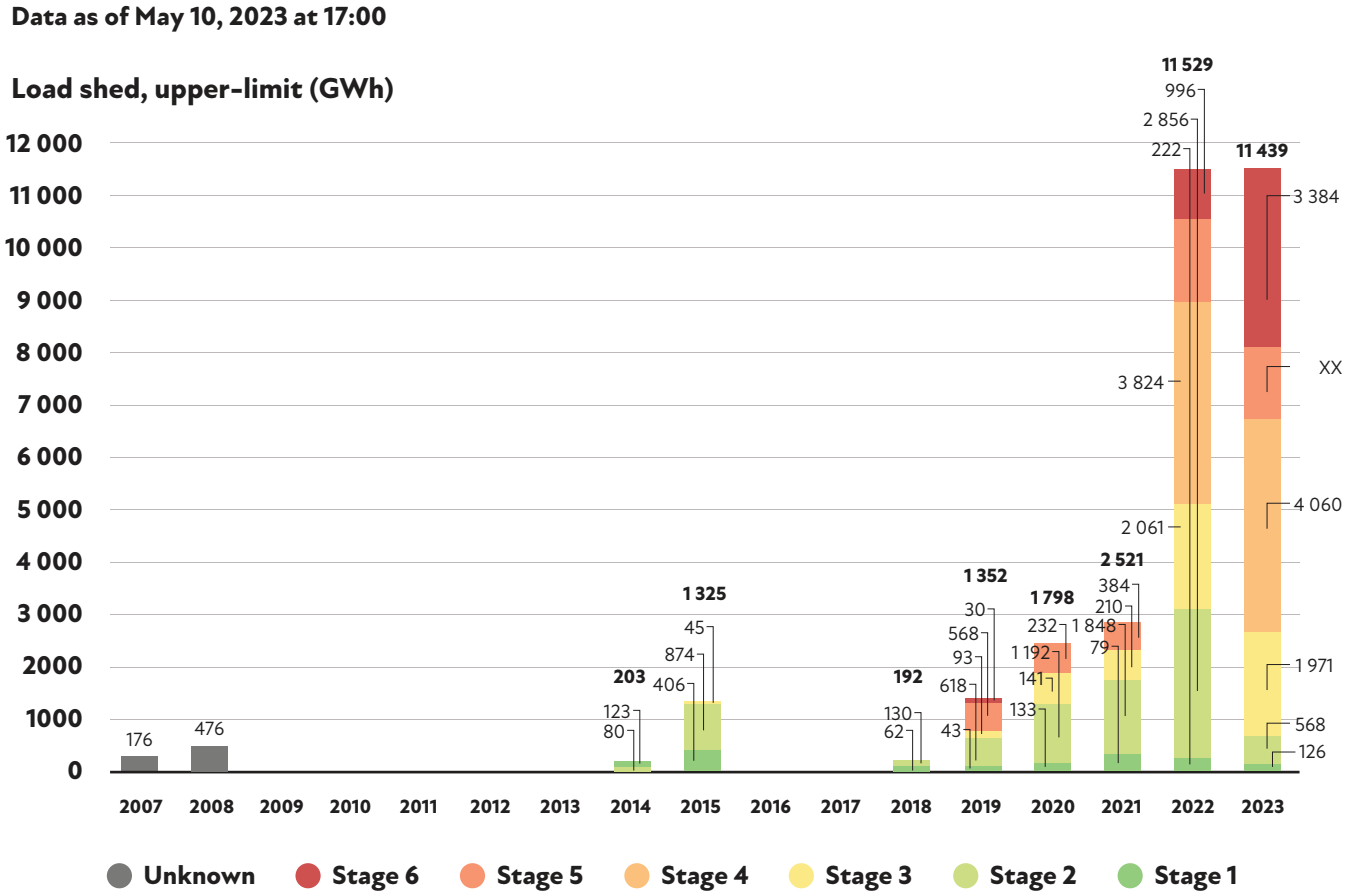


Figure 2: Eskom EAF between 2010-2022
(Source Adapted by MGCA from Eskom Integrated Reports 2010-2022)

[1] The deliberate shutdown of electric power in a part or parts of a power-distribution system, generally to prevent the failure of the entire system when the demand strains the capacity of the system.

2.1.3 LOADSHEDDING

Due to generation capacity constraints, Eskom implements a systematic and planned method of managing the electricity supply and demand imbalances by specifically cutting off electricity supply to specific areas in scheduled and communicated time slots. This is known as loadshedding. The country has witnessed record breaking hours of loadshedding over the past 5 years, with each year being worse than the year before as the supply continues to lag behind demand. **Figure 3** below illustrates loadshedding data over the past 15 years, highlighting that 2022 and 2023 have been the most challenging years to date in terms of loadshedding.



Analysis: CSIR
Sources: Eskom Twitter account, Eskom Hid SOC Ltd, ESP Historical Data, Nersa

Figure 3: Loadshedding data
(Source: Eskom presentation of CSIR analysis, 2023)

Efforts are ongoing to address the underlying issues contributing to loadshedding, such as investing in new power generation capacity and improving the reliability of the electricity grid. However, loadshedding remains a significant challenge for the country's energy sector and its population. **Figure 4** illustrates Eskom's projections, with the full implementation of IRP2019 allocations in a low EAF and low demand scenario, loadshedding was expected to end by the end of 2027, whereas without the implementation of IRP2019 allocations in the same scenario, loadshedding is likely to persist or worsen indefinitely (Eskom, 2022b).

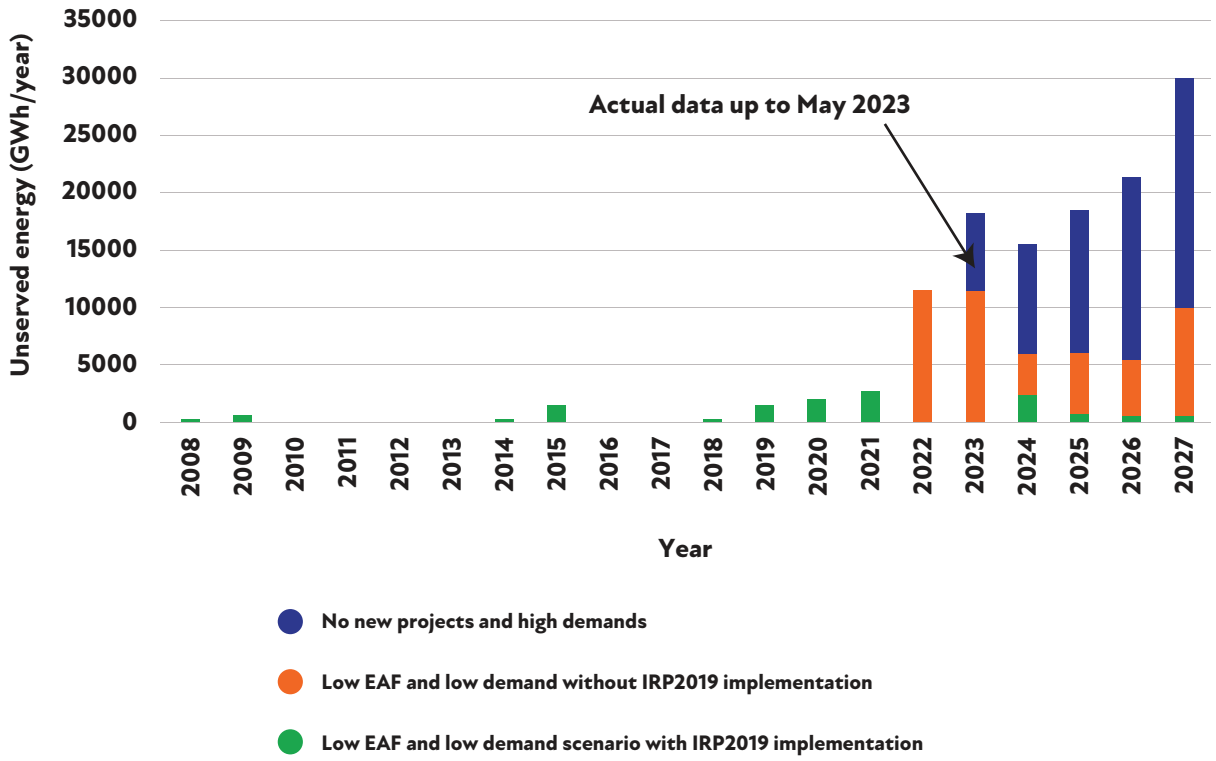


Figure 4: Loadshedding data & scenarios
(Source: (Eskom, 2022b))

2.1.4 THE RENEWABLE ENERGY MARKET

Over the last three years, the South African RE market has transitioned to being led by the private sector. This shift reflects a significant change in South Africa's RE energy landscape, with private investors and companies playing a more prominent role. The government-led initiatives like the REIPPPP have set the groundwork for renewable energy development, and now, private entities are taking a more active role in driving the sector. This shift signifies growing confidence in the country's private RE sector and its potential for sustainable growth, with the private sector taking charge of innovation, financing, and project development. **Sections 2 and 3** provide more detail on renewable energy projects under development in Mpumalanga.

Renewable Energy Independent Power Producer Procurement Programme (REIPPP)

To date, the majority of South Africa's renewable energy has been procured through a government-led auction process called the REIPPPP. This process involves multiple rounds of competitive bidding to procure renewable energy projects, implemented through a series of bid windows (BWs). Consequently, South Africa has managed to attract some of the world's most competitive tariffs for renewable energy projects. A prominent trend observed within the REIPPPP is the consistent decrease in the anticipated average portfolio cost for all technologies with each successive bidding period from BW1-BW5, until a slight increase in BW6 (IPPO, 2023). However, it Is worth noting that external global factors namely the surge in global demand for solar PV products and a weak South African currency played a role in driving up the price of BW6 in comparison to BW5. The combined average price was R0.50/kWh in BW6, showing the continuous efforts to reduce the cost of producing renewable energy.
Of the 26.6 GW renewable energy to be publicly procured by 2030 under the IRP 2019, almost 6.3 GW has already been procured between BW1 to BW4. BW5 is expected to provide a total capacity of 2 583 MW. Of this, 1608 MW will be procured from 12 wind projects, and 975 MW from 13 solar PV projects. Approximately 2.5 GW of these projects have reached financial close by end of 2023. BW6 had 4 200 MW of capacity receiving preferred bidder status. However, the actual result of BW6 fell short of expectations, with just 1 000 MW from 6 bids being procured from solar PV installations, due to limits in grid availability (IPPO, 2023).

2.2 JUST ENERGY TRANSITION

A just energy transition (JET) in South Africa refers to a comprehensive and equitable shift from fossil fuel-based energy systems to cleaner and more sustainable energy sources, while ensuring that the transition benefits all sectors of society, particularly those who are most vulnerable. Like many other countries, South Africa faces the dual challenge of addressing climate change while providing reliable and affordable energy to support economic growth and development.

The energy transition in South Africa has seen new power generation moving from coal regions to primarily coastal regions, driven by the availability of resources such as wind and solar photovoltaics. The full decommissioning of coal-fired power stations in Mpumalanga is expected to be a lengthy process. The just transition endeavour in South Africa is focused on an energy transition strategy that takes into consideration social equity, widespread energy access, and employment opportunities.

Just Energy Transition Partnership (JETP)

The governments of South Africa, France, Germany, the United Kingdom, the United States of America, and the European Union called the International Partners Group (IPG) launched a new, comprehensive Just Energy Transition Partnership (JETP) at the United Nations Framework Convention on Climate Change (UNFCCC) Conference of the Parties (COP26) in November 2021. The JETP supports South Africa's commitment to decarbonise its energy-intensive economy and make the transition to cleaner energy sources in order to achieve the best possible result within its stated NDC range.
The JETP places a strong focus on the importance of a just transition in the design of an associated Just Energy Transition Investment Plan (JET IP).
The IPG commitment is a US$8.5 billion package of grants, concessional financing, and commercial funding to the JET IP, which represents South Africa's transition needs from 2023 to 2027 (The Presidency, 2023).
The Mpumalanga regional economy will be at the centre of this transition. Work is needed to explore economic diversification to ensure the regional economy can attract the investment and stimulate the creation of needed jobs to enable a just transition. The next section, explores the key drivers and barriers for green economy opportunities linked to renewable energy in Mpumalanga.

2.3 POLICIES AND LEGISLATION

Various policies, acts and regulations, play a role in shaping its development of the electricity sector. Notably, the Integrated Resource Plan 2019 is the principal guiding document. Some of the key guiding documents are outlined below.

The National Climate Change Response Policy (NCCRP) of 2011 serves as the foundational policy framework that coordinates climate change responses across various government departments in South Africa. It functions as a compass, guiding the nation's efforts in effectively addressing the challenges posed by climate change. The NCCRP acknowledges the multi-faceted nature of climate change and emphasises the necessity of an approach that is both comprehensive and coordinated.

This policy document reflects the understanding that responding to climate change requires the involvement of all relevant sectors, including energy, transportation, agriculture, and more. By fostering a unified approach, the NCCRP ensures that the collective efforts of different departments are channelled towards a common goal – effectively mitigating and adapting to climate change.

The Carbon Tax Act of South Africa (Act No. 15 of 2019) is a legislation aimed at reducing greenhouse gas emissions by placing a tax on entities that emit carbon dioxide and other greenhouse gases. It came into effect on June 1, 2019. In February 2022, the finance minister announced a carbon tax increase to R144 from January 1, 2022, up from R134 the previous year. This is set to encourage companies to adopt cleaner technologies and practices by making them financially responsible for their emissions. The tax is levied based on the amount of carbon dioxide equivalent emissions produced, and there are allowances and offsets available to mitigate its impact on businesses. The revenue generated from the tax can be used to support efforts to transition to a more sustainable economy and reduce South Africa's overall carbon footprint. This dynamic tax impacts high carbon industries, possibly boosting renewable energy adoption to offset the tax. Particularly in private off-taker agreements, the market potential is significant.

The Integrated Resource Plan (IRP): In 2019, South Africa adopted the revised Integrated Resource Plan (IRP) referred to as the IRP 2019. This document serves as the guide for the procurement of the nation's electricity infrastructure, focusing on achieving the most cost-effective balance between electricity supply and demand. The targets were set to account for various factors that include ensuring a secure energy supply and environmental considerations. The IRP 2019 represents a shift from coal reliance to renewable energy sources. Furthermore, the plan seeks to address government objectives such as affordable electricity, reduced greenhouse gas (GHG) emissions, diversified energy sources, and the promotion of local and regional development. **Figure 4** provides an overview of the IRP 2019's targets for installed generation capacity up to 2030.

	Coal	Coal (Decom-missioning)	Nuclear	Hydro	Storage	PV	Wind	CSP	Gas/Diesel	Other (Distributed generation cogen, biomass, landfill)
Current	37 149	-	1 860	2 100	2 912	1 474	1 980	300	3 830	499
2019	2 155	-2 373	-	-	-	-	244	300	-	Allocation to the extent of the short term capacity and energy cap
2020	1 433	-557	-	-	-	114	300	-	-	
2021	1 433	-1 403	-	-	-	300	818	-	-	
2022	711	-844	-	-	513	400 1000	1 600	-	-	
2023	750	-555	-	-	-	1 000	1 600	-	-	500
2024	-	-	1 860	-	-	-	1 600	-	1 000	500
2025	-	-	-	-	-	1 000	1 600	-	-	500
2026	-	-1 219	-	-	-	-	1 600	-	-	500
2027	750	-847	-	-	-	-	1 600	-	2 000	500
2028	-	-475	-	-	-	1 000	1 600	-	-	500
2029	-	-1 694	-	-	1 575	1 000	1 600	-	-	500
2030	-	-1 050	-	2 500		1 000	1 600	-	-	500
Total Installed Capacity by 2030 (MW)	33 364	-	1 860	4 600	5 000	8 288	17 742	600	6 380	-
% Total Installed Capacity (% of MW)	33 364	-	2.36	5.84	6.35	10.25	22.53	0.76	8.1	-
% Annual Energy Contribution (% of MW)	33 364	-	4.5	8.3	1.2	6.3	17.8	0.6	1.3	-

Committed/already contracted capacity
Included distributed generation capacity for own use
Capacity decommissioned
Extension of koeberg plant design life
New additional capacity
Installed capacity

Figure 5: IRP 2019 targets for installed generation capacity up to 2030
Source: (DMRE, 2019)

The IRP provides a good indication of the intendent technology mix that will constitute the South African electricity mix by 2030. It clearly indicates that the South African transition towards a cleaner electricity sector is underway. It is expected that an updated IRP will be published in the first quarter of 2024.

Schedule 2 of the Electricity Regulation Act (Act 4 of 2006) outlines provisions for exemptions from the requirement stipulated in the Act to apply for and possess a licence issued by the National Energy Regulator of South Africa (NERSA). In a subsequent amendment made in December 2022, the 100 MW limit (above which a licence as required) gazetted in 2021 was entirely removed. This pivotal change allows for the installation of large renewable energy projects beyond the REIPPPP, fostering potential growth and innovation within the market.

Renewable energy incentives: The South African National Treasury and the South African Revenue Service (SARS) have jointly unveiled draft regulations in 2023 designed to incentivise the adoption of solar PV. These incentives are intended to mitigate the impact of power cuts on households and businesses. For individual households, the incentive takes the form of a tax credit, providing a uniform opportunity for individuals to claim the credit for installations between 1 March 2023 and 29 February 2024. The tax credit can reach up to 25% of the solar panel cost, capped at R15 000.
Businesses, on the other hand, are offered a 125% tax incentive based on the Income Tax Act's section 12B. This upfront deduction contrasts with the prior three-year allocation, encouraging quicker return on investments. The incentive is applicable from 1 March 2023 to 28 February 2025. If a business sells the asset before 1 March 2026, only 25% of the sale income is taxable.

2.4 KEY PLAYERS

Table 2 below provides a summary of the major stakeholders or business categories in the renewable energy market, along with a description of the project phases in which they are usually involved.

Table 2: Typical company types involved at different stages of renewable energy projects

IPP	Independent power producers (IPPs) or project developers are responsible for project inception and development, land acquisition, sourcing finance, and bid or proposal submission. IPPs or project developers may sometimes be a project sponsor or may submit a bid with the backing of such an entity. In the small scale renewable energy market, this role is often played by an engineering, procurement and construction (EPC) company. **Project stages involved:** Project development, project construction, project operation and maintenance.
OEM	Original equipment manufacturer. Suppliers of key technology, e.g. the manufacturer of the selected turbine in a wind farm. This company will play a major role in determining the technology partners that will constitute a project, and may also play the role of O&M (see below). **Project stages involved:** Project construction, project operation and maintenance.
O&M	Operation and maintenance (O&M) company. It is usually the main equipment supplier or a technical entity well-versed in the specific technology. **Project stages involved:** Project construction, project operation and maintenance.
EPC	Engineering, procurement and construction. Typically, this player is responsible for managing the various sub-contracts in the construction phase of a project. It may also be involved in the design and development phase of the project. **Project stages involved:** Project development, construction and O&M.
Financiers	Due to significant market growth, numerous financial mechanisms to fund larger commercial and industrial solar PV installations and operations have emerged in recent years, including Power Purchase Agreements (PPAs), fixed roof rentals, lease or rental agreements, upfront capital investment, and bank financing options. **Project stages involved:** Project development, funding, and O&M.

© Freepik

3

MPUMALANGA RE POTENTIAL AND CHALLENGES

The growth of the renewable energy sector in Mpumalanga represents an opportunity to both drive the South African just transition while creating investment opportunities to stimulate job creation and economic growth. Investing in renewable energy infrastructure in Mpumalanga can also stimulate economic growth and create job opportunities. The renewable energy sector has the potential to draw private investment, stimulate innovation, and encourage economic diversification, thereby mitigating the adverse economic effects of the energy crisis.

Figure 6 illustrates the key drivers and barriers to renewable energy projects in Mpumalanga.

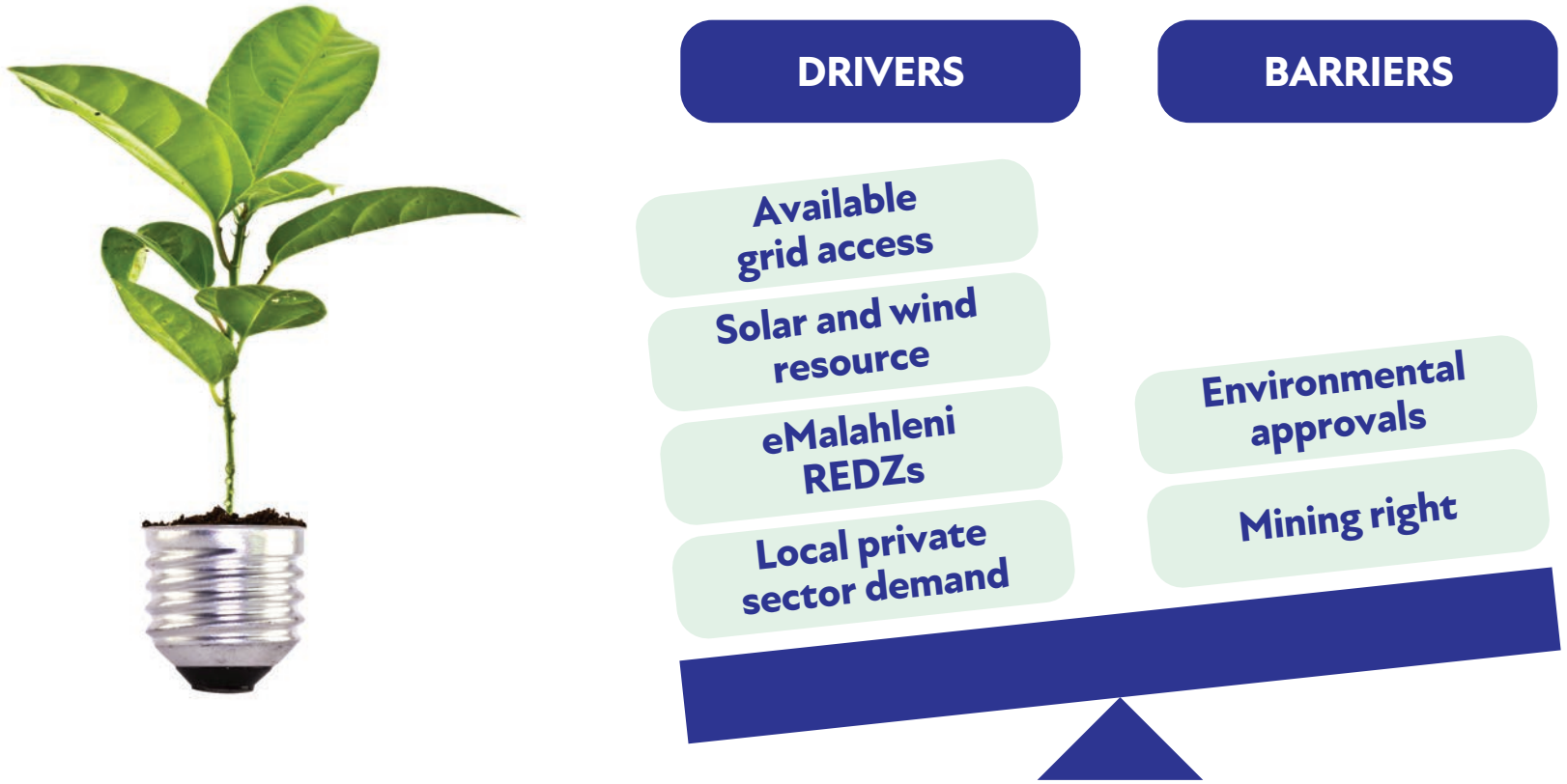


Figure 6: Mpumalanga renewable energy drivers and barriers

3.1 DRIVERS FOR THE MPUMALANGA RE POTENTIAL

3.1.1 AVAILABLE GRID ACCESS

The availability of grid capacity in Mpumalanga presents a significant opportunity for large-scale renewable energy projects to be developed in the province and to take advantage of the existing transmission assets. Currently, Mpumalanga has 3 320MW of grid from 6 520MW in 2022 for projects that are "shovel-ready" rather than on a first-come, first-served basis [2] (Eskom, 2023). This capacity allows for the integration of substantial renewable energy generation in the province, facilitating the transmission of power to the main load centres e.g. Gauteng and other regions.

By leveraging the available grid capacity, Mpumalanga can overcome some of the challenges faced by other regions that are reaching their transmission capacity limits. Eskom's Generation Connection Capacity Assessment of the 2024 Transmission Network (GCCA-2025) highlighted the limited transmission capacity in resource-rich areas like the Northern Cape, which is already strained by the projects procured in the early stages of the REIPPPP.

Locating renewable energy projects in Mpumalanga helps to utilise grid capacity available in the province but also offers numerous advantages for the province. These include:

- **Attracting investment:** The availability of grid capacity in Mpumalanga makes the province an attractive investment destination for renewable energy developers and investors.
- **Energy security and reliability:** Expanding renewable energy generation in Mpumalanga enhances the country's energy security. By diversifying the energy mix and reducing dependence on fossil fuels, Mpumalanga can contribute to a more resilient and sustainable energy system.
- **Regional development:** The establishment of large-scale renewable energy projects in Mpumalanga can spur regional development. These projects often require infrastructure development, construction activities, and operational maintenance, which create job opportunities and stimulate local businesses.
- **Environmental benefits:** Mpumalanga can leverage its grid capacity to facilitate the integration of renewable energy sources, such as solar and wind power, which have minimal environmental impact compared to fossil fuel-based power generation.

[2] Eskom has changed its grid access approach from "first come, first served" to prioritising "shovel-ready" projects that can quickly contribute generation capacity. This shift aims to address grid constraints and ensure efficient utilisation of capacity, as projects that are ready for implementation will be connected before those that simply applied for capacity.

Eskom's plan to decommission several power plants in the coming years presents a significant opportunity for securing additional grid capacity in Mpumalanga. With an expected release of nearly 14 000 MW of capacity until 2030, this development has the potential to create a more favourable environment for renewable energy projects in the province.

Table 3 below is a schedule of the decommissioning schedule provided by Eskom.

Several efforts have been made to allow for the smooth utilisation of the grid infrastructure and one of them is the establishment of zones that are specifically designed to ease the establishment of large-scale renewable energy projects.

Table 3: Scheduled power plants decommissioning schedule
(Source: (Centre for Environmental Rights, 2020))

Power Station	IRP date of shutdown	Eskom updated schedule	Installed Capacity	Province
Komati	2021	2022	1 000	Mpumalanga
Hendrina	2022	2025	2 000	Mpumalanga
Camden	2023	2025	1 600	Mpumalanga
Grootvlei	2020	2027	1 200	Mpumalanga
Arnot	2029	2029	2 100	Mpumalanga
Kriel	2030	2030	2 850	Mpumalanga
Tutuka	2041	2030	3 654	Mpumalanga
Duvha	2034	2034	3 450	Mpumalanga
Matla	2034	2034	3 600	Mpumalanga
Lethabo	2041	2041	3 700	Free State
Matimba	2042	2042	3 990	Limpopo
Kendal	2044	2044	4 116	Mpumalanga
Majuba	2051	2051	4 110	Mpumalanga
Medupi	2069	2069	3 654	Limpopo
Kusile	2073	2073	4 800	Mpumalanga

- Scheduled decommisioning in the next 7 years
- Scheduled decommisioning in the next 20 years
- Scheduled decommisioning in the next 50 years

3.1.2 EMALAHLENI RENEWABLE ENERGY DEVELOPMENT ZONE (REDZ)

On 26 February 2021, the Government Gazette No. 44191 announced the establishment of three additional REDZs to take the total number to 11 across South Africa (DFFE, 2021). This announcement paved way for the establishment of the Emalahleni REDZ.

A REDZ is a designated geographical area or region that has been strategically chosen and officially designated for the development and expansion of renewable energy projects. These zones are typically identified and established by government authorities or relevant energy agencies to promote the growth of renewable energy generation within a particular area.

Renewable energy projects require environmental authorisation (EA) under the National Environmental Management Act (NEMA), the DFFE has indicated that the EA process has been "shortened to allow for a smoother implementation of alternative energy growth in South Africa" (DFFE, 2021).

The Emalahleni REDZ's primary objective is to streamline the process of establishing large-scale renewable energy projects, facilitate the growth of renewable energy initiatives, attract investment to Mpumalanga, and foster both job creation and retention. Figure 6 below shows a map of all the REDZs in South Africa.

The Emalahleni REDZ is located in the Lowveld region of Mpumalanga, known for its abundant mineral resources and mining activity.

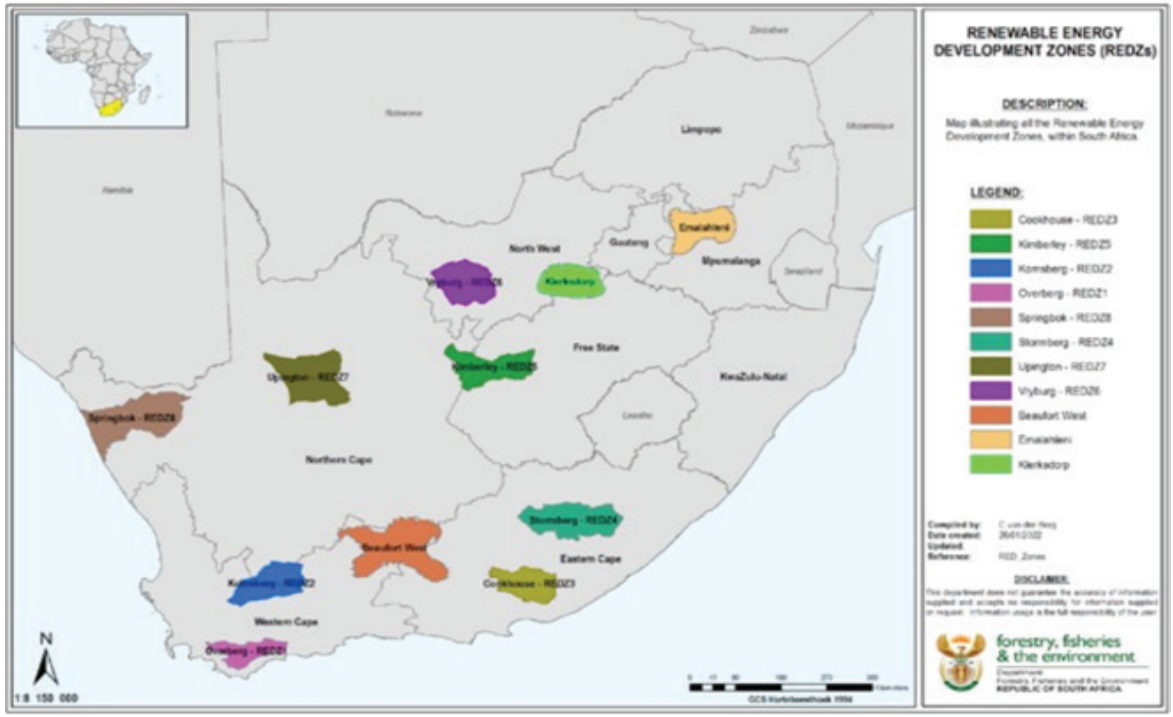


Figure 7: REDZ locations in South Africa
(Source: DFFE 2021)

3.1.3 SOLAR RESOURCE

The presence of transmission infrastructure, location of sites near to load centres, and cheaper land per m² in Mpumalanga are all key to drive investment into solar PV. South Africa averages more than 2 500 hours of sunshine per year, and average solar radiation levels range between 4.5 and 6.5kWh/m² in one day. The global horizontal irradiation in Mpumalanga ranges between a long-term average of 1 752kWh/m² /year and 2 044kWh/m² /year (only ~16% lower than the Northern Cape). This is because of the relatively long duration of sunshine in Mpumalanga, with approximately 2 576 hours of sunshine throughout the year.

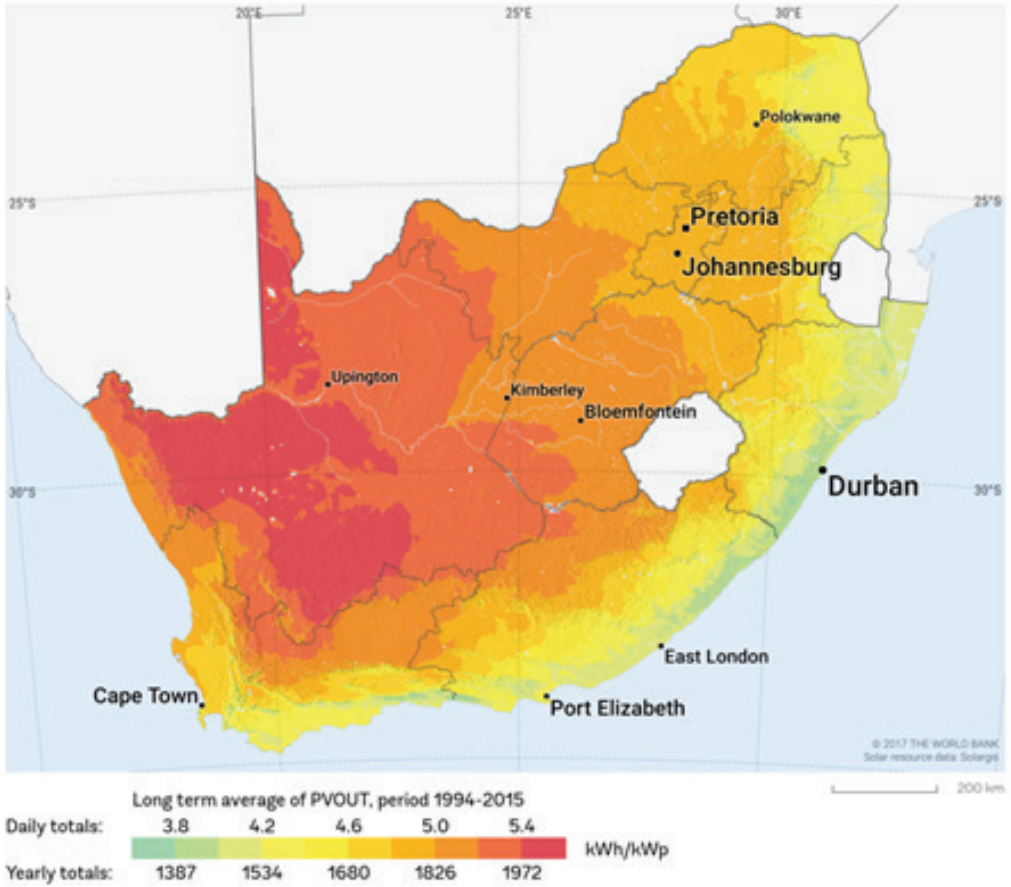


Figure 8: Solar irradiation map for South Africa highlighting Mpumalanga *(Source: World Bank 2017)*

3.1.4 WIND RESOURCE

Wind resource measurements in South Africa have historically focused on coastal areas, however, new investigations suggest that Mpumalanga possesses sufficient wind resources to support a robust business case for wind energy projects. While the wind levels may not be as high as in coastal regions, the province's wind resources are still substantial and suitable for generating clean and sustainable energy. Wind speeds in some parts of the province ranges between 4m/s and 7m/s at 100m above ground level. The cut-in speed is the minimum wind speed at which the wind turbine will generate usable power. This wind speed is typically between 10km/h and 15km/hr (~3m/s and 4m/s). The combination of suitable wind conditions and existing infrastructure creates an ideal environment for wind energy deployment.

There are currently 3 726 MW of wind projects under development or scoping in Mpumalanga (ESKOM, 2022c). Of that, 155 MW is at an early stage of development by Seriti Green[3] in a multi stage project that will see 900 MW of renewables and 800 MWh of battery storage being developed in Morgenzon, Bethal and Standerton areas (Seriti, 2023). This development is critical in assisting energy intensive users (EIU) to meet their carbon neutrality aspirations. **Figure 9** is a map of wind speeds across South Africa.

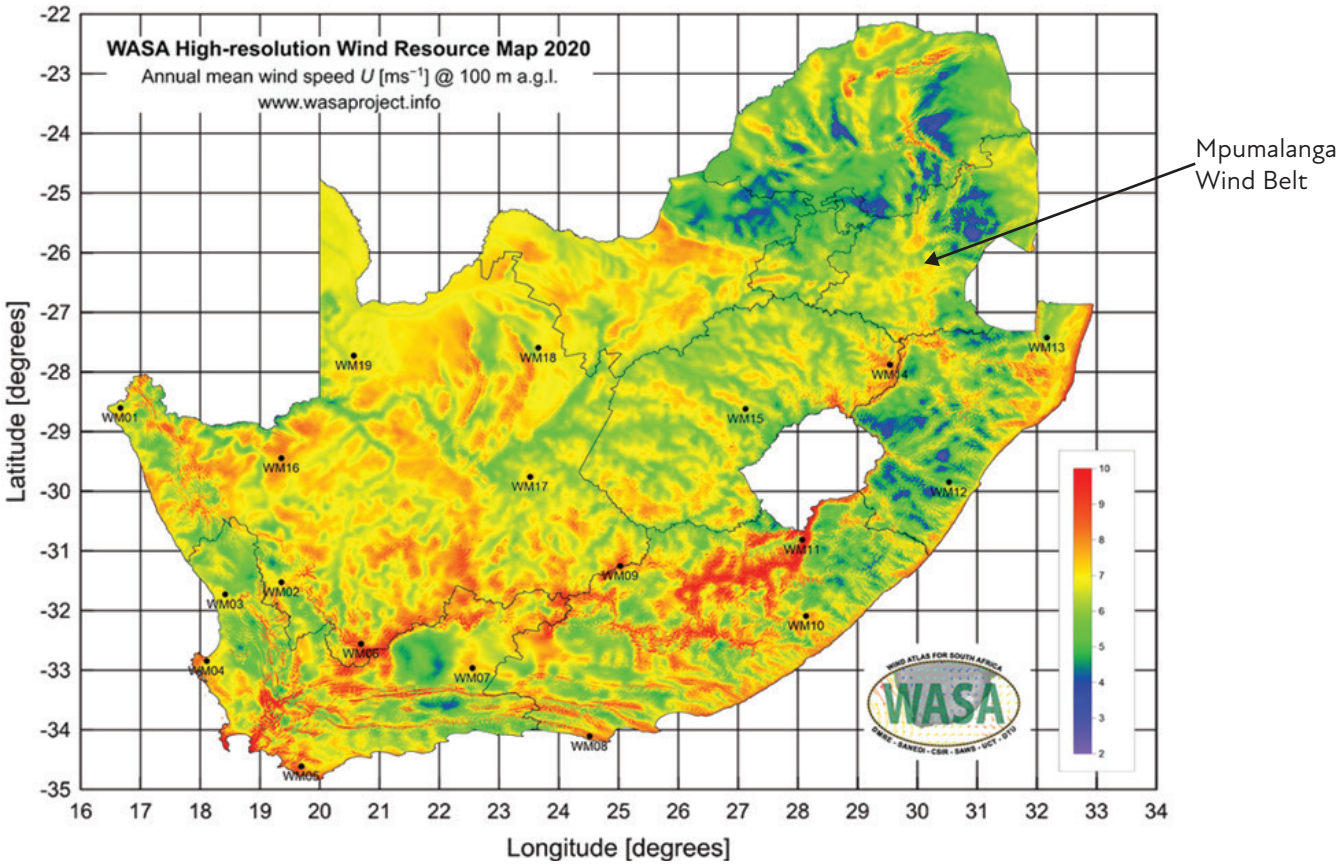


Figure 9: Wind speed map for South Africa highlighting Mpumalanga *(Source: (SAWEA, 2022))*

[3] In December 2022, Seriti Resources acquired 100% of Windlab South Africa through its climate-change-mitigating subsidiary, Seriti Green, the developer of the wind energy initiatives in Mpumalanga's Morgenzon, Bethal and Standerton areas.

The presence of favourable wind resources in specific locations means that wind projects in Mpumalanga are being planned for areas characterised by the highest wind speeds. **Figure 10** below details in green the wind projects that are in various stages of development/scoping in the Morgenzon, Bethal and Standerton in Mpumalanga.

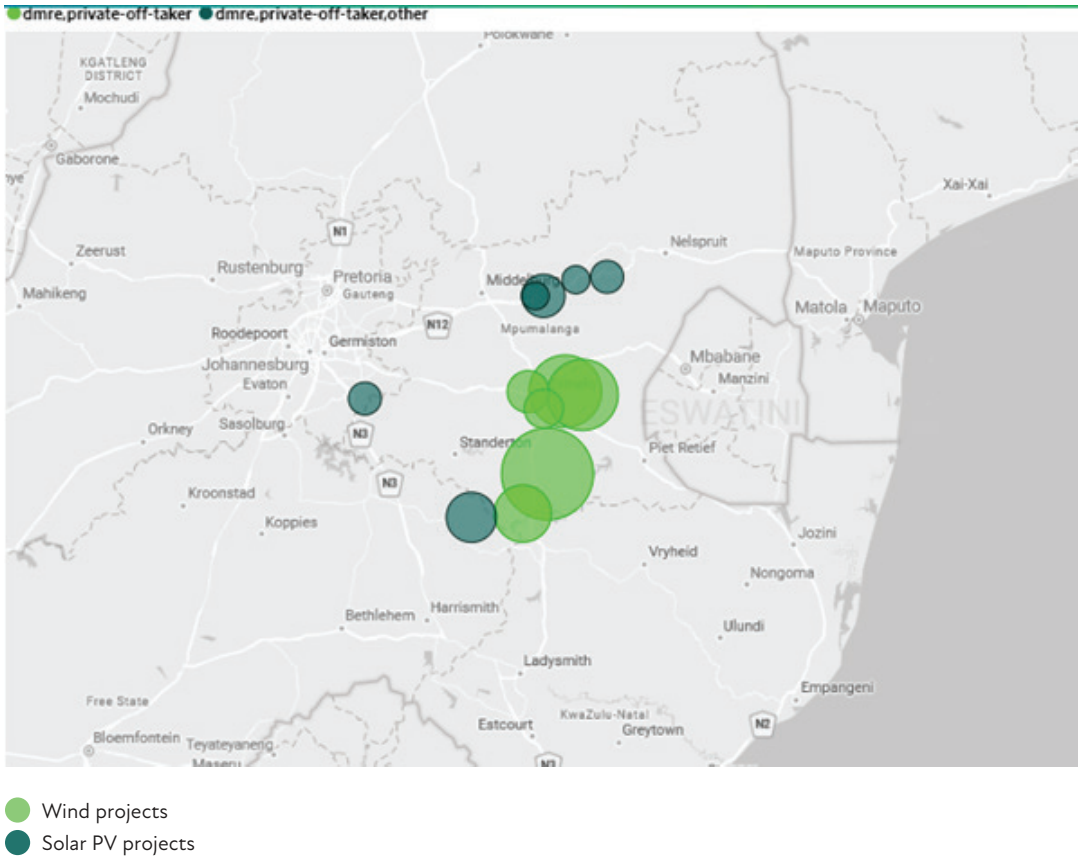


Figure 10: RE Projects currently at various stages of development in Mpumalanga *(Source: (Eskom, 2023))*

3.1.5 LOCAL PRIVATE SECTOR DEMAND

Mpumalanga ranks third in electricity consumption among the nine provinces, primarily due to its concentration of energy-intensive industries. Among these sectors, manufacturing, mining and agriculture are notable contributors to the province's GDP, and these industries have experienced growth in GDP contribution and job creation over the last 3 years after the COVID 19 pandemic (Treasury, 2023). The large number of energy intensive users (EIUs) in and around the Emalahleni area makes it the ideal location to promote private off-taker agreements for the purchase of energy from IPPs.

Furthermore, an increase in private agreements will relieve some of the pressure on Eskom to generate power. Private agreements are more beneficial when the renewable energy sources are in close proximity to the grid that can accept more power generation and also allow wheeling. This scenario is especially true for Mpumalanga.

Mpumalanga is home to rich deposits of coal and gold, followed by iron ore, platinum group metals (PGMs) and other metals, and limited deposits of nickel and chrome. This has played a role in attracting local and international mining companies to the region with an estimated R663 billion invested in the top five capital value mines alone. The energy intensive mining industry has shown significant interest and commitment to incorporate renewable energy in its energy mix. After President Ramaphosa announced the lifting of the licence requirements for generating energy in 2022 thus removing a barrier to investment in large scale renewable energy projects, there has been a significant increase in the development of large-scale renewable projects in the country.

Among these new projects, solar PV has taken the lead nationally, while wind energy has flourished particularly in the region of Mpumalanga. Energy-intensive users, including mines situated in Mpumalanga, have responded to this policy change to become the biggest procurers of large-scale renewable. Additionally, these users have the opportunity to access or even sell surplus electricity through wheeling, utilising the Eskom grid as the means of transmission. Mining companies also contribute critical infrastructure resources, including roads, power lines, water infrastructure, and substations. This valuable infrastructure can be shared and harnessed for renewable energy projects, substantially reducing upfront costs and project timelines. There is also potential for developing renewable energy projects to repurpose (coal) mining land at the end of its useful life.

3.2 CHALLENGES FOR THE MPUMALANGA RE POTENTIAL

Access to land is currently the largest barrier to large-scale renewable energy in Mpumalanga. The province sits at the interface of the countries' mining industry and vital biodiversity hotspots. Furthermore, large scale renewable energy technologies generally require a large land footprint. Finding this land in an area with sufficient resources (i.e. solar irradiation or wind) and the needed grid infrastructure may require substantial upfront capital to acquire a suitable piece of land.

Mpumalanga mining rights

There is significant demand for new sites for large-scale renewable energy in the province. Mining rights have been an issue for developing RE projects in South Africa, with the mining rights taking preference to any above-ground activities. In Mpumalanga, there is substantially more mining activity than in typical renewable energy hotspots such as the Northern and Western Cape.
Section 53 of the Mineral and Petroleum Resources Development Act of 2002 reads as follows:
53. (1) Subject to subsection (2), any person who intends to use the surface of any land in any way which may be contrary to any object of this Act or which is likely to impede any such object must apply to the Minister for approval in the prescribed manner.

This Act has been a barrier to the implementation of large-scale renewable energy projects to date. This section specifically requires individuals or entities (in this instance, IPPs) seeking to use land surfaces allocated for mining to obtain approval from the Minister without a time limit to it and resulting in applications going for years without a response.
For large-scale renewable energy projects, such as solar farms or wind farms, securing appropriate land rights and ensuring compliance with regulations is critical and required by Department of Mineral Resources and Energy (DMRE). If the land intended for renewable energy development is subject to the requirements of Section 53, developers are required to navigate the approval process
The approval process has been the reason for extended delays, uncertainties, and additional administrative burdens on projects. The need to address these regulatory requirements increases project complexity and project costs, slowing down the investment and growth of large-scale renewable energy initiatives.

Applications under Section 53 required written submissions to the Minister of DMRE. DMRE has introduced the electronic South African Mineral Resources Administration System (Samrad Online) on the departmental website for online application submission and tracking. However, there is a need for clarifying the procedure, ensuring that the website works and clarity regarding decision time frames.

Mpumalanga environmental approvals

The migratory routes of numerous endangered large bird species in Mpumalanga remain largely undocumented due to a scarcity of research. This deficiency has led to the allocation of significant expanses for potential bird flight paths, creating conflicts with viable wind energy sites and hindering project approval. Emphasizing the importance of bird tracking, it was suggested that enhancing the mapping of these flight paths could facilitate a more efficient delineation, thereby fostering increased development of wind projects.

Solar projects, in contrast, encounter a different regulatory landscape, benefiting from a government initiative that seeks to exempt solar photovoltaic (PV) and battery storage facilities from the necessity of obtaining environmental authorization. This exemption is particularly applicable in regions officially designated as having medium to low environmental sensitivity. The government's stance reflects a recognition of the comparatively lower environmental impact associated with solar technologies, prompting a strategic shift in regulatory oversight.

Through the **Eskom Land Leasing Programme**, Eskom offers portions of its land to Independent Power Producers (IPPs) to establish additional electricity generation capacity. These land parcels are strategically situated near network connection points, reducing the time required for constructing new grid connections.
Instead of procuring electricity from IPPs, Eskom facilitates a process through which IPPs can transmit power through the Eskom grid, either for their own use or for resale to other consumers. The energy generated from these projects is not a part of REIPPPP and will be transported to various customers via wheeling because the process of selling to Eskom requires a number of lengthy steps, i.e. DMRE capacity allotments; NERSA approval; and confirmation of cost recovery. Eskom aims to collaborate with the private sector to support the expansion of new capacity, in alignment with the expected future deregulation of the electricity industry.

Eskom has plans of decommissioning up to 14 GW of coal-fired generation by 2030. This plan will pave the way for a completely different energy mix, characterised by incremental capacity addition through modular and flexible technologies. These innovations will complement the existing large-scale base load capacity and signify a significant shift towards a more sustainable and diverse energy landscape.

In June 2022, Eskom announced that it had selected 18 projects to lease land to develop renewable energy projects amounting to 1 800 MW of additional capacity around Majuba and Tutuka power stations. These leases were awarded to several IPP investors, namely HDF Energy South Africa, Red Rocket SA, Sola Group and Mainstream Renewable Power Developments. These projects were chosen on the basis of sufficient grid capacity within the two power stations. The land-leasing initiative "will attract an estimated investment of about R40 billion to areas traditionally associated with coal-fired electricity generation" (Eskom, 2022d).

© New Southern Energy

4

EMERGING OPPORTUNITIES, DRIVERS AND BARRIERS

This section provides an overview of the major trends and drivers behind renewable energy and the associated opportunities and barriers that affect the potential for investment in renewable energy and associated job creation in the province.

The evolving South African renewable energy sector, combined with the renewable energy potential and just transition focus in Mpumalanga, creates unique opportunities. The opportunities in this section are relevant for institutional investors, financiers, project developers, component manufacturers, and suppliers in the Mpumalanga region.
Through extensive engagements with key stakeholders in Mpumalanga's green economy, the following emerging opportunities have been identified:

Large-scale renewable energy Large-scale renewable energy generation for private off-take has seen progress as developers are looking at Mpumalanga to locate utility scale projects.

Embedded generation: The private sector plays a crucial role in driving the adoption of renewable energy generation. Opportunities exist in increasing the uptake of rooftop solar PV and ground-mounted solar PV co-located with load sites (i.e. embedded generation).

Energy storage: The storage of energy is a key component to enhance reliability and efficiency of RE systems. This helps address the intermittency of renewable energy sources, ensuring a consistent and dependable power supply.
Table 4 provides an overview of the estimated market size for the combined renewable energy sector in Mpumalanga, highlighting the substantial economic potential within these sectors.

Table 4: Overview of the estimated market size for the combined renewable energy

Emerging opportunity	Sub-opportunities	Estimated market value
Large-scale genration	Transmission or embedded generation connected	R21.1 billion
Embedded generation	Rooftop and ground mount solar PV	R3.2 billion
Energy storage	Battery storage for the commercial and industrial sector (C&I)	R2 billion
TOTAL		**R26.3 billion**

4.1 LARGE-SCALE RE OPPORTUNITIES

The decision in 2022 to remove licence requirements for generating RE in South Africa has had a positive impact for large-scale renewable projects, with solar PV leading the way nationally, and wind energy in Mpumalanga. This move was prompted by the country's ongoing energy crisis, aiming to expedite renewable energy development and alleviate energy shortages. The regulatory change has resulted development of a large number of projects, with energy-intensive users, including Mpumalanga's mines, emerging as major proponents of large-scale renewable energy.

In the near future, there are plans to access electricity using the Eskom grid for through wheeling should there be inadequate space at the load centre.

There are projects equalling 325 MW that are at various stages of EIA that are earmarked for private use and outside the national procurement in Mpumalanga. Of this amount, 224 MW are for solar PV, 99 MW are wind and 2 MW are hydro power (DFFE, 2023). Work is currently in progress on Phase 1 of the Ummbila Emoyeni, a 900 MW energy cluster situated in Mpumalanga.

The construction phase has already commenced for 155 MW of wind energy. Within this cluster, there are plans for 750 MW of wind power and 150 MW of solar energy.
This market is expected to grow by ~250MW/year in Mpumalanga in the short to medium term to ~2 GW (2030), representing a possible market size of R21.1 billion. Table 5 below outlines the key drivers of and barriers to large-scale RE projects in Mpumalanga.

Table 5: Drivers and barriers of large-scale RE

Key Drivers	Barriers
• The cap for setting up power generation systems without a licence was removed in 2022. • The current 3.3GW grid availability in Mpumalanga. • Declining renewable energy prices globally. • Mining companies' commitment to install renewable energy has boosted the • energy market in the province. • Expected grid capacity following 35 GW of decommissioned coal power plants by 2050	• Delay in the process to obtain consent for above ground development on areas with mining rights, due to delays in the process of obtaining ministerial approval in line with section 53 of the Mineral and Petroleum Resources Development Act, 28 of 2002. • The migratory routes of endangered large bird species in Mpumalanga are insufficiently documented, leading to conflicts with potential wind energy sites due to the lack of clearly defined flight paths.

Public power procurement
Although the market opportunity in Mpumalanga is currently private sector led, with the correct incentives there is an opportunity for regional public procurement.

REIPPPPP
Assuming that 10%-15% of the remaining IRP wind and solar allocation (2025 – 2030) is located in Mpumalanga, there is a potential of ~2 GW of public market for REIPPPP projects in Mpumalanga by 2030. This equates to an estimated market size of ~R38 billion, assuming all 2 GW is solar and prices remain constant at R18 847/kW and R16 555/kW for wind and solar PV respectively for large-scale renewable energy projects.

Departmental procurement for public facilities
Municipalities in Mpumalanga are exploring solar PV investment opportunities for office buildings and wastewater facilities. Municipal buildings can represent 10% to 15% of electricity consumption, making energy-efficient interventions essential for reducing overall energy usage. Wastewater treatment is energy-intensive, with treatment and pumping accounting for 30% to 60% of municipal electricity consumption. Optimising energy use in **Wastewater Treatment Works (WWTWs)** can significantly cut costs.

Mpumalanga has 91 **WWTW** plants across the three districts. Installing solar PV systems, especially in smaller and medium-sized plants, offers a sustainable way to meet energy demands.

A 500 kWp to 1 MWp solar PV system (with storage) can meet up to 100% of the energy needs for wastewater treatment plants with a flow rate below 20Ml/day.

The barrier to entry to this market is the credit risk associated with most municipalities in Mpumalanga as they also owe Eskom at least R13 billion across the 17 municipalities


© Freepik

4.2 SMALL SCALE EMBEDDED GENERATION

There is an opportunity for small scale embedded generation in Mpumalanga given the current energy crisis and its impact on the agricultural, commercial, industrial and mining sectors. Embedded generation is regarded as a pragmatic and adaptable energy solution, strategically integrating power generation sources directly into the energy-consuming infrastructure. When ground and roof installations are judiciously co-located with the load, this approach optimises resource allocation by reducing transmission losses and removing the necessity for long-distance energy transport.

Furthermore, embedded generation confers enhanced control to end-users over their energy production and consumption. This facilitates energy self-sufficiency and enables a seamless transition between grid and on-site power sources. Consequently, this method enables energy reliability, and mitigates operational expenditures.

A value chain of equipment vendors, project developers, technical advisors, and financial investors has been created by to supply and support this industry due to:

- Rising electricity prices,
- Energy insecurity,
- Falling technology costs,
- Supportive energy policies, and incentives.

The agricultural, commercial, industrial and mining sectors are anticipated to play a major role in this segment's growth as corporations pursue long-term decarbonisation routes to "green" existing sectors, with on-site generation playing a crucial role in the early stages of such decarbonisation efforts.

The embedded generation market of system sizes between 100 kWp and 1 MWp range is expected to grow by an average of 40 MW per year in Mpumalanga and attract more players to the 14 energy companies that are currently dominating the space. The total embedded generation registered with NERSA has been doubling since 2020 with 2022 alone recording at least 20 MW of solar PV and this trend is expected to continue for the foreseeable future. This trajectory suggests a potential market value of R3.2 billion by 2030.

The expansion potential of the market hinges on the capacity of local municipalities to grant grid access and have a feed-in tariff or facilitate wheeling. The Mpumalanga municipalities capable of leading the solar PV market are Mbombela, Msukaligwa, Emalahleni, Steve Tshwete, Thaba Chewu, and Govan Mbeki. This is due to their existing small-scale embedded generation (SSEG) procedures, Table 6 details the municipalities that allow SSEG, have an application process and have a NERSA approved tariff. The 11 remaining municipalities do not currently have an SSEG policy in place, so customers do not require municipal approval for SSEG installations in the absence of established approval standards. However, certain financial institutions require municipal approval to ensure the long-term security of investments. This requirement has resulted in some hesitation to explore opportunities within these areas governed by the aforementioned municipalities.

Table 6: List of municipalities in Mpumalanga allowing SSEG to connect to the grid

Municipality	Allow SSEG onto the network	Have an official SSEG application process?	Have a NERSA-approved SSEG tariff?
Emalahleni	Yes	Yes	No
Govan Mbeki	Yes	Yes	No
Mbombela	Yes	Yes	Yes
Msukaligwa	Yes	No	No
Steve Tshwete	Yes	No	No
Thaba Chewu	Yes	No	No

Table 7 below outlines the drivers driving the opportunity and barriers players in the industry may face pursuing embedded generation opportunity in Mpumalanga.

Table 7: Key drivers and barriers for embedded generation

Key Drivers	Barriers
• Continued loadshedding and the need for energy security. • Strong business case for solar PV as prices per kWh are competitive with utility rates. • Flexible financing and procurement options of energy solutions from finance houses and developers. • Supportive energy policies and regulations by some local municipalities allowing for small-scale embedded generation. • Solar panel tax incentive pegged at 25% for individuals and 125% for businesses between March 2023 and February 2024.	• Only six out of 17 municipalities in Mpumalanga have defined SSEG procedures. • Misalignment of local SSEG to national SSEG framework as some municipalities have different standards for approval. This leads to some financial institutions not funding PV projects in those municipalities • Technical expertise and skilled workforce for PV system design and installation as the demand for skills has surpassed the supply.

4.3 BATTERY ENERGY STORAGE SYSTEMS (BESS)

In a loadshedding environment, the demand for Battery Energy Storage Systems (BESS) is on the rise. BESS is crucial during power outages and grid instability, swiftly providing stored electricity for essential energy requirements. As loadshedding persists, businesses and homes increasingly value the need for a dependable backup power source.
The expansion of BESS is driven by the growth observed in the renewable energy market, escalating electricity costs, enhanced financial gains from investments in storage solutions, and an increasing demand for energy reliability. This market opportunity empowers organisations and homeowners to take control of their energy needs and reduce reliance on conventional grid-based electricity, particularly during loadshedding.
As battery-operated machinery gains traction in industrial settings, efforts to decarbonize operations have been on the rise. Industries are looking to replace their fossil fuel-based equipment with battery-powered alternatives. The nature of these applications requires specific battery specifications, fostering innovation in this field. In response to this demand, two battery assembly companies have established themselves in Emalahleni and Mbombela, strategically positioning themselves near clients to promptly address their needs.
The financial viability of BESS has improved, as financiers now assess the client/applicant's expected revenue loss and opportunity cost without emergency power, improving access to finance and thus making renewable solutions an attractive investment.
Traditionally, organisations have relied on diesel generators for emergency power. However, this approach has become less financially viable due to the rising cost of fuel and maintenance expenses associated with frequent usage. As a result, organisations are exploring alternative storage technologies to provide emergency power Various battery storage options are still entering the market, providing a range of choices in line with available finance.
Table 8 below compares the most common technologies used for emergency power.

Table 8: Li-Ion and diesel generators comparison

Technology	Use case	Key benefits	Current barriers
Lithium-ion (Li-ion) Investment Cost R/kWh capacity: 4 000 - 10 000	Widely used for grid-scale energy storage and electric vehicle applications, providing a reliable and efficient means of storing electricity for peak demand management and renewable energy integration.	High energy density, long cycle life, and fast charge/discharge capabilities make Li-ion batteries an ideal solution for capturing and releasing energy efficiently.	Concerns about resource availability and environmental impact in the extraction of lithium, cobalt, and other materials pose sustainability challenges for mass adoption. The issue of battery safety is gaining prominence, with the need for robust safety measures and regulations to address potential risks associated with energy storage systems.
Diesel generators Investment Cost R/kWh capacity: 2 000 - 4 000	Industrial facilities, remote locations, and critical infrastructure, providing reliable electricity during grid outages or in off-grid situations	Diesel generators offer high power output, rapid response times, and the ability to sustain extended operation	The environmental impact of diesel generators, including air pollution and greenhouse gas emissions, has raised concerns about their sustainability and compliance with emission regulations. Additionally, dependence on imported fossil fuels exposes users to fluctuations in fuel prices.

The expansion of the solar PV market will determine the potential market. The market size is anticipated to reach 48 MWh (R288 million) annually, assuming an average installed price of R6 000/kWh in commercial applications.

This estimate makes the assumption that 25% of all embedded solar PV (10MW) will have at least a four-hour storage capacity per loadshedding cycle under stage 6 loadshedding. The market need for behind-the-meter energy by 2030 is estimated to be 336MWh (R2 billion).

Table 9 below outlines the key drivers and barriers to unlock the potential R2 billion potential market in the battery energy storage systems.

Table 9: Key drivers and barriers for BESS

Key Drivers	Barriers
• Continued loadshedding and the need for energy security. • Technology cost per kWh has been dropping year-on-year and is now cheaper than conventional back up energy sources like diesel generators. • Increased financial returns from storage investments. • Batteries provide energy security during loadshedding. • Enabling the delaying or postponing of planned expansions or enhancements to an infrastructure's power or resource capacity. • The stacked benefit of time of use tariff management and demand charge reduction.	• Upfront cost per kWh is still relatively higher than conventional sources of emergency power like diesel generators. • Limited awareness and understanding: Businesses not aware of the cost-saving opportunities, energy resilience benefits, and load management capabilities that battery storage systems can provide in the commercial and industrial sector.


© Freepik

5

FINANCE AND INCENTIVES

South Africa ranks as one of the top 15 nations in the world in terms of driving the green growth agenda (ahead of Australia, Singapore, and Finland). This drive is on the back of a range of funding solutions and tax incentives available to green technology manufacturers and service companies, as well as those who use or procure such goods and services.

The South African Climate Finance Landscape looks at detailed projectlevel data, understanding in detail the source, disbursement, instrument and use. The insights can support public and private role-players with information to shape sectoral strategies and selected policies and improve coherence and coordination between public and private level spending in the sectors. The South African Climate Finance Landscape has tracked R62.2 billion in annual climate finance invested in SA. *Find out more* ***here****.*

General database web page

The GreenCape Finance Desk hosts a web page with a number of Green Finance resources that cover funding and incentives available to companies operating in the green economy. A few of the available database are highlighted below.

The Green Finance Desk (GFD) primarily acts as a facilitator in the financing of green projects and green business. The GFD works across all sector desks at GreenCape. For more support please contact jack@greencape.co.za

Green Finance Database

GreenCape maintains a database of funding sources and incentives that may be relevant to green economy investors. The database contains information on more than 150 funding opportunities, including an overview of the opportunity and relevant contact details and links. It is ideal for any entity seeking a broad range of funding solutions and financial incentives, with South African institutions being the main source of opportunities. The database is available to view and download online [4].

Government funding and incentives database

An updated document focused on South African government funding and incentives is available to view and download online [5]. These incentives cover local manufacturing, critical infrastructure grants, small enterprise development and a diverse set of sector specific incentives (i.e. Aquaculture Development and Enhancement Programme).

Finfind database

Finfind [6] is an innovative online finance solution that brings together SMME finance providers and finance seekers. With a focus on finance readiness, Finfind has more than 200 lenders and over 350 loan products available to SMEs. The database is ideal for South African SMMEs who are seeking funding and/or business advisory services, and those who want to improve their understanding of finance.

AlliedCrowds database

AlliedCrowds [7] is the first complete aggregator and directory of alternative finance providers in the developing world.

Sign-up is free and allows users to access a global database where one can filter for sector (including greentech, agriculture and social impact), type of capital (equity, lending, grant), and type of funding (crowdfunding, angel investing, venture capital, impact investing). In addition:

- Themed databases around the Sustainable Development Goals (SDGs) and the World Green Economy Organisation (WGEO) are available.

- Reports, including a number specifically about African funding sources, can also be downloaded for free.

- Businesses / organisations can also contact Allied Crowds to create a customised funding database. This resource is ideal for any entity seeking a broad range of financial solutions on a global scale.

[4] https://www.green-cape.co.za/content/focusarea/green-finance-databases
[5] https://www.greencape.co.za/assets/Uploads/Government-Funding-and-Incentive-Booklet.pdf
[6] https://www.finfindeasy.co.za/
[7] https://alliedcrowds.com/

GREENCAPE'S GREEN FINANCE WEB-PAGE

GREEN FINANCE DATA-BASE

GOVERNMENT FUNDING AND INCENTIVE BOOKLET

FINFIND WEBSITE

ALLIED CROWD WEBSITE

CLICK the buttons on the left to access the relevant content

© Freepik


© Freepik

6

REFERENCES

Centre for Environmental Rights, 2020. Centre for Environmental Rights. [Online]
Available at:
https://cer.org.za/wp-content/uploads/2022/02/Annexure-A1_Summary-Table.pdf
[Accessed 12 August 2023].

DFFE, 2021. Geographical areas for the development of renewable energy development zones gazettes. [Online]
Available at:
https://www.dffe.gov.za/geographicalzones_renewableenergy
[Accessed 31 March 2023].

DFFE, 2021. Identification of Geographical areas fo strategic importance for the development of large scale photovoltaic energy facilities, s.l.: s.n.

DFFE, 2023. GIS Data Downloads. [Online]
Available at:
https://egis.environment.gov.za/data_egis/data_download/current
[Accessed 31 July 2023].

DMRE, 2019. Integrated Resource Plan , s.l.: s.n.

Eskom, 2022b. Medium-term system adequacy outlook report, s.l.: s.n.

ESKOM, 2022c. GCCA 2022 Update Interactive Map. [Online]
Available at:
https://www.eskom.co.za/eskom-divisions/tx/gcca/gcca-2022-update-interactive-map/
[Accessed 12 July 2023].

Eskom, 2022d. Eskom. [Online]
Available at:
https://www.eskom.co.za/eskom-signs-land-lease-agreements-with-independent-clean-power-generators/
[Accessed 12 July 2023].

Eskom, 2023. Generation Connection Capacity Assessment (GCCA- 2025), s.l.: s.n.

ESKOM, 2023. Integrated Report, s.l.: s.n.

Eskom, 2023. System status reports. [Online]
Available at:
https://www.eskom.co.za/eskom-divisions/tx/system-adequacy-reports/
[Accessed 27 October 2023].

IPP Office, 2023. IPPPP Q4 REPORT, s.l.: s.n.

SAPVIA, 2022. The localisation potential of the South African solar photovoltaics (PV) industry and recommendations to support local manufacturing in South Africa, s.l.: s.n.

SAWEA, 2022. SAWEA. [Online]
Available at:
https://sawea.org.za/south-african-wind-atlas/
[Accessed 12 August 2023].

Seriti, 2023. Seriti. [Online]
Available at:
https://seritiza.com/news-media/announcements/2023/seriti-to-construct-155-mw-wind-farm-in-mpumalanga/
[Accessed 19 July 2023].

The Presidency, 2023. SOUTH AFRICA'S JUST ENERGY TRANSITION INVESTMENT PLAN (JET IP), s.l.: s.n.

Treasury, M. P., 2023. 2022/23 Provincial TreasuryAnnual Report, s.l.: s.n.

giz Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

GreenCape

yes YOUTH EMPLOYMENT SERVICE

YES 4YOUTH .CO.ZA

MPUMALANGA GREEN CLUSTER AGENCY

TIPS TRADE & INDUSTRIAL POLICY STRATEGIES

NBI National Business Initiative

WWF