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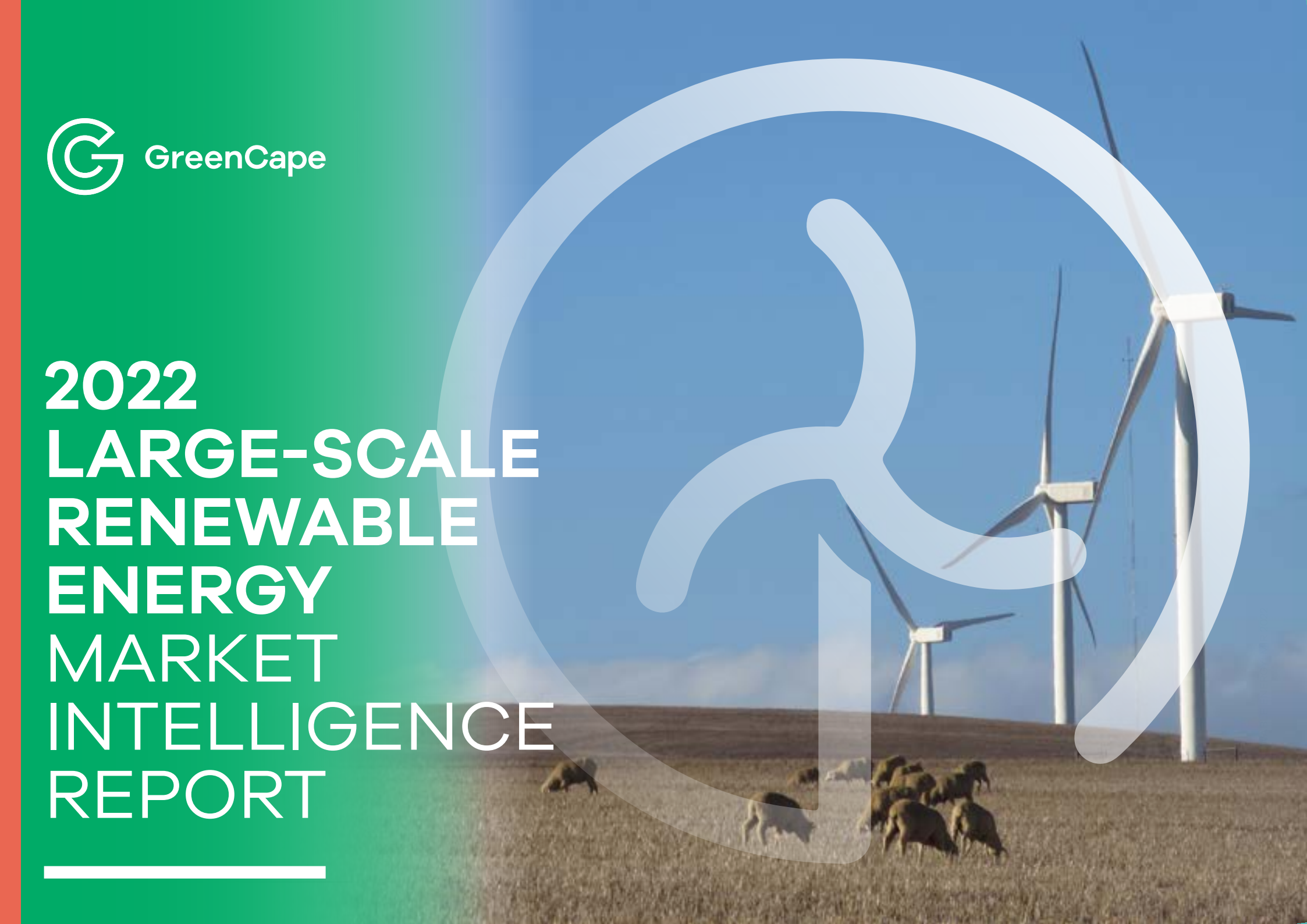
2022 LARGE-SCALE RENEWABLE ENERGY MARKET INTELLIGENCE REPORT



GreenCape

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Acknowledgements

This market intelligence report was produced in partnership with the Western Cape Government Department of Economic Development and Tourism. We thank Mandisa Mkhize and Jack Radmore for the time and effort that they have put into compiling this market intelligence report.

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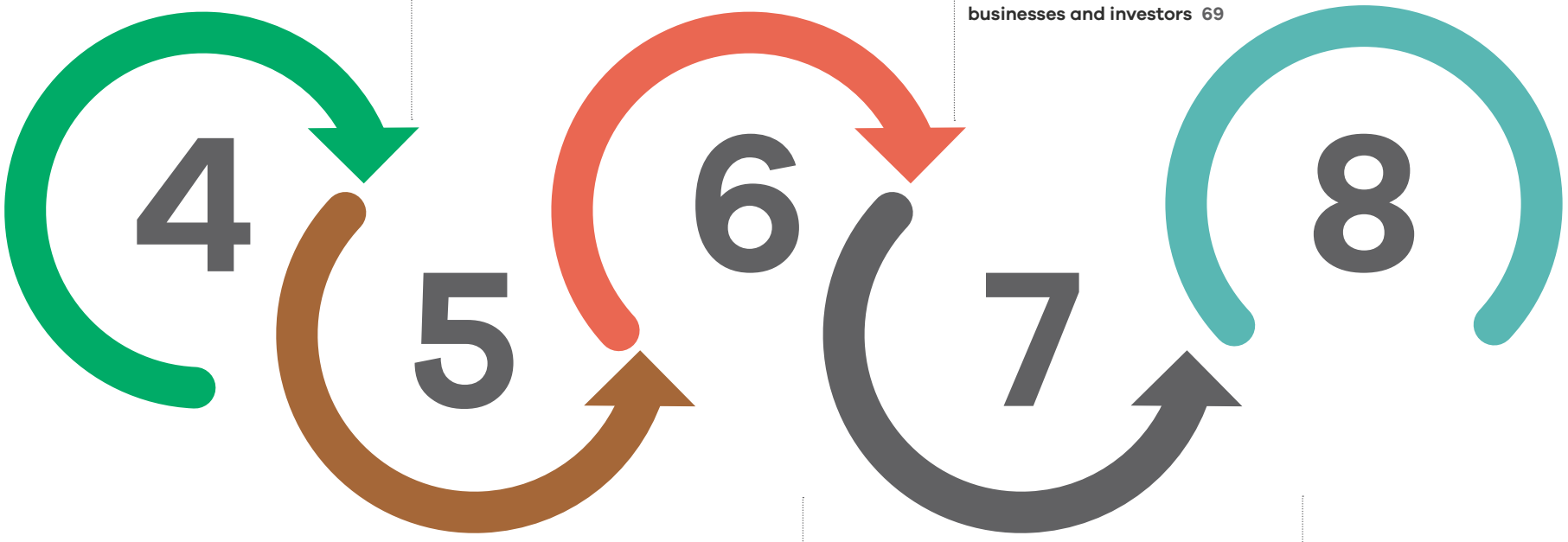

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LIST OF ABBREVIATIONS AND ACRONYMS

AfCTA	African Continental Free Trade Agreement
AU	African Union
BESS	battery energy storage systems
BW	Bid Window
CCT	City of Cape Town
COD	Commercial operation date
COP	Conference of the Parties
CSIR	Council for Scientific and Industrial Research
CSP	Concentrated solar power
DBSA	Development Bank of Southern Africa
DE	Distribution entity
DEA	Department of Environmental Affairs
DEDAT	Department of Economic Development & Tourism
DMRE	Department of Mineral Resources and Energy
DSI	Department of Science and Innovation
dtic	Department of Trade, Industry and Competition
EAF	Energy availability factor
ED	Economic development
EPC	Engineering, procurement and construction
ERA	Electricity Regulation Act No 4 of 2006
GCCA	Generation Connection Capacity Assessment
GE	Generation entity
IDC	Industrial Development Corporation
IDZ	Industrial Development Zone
IEA	International Energy Agency
IEP	Integrated Energy Plan
ISMO	Independent System and Market Operator
IPP	Independent Power Producer
IPPO	Independent Power Producers Office
IRP	Integrated Resource Plan
IRR	Internal Rate of Return
kWh	Kilowatt-hour
Li-ion	Lithium-ion
MEC	Maximum Export Capacity
MTPPP	Medium Term Power Purchase Procurement
MWp	Megawatt peak
NDP	National Development Plan
OCGT	Open cycle gas turbine
OEM	Original equipment manufacturer
O&M	Operation and maintenance
PPA	Power purchase agreement
PV	Photovoltaic
RE	Renewable energy
REFIT	Renewable energy feed-in-tariff
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RMIPPPP	Risk Mitigation Independent Producer Procurement Programme
SA	South Africa
SAESA	South African Energy Storage Association
SAPVIA	South African Photovoltaic Industry Association
SAREM	South African Renewable Energy Masterplan
SARETEC	South African Renewable Energy Technology Centre
SAWEA	South African Wind Energy Association
SED	Socio-economic development
SEZ	Special Economic Zone
SIPs	Strategic infrastructure projects
SSEG	Small-scale embedded generation

TE	Transmission Entity
WC	Western Cape

Exchange rates used:
1 USD = R14.89 (October 2021)

EXECUTIVE SUMMARY

This market intelligence report is written for foreign and local investors looking to invest directly in the South African renewable energy market. It highlights market opportunities in the public and private large-scale renewable energy[1] market in South Africa (SA) and the Western Cape.

SA currently has a single utility model managed by the state-owned entity Eskom. By the first half of the year 2021 (H1-2021)[2], SA had 52.6 GW of wholesale/public nominal capacity (Calitz, J. Wright, J.G. (2021)). Coal-fired power generation currently dominates the electricity mix, which contributed 83.5% to system demand in H1-2021.

In H1-2021, system demand increased by 5.4TWh relative to H1-2020 (5.0%) but was 2.5TWh less than that experienced in H1-2019 (-2.2%). System demand recovered notably in H1-2021 but not yet to pre-COVID 2019 levels.

Since the establishment of the Independent Power Producers Office (IPPO) in 2010, over 6.42 GW of electricity from renewable energy sources has been procured from 112 Independent Power Producers (IPPs) through the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP).

Over 5.25 GW is already operational (81 IPPs), with the balance expected to be connected in 2022.

The year 2021 has seen the revival of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) confirmed by the Department of Mineral Resource and Energy (DMRE) and the IPPO with a target of procuring a total of 11.83 GW by 2030.

[1] Large-scale renewable energy includes all projects of greater than 1MW and covers generation by a facility that will supply and feed to the national utility (i.e., Eskom) or distribution utility (i.e., a municipality) and generation for private consumers.

[2] H1: January to June. E.g., H1-2021 refers to first half of year 2021. H1-2020 refers to first half of year 2020.

This includes 6 800 MW for solar and onshore wind, and 513 MW for battery storage. These targets align with the IRP 2019 allocations for additional generation capacity between 2022 and 2024. The most recent procurement round for 2 600 MW (1,600 onshore wind and 1 000 MW solar photovoltaic (PV) was oversubscribed, with REIPPPP Bid Window 5 (BW5) receiving 102 bids, with a total capacity of 9 644 MW. 25 projects with a combined capacity of 2 583 MW were identified as preferred bidders. Beyond the record low weighted average bid prices of R0.47/kWh, BW5-awarded projects include eight (600 MW) projects located in the Free State and KwaZulu Natal's first REIPPPP project, a 140 MW onshore wind site.

Grid constraints in SA's high-yield renewable energy areas need to be addressed urgently. Following bidding round 5 (BW5), where several lower-cost bids were not selected as preferred bidders due to grid constraints, Eskom confirmed that there is no longer grid capacity in the Northern Cape and that the network in the Western Cape (WC) is at saturation point. The state-owned utility needs tariff support to raise capital to finance the grid upgrades required and has solicited industry-wide support on negotiations with private landowners for securing servitudes[3] in grid constrained areas. This presents a challenge, and Eskom will need to confirm what transmission grid evacuation capacity remains ahead of BW6, scheduled for launch early 2022.

Key developments influencing the market in 2021/22:

- Eleven (11) Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) preferred bidders announced a total generation capacity of 1 995 MW, with a total of R45 billion investment attracted.
- The DMRE gazetted the amendments to Schedule 2 of the Electricity Regulation Act, exempting a generation facility of up 100 MW to procure power without requiring a generation licence from the National Energy Regulator of South Africa (NERSA).
- Eskom has announced grid constraints in SA's high-yield renewable energy areas.
- Twenty-five (25) Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) BW5 preferred bidders announced with a total generation capacity of 2 583 MW (with 1 608 MW of onshore wind and 975 MW of solar PV) with a total of R50 billion investment attracted.

In addition to the gazetting an updated Integrated Resource Plan (IRP) in October 2019, **these developments suggest substantial growth opportunities in the large-scale renewable energy market over the next ten years (2020 – 2030)**. Based on the R/MW overnight capital cost per technology[4], the approximate South African market value per technology based on IRP 2019 allocations is R99 billion for solar PV, R271 billion for wind, and R48 billion for distributed generation of up to 100 MW.

[3] Servitudes: means a parcel of electric power transmission rights granted to Eskom over immovable property of another and registered or to be registered against the title deed of the land in question and usually involves the payment of compensation.

[4] Based on previous bid rounds, i.e., bid rounds earlier than BW5

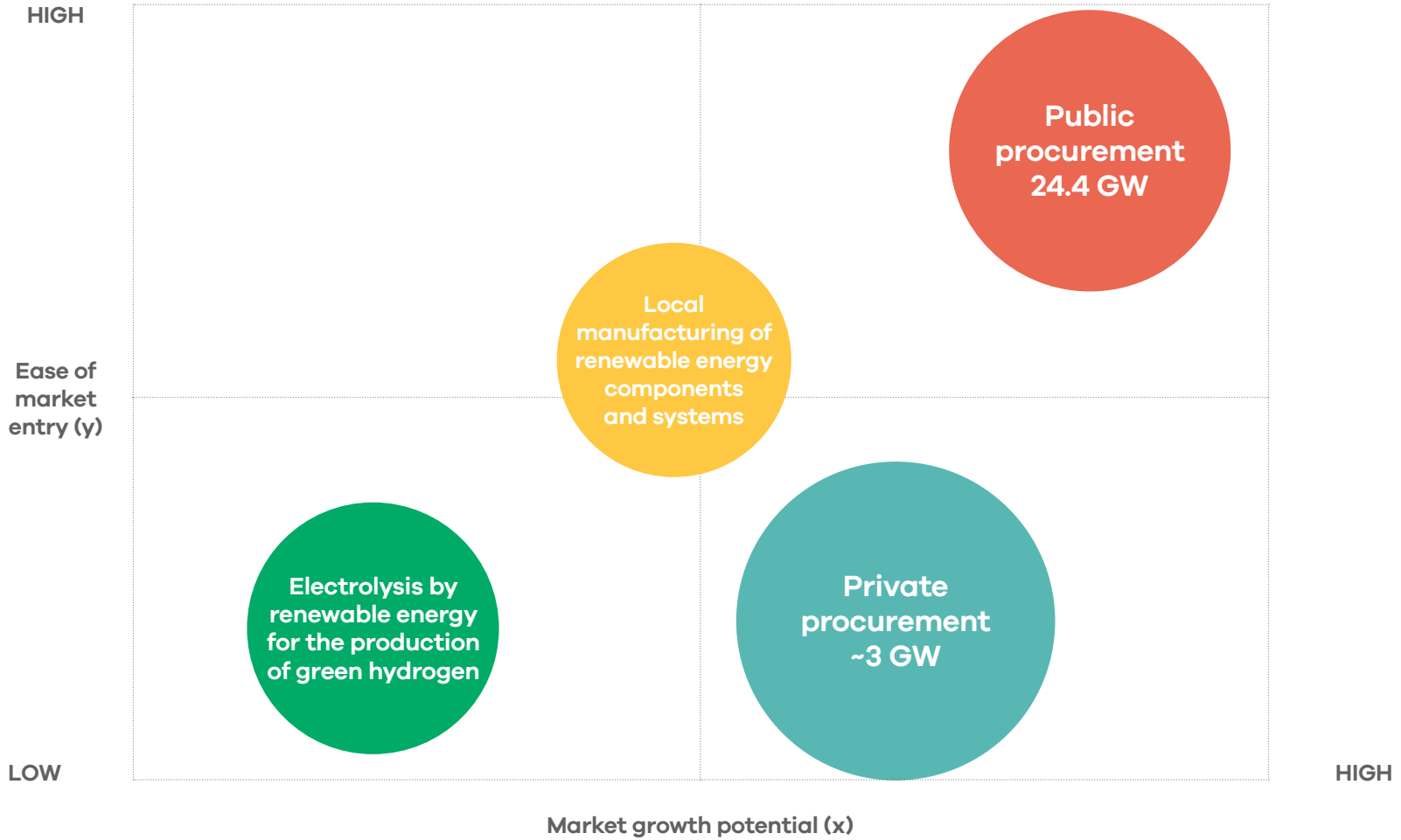

Figure 1: Market growth potential matrix of the large-scale renewable energy opportunities[5]

[5] This graph gives indicative market size potential. No quantitative modelling has been conducted.

This will depend largely on (1) the continuation of **new bid windows** (BW6 expected early 2022) of the REIPPP programme against the IRP 2019 allocations, (2) local content requirements; and (3) the private sector uptake of renewable energy projects based on the **changes to generation licence conditions requiring registration only (i.e., not a generation licence) up to a threshold to 100 MW (previously threshold was 1 MW).**

The market opportunities in large scale renewable energy include:

- Public procurement of new generation capacity;
- Private procurement of new generation capacity;
- Increased local manufacturing of renewable energy components and systems; and
- Electrolysis by renewable energy to produce green hydrogen.

Figure 1 illustrates the emerging and developing opportunities within the large-scale renewable energy market in SA. **The public procurement of new generation capacity mainly driven by IRP 2019** has the greatest growth potential and relatively low entry barriers due to the IPPO's established REIPPPP procurement framework.

The private sector procurement of new generation capacity opportunity is mainly driven by the 100 MW licensing exemption enabling energy-intensive users[6] such as large industrialists to generate electricity for their use (demand side); IPPs can now explore multiple viable off-taker options (Eskom, municipalities and industrialists/miners) and assess the associated risks of undertaking a project for the relevant investor. Under the recently announced legislation amendments assuming an increased demand for renewable energy components and long-term market outlook, there is a business case for **local manufacturing of renewable energy components for the publicly procured generation.**

There is also an opportunity to increase the overall demand for renewable energy at a scale much larger than envisaged in the current 2019 IRP. **Electrolysis by renewable energy for green hydrogen production** has received industry attention and interest in investment for downstream use applications that address decarbonisation targets for the hard-to-abate sectors (iron, steel and cement). **Table 1** gives an overview of the investment opportunities, key stakeholders, key drivers and barriers, and the macro context.

[6] According to the Energy Intensive Users Group (EIUG); Energy intensive users are consumers that account for more than 40% of the electrical energy consumed in South Africa.

SUMMARY OF MARKET OPPORTUNITIES

Table 1: Summary of market opportunities within the large-scale renewable energy market[7]

Opportunity	Stakeholders	Key drivers	Barriers	Term	Macro context
Public procurement	• Developers/IPPs, EPCs, OEMs, O&Ms. • Industrialists. • Local manufacturers. • Financiers & legal. • Municipalities. • Energy-intensive users.	• 11.8 GW by 2030. • Expected 35 GW decommissioned coal by 2050. • Electricity Regulations on New Generation Capacity. • Municipal Energy Resilience fund in the Western Cape.	• Requirement for grid infrastructure investment to upgrade the grid. • Local governments lack capacity (financial, technical, procurement planning).	Short term (**Present**).	• Energy crisis. • Unemployment rates. • Economic Recovery. • Just Energy Transition. • Infrastructural development plans. • Heavy industries and mining sector net-zero targets. • The global[8] effort to drive a hydrogen economy and elimination of CO_2 emissions by replacement of existing grey/black hydrogen processes. • COP 26.
Private procurement		• 100 MW licensing exemption. • Declining RE prices. • Wheeling framework.	• Policy and clarity of procurement rules. • Capital requirements.	Medium to long term (**3 – 5 years**).	
Local manufacturing of renewable energy components and systems	• Local manufacturers, OEMs, EPCs. • dtic, DMRE, IPPO.	• Increased local content requirements in all public procurement, including in upcoming REIPPPP rounds.	• Policy uncertainty. • Procurement rules change (90:10 in REIPPPP). • Commercial viability. • Market certainty.	Medium to long term (**3 – 10 years**).	

[7] REIPPPP – Renewable Energy Independent Power Producers Procurement Programme, DMRE – Department of Mineral Resources and Energy, dtic – Department of Trade and Industry Competition, REDZ – Renewable Energy Development Zones, IDZ – Industrial Deveopment Zone, SEZ – Special Economic Zone, MEC – Maximum Export Capacity, EPC – Engineering Procurement Construction, OEM – Original Equipment Manufacturer, IPPs – Independent Power Producers, O&Ms – Operations & Management, IPPO – Independent Power Producers Office, EAF – Energy Availability Factor, SAREM – South African Renewable Energy Masterplan, SACREE – SADC Centre for Renewable Energy and Energy Efficiency. PGMs – Platinum Group Metals. COP 26 - 26th Conference of the Parties to the United National Framework Convention on Climate Change (UNFCCC).

[8] IRENA and the World Economic Forum (WEF) launched a "Enabling Measures Roadmap for Green Hydrogen" at the COP 26. Roadmaps launched for Japan and Europe.

Table 1 continued...

Opportunity	Stakeholders	Key drivers	Barriers	Term	Macro context
Electrolysis using renewable electricity for the production of green hydrogen (H_2)	• dtic, DSI, IDC. • PGMs sector. • Heavy industry industrialists. • Sasol.	• Green H_2 import demands by developed countries. • dtic's Green Hydrogen Panel. • DSI-led Platinum Valley- and Hydrogen Valley Initiatives, and Hydrogen Society Roadmap. • PGMs endowment.	• Limited policy frameworks. • Infrastructure limitations. • Economic competitiveness.	Long term (+ **10 years**).	See previous page.

WHAT'S NEW?

Since the publication of the 2021 Large-scale Renewable Energy Market Intelligence Report, there have been several important developments in the sector and the national government's Renewable Energy Independent Power Producers Procurement Programme (REIPPPP).

What happened in 2021:

- **March:** Risk Mitigation IPP Procurement Programme (RMIPPPP) preferred bidders announced.
- **April:** Request for Qualification and Proposals under REIPPPP BW 5 released.
- **May:** The IPPO held a bidders' conference for BW 5 where there was an announcement on shifting the procurement split: from 70:30 to 90:10[9].
- **June:** Eskom released a transmission Generation Connection Capacity Assessment of the 2023 transmission network (GCCA 2023). The assessment reported that the Northern Cape and WC power corridors are highly constrained.
- **July:** Department of Trade, Industry and Competition dtic Minister Ebrahim Patel announced that he had mandated the Industrial Development Corporation (IDC) to lead the government's efforts to commercialise green hydrogen, which is produced using an electrolyser, powered by renewable energy, to split water into hydrogen and oxygen.
- **August:** The DMRE gazetted the amendment to Schedule 2 of the Electricity Regulation Act exempting activities of no more than 100 MW from generation licence requirements from the National Energy Regulator of South Africa (NERSA).
- **August:** IPP Office received 102 bids for REIPPPP BW 5. Of the 102 bids received, 63 are for solar PV, and 39 are onshore wind.

[9] The REIPPPP procurement bid weighting evaluation changed from 70% price: 30% socio-economic commitments to 90% price: 10 contributor status

- **September:** Western Cape Minister of Finance and Economic Development David Maynier launched the Western Cape Municipal Energy Resilience Fund (R13 million) targeted at qualifying municipalities for research and planning to support renewable energy projects in the province.

- **October:** Twenty-five (25) REIPPPP BW5 preferred bidders were announced.

- **November:** At the 26th Conference of the Parties (COP) to the United National Framework Convention on Climate Change (COP26), President Cyril Ramaphosa secured a commitment of ~R130 billion concessional climate financing from France, Germany, the UK and US governments. The financing aims to aid SA to move away from coal to cleaner energy sources.

Rolling blackouts (load shedding) continued throughout 2021, with Eskom unable to match current demand with available supply. As of November 2021, load shedding occurred for 1 136 hours, with an upper limit of 2 455 GWh; a 37% YTD increase compared to the 859 GWh upper limit of energy shed in 2020 (CSIR 2021). The extent of load shedding experienced was largely driven by the existing coal fleet's declining Energy Availability Factor (EAF) due to higher planned maintenance. Overall, the YTD EAF was 62.18% by H2 of 2021 (relative to 65.04% in 2020 and 66.9% in 2019).

A concerning shift of the unplanned outage component of the EAF has also been highlighted where unplanned outages of up to 15 300 MW were experienced and were greater than 10 000 MW for more than 80% of H1-2021. The EAF has dropped by 2.89% since 2020, even though there was 1 594 MW of newly commissioned coal. According to Eskom's System Status and Outlook Briefing released in October 2021, a minimum of 4 000 MW additional generation capacity is required to ensure utility meets energy demand and maintains system stability.

INTRODUCTION AND PURPOSE

This market intelligence report is written for foreign and local investors looking to invest in the South African green economy through project development, asset management, equity, debt, equipment manufacturing, or support services.


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Globally, the impact of COVID-19 has been significant, but the impact on the shift to renewable energy transition has been limited. With at least 40% of the world population at the time of writing and rebounding economies, the global electricity demand was set to increase by more than 1 000 terawatt-hours (TWh) in 2021, well above pre-pandemic levels (International Energy Agency. 2021). Renewable energy use has increased by 3% in 2020/21 while the demand for all the other fuels (coal, gas and oil) all decreased by between 2% and 8%. (International Energy Agency, 2021).

The share of renewables in the global electricity generation jumped to 29% in 2020/21, up from 27% in 2019. Renewable electricity generation in 2021 is set to expand by more than 8% to reach 8 300 TWh, the fastest year-on-year growth since the 1970s.

Solar PV and wind are set to contribute two-thirds of renewable growth. China alone should account for almost half of the global increase in renewable electricity generation in 2021, followed by the United States, the European Union and India (International Energy Agency 2021). The key economic drivers behind this global increase have been government policy support, dedicated procurement programmes, and continually reducing operating and technology costs.

The South African renewable energy market follows a similar trend to the global trends detailed above in terms of technology choice. Solar PV and onshore wind dominate the market growth, backed by a growing small-scale embedded generation market (mostly solar PV for commercial and industrial businesses) and private sector large-scale projects for energy-intensive users such as mines.

As shown in **Figure 2**, introducing renewable energy in the South African context dates back to 2003, with the delivery of the 2003 White Paper on Renewable Energy. However, the renewable energy framework took shape only with the IRP 2010-2030 in 2010. The purpose of the IRP 2010 was to determine the preferred energy mix over the next 20 years. It included allocations for renewable energy, amounting to 14 725 MW, coal-fired plants of 6 250 MW, and gas-fired power plants of 3 726 MW.

To facilitate the uptake of renewable energy in SA, as detailed in the 2010 IRP, the REIPPPP was established. The Independent Power Producers Office (IPPO) was created to fulfil three specific duties for the REIPPPP:

- professional advisory services;
- procurement management services; and
- monitoring, evaluation and contract management services.

In October 2019, the IRP 2019, with the preferred energy mix up until 2030, was released. The plan includes allocations for additional renewable energy generation amounting to 20 400 MW (excluding distributed generation of at least 4 GW), coal-fired plants of 1 500 MW, and gas-fired power plants of 3 100 MW. To begin the procurement envisioned in the IRP, in September 2020, the Minister of the DMRE issued a section 34 determination for the procurement of a further 11 813 MW of renewable energy between 2022 and 2027, of which 6 800 MW is allocated to wind and solar PV, and 513 MW to capacity generated from storage.

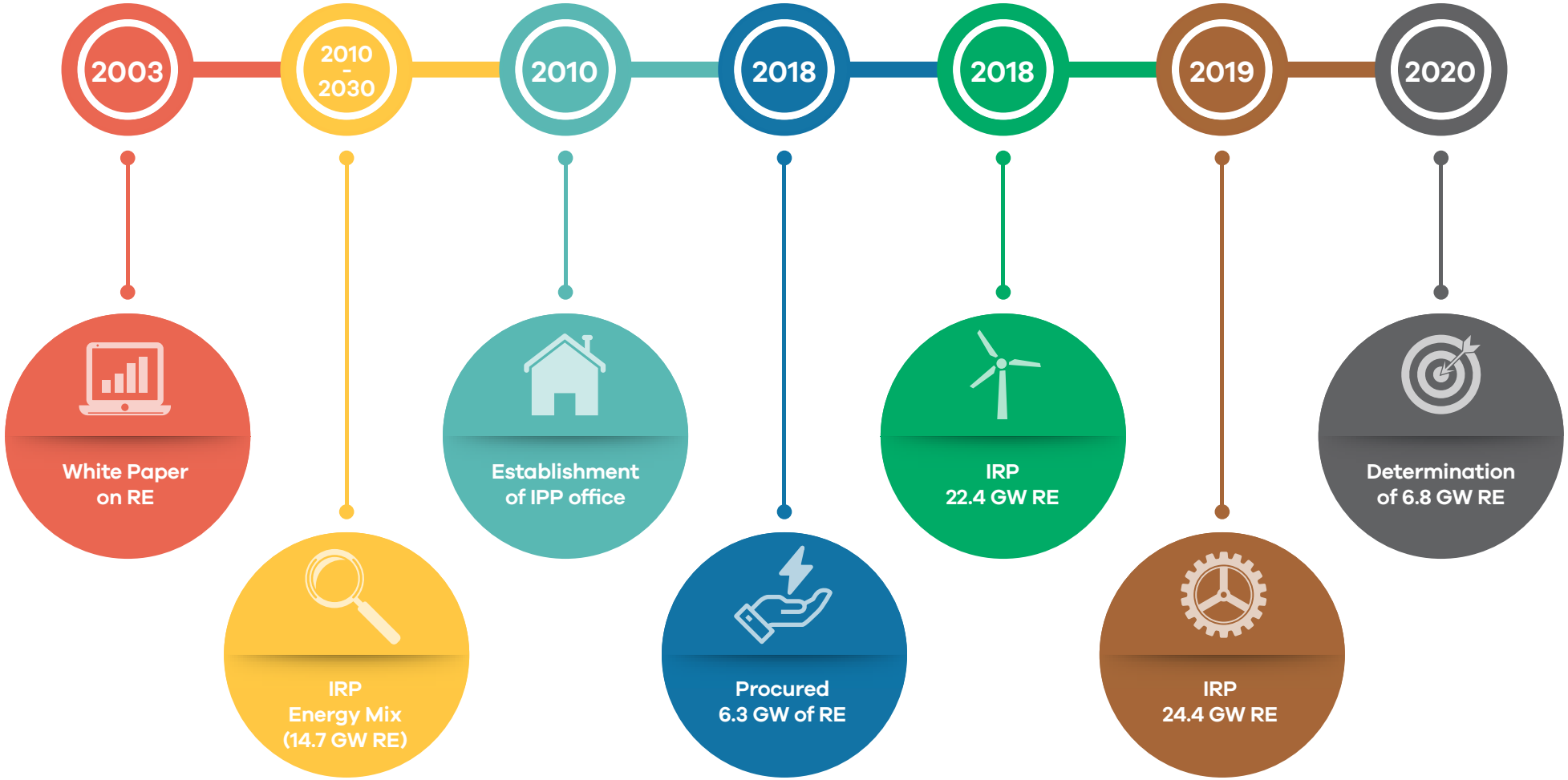

Figure 2: Commencement and timeline of REIPPPP in South Africa

Given this context, there are several opportunities for potential investors in the renewable energy market in SA. This market intelligence report (MIR) provides potential investors in the large-scale renewable energy space with a greater understanding of market opportunities in SA, considering the size of the opportunities and the level of risk involved. The MIR is compiled for foreign and local investors (persons or organisations) looking to invest in the large-scale renewable energy market through project development, asset management, equity, debt, equipment manufacture, or support services.

In what follows:

Section 2 overview the sector and describes the market size and key players.
Section 3 details the general legislative and regulatory framework governing renewable energy.
Section 4 highlights market drivers crucial for sustainable market growth and attractiveness.
Section 5 highlights the emergent opportunities in the market.
Section 6 addresses market barriers and uncertainties that may affect the industry.
Section 7 focuses on funding and incentives.
Section 8 gives an overview of the WC as Africa's growing Greentech hub.
Section 9 focuses on the services that GreenCape provides to its members.

Note: GreenCape's Energy Services Market Intelligence Report explores the energy services market, including the embedded generation renewable energy market, focusing on the embedded generation of less than 1 MW. and energy efficiency. The energy services market is thus not covered in this Large-Scale Renewable Energy Market Intelligence Report.

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SECTOR OVERVIEW

The South African large-scale renewable energy capacity accounts for approximately 10% of the wholesale/public nominal capacity. The industry is showing growth and potential with just over 5 GW of large-scale connected and operational projects.

Wind turbine manufacturing at GRI, Atlantis, Western Cape.
©GreenCape

This section gives an overview of the market, describes the market size (present and future), and breaks down the basic renewable energy value chain and key players. This section aims to provide foundational information needed to explore the investment opportunities in the South African renewable energy market.

2.1. South African electricity landscape

SA's electricity supply is currently dominated by coal-fired power generation. The country has coal-fired generation stations with an installed capacity of 38.7 GW, with the additional coal unit (+725 MW) at Kusile Power Station coming online. This represents more than ~74% of the country's total wholesale/public nominal capacity, amounting to ~52.6 GW. These stations are primarily owned and operated by Eskom, the national power utility. Eskom supplies ~95% of SA's total electricity demand.

The remaining 5% of demand is met through municipalities, imports and independent power producers (IPPs).

There has been a distinct flattening in demand since 2010, resulting in reduced dependence on coal-based electricity (87% in 2010 versus 65% in 2020) (Calitz, J. Wright, J.G. (2020). In H1-2021, system demand increased by 5.4TWh relative to H1-2020 (5.0%) but was 2.5TWh less than that experienced in H1-2019 (-2.2%) (Calitz, J. Wright, J.G. (2021).

Over more than ten years, a historic supply and demand imbalance in SA's single buyer energy model resulted in intensive load shedding continuing country-wide during 2021. As of November 2021, load shedding had occurred for 1 136 hours, with an upper limit of 2 455 GWh; a 37% YTD increase compared to the 859 GWh upper limit of energy shed in 2020 (Calitz, J. Wright, J.G. (2021). This equates to 76% of the full-year load shedding in 2020.

Load shedding has been driven by a combination of factors, including:

- Delayed commissioning and underperformance of new-build coal generation capacity;
- Degradation of the existing Eskom coal fleet EAF declining from ~94% in 2002, ~65% in 2020, 67% in 2019/20 to 61.31% for H1[10]-2021;
- An alarming and continued trend increasing Unplanned Capability Loss Factor (UCLF) of up to 15 300 MW was experienced in H1 2021 (Calitz, J. Wright, J.G. (2021).

2.2. The development of large-scale renewable energy in South Africa

Introducing renewable energy into national energy planning extends as far back as the 1998 White Paper on the Energy Policy of SA. The policy committed to encouraging private sector participation, competition, and open, non-discriminatory access to the transmission system.

The sector was further supported by the 2003 White Paper on Renewable Energy. The government set a target of 10 000 GWh renewable energy consumption by 2013, and in 2009 NERSA approved the policy and tariffs for a Renewable Energy Feed-in Tariff (REFIT) programme.

The IRP was adopted as the official long-term government plan for new electricity generation capacity, including project timelines. The IRP 2019 aims to double the electricity capacity through a diversified energy mix, mainly coal, gas, nuclear and renewable energy. It estimated planned generation capacities contributing to the overall energy mix. Nevertheless, the 2011 promulgation of the IRP 2010 – 2030 Policy Adjusted Plan issued by the then Department of Energy (DoE) had the greatest impact on the renewable energy sector. **Figure 3** illustrates some of the essential large-scale renewable energy developments in SA to date.

[10] H1 – January to June

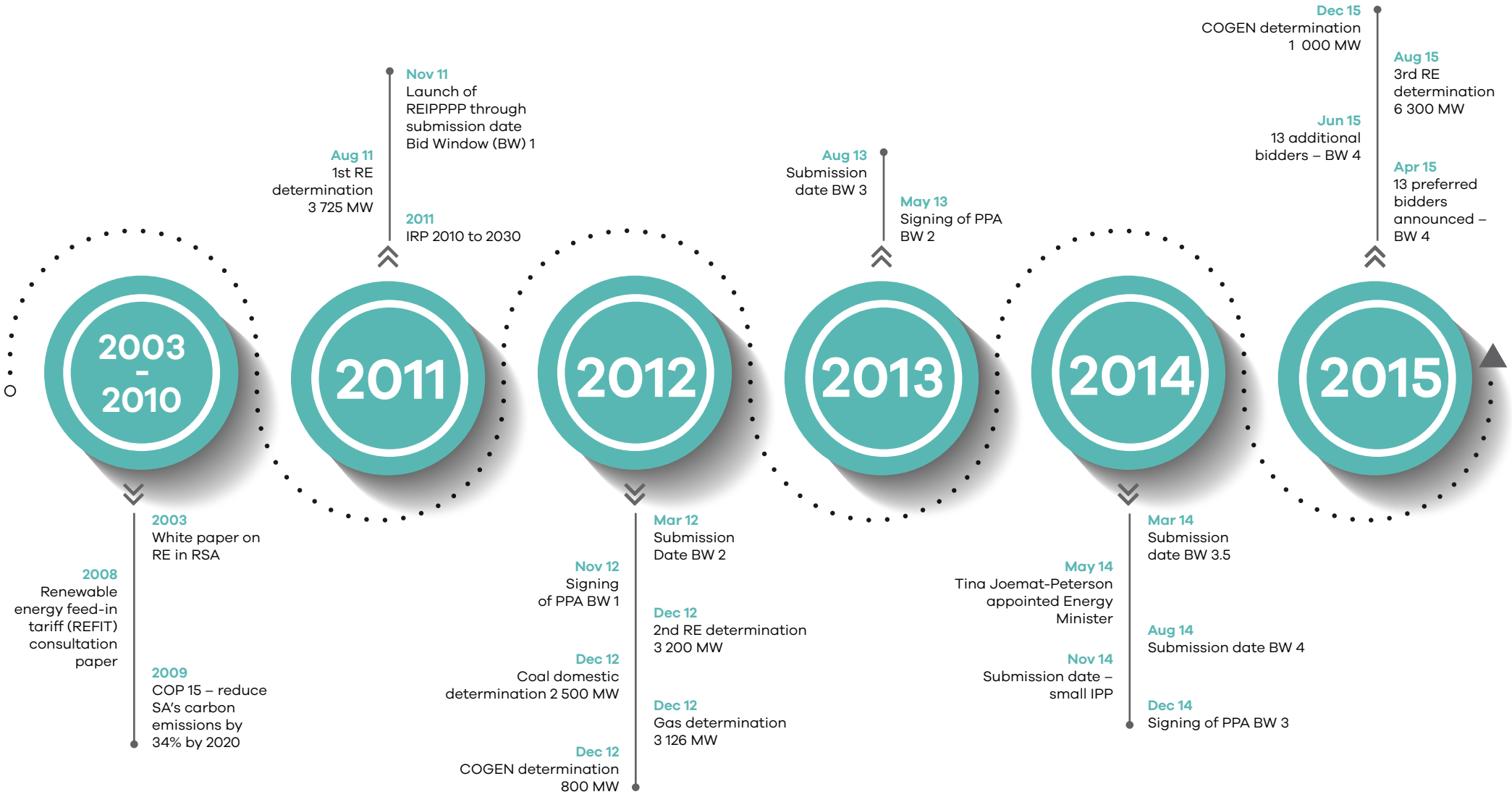


Figure 3: Key large-scale renewable energy movements in South Africa achieved to date

Figure 3: Continued...

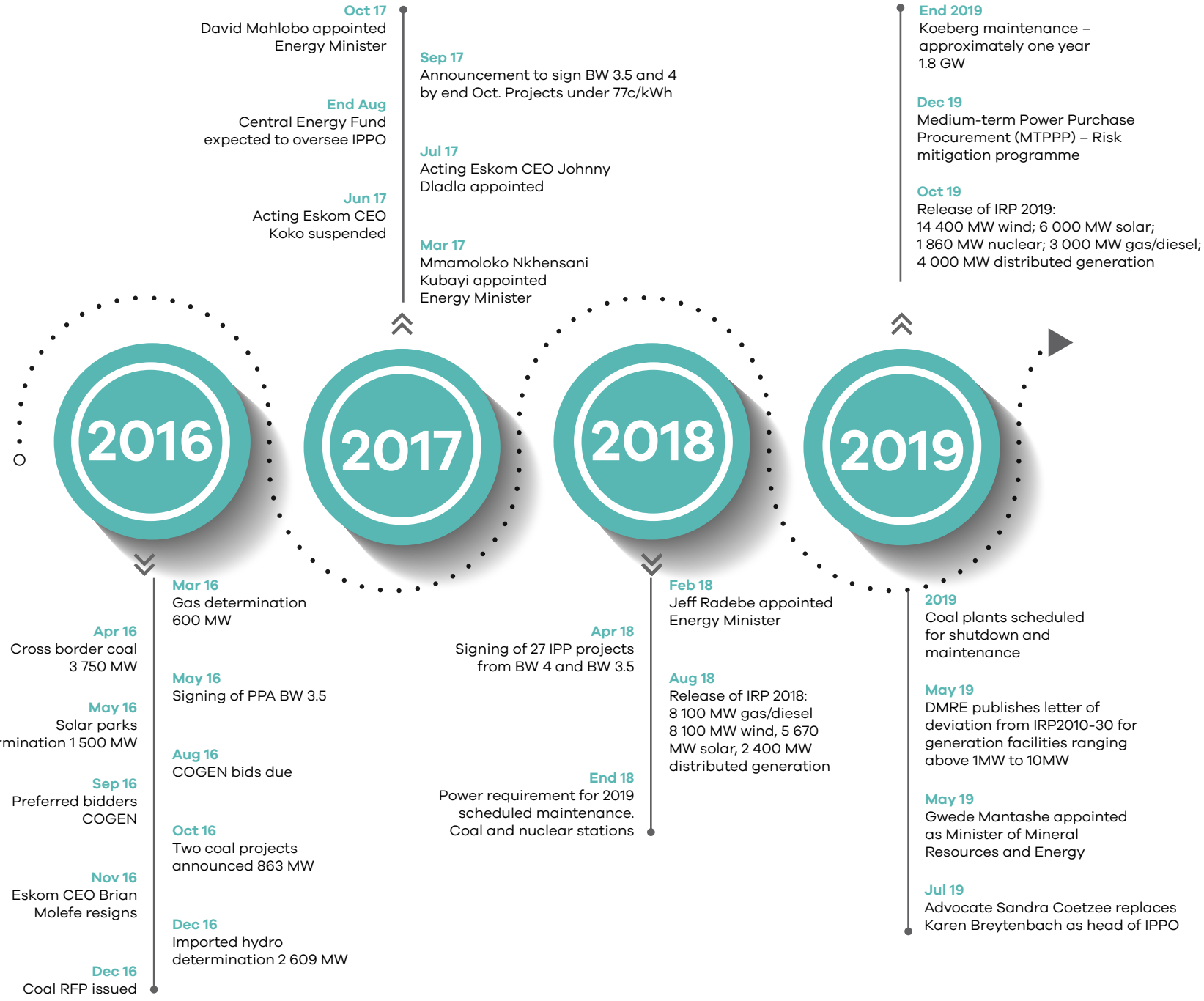
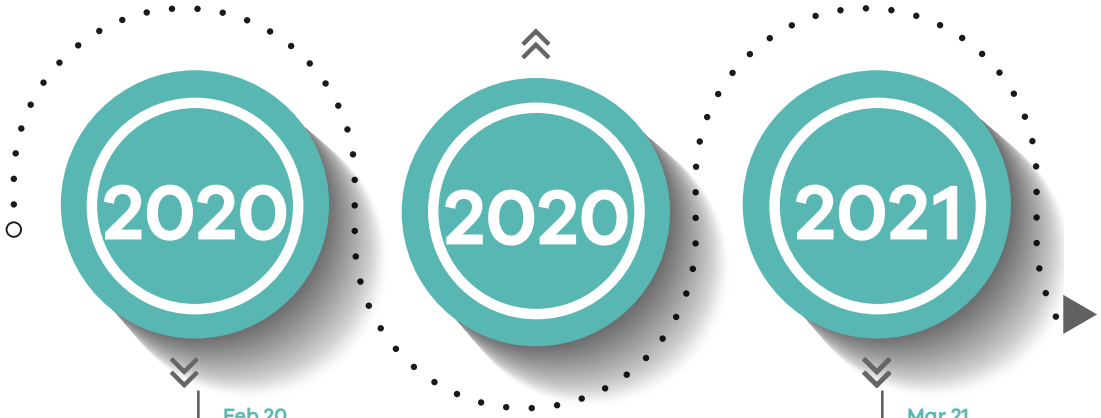


Figure 3: Continued...



Apr 20
DBSA announced Tshifiwa Bernard Magoro as the new head of the Independent Power Producer Office (IPPO) effective from 1 May

Aug 20
IPPO/ DMRE RFP issued for 2 000 MW Risk Mitigation Independent Power Producers Programme (RMIPPPP)

Feb 20
DMRE, under revised Schedule 2 of the Electricity Act, enabled self-generation and facilitating municipal generation under "Distributed Generation". Generation plant may only require registration

Jul 20
DMRE/IPPO developed and issued a refinancing protocol to ensure a standardised approach to the preparation and assessment of all refinancing applications received

Sep 20
DMRE signs off Section 4 Ministerial determinations: 4 800 MW of wind; 2 000 MW of solar; 3 000 MW of gas or diesel to power; 1 500 MW of new coal; 513 MW of energy storage

Oct 20
DMRE gazettes amendments to the Electricity Regulations on Generation Capacity, enabling municipalities in good financial standing to buy or procure new generation capacity under IRP

Mar 21
Eight preferred bidders announced – RMIPPPP

Jun 21
Additional three preferred bidders announced - RMIPPPPP

Aug 21
DMRE gazetted the amended Schedule 2 of the Electricity Regulation Act allowing projects of up to 100 MW to generate power without the requirement of a generation licence

Aug 21
102 bids received for Bid Window 5

Oct 21
25 preferred bidders announced – REIPPPP BW5

Although renewable energy in the South African context dates back to 1998 with the 1998 White Paper on Energy Policy, it is still a relatively new market in SA, with the first large-scale projects coming online in 2013. At the time of writing, 6 422 MW of renewable energy had been procured through the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), with 5 250 MW generation capacity added to the national grid, 62 949 GWh of energy has been generated by renewable energy sources procured under the REIPPPP since the first project became operational in November 2013 (IPPO 2021).

The growth of SA's renewable energy industry in recent years results from several factors:

- Proactive government policy in procuring renewable energy capacity;
- Increases in electricity tariffs charged by the national utility, Eskom;
- Wind and solar energy compete on a levelized cost of electricity basis with coal and nuclear.

The biggest development and driver of the large-scale renewable energy market in SA was the establishment of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) in 2011.

2.2.1. The Renewable Energy Independent Power Producer Procurement Programme

Over the last decades, the South African large-scale renewable energy model evolved, and there have been refinements. Key policy movements are summarised in Table 2.

The major goal of establishing a renewable energy programme was to ensure fair competition and independence, free from undue influence. With all previous generation, transmission, and distribution shares managed by Eskom, the programme separated powers.

Central to SA's renewable energy programme was the establishment of the Independent Power Producer Procurement Programme (IPPPP) by the former Department of Energy (DoE) (now DMRE) (see Figure 4), National Treasury (NT), and the Development Bank of Southern Africa (DBSA) in 2010.

A memorandum of agreement (MoA) was concluded between the parties, and the DBSA was directed to support the establishment of the Independent Power Producer (IPP) office. The MoA has been subsequently extended to 2023.

The IPP office is housed in the DBSA, which oversees staff, operations and procurement of consultants, goods and services. Initial funding was provided as a loan recoverable once an IPP project reached its financial close stage. The office is now funded from IPP project fees. The office is an agent of the DMRE and is mandated to implement the IPPPP, whilst National Treasury, through the Government Technical Advisory Centre, manages the IPP office account. National Treasury also provides a guarantee to back the obligations of Eskom in terms of the Power Purchase Agreements (PPAs) with the IPPs.

Table 2: Key policy movements in the establishment of the renewable energy sector in SA

	Initiation	Market Development	Transition	Consolidation	Growth
Pivotal movements	**RE policy uncertainty**	**Programme development**	**Bid Window 1-2 [nascent market – high returns]**	**Bid Window 3-4 [competitive market]**	**RMIPPPP and Bid Window 5 [Market growth]**
Timeline	**1998 – 2008**	**2009 – 2010**	**2011 – 2013**	**2014 – 2019**	**2020 - 2021**
Government	1998 White Paper on Energy.	2009 – Renewable energy feed-in-tariff (REFIT)[11] phase 2 launched by NERSA.	2011 – DMRE[12] abandons REFIT for the competitive tender process.	Nuclear debate.	Determination based on new IRP 2019.
	2003 White Paper on RE.	2009 – COP 15 commitments.	2011 – 1st determination: 3 725 MW.	BW 3 (17) preferred bidders in December 2014.	Issue of RMIPPPP RFP (2 000 MW).
	2007/08 loadshedding.	IRP 2010 – 2030.	Aug 2011 – Issue of REIPPPP RFP.	BW 3.5 (2) preferred bidders in December 2014.	Issue of REIPPPP RFP BW5 (2 600 MW).
	2008 – REFIT draft guidelines issued by NERSA.	2010 – Establishment of IPP office.	Nov 2011 – Bid submission period.	Delay in Bid Window 4 (BW4) announcement – job losses as a result.	August 2021 Bid submission period.
	2008 – Eskom solar hot water rebate programme.	–	Dec 2011 – Preferred bidder announcement.	April 2018 – Sign BW4.	RMIPPPP preferred bidders announced.
	2008 – Energy Act enacted.	–	11 Dec 2011 – COP 17 in Durban.	August 2018 – Updated IRP released for public comment.	October 2021 - 25 BW 5 preferred bidders announced.
	2008 – Commissioning of Darling Wind Farm.	–	2012 – 2nd determination – 3 200 MW.	October 2019 updated IRP released.	–

[11] REFIT (renewable energy feed-in tariff) programme was a renewable energy programme launched by NERSA in 2009, which was later revised (with developers, lawyers and funders' input) to the REIPPPP, launched in 2011.

[12] Previously referred to as the Department of Energy (DOE)

Table 2: Continued...

	Initiation	Market Development	Transition	Consolidation	Growth
Government	–	–	Nov 2012 – Signing of PPA BW1.	–	–
	–	–	May 2013 – Signing of PPA BW2.	–	–

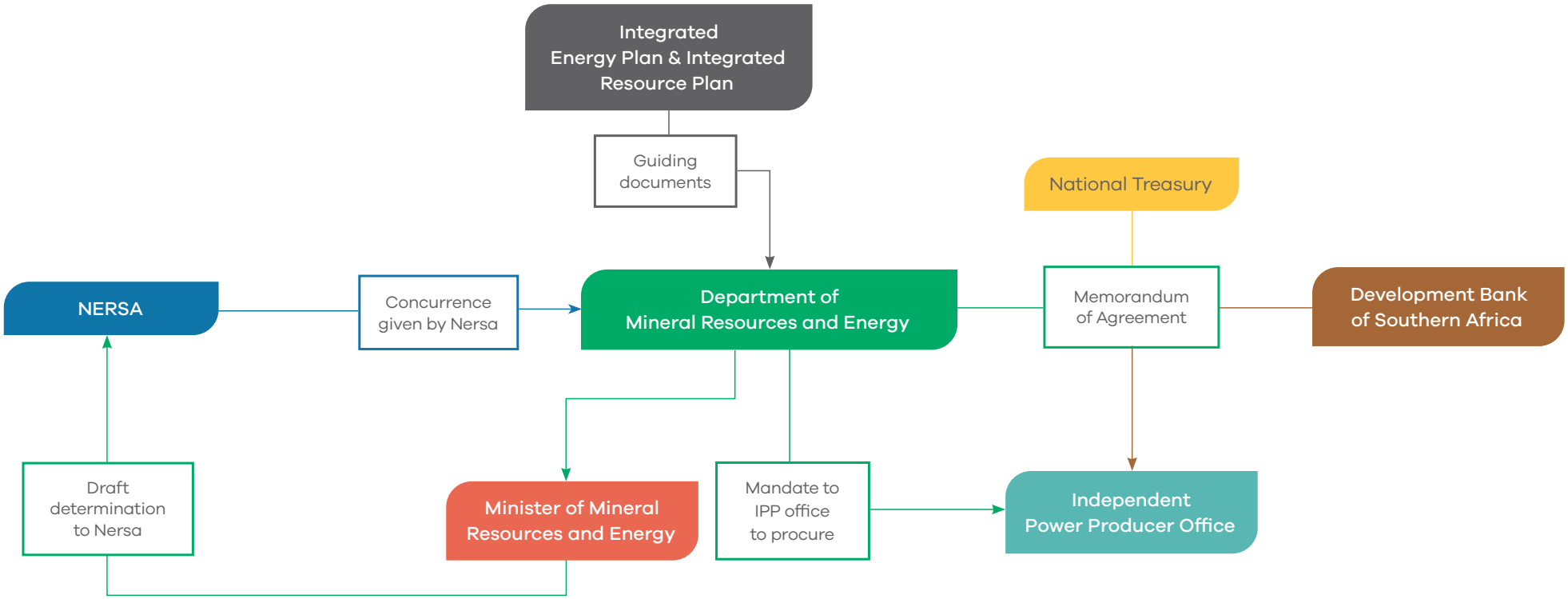


Figure 4: Governance structure of Independent Power Producers Office (IPPO)[13]

[13] DoE (Department of Energy) is now known as the Department of Mineral Resources and Energy (DMRE), established in June 2019 as a merger between the Department of Energy and Department of Mineral Resources

The formation of the IPP Office's procurement process, Figure 5, has been lauded as one of the key elements driving success.

Figure 5: IPPO procurement process

SA's renewable energy market grew exponentially from the IPPO in 2010 until 2015, when delays slowed market growth. Up until 2015, the IPPO, with the support of the DMRE, has procured 6 422 MW of renewable energy generation IPPO 2019). This has been managed through eight BWs[14] in the large-scale REIPPPP, including two bid rounds in the small REIPPPP. In the WC, the IPPO reports that there are 14 large-scale renewable energy projects that have reached commercial operation date (COD) in the province between November 2013 and June 2020 (IPPO, 2020).

2.3. South Africa large-scale renewable energy market size

The South African large-scale renewable energy market has grown over the last eight years since the first project came online in 2013. The market presents both current and future opportunities for investors. The REIPPPP has attracted investment from prominent global renewable energy project developers and Tier 1 component manufacturers. It has done so because of the growth potential, localisation requirements, transparency, and strong government support.

REIPPPP highlights to date (IPPO 2021):

- In the Large REIPPPP, 91 projects have reached financial close. There is still one BW 3 project that has not reached a financial close. The project has become unviable due to complications with fuel supply, and the DMRE is following the process of withdrawing the project from the procurement process.
- Two (2) BW4 projects started operations in the second quarter of 2021, bringing the total to 17 (out of 26) BW4 projects that have reached commercial operation.
- The projects procured under the two small programmes were still on hold during Q1 2021/2022. The Eskom Board decided not to sign power purchases with projects for various reasons. The DMRE reviews the outcome of the Eskom board meeting and follows due governance processes to recommend the cancellation of the programme.

[14] Bid windows 1, 2, 3, 3.5, 4,5 and smalls BW1 (1S2) and BW2 (2S2).

Energy supply capacity impact of the REIPPPP (by June 2021):

- 6 422 MW of electricity had been procured from 112 RE Independent Power Producers (IPPs) in seven bid rounds.
- 5 250 MW of electricity generation capacity from 81 IPP projects has been connected to the national grid; and
- 62 949 GWh of energy has been generated by renewable energy sources procured under the REIPPPP since the first project became operational in November 2013.

The economic impacts of the REIPPPP have included the following (IPPO, March 2021):

- Investment (equity and debt) to the value of R209.7 billion, of which R41.8 billion (20%) is foreign investment, was attracted.
- Created 60 517 job years for South African citizens to date.
- Socio-economic development contributions of R1.6 billion to date.
- Enterprise development contributions of R484.1 million to date.
- From inception to date, the programme has realised carbon emission reductions of 63.9 Mton CO_2.

Table 3 provides the breakdown of the large-scale and small-scale REIPPPP procured, determined and operational capacity allocations across all renewable energy technologies (IPPO June 2021, NERSA determination).

In the Western Cape, there have been 14 utility scale renewable energy projects procured between November 2013 and June 2021 (13% of the total number of projects). In addition, seven of the 25 preferred bidders in BW 5 are located in the WC (28% of the total number of projects). The WC has been allocated 9% of total REIPPPP procured capacity to date. Including the BW5 preferred bidders, the WC has been allocated 15% of total REIPPPP capacity:

- 1391 MW (15%) of renewable energy capacity - 14 contracted projects and seven preferred bidders in BW 5 (785 MW);
- 592 MW operational from 11 projects;
  - o 458 MW is onshore wind; and
  - o 134 MW of solar.

The combined IPP investment share of the province, across BW1 to BW4, 1S1 and 1S2, would be equivalent to 2.5% of WC's annual gross domestic product (R 591 billion).

By June 2021; the project value that has been realised in the WC totalled R8.9 billion.

Western Cape based project developers dominated the REIPPPP BW5 preferred bidders. over 75% of the selected projects were developed by WC based project developers contributing an estimated R40 billions of investments towards BW5. A decision to set up a renewable energy company within the WC is informed by an ease of doing business, infrastructure availability, logistics support and location and the relatively advanced renewable energy regulatory reform established within the province. Although the companies' activities span across the country; setting up within the WC offers a head start into business development and market entry opportunities due to the widely developed ecosystem set up to support renewable energy investments.

Table 3: Large-scale and small-scale REIPPPP procured, determined and operational capacity allocations across all renewable energy technologies

Programmes	Large-scale IPP (MW)			Small-scale IPP (MW)		
Technology	Procured	Operational	Determined to date	Procured	Operational	Determined
Wind	3 357	2 513	11 160	9	0	400
Solar PV	2 292	2 212	8 225	80		
Concentrated solar power	600	500	1 200	0		
Landfill gas[15]	13	25	540	0		
Small hydro	19			0		
Biomass	42			10		
Energy Storage	–	–	513	–		
Other	99	–	–	–	–	–
Total	**6 422**	**5 250**	**21 638**	**99**	**0**	**400**

Total investments made in the programme (debt and equity) over the procured bidding windows, excluding the expedited round, totalled more than R209.7 billion as of June 2021 (IPP Office). This is split between domestic (80%, R167.9 billion) and foreign (20%, R41.8 billion) investments. The programme has successfully attracted investments and attracted them from a wide variety of investment sources (see **Figure 6**).

For the latest BW5 results, the debt: equity ratio was 65:35, compared to the BW1 (72:28), BW2 (75:25), BW3 (71:29) and BW4 (77:23); signalling the renewed investor confidence towards the REIPPPP. In addition, the average internal rate of return (IRR) for the preferred bidders for BW5 was reported to be 11.35%, and BW4 was at 17.27%.

[15] Landfill gas is a mix of different gases created by the action of microorganisms within a landfill as they decompose organic waste, including for example, food waste and paper waste.

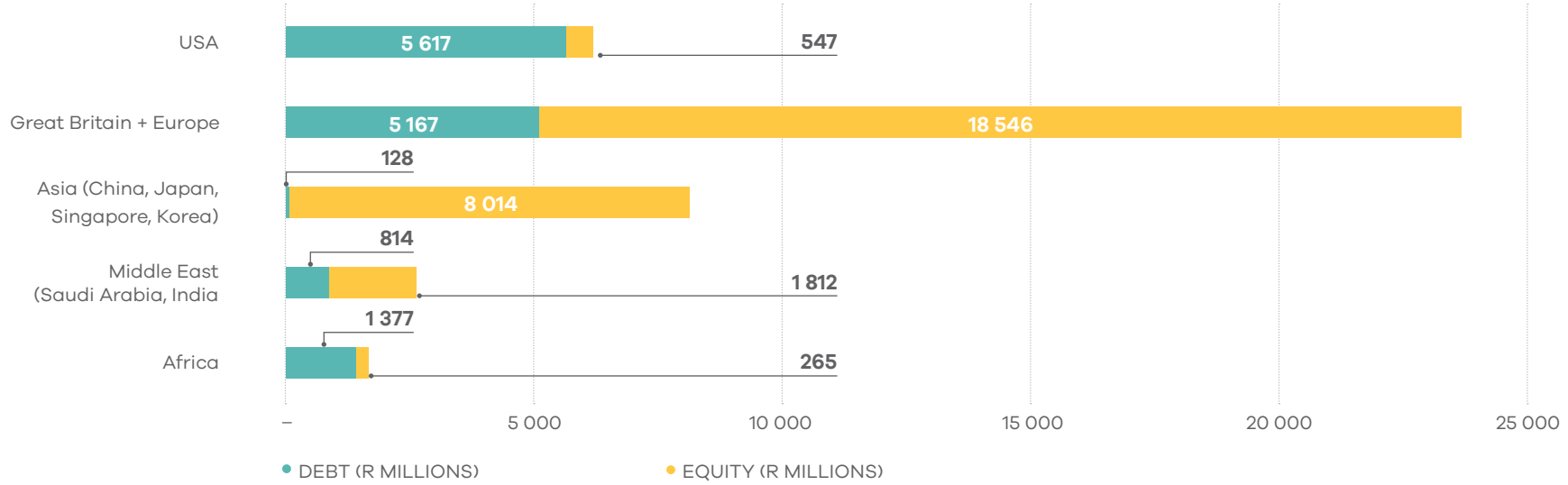


Figure 6: Countries from which private investments in the REIPPPP were made

Source: GreenCape, IPPO, 2021

Allocations of generation capacity in Table 4 present the final procured MW capacity per bid round, including the small IPP programme. As the table shows, wind and solar PV are the dominant technologies in actual capacity procured. Future rounds of the programme will have to adjust their allocated technology because of favourable bid prices and high (over-) subscription rates.

Table 4: Actual procured generation capacities per REIPPPP BW[16] (IPPO, June 2021)

Programmes	Large-scale IPP (MW)						Small-scale IPP (MW)	
Rounds	Round 1	Round 2	Round 3	Round 3.5	Round 4 a, b	Round 5	S1	S2
Wind	649	559	787	0	1 363	1 608	9	0
Solar PV	627	417	435	0	813	975	30	50

[16] Determinations were leading to 6 bid windows – 1, 2, 3, 3.5, 4 and the expedited round. Energy has only been procured from 5 bid windows – 1, 2, 3, 3.5, 4 and 5

Table 4: Continued...

Programmes	Large-scale IPP (MW)						Small-scale IPP (MW)	
Concentrated solar power	150	50	200	200	0	0	0	0
Landfill gas	0	0	13	0	0	0	0	0
Small hydro	0	14	0	0	5	0	0	0
Biomass	0	0	17	0	25	0	10	0

Technology improvements, investor risk appetite, and the global renewable energy drive have resulted in solar PV and wind prices as low as R0.43/kWh and R0.49/kWh, respectively, in the latest South African bid rounds (see Table 5). Based on the bids received for the solar PV, tariff prices ranged between R0.37/kWh - R0.48/kWh; and ranged between R0.34/kWh – R0.48/kWh for onshore wind (IPPO 2021).

Table 5: Tariffs offered by solar PV, wind, and CSP projects over BWs [R/kWh]

Programmes	Large IPP							Small-scale IPP	
Rounds (AVG R/kWh)	Round 1	Round 2	Round 3	Round 3.5	Round 4 a, b	Expedited	Round 5	S1	S2
Wind	1.51	1.19	0.87	–	0.75	0.62	0.49	1.15	–
Solar PV	3.65	2.18	1.17	–	0.91	0.62	0.43	1.22	1.01
Concentrated solar power	3.55	3.32	1.93	1.8	–	–	–	–	–
Landfill gas	–	–	1.11	–	–	–	–	–	–
Small hydro	–	1.36	–	–	1.24	–	–	–	–
Biomass	–	–	1.65	–	1.61	–	–	1.65	–

As the price points for successful bids bottom out, the strategic advantage for winning bids will shift to those with stronger, more innovative Black Economic Empowerment (BEE) programmes/ partnerships; agile approaches/ strategies towards meeting financial close within four months (as opposed to nine months in previous rounds).

Key changes implemented in REIPPPP BW5:

- Evaluation weighing was changed from 70:30 (ED scorecard price) to 90:10 (BBB-EE contributor status level).
- No competitive ED scorecard targets for BW5 led to a decline in commitments.
- Employment of skilled Black employees with specialised skills minimum threshold of 10%, employees who are Black youth (30%), employees who are Black women (10%).
- Shareholding by Black people in the Construction Contractor and Operations Contractor are Black women.
- Introduction of Skills Development Contributions' minimum threshold requirement;
- Introduction of Black Enterprise Procurement minimum threshold requirement.

There are also opportunities noted with the anticipated changes for BW6:

- Re-introduce the ED competitive scorecard as per the National Treasury recommendations.
- Reduce the PPA tenure for new contracts following reforms currently happening at Eskom.
- Developing BBB-EE codes specific to onshore wind and solar PV industries.
- Increase demand for grid ancillary services per the grid operator's requirements as seen in RMIPPPP projects.

In the PPA tenure review process, industry stakeholders have engaged in discussions about the possibility of utilising the IPPs infrastructure once the PPA tenure with Eskom has ended.

An opportunity for the consumers to buy cheaper and cleaner electricity from an operational infrastructure that has paid off its debt and generated a return on investment. This idea presents an opportunity for South Africans to buy cheaper and cleaner renewable energy, conduct R&D and establish clear regulatory (SABS) standards for renewable energy waste management from the decommissioning of REIPPPP plants.

2.3.1. Future market growth potential: The Integrated Resource Plan

The IRP is a national government document that aims to provide a clear indication of SA's electricity demand and how this demand will be supplied, and at what cost. Section 34(1)(a) of the Electricity Regulation Act 4 of 2006 (ERA) allows the Minister of Mineral Resources and Energy (DMRE), in consultation with the National Energy Regulator of South Africa (NERSA), to make Ministerial Determinations for new generation capacity if it is believed that it is required to secure the continued, uninterrupted supply of electricity.

The South African utility scale market 2020-2030

The 2019 Integrated Resource Plan provides direction on how South Africa plans to meet its electricity demand over the next 10 years. This can give an investor a good indication of the potential market that will exist and that can be accessed.

The Ministerial Determinations may also outline the energy sources from which electricity must be generated. These decisions are based on the most up to date IRP.

In May 2011, the then Department of Energy (DoE) – now the DMRE – released the Integrated Resource Plan 2010-2030 (IRP 2010), providing SA's forecast energy demand for the 20 years from 2010 to 2030. The IRP 2010 was intended to be a 'living plan' that would be reviewed by key stakeholders at least every two years.

In 2019, an updated 2019 IRP was gazetted. In the IRP 2019, besides capacity additions, several assumptions have changed since the promulgation of IRP 2010–2030. Key assumptions that changed include the electricity demand projection (decreased by 0.6% since 2010), Eskom's existing plant performance (EAF ranged between 57.7% in January 2021 to 66.4% in June 2021 and down to 56.5% on October 21 to 56.5%), and updated technology costs.

The IRP generally considers several scenarios, with **the policy adjusted IRP being the primary plan. The policy adjusted scenario in IRP 2019** is shown in **Figure 7** is the final IRP 2019 that was gazetted for implementation.

For the period ending 2030, several policy adjustments are proposed to ensure a practical plan that will be flexible to accommodate new, innovative technologies that are not currently cost-competitive.

It aims to minimise the impact of the decommissioning of coal power plants and the changing demand profile. Some of these adjustments include increased build limits to smooth the rollout of renewable energy, which will help sustain the industry and including 1 500 MW of coal-to-power to minimise the impact of job losses resulting from the decommissioning.

	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 capcity and energy gap
2020	1 433	-557	–	–	–	114	300	–	–	
2021	1 433	-1 403	–	–	–	300	818	–	–	
2022	711	-844	–	–	513	400 1 000	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)	43		2.36	5.84	6.35	10.52	22.53	0.76	8.1	–
% Annual Energy Contribution (% of MWh)	58.8		4.5	8.3	1.2	6.3	17.8	0.6	1.3	–

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

Figure 7: Policy adjusted plan IRP 2019

The following has taken place under the past two IRPs:

- By June 2021, a total of 6 422 MW under the REIPPPP has been procured, with 5 250 MW operational and made available to the grid. Also, IPPs have commissioned 1 005 MW from two open cycle gas turbine (OCGT) peaking plants.
- Under the Eskom build programme, the following capacity has been commissioned: 1 332 MW of Ingula pumped storage, 4 764MW of coal (Medupi), 2 397 MW of coal (Kusile) with three units of 800 MW each still under construction and 100 MW of wind (Sere Wind Farm) (Eskom 2021[17]).

The **Western Cape** has attracted 9% of the procured capacity (MW) in the REIPPPP and 30% of the preferred bidders (in terms of capacity in MW) in BW5.

Table 6 details the potential market growth that investors can expect based on the IRP 2019. Table 6 also provides an estimated potential market growth for the WC that investors can expect based on the IRP 2019 and assuming a future share of 15% in the province (which would require resolving grid constraints expected post BW 5).

Table 6: New additional capacity by 2030 based on IRP 2019

Technology	IRP 2019 provisions by 2030 (MW)	Possible Western Cape capacity by 2030 (MW) (assuming 15% share)
Coal	1 500	–
Nuclear	1 860	–
Hydro	2 500	–
Storage	2 088	–
PV	6 000	900
Wind	14 400	2160
CSP	0	–
Gas/Diesel	3 000	–
Other (embedded generation)	4 000	600

[17] System Status and Outlook Briefing; 25 October 2021

The other technology category includes distributed generation, co-generation, biomass, and landfill gas. The 2019 IRP increased the renewable energy capacity, not including distributed generation, to 33% by 2030. It also strongly encourages new industries and job creation and holds potential for localisation across the value chain (IRP, 2019).

An approximate market value per technology based on IRP 2019 allocations can be estimated using an indicative R/MW overnight capital cost per technology in the previous four bid rounds[18].

This is depicted in **Table 7**. The renewable energy potential market is valued at R418 billion for solar PV, onshore wind and distributed generation. Assuming a future share of 15% of future allocations in the province, the WC market potential is approximately R62 billion.

[18] Bid window 5 data are not included.

Table 7: Future pipeline based on IRP 2019 allocations

Technology	Indicative ZAR (million)/ MW cost[19]	IRP 2019 new capacity (MW)[20]	Potential market value	Potential market value (Western Cape)[21]
Solar PV	R16.5 million	6 000	R99 billion	R14.8 billion
Wind	R18.8 million	14 400	R271 billion	R40 billion
SSEG	R12.0 million	4 000	R48 billion	R7.2 billion

2.3.2. Future market growth potential: Beyond the Integrated Resource Plan

In a collaborative study conducted by the Council for Scientific and Industrial Research (CSIR) and Meridian Economics (Wright & Calitz, 2020) as a background for a potential climate finance transaction for the accelerated decommissioning of coal power stations, the IRP of 2019 was expanded to 2050. This study was conducted utilising a high temporal resolution systems-level approach in a modelling tool that is widely used in SA (viz. Plexos).

The South African electrical energy mix at the study was 81% coal, and this is expected to shift to 55% by 2030 and 11% by 2050 in a least-cost scenario. This coal decommissioning pace could be accelerated based on climate finance, including the R131 billion green finance deal announced at COP26.

According to the CSIR study, the least-cost new-build mix comprises the following renewable energy elements: (1) solar PV, (2) wind, (3) storage and (4) natural gas-fired capacity.

This is supported by the existing fleet of generation capacity, including coal, nuclear and imported energy, such as hydropower. This model showed that it is the least-cost to have a 41% carbon-free energy mix by 2030 and 76% carbon-free by 2050. **This translates to 36% renewables by 2030 and 76% by 2050** (Jarrad Wright & Calitz, 2020).

Related work by Meridian (Renaud et al. 2020) determined through industry input that, after an initial ramp-up period of 2-3 years, a sustainable renewable energy build of 5-10 GW per year could be achieved. The total share allocated to the WC would likely reduce due to accessibility of land and grid access constraints. Still, if the province can maintain a 10% share of allocated growth, the local market could see between 500MW and 1GW of renewable energy build per annum.

[19] Price from the most recent bid window of South Africa's REIPPPP puts the capital costs used for wind and solar PV at R18 847/kW and R16 555/kW respectively for large-scale and R12 000/kW for small scale.

[20] BW 5 took up the 2583 MW (1 608 MW wind and 975 solar) from the forecast market size

[21] Assuming a future share of 15% in the province based on 9% procured to date and 30% preferred bidders in BW 5

2.4. South Africa renewable value chain

In SA, the global industry players dominate the renewable energy value chain, which has a typical structure, as illustrated in Figure 8. With market developments (e.g., reduced profit margins due to decreased tariffs), there has been considerable consolidation in the market.

Examples of such consolidation include Siemens/Gamesa, Nordex/Acciona and LM Wind/GE. In addition, there is considerable vertical integration from EPC to O&M, especially in the case of solar PV.

At each node of the value chain, opportunities are available for localisation.

As the South African industry gears up to meet the 24.4 GW of new renewable energy build required by 2030, the need for local value creation is increasingly growing to ensure the sector contributes to the country's infrastructural needs; economic objectives, including through establishing a local manufacturing base; Just Transition objectives, including job creation in transition areas.

Section 4 of this report highlights some of the emerging market opportunities identified along the value chain.

Figure 8: Renewable energy value chain

Source: IRENA, 2017

2.5. Key players in the South African large-scale renewable energy market

Stakeholders in the large-scale renewable energy industry developed in response to the REIPPPPP are best categorised according to the project development phases that the programme follows: development, construction, and operation and maintenance. The key players or company types involved in this market are described in Figure 9, indicating the project development phase in which they are typically involved.

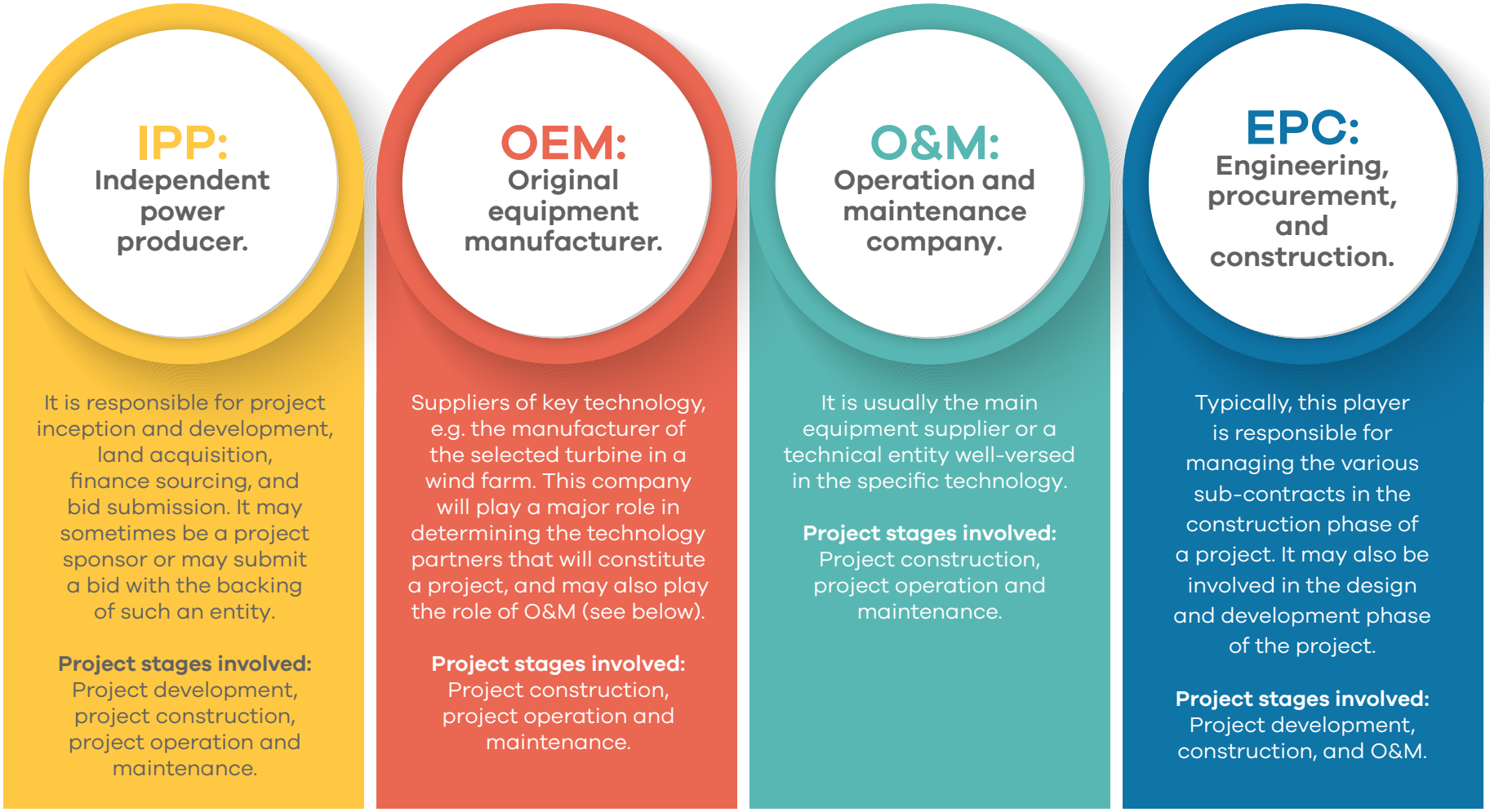


Figure 9: Typical company types involved at different stages of project life

POLICIES AND REGULATION

Policies and regulatory frameworks provide regulatory certainty to the market and guide the development of the renewable energy sector in South Africa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This section details the general legislative and regulatory framework governing renewable energy, focusing on the REIPPPP.

3.1. Guiding policies

SA's economic growth is guided by several key policies summarised in **Figure 10**, and the policies highlighted in **Figure 11** relate directly to REIPPPP.

The economic development component ensures the REIPPPP creates sustainable value for the local communities, and ultimately SA's economic development; through revenue obligations to which the IPPs commit. The design of the REIPPPP considers all these policies, making it a highly strategic infrastructure and development programme.

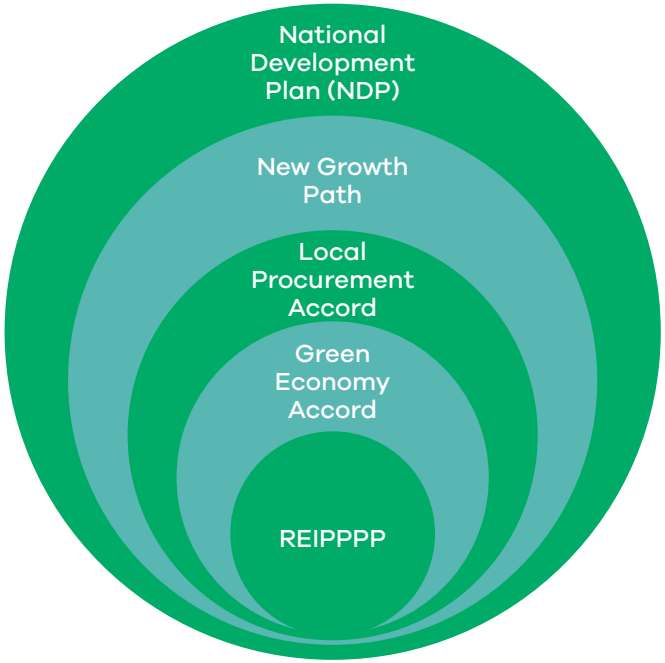

Figure 10: Policies guiding South Africa's economic growth trajectory

National Development Plan (NDP) *(August 2012)*	Aims to eliminate poverty and reduce inequality by 2030.
New Growth Path *(November 2010)*	Sets targets for creating jobs and identifies priority areas, with infrastructure development as key to this vision's success.
Local Procurement Accord *(October 2011)*	As the economy grows and the country industrialises, this accord sets an aspirational target of 75% of all products manufactured locally. This is particularly evident in the REIPPPP's local content rules.
Green Economy Accord *(November 2011)*	Together with the New Growth Path, this accord between the government, labour and business seeks to shift the country's economy towards sustainable development, green job creation, and industrial development.
Integrated Energy Plan (IEP) *(December 2016)*	Outlines the general energy plan for the country. The IEP looks into energy security, access to energy, reducing the cost of energy supply, energy efficiency, localisation and sustainability in all energy matters.
Integrated Resource Plan (IRP) *(November 2019)*	Specifically outline the planning, sourcing, and quantities of electricity generation sources contributing to the county's generation mix.
2003 White Paper on Renewable Energy *(November 2003)*	Determines that a significant and equitable level of national resources should be invested in Renewable Energy while setting renewable energy generation capacity targets.

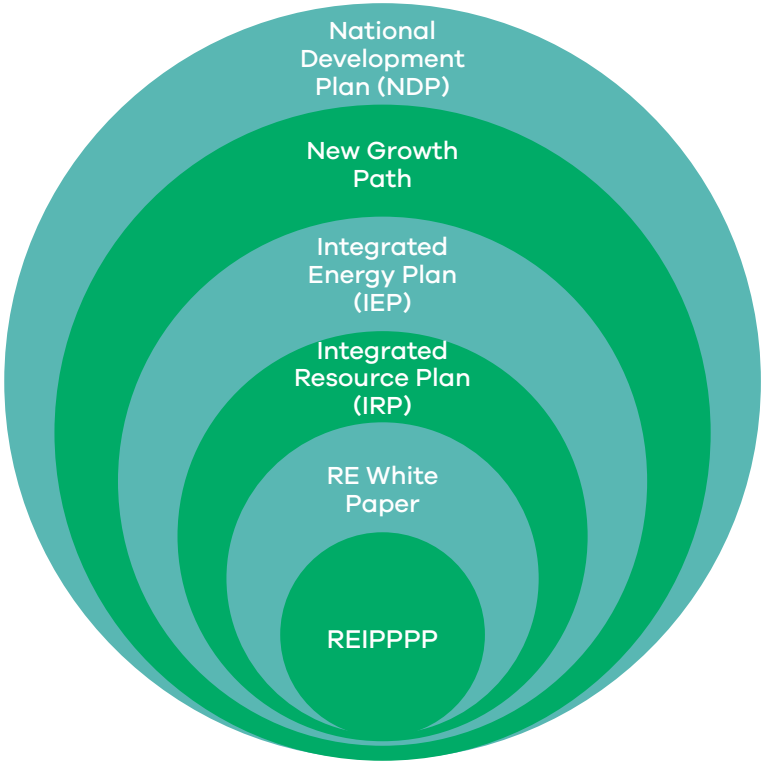

Figure 11: Eco-system of policies relating to the REIPPPP

3.2. Government departments involved in the energy and electricity sector

Different government departments are involved in executing the policies listed in **Section 3.1**.

The most prominent departments, according to the 2018 South African Energy Sector Report (DoE, 2018), are listed below with a summary of their interaction with the REIPPPP:

Department of Mineral Resources and Energy (DMRE)	The mission of the DMRE is to regulate and transform the sector for the provision of secure, sustainable and affordable energy and the promotion and regulation of minerals and mining. This includes the electricity sector, governed mainly through the Electricity Regulation Act 4 of 2006. This department was previously referred to as the Department of Energy (DoE).
National Energy Regulator of South Africa (NERSA)	NERSA issues licences for the operation of generation, distribution, and transmission infrastructure; regulates imports, exports, and trading of electricity; determines and approves electricity prices, tariffs, and the conditions under which electricity may be sold.
National Nuclear Regulator (NNR)	NNR regulates the operation of nuclear power stations, such as Koeberg and all elements of the South African nuclear energy value chain. Its role is to protect people, property, and the environment against nuclear damage.
Department of Public Enterprises (DPE)	The Minister of Public Enterprises is the shareholder representative of the South African government and has oversight responsibility for Eskom.
National Treasury (NT)	NT is responsible for financial and reporting oversight for Eskom (as a state-owned entity) and has played a pivotal role in providing government loans and guarantees in favour of Eskom.
Department of Water and Sanitation (DWS)	DWS oversees water allocations and ensures adequate water supply infrastructure, among others, for the South African electricity sector.
Department of Environment, Forestry and Fisheries (DFFE)	DFFE ensures adherence to environmental compliance and rights protection relating to preventing pollution, ecological degradation, promoting conservation, and securing ecologically sustainable development.
Department of Trade, Industry and Competition (dtic)	Responsible for ensuring industrialisation through the REIPPPP's economic development component, especially local content and black economic empowerment and development of small businesses.

EMERGING OPPORTUNITIES, DRIVERS AND BARRIERS

The evolving South African energy landscape creates opportunities for investors, financiers, project developers, component manufacturers, and suppliers in the large-scale renewable energy markets.

Cleaning of wind turbine components.
©Mainstream Renewable Energy

The following large-scale renewable energy market drivers, opportunities and market barriers have been identified through engagement with various green economy stakeholders. Each is outlined in greater detail in the subsections below.

4.1. Market drivers

The decreasing cost of renewable energy and a conducive policy landscape has created an attractive large-scale renewable energy market in SA.

4.1.1. The decreasing cost of large-scale renewable energy

The REIPPPP has been lauded globally for its clear mandate, growth path and independence in its procurement approach.

This is clearly illustrated through a tariff decline of over 88% for solar PV and 68% for onshore wind over the past nine years since the BW1 preferred bidders signed the PPA with Eskom in 2012. **Figure 12** illustrates the decline in average tariff in the wind and solar PV sector over the five BWs, plus expedited rounds that have been initiated, together with the capacity awarded for each BW. In the recent BW5, the bid tariff price for wind and solar comes in at less than R0.47/kWh (see **Figure 12**).

4.1.2. Policy drivers of market size

SA's economic growth is guided by several key policies (summarised in Section 3.1). As indicated, the design of the REIPPPP is informed by these policies to be a highly strategic infrastructure and development programme. In addition, in October 2020, the South African Government published the Economic Reconstruction and Recovery Plan (ERRP). Energy security is one of the priority interventions in this plan.

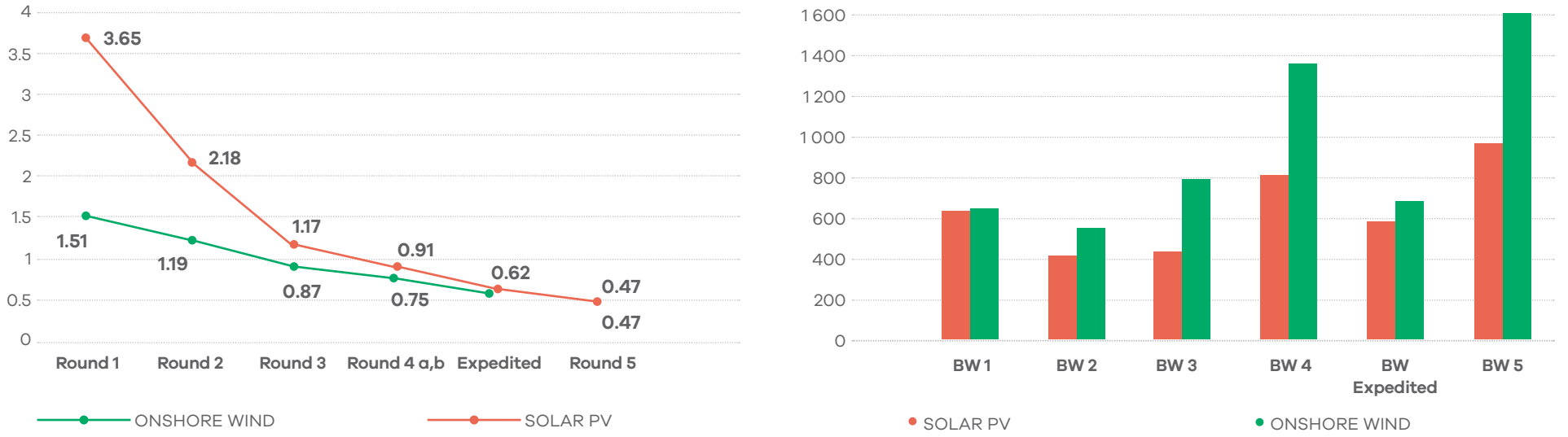

Figure 12: Tariff decline and capacity awarded for solar PV and onshore wind across all BWs

Implementation of the IRP to ensure diversification of energy sources, enabling new entrants into the energy space and enabling generation for own use are listed as key elements of this intervention – the last of these already enacted through the amendment of Schedule 2 of the Electricity Regulation Act in 2021 to allow projects of up to 100 MW to generate power without the requirement of a generation licence.

Electricity wheeling and trading

Electricity wheeling and energy trading will enable opportunities for distributed generators to increase their access to off-take agreements. As allowed by the DMRE and implemented by local municipalities, electricity wheeling will allow generators to wheel power to a willing buyer anywhere in the municipality or country.

The City of Tshwane, Nelson Mandela Bay Metropolitan Municipality and the City of Cape Town (CCT) are some of the major municipalities that are currently or already have implemented legislation to allow for wheeling.

The release of regulations allowing private sector energy trading will also open the market to private sector power purchase agreements and on-sales to private consumers using the national and local distribution networks[22].

4.1.3. Other related drivers

SA is a signatory of the Paris Agreement on Climate Change. The government has ratified this agreement. A host of additional international frameworks have been undersigned to promote the green economy and combat climate change.

The Municipal Energy Resilience (MER) project is a 3-year programme running to July 2023.

The MER project is spearheaded by the Western Cape Government's Department of Economic Development and Tourism's (DEDAT) Energy Directorate within the Green Economy Chief Directorate and supported by the combined efforts of the Department of Local Government (DLG), Department of Environmental Affairs & Development Planning (DEA&DP) and Provincial Treasury (PT).

The key objectives of the MER project are the development, support and capacity building to implement renewable energy projects in municipalities across the province. This project is aimed at building capacity (technical, financial, etc.) for the municipalities, businesses and households to generate, procure and sell their own power including, but not limited to, municipalities transacting directly with IPPs (Independent Power Producers), all aimed at increasing energy and economic resilience.

[22] One licence has been allocated to PowerX, but the process by which more licences can be allocated is yet to be completed.

Table 8: Sustainable Development and Climate Change Agreements to which South Africa is a signatory

Policy Plan	Policy Aim and Description
Just Energy Transition Partnership with South Africa	Announced at the COP to the United National Framework Convention on Climate Change (COP26) in Glasgow in November 2021, South Africa, France, Germany, the United Kingdom, United States of America governments, and the European Union entered into a long-term partnership to support SA's decarbonisation efforts, focusing on the electricity system and goals set out in the updated Nationally Determined Contributions (NDCs) to effect a just transition to low carbon and climate-resilient economy. The first phase of financing will mobilise $8.5 billion (R131 billion) through various mechanisms, including grants, concessional loans and investments and risk-sharing instruments, including mobilising the private sector.
The Paris Climate Agreement	The Paris Climate Agreement was adopted at COP21 and set a global temperature goal of staying well below a rise of 2°C, and preferably 1.5 °C, compared to pre-industrial levels.
The 2030 Agenda	The adoption of the 2030 Agenda for Sustainable Development in 2015 signalled the world's leaders' universal commitment to confront challenges that must be successfully overcome if humankind survives on this planet.
Addis Ababa Action Agenda	This agenda was the outcome of the 2015 Third International Conference on Financing for Development attended by the United Nations Member States, the International Monetary Fund (IMF), the World Bank, the World Trade Organisation (WTO) and other business and civil society leaders and stakeholders. It provides a comprehensive set of policy actions to finance sustainable development, transform the global economy and achieve the Sustainable Development Goals. It also provides a global framework for aligning financing for sustainable development to ensure that financing is stable and sustainable.
Rio +20 Summit	The Rio +20 Conference on Sustainable Development took place in Rio de Janeiro, Brazil, from 20 to 22 June 2012. A key outcome for SA was the recognition of green economy policies as a viable tool for advancing sustainable development and poverty eradication. Delegates hoped to renew political commitment to sustainable development, assess the progress and implementation gaps in meeting already agreed upon commitments, and address new and emerging challenges.

The R131 billion financing pledged at COP 26 is of particular significance, and it aims to support the country's shift from coal to cleaner energy sources. The financing will support an accelerated decommissioning of coal-fired generation and ensure the affected communities and workers are supported. The country aims to prevent up to 1.5 gigatonnes of emissions over the next 20 years.

In addition to the above, other future enablers of market growth could be:

- Export of renewable energy (via the South African Power Pool),
- Replacement of other energy sources (heat and liquid fuels) with electricity; and
- Dedicated renewable energy generation for desalination (seawater or water from secondary sources) and subsequent electrolysis for hydrogen production as an alternative energy carrier (either directly or through synthetic fuels).

The local manufacturing of renewable energy components could be enabled by the complementary industrial base (steel, concrete), proven ability in manufacturing (e.g. in the automotive sector) and the potential for exports, which may be further enabled by the African Continental Free Trade Agreement (AfCFTA)[23].

4.2. Market opportunities

Changes in the country's electricity sector continue to present various opportunities in the large-scale renewable energy market.

This section discusses the opportunities presented by the 2019 IRP and challenges to the renewable energy sector's growth. This section also details additional and continuing opportunities presented by the market.

4.2.1. Public procurement of new generation capacity

This opportunity is related to any new renewable energy capacity generated by IPPs either being sold to the national utility (procured through the REIPPPP); or to the public entities such as local municipalities. The IRP determines the total market size for electricity generation needed to meet the country's demand.

The latest Integrated Resource Plan (IRP) 2019 allocations indicate 14 400 MW for wind, 6 000 MW Solar Photovoltaic (PV), and a minimum of 4 000 MW of embedded generation to be procured by 2030 (see Figure 7). Public entities will procure most of this.

A closer look at the programme's yearly roll out as per the IRP 2019 (see **Figure 7** earlier) – specifically solar PV and wind energy capacity, the dominant technologies – demonstrates a market opportunity with a future market value of R50 billion/year (~2600 MW of wind and solar/annum) when there are allocations to both technologies in the year.

[23] According to the African Union (AU), the African Continental Free Trade Agreement (AfCTA) was conceptualised in 2012 and launched on 1 January 2021. The agreement connects 1.3 billion people across 55 African countries with a combined gross domestic product (GDP) valued at $3.4 trillion. Primarily, the agreement aims to reduce the tariffs by 90% among member countries. The World Bank claims this agreement presents a major opportunity of increasing Africa's export by $560 billion, mostly in manufacturing.

An additional key outcome of the IRP 2019 is the coal decommissioning schedule. According to the IRP 2019, 5 400 MW of electricity from coal generation by Eskom will be decommissioned by 2022, increasing to 10 500 MW by 2030 and 35 000 MW by 2050. It is also expected that by 2024, 1 800 MW of nuclear power generation (Koeberg) will reach end-of-life. However, Eskom has initiated preparations and processes to extend the life of this plant to 2044 (IRP 2019). Although not provided for in the IRP 2019, in June 2020, DMRE issued a request for information (RFI) to successfully assess the market to implement the Nuclear New Build Programme. In August 2021, NERSA then issued concurrence with the Section 34 Determination for 2 500 MW of new nuclear generation capacity. In September 2021, NERSA approved the Section 34 Determination for the 2 500 MW of new nuclear energy. DMRE plans to issue an RFP for this 2 500 MW nuclear programme at the end of March 2022.

The extent of the planned decommissioning of coal-based power generation will provide space for an entirely different energy mix, focusing on incremental capacity addition (modular) and flexible technology to complement the existing installed inflexible capacity (IRP 2019). The IRP 2019 envisioned energy mix presents an opportunity for the future of the REIPPPP as a tool that attracts investment and creates jobs in the South African economy. As indicated, the large-scale RE markets size is forecasted to enable investment of R418 billion by 2030 (R62 billion for WC).

As a result of rising electricity prices plus their efforts to promote energy security, municipalities – which rely heavily on revenue from the sale of electricity to subsidise other services – have explored options to procure electricity from IPPs.

One of the key market developments influencing the market in 2021 is the 2020 amendment to the Electricity Regulations on New Generation Capacity, enabling municipalities in good financial standing to procure or buy new generation capacity and develop their power generation projects. This presents a market opportunity, potentially for IPPs outside of the REIPPPP and the distributed renewable energy in the 1-100 MW range[24].

Some key developments within this market opportunity:

- In October 2020, Merafong municipality published EOI for solar PV clusters. https://tenderbulletins.co.za/gazette-tender/expression-of-interest-for-the-development-financing-construction-operation-and-maintenance-of-solar-farm-clusters-and-securing-energy-off-take-in-the-merafong-municipal-area/.
- In January 2021, the CCT has requested a determination to allow for procurement. The CCT has committed to purchasing ~520 MW of renewable energy over the next 15 years, and most of the other metro municipalities also have committed to purchasing a similar scale.
- In June 2021, WCG DEDAT published RFI for renewable energy projects as part of Municipal Energy Resilience (MER)
- In July 2021, CCT released an RFI for innovative financing of renewable energy projects owned and operated by the city.
- In July 2021, eThekwini Metropolitan Municipality released RFI for 400MW new generation capacity.
- In October 2021, George municipality published an RFI for power generation/power storage/power wheeling for the George municipal area.

[24] Generation of 1-100 MW

Coordinating bodies such as the South African Local Government Association (SALGA) and Association of Municipal Electricity Utilities (AMEU) can replicate/recreate the IPPO type procurement framework that can support municipalities across the country and contribute to the process of de-risking the projects earmarked for municipal procurement. Relating to localisation opportunities within emerging procurement, the dtic established public sector procurement forums at the provincial level; and SALGA concluded a MoA with dtic where SALGA, on behalf of the dtic, is educating municipal key executive decisions makers and other procurement officials about local content provisions.

4.2.2. Large-scale battery storage

Globally, 5 GW of storage capacity was added to electricity systems in 2020 – up by more than 50% from 2019.

Large-scale ("grid-scale") installations rose by more than 60%, driven by the rising renewable energy investments and growing hybrid auctions with storage. In comparison, the behind-the-meter installations fell by 12% (IEA; 2021a). The behind the meter assets were heavily affected by the COVID-19 crisis, as these are assets financed by household income and businesses' revenues.

In South Africa, the energy storage technology based on the large-scale batteries market emerged recently, driven by the IRP 2019 provisions. The emerging long-term plan made a total allocation of 2 088 MW by 2030 towards storage, with the latest Ministerial Determination confirming the IRP 2019's 513 MW provision towards storage in 2022. Energy storage costs were revised, considering the longer gas infrastructure lead time and deciding that the power systems need more energy storage, especially given the extent of the wind and solar allocation in the IRP 2019.

Like global markets, SA's energy storage market needs a consistent policy to promote the local uptake and attract investments into this opportunity. IRP 2019's power system simulations reported that the country's power system would use a combination of renewable energy, gas and storage to meet demand in the long term. In SA, the battery value proposition depends on the service offering/value stacking: frequency and voltage control, peak shaving, deferral of grid infrastructure and reducing renewable energy curtailment.

The RMIPPPP was designed to meet the performance specifications stipulated by the Transmission System Operator (SO), which included the need for each project to be dispatchable between 05:00 and 21:30 daily in response to the instruction from the SO. In addition, each project was required to provide ancillary services necessary for grid stability. Three preferred bidders combined wind and solar with BESS storing excess energy and a hybrid controller to send power to the grid as needed.

This type of procurement, led by DMRE, SO, and IPPO, is the first of its kind in SA; and also paves the ways for additional ways and opportunities that the existing renewable energy plants can further alleviate the energy crises in SA.

4.2.3. Private procurement of new generation capacity

The private renewable energy market in SA is evolving and growing rapidly, and the national regulatory environment has struggled to keep the pace of this growing market. As of November 2021, NERSA has registered 438 projects totalling 206 MW, with 44 MW under consideration and has issued three power generation licences totalling 59 MW.

The DMRE gazetted the Amended Schedule 2 of the Electricity Regulation Act 4 of 2006 on 5 October 2021 (Third Amendment). The Amendment served to increase the threshold for generation without the need for a license from 1 MW to 100 MW.

Eskom's battery energy storage systems project

Eskom's Battery Energy Storage Systems (BESS) project involves the development of 360 MW storage systems (equivalent to 1440 MWh with four hours of storage) at seven sites in South Africa's Western Cape; Northern Cape, Eastern Cape and KwaZulu Natal. The project is the first of its kind in Africa and is to be constructed in two phases (installation of 800 MWh and 640 MWh, respectively). Phase 1 is funded by the World Bank ($320 million) and New Development Bank ($90 million), boosted by a $57.67 million loan from the African Development Bank (AfDB). The AfDB loan is a concessional loan from the Clean Technology Fund (CTF), a multi-donor trust fund under Climate Investment Funds, and was enabled by savings from a loan to Eskom previously approved in 2011 under Eskom's Renewable Energy Project.

The New Development Bank has approved further financing to the value of $310 million for Phase 2 of the project.

The BESS project will reduce Eskom's reliance on fossil fuel generated electricity at peak times by improving dispatchability of variable renewable energy and enabling the better utilisation of all renewable energy generated. It will also provide alternative solutions for grid support in constrained distribution networks. The sites are at Eskom substations located at existing variable renewable energy plants and sites earmarked for distributed solar PV.

Sources: Engineering News, 2 November 2021 and African Development Bank Group

The intervention to reform the electricity regulation regime has been hailed as a positive way forward by the energy sector and industry across the board. It is envisaged that this step will unlock significant investment in new generation capacity in the short-to-medium term, make significant inroads towards achieving national energy security and reduce the impact of load shedding across the country. At writing, NERSA had not received any registration applications for the large projects following the 100 MW licensing exemption threshold.

The potential market size for this opportunity has been estimated to be ~500 MW per year, with approximation drawn from the IRP 2019 (see Figure 7) with unlimited provisions between 2019 – 2022 and investment potential of R48 billion (see Table 7). This opportunity spans all technologies (biomass, landfill gas and co-generation) that do not have technology-specific allocations in the broader IRP 2019 provisions. However, it is expected that solar PV will remain the dominant technology due to technical maturity, price and ease of implementation.

With the DMRE's schedule 2 amendment allowing generation without the need for a license from the 1 MW to 100 MW; it is currently unclear whether provisions for this opportunity are accounted for within the IRP 2019, or to approach this opportunity as done for the small-scale embedded generation (SSEG) where the growth in the private sector driven demand. Therefore, as it stands, the best estimation for annual growth will refer to the distributed generation allocations in the IRP 2019.

Various mining companies have publicly declared investments committed to developing solar PV, wind and battery storage and/or hybrid projects in the pipeline to take advantage of the determination.

Some of the major mining companies in SA who announced plans for renewable energy in 2021/22 include:

- Goldfields: Building a 40 MW solar project after receiving a licence from NERSA. The project will cost R660 million.

- Royal Bafokeng: 30 MW solar project feasibility study.
- Sibanye Stillwater: 50 MW solar plant; 175 MW solar facility, and supply from a 250 MW farm
- Anglo Platinum: 100 MW solar plant and an additional 220 MW of solar capacity for a proposed hydrogen-powered haul-truck project.
- Exxaro: 70 MW solar project through its subsidiary, Cennergi.

The mining sector has reported a pipeline of renewable energy projects totalling 2 GW that could be brought on stream by 2022/2023, with an estimated cost between R30 billion and R40 billion. The leading technology of interest is solar power, alongside solar-diesel hybrid power projects or battery energy storage systems for overnight operations.

South African Renewable Energy Masterplan (SAREM) is one of the 14 industry specific masterplans currently under development since July 2019. The objective of SAREM is delivering an implementable plan for driving industrialisation through the renewable energy sector and its value chain. It is a collaborative plan between social compact partners, i.e. government, industry and labour. SAREM also has project committee with representatives from DMRE, dtic, Department of Science and Innovation (DSI), PPGI, labour, industry (with relevant industry associations); that ensures the SAREM process hurdles over any blockages. At the helm of this structure; Executive Oversight Committee (EOC) is chaired by the Minister of DMRE; nominated labour and industry representatives provides oversight on the plan and its implementation.

4.2.4. Increased local manufacturing of renewable energy components and systems

Establishing a thriving manufacturing sector is a powerful engine for growth and development. This section considers the opportunities for local manufacturing of wind, solar PV and battery component and systems.

Solar PV and wind manufacturing

SA has a strong base for manufacturing key renewable energy components - a strong steel and cement industry for towers, a strong extrusion industry for mounting structures, strong electro-technical for key electrical components, raw and semi-processed minerals for use in batteries and strong boatbuilding and textile industry as a foundation for blades.

The REIPPPP has become the primary mechanism for renewable energy localisation and industrialisation, using local content requirements; see **Table 10**

With the published IRP2019, the DMRE has signalled the technologies that will form the South African energy mix. Capitalising on the value chain opportunity in IRP2019 could see SA ramping up to a potential 2030 scenario of 39 000 full-time permanent jobs added and R23bn turnover of renewable energy manufacturing per year. Longer-term ambitions for growth scenarios such as the hydrogen economy may see such numbers more than tripled in annual manufacturing turnover and a 200 000 strong workforce servicing the value chain in 2050.

Table 9: Average local content as a percentage of total project cost versus threshold

Source: IPPO, 2021

	Minimum threshold BW 1-4	BW1	BW2	BW3	BW3.5	BW4	Minimum threshold BW5	BW5
Value of Local Content Spend	25%-45%	34,4%	50,2%	47,5%	40,6%	48,6%	40%-45%	44,0%
Adjusted Enterprise Development Contributions (during Operations)	–	0,4%	0,3%	0,8%	0,0%	1,9%	0,6	0,6%
Adjusted Socio-Economic Development Contributions (during Operations)	1%	1,3%	0,8%	3,2%	1,4%	5,3%	1,1%	1,1%

The production of green hydrogen would enable the scale of renewable energy manufacturing and job creation for export, which would stimulate a high demand for renewable energy and promote local manufacturing of renewable energy technologies.

The bulk of localisation in solar PV was in the balance of plant, mounting structures and trackers. In the wind, it was the balance of plant and towers. The bulk of the imports in solar PV was in the photovoltaic module with its associated inputs, such as frames, glass and cells.

The **Western Cape (WC)** has built a reputation as a leading green tech manufacturer. Creating a dedicated green manufacturing hub at Atlantis in Cape Town is key to the province's goal in landing a large portion of this manufacturing opportunity in the WC. The focus of the Atlantis Special Economic Zone (SEZ) is to develop a world-class facility to attract renewable energy component manufacturers and suppliers in the WC by providing reduced energy costs, trade and tax support, and physical infrastructure. If the WC could attract just 25% of the annual production, assuming 70-90% localisation of key components and 90% of the balance of plant by 2030 would be R10 billion per year in 2030, employing close to 9 000 people across the value chain. Looking at cumulatively, by 2030, the total production value from new capacity at these target levels would be up to R92.5 billion.

In the wind value chain, the collection of components that constitute the rotor, nacelle and drivetrain are untapped from a local manufacturing perspective.

By 2030, it is estimated that some **14 million solar panels** and **3 600 wind turbines**[25] would be required to fulfil IRP2019. Annual production, assuming **70-90% localisation of key components** and **90% of the balance of plant** by 2030, is estimated to be **R38-44 billion per year** in 2030, contributing **R141-164 billion/year to GDP employing 32 500 to 35 000 people** across the value chain. Looking at cumulatively, by 2030, the total production value from new capacity at these target levels would be up to R370 billion.

However, the South African renewable energy manufacturing sector has been in survival mode due to many factors, including the small size of the domestic market, the threat of cheap imports, policy uncertainty, high input costs and a limited skills base geared towards renewable energy manufacturing.

It is important to the sector's future that the local market is dynamic, growing and competitive.

A review of the barriers to local competitiveness in SA has identified the most important aspects influencing manufacturing competitiveness in SA: cost and availability of labour and materials, local market attractiveness, energy cost and policies, economic, trade, financial and tax system, physical infrastructure, supplier network government investments in manufacturing (Deloitte, 2013).

Table 11 provides a breakdown of the local manufacturing opportunities in the solar and wind value chain, based on the past bid rounds and key input materials' availability, quality, and cost.

[25] Example based on 450W PV panels and 4MW wind turbines.

Table 10: Local manufacturing opportunities in the solar PV and wind sectors

Solar PV components	Description
Module manufacturing	Additional module manufacturing presents a short-term opportunity in the South African market. The business case for new entrants may not be strong based on local demand only, given currently established (dedicated OEM and toll) module manufacturing capacity.
Aluminium module frame and junction box	Expansion of aluminium module frame and junction box manufacturing facilities provided the cost of aluminium can be reduced to be cost-competitive with imports also presents a strong business case.
System assembly of inverters	System assembly of inverters with core imported products and some local components and manufacturing under license. This would require support from local producers to meet quality standards and access to testing and certification locally. Expanding magnetics production would be possible with additional milling capacity, and enclosure and packaging production could also be expanded.
Transformers	Expanding transformer production through reductions in input material costs (especially steel) and improved efficiencies to meet the standards expected by international inverter manufacturers.
Mounting structures	Mounting structures are more readily localised due to the high cost of transport but are relatively lower value components of a solar PV system. Expansion of production of steel and aluminium mounting structures could be done provided steel-production and aluminium extrusion production capacity can be expanded, the support provided for tooling and cost of these inputs reduced to be cost-competitive with imports.
Cable production (AC & DC)	Expanding cable production could be enabled by expanding local conductors, insulation, and armour provided input material costs (steel, aluminium, and polymers) are addressed. Local aluminium rod production could boost local cable production.
Wind components	**Description**
Wind tower	Additional wind tower and tower internals manufacturing are possible.
Nacelle assembly	Local nacelle assembly (even if initially largely from imported components) is an important enabler of higher value local turbine component manufacturing. Local nacelle assembly could also expand existing casting, forging and transformer production if capacitated for renewable energy component production. However, it should be recognised that the localisation potential of all these components is currently considered medium rather than high.
Blades	Work has been done to explore the potential of a local blade manufacturing facility. A demand of 400 MW/year/OEM for a minimum of 5 years is required for this to be a viable option.
Cable production	Expanding cable production could be enabled by expanding local conductors, insulation, and armour provided input material costs (steel, aluminium, and polymers) are addressed. Local aluminium rod production could boost local cable production.

Table 11 provides a breakdown of the local opportunities for input materials required to manufacture solar and wind components based on the past bid rounds and the availability, quality and cost of key input materials.

Table 11: Input materials required to manufacture wind and solar components

Material	Currently localised for the Renewable Energy Value Chain (Y/N)	Potential for Localisation for Renewable Energy Value Chain (L/M/H)	Conditions for localisation
Silicon & glass	N	M	SA production potential for rolled glass is high, but manufacturers consider it uncompetitive, especially against Asian producers with large economies of scale. The high iron content of SA silicon will require large demand/economies of scale to produce low iron solar glass.
Cement & concrete	Y	H	Already produced locally; with some competition from imports.
Iron & steel	Y	H	Existing flat-rolled and stainless steel capacity, but imported steel (China, Taiwan, Korea) dominates as local steel is not competitive (quality and cost).
Polymers & plastics	N	L-M	Diverse polymers and plastics required; The extent of localisation would depend on specifications and whether related parts are produced/assembled locally. There is no advantage to local polymers and plastics for the solar value chain; SA is generally an importer of (specialised) polymers and plastics.
Aluminium & alloys	Y	H	Already produced locally, but not competitively.
Copper and alloys	Y/N	L	Limited amount of copper produced locally; often imported due to inadequate local supply (quantity & quality).
Other metals & minerals (e.g. cadmium)	Y/N	L/M	Diverse metals and minerals produced in SA the extent of localisation would depend on specifications and whether related parts are produced/assembled locally, and there is an advantage to local production of specific metals and minerals to the specification required in the solar PV components.
Oil	N	L	Specialised oils required in the wind industry.
Coolant	N	L	Specialised synthetic lubricants required in the wind industry.

Local battery manufacturing

Beyond SA's conducive solar and wind resources, the country has some of the world's largest high-grade resources in vanadium, platinum, palladium, nickel, manganese, rare earth, copper and cobalt, which are used in the global energy storage sector and create an opportunity for new industry and localisation. SA also has a developed metallurgical infrastructure that can expand into downstream capabilities to maximise the localisation of battery manufacturing.

While the country currently imports Li-ion batteries, in 2017, the DSI has supported the establishment of two pilot facilities to facilitate the local production of lithium-ion batteries. A precursor development pilot facility located in Nelspruit is focused on producing value add manganese-based precursors like lithium manganese dioxide (LMO) and nickel manganese cobalt (NMC), which are critical components of the LIB cathode.

The competitiveness of the Li-ion batteries industry in SA and associated benefits for growth and jobs depends on the ability of the industry to serve local and export markets with battery cells.

In addition to these industry initiatives, in March 2020, three companies Metair Investments, Mega million Energy Company and Bushveld Minerals, have invested in partnerships to manufacture Li-ion batteries and redox-flow batteries locally, for storage applications. Bushveld Energy established a manufacturing base that locally produces vanadium redox flow batteries (VRFB), an alternative battery technology to Li-ion batteries.

To support local battery manufacturing, the dtic listed industrial lead-acid batteries as products designated for local production with a minimum local content threshold of 50% to enable batteries for large energy systems. Beyond such initiatives, the dtic has suggested that the government implement a supporting policy to ensure alignment across the spheres of industry.

In August 2021, I-G3N, a South African black woman-owned lithium-ion battery manufacturer, successfully raised $1.3 million (R 18 million) from EDGE Growth and ASISA SED initiative. The financing partner made this investment following the explosive growth of demand for energy storage globally; and locally due to loadshedding. This investment signals positive sentiments towards one of the local manufacturers that serves over 60 000 installers. I-G3N plans to access the larger market segment following the 100 MW licensing exemption adoption.
Source: **ESI Africa, August 2021**

With strong policy commitments, opportunities for the beneficiation of battery metal minerals for energy storage manufacturing industries can be created. Testing and certification facilities must expand into global export markets to ensure the local standards are aligned and recognised worldwide.

An emerging second life battery market in SA has created localisation potential through re-assembling and recycling the batteries. Commonly, these second-life batteries are sourced from the automotive industry in developed countries. Upon reaching SA, the batteries are good for stationary energy storage purposes.

One stakeholder confirmed that these batteries could be stacked up to support generation facilities larger than 1 MW. In this nascent industry with a few players, the demand side is largely industry, farmers, and the mining sector. The regulation aspect in SA is currently unclear and can be attributed to the delayed growth of this opportunity; however, this stakeholder can be viewed as a successful company that has managed to leverage the various opportunities downstream of the renewable energy sector. Despite this promising prospect, a report prepared by Mintek for DSI and CSIR has indicated that there is currently no business case for establishing a commercially viable recycling plant in SA (Mintek,2021).

4.2.5. Electrolysis by renewable electricity for the production of green hydrogen

The potential for SA to produce, use, and export hydrogen has received much attention from the government and industry in the last two years. Electrolysis of water by renewable energy enables the production of green hydrogen, which is of particular interest for the hydrogen export market and the decarbonisation of hard-to-abate sectors (e.g. iron, steel and cement). The production of green hydrogen via electrolysis can increase the overall demand for renewable energy beyond that envisaged in the current 2019 IRP, which determines the total market size for electricity generation to meet the country's demand and thus the market size for renewable energy.

The size of the electrical demand supporting hydrogen production for local and export demand has been estimated in a study by IHS Markit finalised in 2021 (IHS Markit, 2021).

With a supportive commercial and policy environment, a production of 3.8 million tonnes per annum (Mtpa) of hydrogen could be developed in SA by 2050 (0.75 Mtpa by 2030); over 2.0 Mtpa would be for domestic consumption – contributing about 6 to 8% of final energy demand. By contrast, Enertrag has calculated that if SA could supply 10% of global demand for green ammonia (for fertilizer and shipping fuel) and sustainable aviation fuel, together with 5% of global green steel demand, the electrical demand to provide the hydrogen in 2050 would come to 1 350 TWh/year, requiring an installed capacity of 300GW each of solar PV and wind), dwarfing the size of the current grid (Bischof-Niemz, T. 2021).

Infrastructure South Africa of the Presidential Climate Commission in the Presidency; has noted SA's strategic advantages in producing green hydrogen to include: superior renewable energy endowment, the largest concentration of platinum group metals and deep expertise in the Fischer-Tropsch process used to produce power fuels.

There is an opportunity to set up green hydrogen production centres in the Northern Cape (which has abundant renewable energy plants and is close to the ocean) and demand centres within the Mpumalanga region, the highest concentrations of SA's greenhouse gas (GHG) emissions. This also offers grey hydrogen producers an opportunity to transition towards green hydrogen as coal continues to face a gradual export decline. Currently, coal accounts for 23% of hydrogen production and electrolysis are less than 2% of the global hydrogen production (Muhammed, 2020).

4.3. Market barriers and uncertainties

Uncertainty about the rollout of the REIPPPP and statements made by the DMRE, Eskom and coal labour unions about the future of renewable energy continues to create doubt in the market. This has, to some extent, been addressed by statements in support of the programme by the Presidency and the announcement of preferred bidders for BW5.

However, uncertainty about the timing of an updated IRP and future energy procurements, such as BW6, may still create substantial industry uncertainty.

There is a critical need for action by the Government on four levels:

- **ensuring continuity and continued transparency** in the rollout of the renewable energy procurement programme;
- efforts to **support the manufacturing base, attract new investment** and build confidence;
- prioritising the **reform of the country's electricity sector** to reflect SA's sustainable resources and market offerings; and
- the availability of **black equity players to meet the 30% BEE shareholding** requirement in each REIPPPP project developed.

4.3.1. Ensuring continuity and transparency

The success of the REIPPP programme has hinged on the market size and expected longevity that the programme affords investors and the lauded transparency in the programme's execution. Substantial and consistent efforts are required to maintain these conditions, especially considering earlier programme delays.

As a result of the market uncertainty, the sector has seen several international businesses closures, halted investment decisions, and lost market confidence. For current players in the market, continued delays mean financial losses and idle manufacturing facilities.

Markets in other parts of the world are on the rise. Local markets are facing greater competition for investments. Project developers need to understand the framework for competition; manufacturers need to build the case to invest and develop the necessary skills and teams to execute this project.

4.3.2. Maintaining the country's existing manufacturing base

Recognising the REIPPPP's success in attracting investments, it is important to ensure the successful implementation of projects such as the dtic's Special Economic Zone (SEZ) programme. Likewise, to maintain and grow the local manufacturing base, the local content and enterprise development components of the REIPPPP need to be executed effectively and consistently.

Again, a long-term market view is crucial to sustaining investor confidence through certainty and clarity on the rollout of the proposed 20.4 GW of wind and solar capacity allocated to renewable energy generation.

4.3.3. Available grid capacity on the Eskom grid

Grid constraints in SA's high-yield renewable-energy areas need to be addressed urgently. Eskom's GGCA-2023 Phase 1 report confirmed that there was no longer grid capacity in Northern Cape and that the network in the WC was at saturation point. The state-owned utility needs to raise capital to finance the grid upgrades required and has solicited industry-wide support on negotiations with private landowners' for securing servitudes[26] in grid constrained areas.

Beyond the uncertainty experienced by manufacturers lies the risk of projects failing to meet their local content commitments due to constrained manufacturing capacity and programme execution. In turn, it will increase the REIPPPP's reputational risk and impact SA's investment potential.

This presents a challenge, and Eskom will need to confirm what capacity remains ahead of BW 6, currently scheduled for launch in January 2022.

4.3.4. Eskom unbundling – reforming the country's electricity sector

The South African government has unbundled the national electricity utility (Eskom) into three subsidiaries, namely Eskom Generation (generation entity), Eskom Transmission (transmission entity), and Eskom Distribution (distribution entity). This new business model aims to improve the power utility through greater transparency and accountability and allows stakeholders a more efficient approach to addressing generation, transmission and distribution challenges separately.

[26] Servitudes: means a parcel of electric power transmission rights granted to Eskom over immovable property of another and registered or to be registered against title deed of the land in question and usually involves the payment of compensation.

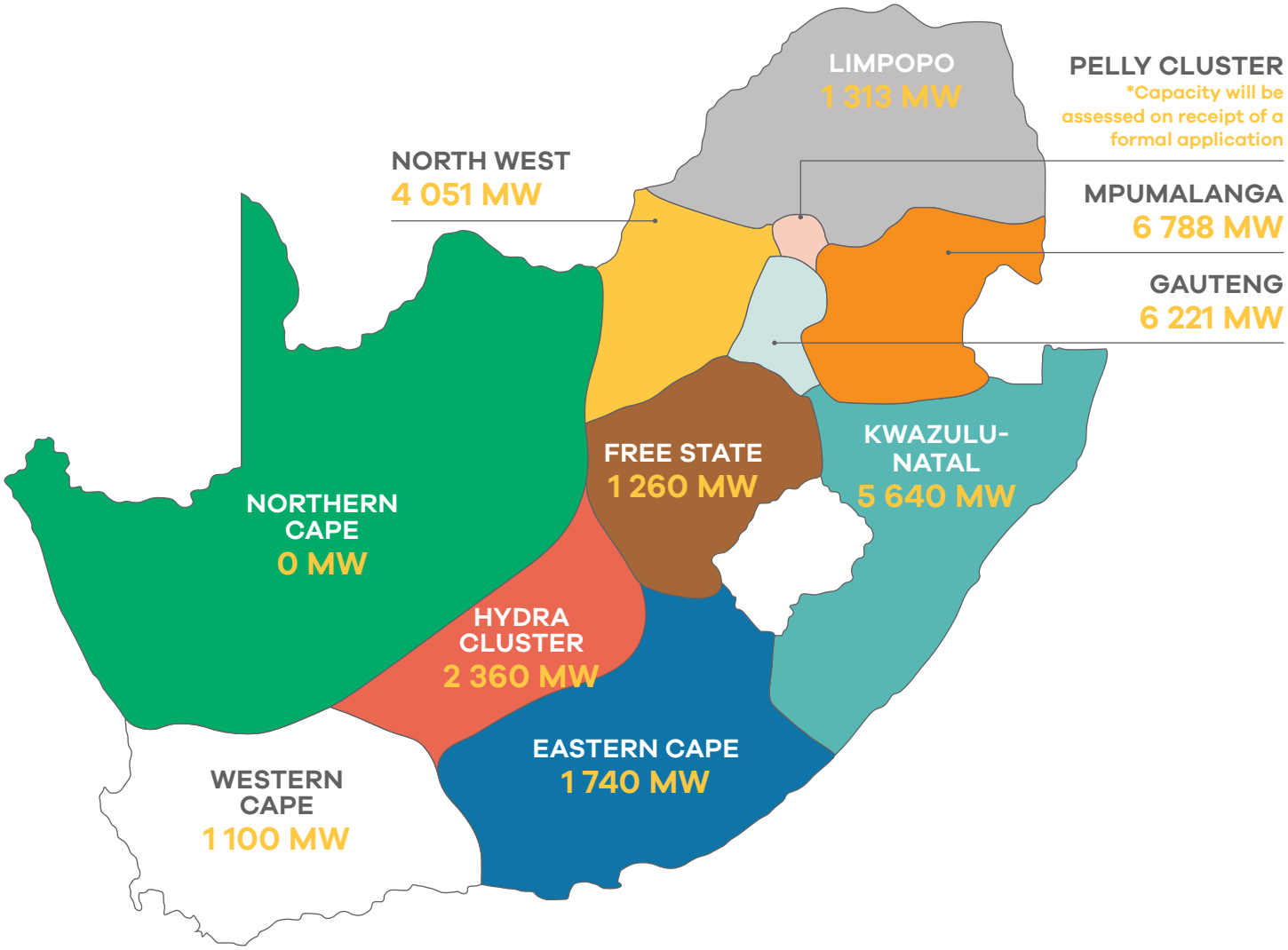

Figure 13: Eskom Supply area grid capacity pre-BW five projects based on the Eskom's

Source: GGCA 2023 report Phase 1 published in June 2021

This unbundling process ensures that the generation capacity runs uninterrupted, and that South Africans will receive uninterrupted electricity. While the industry waits for the legal establishment of the transmission entity, the creation of a state-owned Independent System and Market Operator (ISMO) is the next step in optimising the electricity market system and procurement process, a proposal dating back to the 1998 White Paper on Energy Policy that was then abandoned entirely. The initial motivation of a single buyer model was due to various technical, economic and institutional factors. The model has successfully worked in many Asian, African and Eastern European countries. Other merits include simplifying price regulation by maintaining a unified wholesale price, protecting IPP lenders from market risk, making projects more commercially viable and bankable through PPAs, and preserving the key role of the DMRE in decisions on investment in generation capacity.

According to the Department of Public Enterprises' *Roadmap for Eskom in a reformed Electricity Supply Industry and update from Andre de Ruyter at the Briefing to the Select Committee on Public Enterprises and Communications on Eskom Unbundling Process; May 2021*, unbundling will take place over several years (2019 – 2022). According to the roadmap, the unbundling started with functional separation, followed by legal separation by December 2021.

Eskom completed a process of functional separation with the establishment of divisional boards and managing directors. This included re-linking over 8000 employees from various functions into the three businesses.

The next step has been to complete the legal separation, setting up separate legal entities for each of the three businesses. Legal separation of Transmission was expected to be completed by December 2021. It has been anticipated that by the end of the 2021/22 financial year, there will be progress with the first milestone; setting up the Transmission business as a wholly-owned subsidiary of Eskom. Legal separation of the Generation and Distribution divisions is expected to be completed by December 2022.

Eskom's financial sustainability

Eskom's unsustainable debt status, including its failure to service even the interest payments on this debt, is the single biggest risk to Eskom's continued operation. It contributes directly to SA's deteriorating investment grade. Eskom has failed to finance its borrowings even with a more than 500% tariff increase over recent years. To pave the way out of this debt crisis, the Minister of Finance tabled a Special Appropriation Bill that allocated a further R26 billion in 2019/20, and R30 billion more in 2020/21, on top of the R350 billion guarantee already provided.

Implications of Eskom's reform plan for the renewable energy sector in South Africa

While Eskom undergoes this transformation, the renewable energy industry is expected to gradually gain more access to the market through enabling regulatory determinations from NERSA, DMRE and other relevant regulatory bodies. **Table 12** highlights key unbundling decisions and industry impacts expected from these decisions.

Table 12: Eskom unbundling decisions and related impact on the renewable energy industry

Eskom unbundling decision	Industry impact
Revision of the early bid rounds tariff prices	Revising tariff prices of early BW rounds may add to the risk already associated with the REIPPP programme. Risks have increased because of regulatory uncertainty and the delayed IRP. However, the plan highlights ongoing discussions with the affected IPPs over PPA extension to offset the losses incurred by the investors and repair dented investor confidence.
The Transmission Entity (TE) will be the buyer	Core to Eskom's unbundling plan is the establishment of the TE as a market and system operator. The TE and intra-company competition will stimulate the market and project finance (locally and internationally) as a separately managed transmission unit. Insurance premium rates are likely to decline due to the reduced risk factor in the industry and within Eskom. The TE will play a major role in enabling competition in the market, allowing renewable energy to compete with Eskom over energy procurement to the national grid. When the restructuring is completed, the buyer will be the TE. Consequently, the existing PPAs between Eskom and various IPPs will be transferred to the TE. However, it should not be of great concern to IPPs and lenders, as long as the sovereign guarantees provided by the SA Government under the implementation agreements are not adversely affected.
Open market model and intra-company electricity trading	Ideally, the TE, as a buyer, could stimulate the market through an open market model. As a transition from the existing single utility model, the TE model will encourage competition, leading to cheap and accessible clean energy for South African communities.
Eskom Generation Entity (GE) competition	Each power station will have its own PPA with pre-defined, fixed, and guaranteed tariffs with the TE. Eskom will likely seek to broaden its business by diversifying into various energy production sectors, including renewable energy.
Eskom financial crisis	It remains unclear how the Eskom debt issue will be resolved, and its debt may be transferred to the National Treasury. Uncertainty will continue to affect international investors' perception of South Africa's REIPPP programme, the economy, and governance. However, the TE establishment will hopefully stimulate the industry over a short-term period and offer risk-adjusted returns to investors.

FUNDING AND INCENTIVES

A range of general and sector-specific funding solutions and incentives is available to investors, manufacturers, and service companies in the green economy. It covers Development Finance Institutions (DFIs), local public and private sector financiers and investors, and a considerable range of tax incentives.


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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 project-level 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.

5.1. 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 visit https://www.greencape.co.za/content/sector/green-finance

ACCESS TO THE SOUTH AFRICAN CLIMATE FINANCE LANDSCAPE

5.1.1. Green Finance Database

In conjunction with the Western Government Department of Economic Development and Tourism, 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[27].

5.1.2. Government funding and incentives database

An updated document focused on South African government funding and incentives is available to view and download online[28]. 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).

[27] https://www.green-cape.co.za/content/focusarea/green-finance-databases

[28] https://www.greencape.co.za/assets/Uploads/Government-Funding-and-Incentive-Booklet.pdf

5.1.3. Finfind database

Finfind[29] 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.

Wesgro has partnered with Finfind to assist local companies seeking finance for their business. See more here: https://wesgro.finfind.co.za/quiz/disclaimer/wesgro

5.1.4. AlliedCrowds database

AlliedCrowds[30] 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.

Click the buttons below to access the relevant content

GREENCAPE'S GREEN FINANCE WEB-PAGE

GREEN FINANCE DATABASE

GOVERNMENT FUNDING AND INCENTIVE BOOKLET

FINFIND WEBSITE

ALLIED CROWDS WEBSITE

29 https://www.finfindeasy.co.za/

30 https://alliedcrowds.com/

THE WESTERN CAPE: AFRICA'S GREENTECH HUB

The Western Cape is a world-class investment destination.


©Mainstream Renewable Energy

The province provides businesses and investors with prime locations, modern infrastructure, a skilled workforce, low operational costs and an abundance of natural resources. It is also a sought-after place to live, with unrivalled natural beauty, vibrant culture, excellent schools and universities, and an outstanding quality of life.

In 2017, Cape Town was ranked among the top 21 global investment destinations by Foreign Direct Investment (fDi) Intelligence, a division of the Financial Times.

A great place for green business

There are compelling reasons why the Western Cape Province is viewed by many as Africa's green economy hub. Coupled with a strong and rapidly growing market for green technology and services in South Africa and beyond, the Western Cape offers:

- Africa's renewable energy and cleantech hub, with a critical mass of leading companies present.
- Local presence of major professional services and financiers.
- Significant market opportunities for businesses and investors in agriculture, energy services, utility scale solar and wind, waste, water, bioeconomy and resource efficiency.
- A supportive government that has made ease of doing business and the green economy key priorities.
- Five universities with comprehensive R&D capabilities and dedicated green economy skills programmes.
- A range of investment incentives in the Atlantis Special Economic Zone (SEZ) for Green Technologies.

Supporting businesses and investors

The province also offers dedicated support for businesses and investors focusing on greentech and services, including:

Western Cape Department of Economic Development & Tourism: Driving the green economy policy landscape in the Province.
InvestSA One Stop Shop: Offers convenient investor support on permits, licensing and registrations - all under one roof.

City of Cape Town Enterprise and Investment: Creates an enabling environment to attract investment that generates economic growth and job creation in Cape Town
GreenCape: Provides dedicated support and market intelligence to green economy sectors.
Wesgro: The official investment and trade promotion agency for the Western Cape.
SAREBI: A business incubator providing nonfinancial support to green entrepreneurs.
SARETEC: Offers specialised industry-related and accredited training for the wind and solar industries.

Market opportunities in the province and South Africa

Some of the major market opportunity areas in the province and South Africa in the next five years are outlined in the graphic on the next page (see individual MIRs and the GreenCape website for more information).

R&D capabilities and skills

The region's five universities – University of Cape Town, Stellenbosch University, University of the Western Cape, the Cape Peninsula University of Technology and the George campus of the Nelson Mandela Metropolitan University – underpin all of this with comprehensive research and development (R&D) capabilities and dedicated green economy skills programmes.

ATLANTIS SPECIAL ECONOMIC ZONE FOR GREEN TECHNOLOGIES

The Atlantis SEZ is a zone dedicated to the manufacturing and provision of services in the green technology space - technologies that reduce or reverse the impact of people on the planet. Wind turbines, solar panels, insulation, biofuels, electric vehicles, materials recycling and green building materials are all examples of green technologies that will be welcomed to the zone.

The zone welcomes manufacturers, service providers, suppliers and other players in the value chains of different green technologies. The SEZ is situated in the Atlantis industrial area north of Cape Town, south of Wesfleur, east of Dassenberg Road, and west of the Witsand community.

Why invest in the Atlantis SEZ?

There are strong and growing South African and African markets for greentech. The South African greentech manufacturing market is worth at least R30bn; with a growing greentech market in the neighbouring countries. South Africa has opportunities in energy, waste, agriculture, transport and other sectors and is a great entry point for the whole of Africa, in particular the SADC region.

Atlantis is a great location and development ready. 94 hectares of zoned development-ready land is available for leasing to investors. Bulk infrastructure is in place and Atlantis has new public transport and shipping links, whilst boasting fibre connectivity too. Atlantis is also close to major ports, roads, universities and greentech markets.

Investors have access to extensive investment support through the One Stop Shop for investor support and the rest of the investor support ecosystem, which includes InvestSA, GreenCape, the City of Cape Town, and Wesgro. Together the ecosystem provides information and advocacy; market intelligence; facilitated access to permits and licenses, planning and development approval; and skills training.

Investors and tenants are accessing attractive incentives in the form of tax relief and allowances, employment tax incentives, fast-tracked development approvals, fee exemptions and subsidies.

There is an attractive, wide-ranging skills base to recruit from with 5 universities and many more colleges in the province, and a large range of unskilled, semi-skilled, technical and professional candidates.

FOR MORE INFO, CLICK TO EMAIL THE ATLANTIS SEZ BUSINESS DEVELOPMENT EXECUTIVE

atlantis
special economic zone
cape town

CLICK TO VIEW THE ATLANTIS SEZ WEBSITE

GREENCAPE'S SUPPORT TO BUSINESSES AND INVESTORS

GreenCape is a non-profit organisation that works at the interface of business, government and academia to identify and remove barriers to economically viable green economy infrastructure solutions.
Our vision is a thriving prosperous Africa, mobilised by the green economy

GreenCape is a non-profit organisation that works at the interface of business, government and academia to identify and remove barriers to economically viable green economy infrastructure solutions. Our vision is a thriving prosperous Africa, mobilised by the green economy

Working in developing countries, GreenCape catalyses the replication and large-scale uptake of green economy solutions to enable each country and its citizens to prosper. We work with businesses, investors, academia and government to help unlock the investment and employment potential of greentech and services, and to support a transition to a resilient green economy.

We assist businesses by removing barriers to their establishment and growth and provide our members with:

- free, credible and impartial market information and insights
- access to networks of key players in government, industry, finance and academia
- an advocacy platform to help create an enabling policy and regulatory environment for green business

We assist local, provincial and national government to build a resilient green economy by providing:

- support on the development of standards, regulations, tools and policies
- expert technical knowledge on key sectors in the green economy
- access to networks of key players across business, academia, and internationally

Since inception in 2010, GreenCape has grown to a multi-disciplinary team of over 40 staff members, representing backgrounds in finance, engineering, environmental science and economics.

Our market intelligence reports form part of a working body of information generated by sector desks and projects within GreenCape's three main programmes – energy, circular economy and resources.

Benefits of becoming a GreenCape member

We currently have over 2 500 members, and offer free membership. Becoming a member of GreenCape will give you access to the latest information regarding developments in the various sectors; access to tools, reports, and project information; and offer you the opportunity – through our networking events – to meet and interact with various stakeholders in the green economy.

CLICK HERE TO BECOME A GREENCAPE MEMBER

We have facilitated and supported ~R42bn of investments in renewable energy projects and manufacturing. From these investments, more than 19 000 jobs have been created.

Through our WISP (industrial symbiosis) programme, by connecting businesses with waste / under-used resources:

435 000 fossil GHG emissions saved (equivalent to the electrical usage of 117 840 households in SA);

Over R150 million in financial benefits (additional revenue, cost savings and private investments);

398 economy wide jobs.

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The writing of this MIR was made possible with the generous support of the Department of Economic Development and Tourism of the Western Cape Government of South Africa

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