GreenCape

UTILITY-SCALE RENEWABLE ENERGY MARKET INTELLIGENCE REPORT

2021

GreenCape

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. Working in developing countries, GreenCape catalyses the replication and large-scale uptake of these solutions to enable each country and its citizens to prosper.

Acknowledgements

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LIST OF ABBREVIATIONS AND ACRONYMS

BW	Bid window
CAGR	Compound annual growth rate
CCA	Customs controlled area
CCGE	Closed Cycle Gas Engine
CCGT	Closed Cycle Gas Turbine
CCT	City of Cape Town
COD	Commercial operation date
CPUT	Cape Peninsula University of Technology
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
DG/EG	Distributed Generation/Embedded Generation
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
EDD	Economic Development Department
EKF	Danmarks Eksportkredit (Denmark Export Credit Agency)
EOI	Expression of interest
EPC	Engineering, procurement and construction
ERA	Electricity Regulation Act No 4 of 2006
ETI	Employment tax incentive
GE	Generation entity
GWp	Gigawatt peak
ICE	Internal Combustion Engine
ICN	International Cleantech Network
IDC	Industrial Development Corporation
IDZ	Industrial Development Zone
IEA	International Energy Agency
IEC	International Electrotechnical Commission
IEP	Integrated Energy Plan
IFC	International Finance Corporation
ISMO	Independent System and Market Operator
IPP	Independent Power Producer
IPPO	Independent Power Producers Office
IRP	Integrated Resource Plan
kWh	Kilowatt-hour
LCOE	Levelised cost of energy
LIB	Lithium-ion battery
Li-ion	Lithium-ion
LMO	Lithium manganese dioxide
LNG	Liquefied natural gas
MCSA	Minerals Council South Africa
MEC	Maximum Export Capacity
MES	Minimum Emission Standard
MoA	Memorandum of agreement
MTPPP	Medium Term Power Purchase Procurement
MWp	Megawatt peak
NDP	National Development Plan
NEDLAC	National Economic Development and Labour Council
NMC	Nickel manganese cobalt
OCGT	Open cycle gas turbine
OEM	Original equipment manufacturer

O&M	Operation and maintenance
PCE	Portfolio Committee on Energy
PPA	Power purchase agreement
PPD	Peak Plateau Decline
PPPFA	Preferential Procurement Policy Framework Act
PV	Photovoltaic
R&D	Research and development
RE	Renewable energy
RECP	Renewable Energy Cooperation Programme
REFIT	Renewable energy feed-in-tariff
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RFBs	Request for Bids
RFP	Request for proposal
RMB	Rand Merchant Bank
RMIPPPP	Risk Mitigation Independent Producer Procurement Programme
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
SMC	Supply Management Chain
SSEG	Small-scale embedded generation
TE	Transmission Entity
UNCTAD	United Nations Conference on Trade and Development
VFRB	Vanadium flox redox battery
VRE	Variable Renewable Energy
WACC	Weighted Average Cost of Capital

Exchange rate used: 1 US Dollar = R16.64 (October 2020)

EXECUTIVE SUMMARY

This market intelligence report is compiled for foreign direct and local investors that are looking to invest directly in the South African green economy through project development, asset management, equity, debt, equipment manufacturing, or support services. It highlights market opportunities in the utility-scale renewable energy market in South Africa.

South Africa has a single utility model managed by the state-owned entity, Eskom, with a total installed generation capacity of 48 GW. This capacity is currently dominated by coal-power stations (over 80%).

Since the establishment of the Independent Power Producers Office (IPPO) in 2010, more than 6.4 GW of electricity from renewable energy sources has been procured through the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP). Of this, just over 4 GW is already connected to the national electricity grid, with the balance expected to be connected by 2020/21. The cost of renewable energy projects continues to decrease, with projects in the most recent rounds (round 4 of the REIPPPP) producing a levelised cost of energy of less than R0.61/kWh.

Key developments influencing the market in 2020/21:

- The Department of Mineral Resources and Energy (DMRE) has gazetted amendments to the Electricity Regulations on New Generation Capacity. The amendments clarify the regime applicable to municipalities when requesting determinations under Section 34 of the Electricity Amendment Act, and enable municipalities in good financial standing to procure or buy new generation capacity and develop their own power generation projects.
- The Section 34 Determination enables the DMRE to undertake procurement of additional electricity capacity in accordance with the Integrated Resource Plan (IRP 2019). The capacity determined is 11.3 GW of generation and 513 MW of energy storage, including 6 800 MW renewable energy generation.

- A request for proposals for new generation capacity of 2 000 MW under the Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) was issued in August 2020, with the closing date extended to December 2020. In March 2021, DMRE announced the eight preferred bidders totalling 1845 MW and a further three eligible bids totalling 150 MW (these three bids are subject to value for money propositions in line with the provisions in the RFP). The solutions provided by these preferred bidders include a combination of a range of technologies that are solar PV, wind, liquefied gas and battery storage. These eight projects will inject a total of private sector investment amount of R45 billion into the country's economy.

- On 19th March 2021, the DMRE released a Request for Proposals (RFPs) for a new bid window under REIPPPP (BW 5). The RFP calls for proposals from IPPs to develop new generation capacity of 2 600 MW, including 1 600 MW from onshore wind and 1 000 MW from solar photovoltaic.

In addition to the Integrated Resource Plan (IRP) gazetted in October 2019, these developments suggest significant growth opportunities in the utility-scale renewable energy market over the next ten years (2020 – 2030). Based on the R/MW overnight capital cost per technology (as per the IPPO quarterly reports), the approximate available South African utility-scale renewable energy market value based on IRP 2019 allocations is R99 billion for solar PV, R271 billion for wind, and R48 billion for distributed generation of less than 10 MW.

This available market will depend largely on (1) the commencement of **new bid windows** of the REIPPP programme against the IRP 2019 allocations; (2) local content requirements; (3) the **licensing requirements for distributed generation;** and (4) t**he finalisation of Eskom's unbundling process and legal establishment of the transmission entity.**

Wind turbine manufacturing at GRI Renewable Industries, Atlantis Special Economic Zone for green technologies. **©GreenCape**

SUMMARY OF MARKET OPPORTUNITIES WITHIN THE UTILITY-SCALE RENEWABLE ENERGY MARKET[1]

Table 1: Summary of market opportunities within the utility-scale renewable energy market

Opportunity	Stakeholders	Key drivers	Barriers	Term	Macro impact
Continuation of the REIPPPP based on the IRP 2019 allocations	• IPPs, EPCs, OEMs, O&Ms • Local manufacturers • Financiers	• 6 800 MW, 4th determination • Expected 35 GW decommissioned coal by 2050 • Eskom EAF restraints	• Consistency and scale of procurement	Short to medium term **(1-5 years)**	• Energy security, load shedding reduce - Economy & jobs recovery- • Eskom's dire financial situation • Just Transition • South African Infrastructure Plan
Increased local manufacturing of renewable energy components and systems	• Local manufacturers, OEMs, EPCs • DTIC, DMRE, IPPO	• Increased local content requirements from upcoming REIPPPP rounds • Eskom's Just Energy Transition plans, risk of stranded assets (repurposing sites) • Local manufacturing support through the REDZ, IDZs, SEZs, RE corridors, etc.	• Energy and industrial policy uncertainty • The business case for local manufacturing still depends on restrictive trade policies	Medium to long term **(3-10 years)**	• Job transition for the coal sector • Disrupted economy due to COVID-19 impacts on the economy and unemployment rates
Distributed generation (1–10 MW as per the IRP 2019)	• Municipalities • Mining companies • Industrialists and commercial customers • Eskom • IPPs	• Municipalities in good financial standing can apply to procure new generation capacity • Mining sector allowed to self-generate, only required to register with NERSA • Wheeling opportunities • Uncapped capacity from 2019 to 2022 in IRP 2019 • Hybrid solutions and competitive tariff prices	• Policy uncertainty on third party transactions • Private PPAs structuring	Short term **(1–3 years)**	• Increasing cost of Eskom's electricity • Eskom's EAF: Availability and reliability of energy supply

[1] **REIPPPP** – Renewable Energy Independent Power Producers Procurement Programme; DMRE – Department of Mineral Resources and Energy; dtic – Department of Trade, Industry and Competition; REDZ – Renewable Energy Development Zone; IDZ – Industrial Development Zone; SEZ – Special Economic Zone; MEC – Maximum Export Capacity; EPC – Engineering Procurement Construction; OEM – Original Equipment Manufacturer; IPPs – Independent Power Producers; O&M – Operation & Maintenance; IPPO – Independent Power Producers Office; EAF – Energy Availability Factor

Opportunity	Stakeholders	Key drivers	Barriers	Term	Macro impact
Utility-scale battery energy storage development and deployment	• IPPs, EPCs, O&Ms • Local manufacturers, financiers • Mining sector	• Battery Energy Storage System (BESS) – (min. 80 MW/320 MWh usable capacity for seven months) • Global financing institutions • Grid stability use case	• Price of batteries in South Africa market – deviates from least-cost path • Limited policy on battery integration • Lack of infrastructure and R&D studies	Medium term **(5 years)**	• Price of battery storage declining (global) • CEP (Clean Energy Portfolio) thus Wind, Solar, Storage compared to Gas as balancing generation

Component cleaning at Perdekraal Wind Farm. **©Mainstream Renewable Power**

WHAT'S NEW?

CLICK HERE TO WATCH A SUMMARY OF THE 2021 UTILITY-SCALE RENEWABLE ENERGY MIR OPPORTUNITIES

Since the publication of the 2020 Utility-Scale Renewable Energy Market Intelligence Report (MIR), there have been several important developments in the sector and in the national government's Renewable Energy Independent Power Producers Procurement Programme (REIPPPP).

What happened in 2020:

- **February:** The Minister of Mineral Resources and Energy (DMRE), Gwede Mantashe, sends two draft ministerial determinations (the Proposed Determinations), prepared under section 34 of the Electricity Regulation Act, to the National Energy Regulator of South Africa (NERSA).
- **March:** The COVID-19 case rate increases in South Africa. Like many countries, the national government implements national restrictions ("lockdown regulations") to reduce the spread of the virus. This included the limiting of active business activity. The lockdown, coupled with reduced international trade, sees the South African gross domestic product (GDP) shrink by 51% in quarter two of 2020.
- **April:** Eskom issues several *force majeure* notices to operators of independent wind power plants, with lower demand caused by the country's lockdown in response to the COVID-19 pandemic reported as the reason.
- **April:** Eskom System Operator and General Manager Telecommunications, Tshifhiwa Bernard Magoro, appointed as new head of the Independent Power Producers Office (IPPO).
- **June:** DMRE approves the refinancing initiative for projects bid window 1 – 3.5 IPPs (sellers) that are in operation, to reduce tariffs over the remainder of the PPA term. At the time of writing, 70% of the 64 operational IPPs have indicated they will participate in the refinancing initiative.
- **July:** Request for Bids for Eskom's first package Battery Energy Storage Program advertised.

- **August:** Independent Power Producers Office (IPPO) issues Request for Proposals (RFP) for 2 000 MW Risk Mitigation Independent Power Producers Programme (RMIPPPP) with an initial due date of 24 November; then extends bid deadline submission to 22 December.

- **September:** DMRE determines 6 800 MW to be procured to be generated from renewable energy sources (solar: 2 000 MW and onshore wind: 4 800 MW) and 513 MW to be generated from storage. In total, this will enable the development of an additional 11 813 MW of power by 2030.

- **October:** DMRE gazettes the amendments to the Electricity Regulations on New Generation Capacity, enabling municipalities in good financial standing to develop their own power generation projects.

Rolling blackouts (load shedding) continued throughout 2019 and 2020 with Eskom being unable to match current demand with available supply. In March 2020, the country's electricity demand dropped by more than 6 000 MW immediately after nationwide implementation of Level 5 lockdown regulations. This allowed Eskom the opportunity to conduct short-term maintenance and repairs. A total of 9 000 MW generating units were taken offline to preserve the integrity of the systems, that would be available at short notice if required. A slight relaxation of the lockdown regulations from Level 5 to Level 3 saw the bulk of industries returning to business. As the economic lockdown eased, the utility immediately implemented staged load shedding to deal with a surge in energy demand. Eskom's CEO confirmed that there would be an increased risk of load shedding for another 12 months from August 2020.

This MIR updates 2020 report highlights:

Changes in opportunity drivers/ enabling environment:

- The DMRE gazetted amendments to the Electricity Regulations on New Generation Capacity, enabling municipalities in good financial standing to procure new generation capacity in line with the IRP 2019;

- The DMRE revised Schedule 2 of the Electricity Act, enabling self-generation and facilitating municipal generation under "Distributed Generation". Generation plants may only require registration;

- The DMRE welcomed NERSA's concurrence to the ministerial determination for the procurement of 11 813 MW of power with 4 800 MW (wind), 2 000 MW (solar PV) and 518 MW for renewable energy storage; and

- The DMRE has released a Request for Proposals (RFPs) for a new bid window under REIPPPP (BW 5). The RFP calls for proposals from IPPs to develop new generation capacity of 2 600 MW, including 1 600 MW from onshore wind and 1 000 MW from solar photovoltaic.

- Minister Gwede Mantashe announced that the licensing threshold for embedded generation is increased from 1 MW to 10 MW. In order to connect to the grid and/or trade surplus energy capacity, there is a requirement for license. Self-generation plants of any size do not require a license and there is no limit.

INTRODUCTION AND PURPOSE

This market intelligence report is compiled for foreign direct and local investors that are looking to invest directly in the South African green economy through project development, asset management, equity, debt, equipment manufacturing, or support services. It highlights market opportunities in the utility-scale renewable energy market in South Africa.

Globally, the impact of COVID-19 has been significant. Global energy demand declined by 3.8% in the first quarter of 2020, with most of the impact felt in March as confinement measures were enforced in Europe, North America, and elsewhere. The demand for coal, gas, and oil decreased by between 2% and 8%. Renewables were the only source that posted growth in demand, driven by larger installed capacity compared to other generation sources and priority dispatch (International Energy Agency.,2020).

During the 2020 COVID-19 pandemic, renewables were the only source of energy that posted a growth in demand internationally. On the back of low operating costs and preferential access to many power systems, the share of renewables in the electricity generation mix rose considerably, with record-high hourly shares of variable renewables across the world.

The share of renewables in capacity expansion continued its upward trend to reach 72% in 2019/20. Similarly, the renewable share of total generation capacity rose from 33.3% in 2018 to 34.7% in 2019/20. At the end of 2019 and the beginning of 2020, global renewable generation capacity amounted to 2 537 GW. Renewable generation capacity increased by 176 GW (+7.4%) in 2019, led by solar PV, wind energy, and hydropower (IRENA 2020). Solar PV capacity expanded the most (98 GW) (IEA Renewables, 2020). Meanwhile, onshore wind additions totalled 59 GW, and hydropower growth increased by 12 GW. The key economic drivers behind this global increase were government policy support, dedicated procurement programmes, and continually decreasing operating and technology costs.

The South African renewable energy market is following a similar trend to the global breakdown detailed above in terms of technology choice. Solar PV and onshore wind are dominating the market growth, backed by a growing small-scale embedded generation market (mostly solar for commercial and industrial businesses).

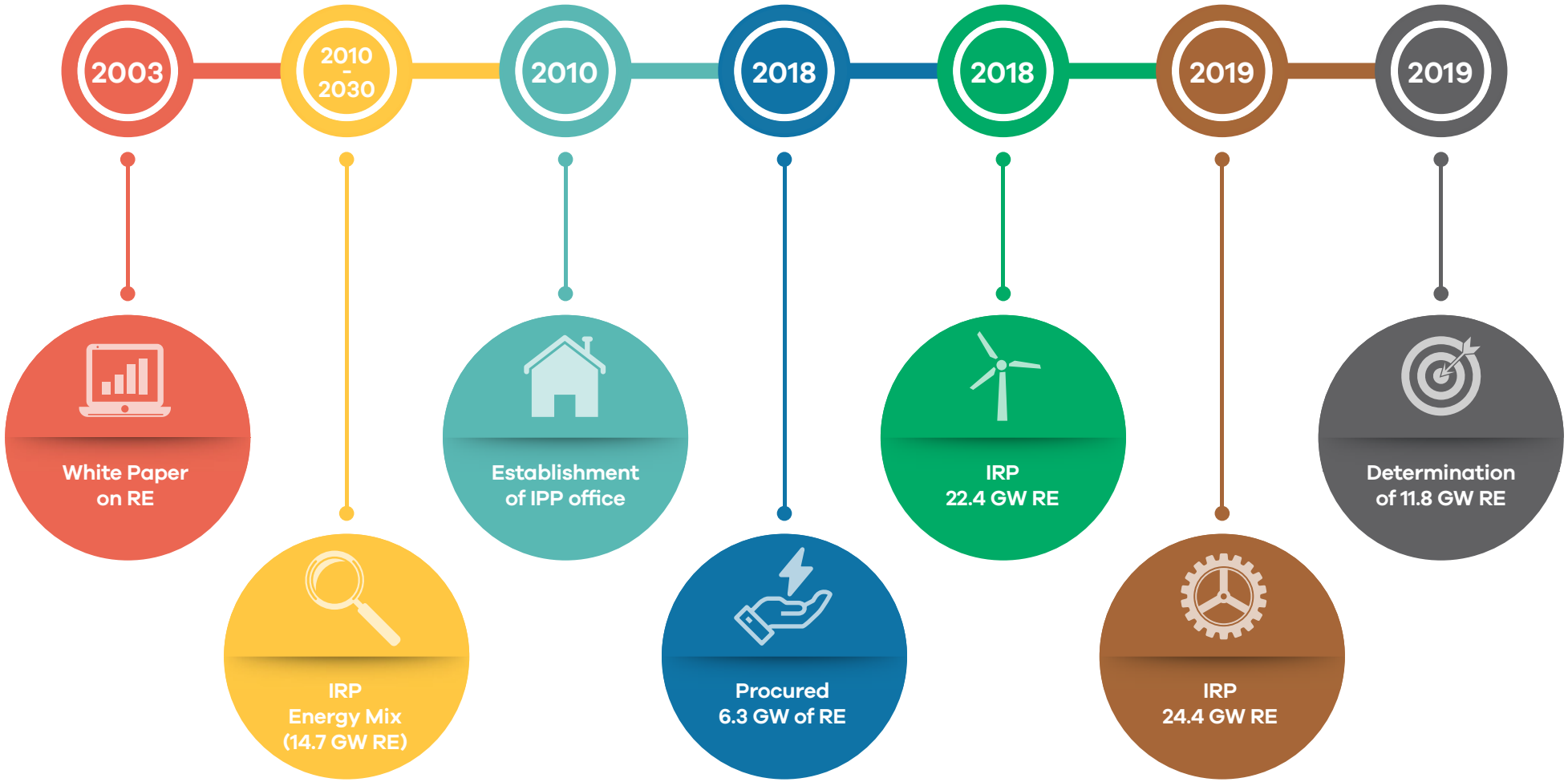
As shown in **Figure 1**, the introduction of renewable energy in the South African context dates back to 2003 with the delivery of the 2003 White Paper on Renewable Energy. However, only with the release of the Integrated Resource Plan (IRP) 2010-2030 in 2010 did the renewable energy framework start to take shape. The purpose of the IRP 2010 was to determine the preferred energy mix over the next 20 years. It included determinations 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 South Africa, as detailed in the 2010 IRP, the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) was established. The Independent Power Procurement 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.

Gouda Wind Farm, Western Cape.
©Nicholas Fordyce

Figure 1: Commencement and timeline of REIPPPP in South Africa



In October 2019, the IRP 2019 with the preferred energy mix up until 2030 was released. The plan includes determinations for additional renewable energy amounting to 20 400 MW (excluding distributed generation of 4 GW), coal-fired plants of 1 500 MW, and gas-fired power plants of 3 100 MW.

To begin the procurement process after the publishing of the South African national IRP for electricity, the Minister of Mineral Resources and Energy gazetted two Section 34 determinations[2] related to the procurement of 2 000 MW of new generation capacity under the Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) between 2019 and 2022, and the procurement of a further 11 813 MW between 2022 and 2027.

Given this context, there are several opportunities for potential investors in the renewable energy market in South Africa. This Market Intelligence Report (MIR) provides potential investors in the utility-scale renewable energy space with a greater understanding of market opportunities in South Africa, taking into account the size of the opportunities and the level of risk involved.

The MIR is compiled for foreign direct and local investors (persons or organisations) that are looking to invest directly in the utility-scale renewable energy market through project development, asset management, equity, debt, equipment manufacture, or support services.

In what follows:

Section 2 gives an overview of 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 emerging **opportunities, drivers, and barriers.**
Section 5 focuses on **funding and incentives.**
Section 6 gives an overview of the Western Cape as Africa's growing greentech hub.
Section 7 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 and energy efficiency. The energy services market is thus not covered in this Utility-Scale Renewable Energy Market Intelligence Report.

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[2] Under the Electricity Regulation Act 4 of 2006

SECTOR OVERVIEW

The South African utility-scale renewable energy accounts for approximately 14% of the available installed capacity. The industry is showing growth and potential with more than 4.3 GW of utility-scale projects connected and operational.

Wind turbine construction at
Perdekraal, Western Cape.
©Mainstream Renewable Power

This section gives an overview of the market, describing the market size (present and future), and providing a breakdown of the basic renewable energy value chain and key players. The 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

South Africa's electricity supply is currently dominated by coal-fired power generation. The country has coal-fired generation stations with an installed capacity of between 36.5 GW and 40 GW. This represents more than 80% of the country's total installed capacity, amounting to 48 GW (Department of Energy 2019). These stations are primarily owned and operated by Eskom, the national power utility. Eskom supplies ~95% of South Africa's total electricity demand. The remaining 5% is met through municipalities, imports, and independent power producers (IPPs).

Since 2010 there has been a distinct decline in electricity demand (87% in 2010 compared to 79% in 2019) (Wright & Calitz, 2020). A historic imbalance of supply and demand in South Africa's single buyer energy model over more than ten years resulted in intensive load shedding experienced country-wide during 2019 and the first half of 2020. An estimated 1.3 TWh, 530 hours, were loadshed during these periods with up to Stage 6 load shedding implemented, which had a significant impact on the economy (R 60 – 120 billion) (Wright & Calitz, 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 energy availability factor (EAF) declining from ~94% in 2002 to 67% in 2019/20.

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

The introduction of renewable energy into national energy planning extends as far back as the 1998 White Paper on the Energy Policy of South Africa. 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, by which the government set a target of 10 000 GWh renewable energy consumption by 2013, and NERSA's approval in 2009 of the policy and tariffs for a Renewable Energy Feed-in Tariff (REFIT) programme.

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. The Integrated Resource Plan (IRP) was adopted as the official long-term government plan for new electricity generation capacity inclusive of project timelines. It estimated planned generation capacities contributing to the overall energy mix.

The IRP aims to double the electricity capacity through a diversified energy mix; mainly coal, gas, nuclear, and renewable energy. Figure 2 on pages 14, 15 and 16, illustrates some of the essential utility renewable energy developments in South Africa to date, with additional drivers affecting the market listed in Table 2 (page 17).

Figure 2: Key utility renewable energy movements in South Africa to date

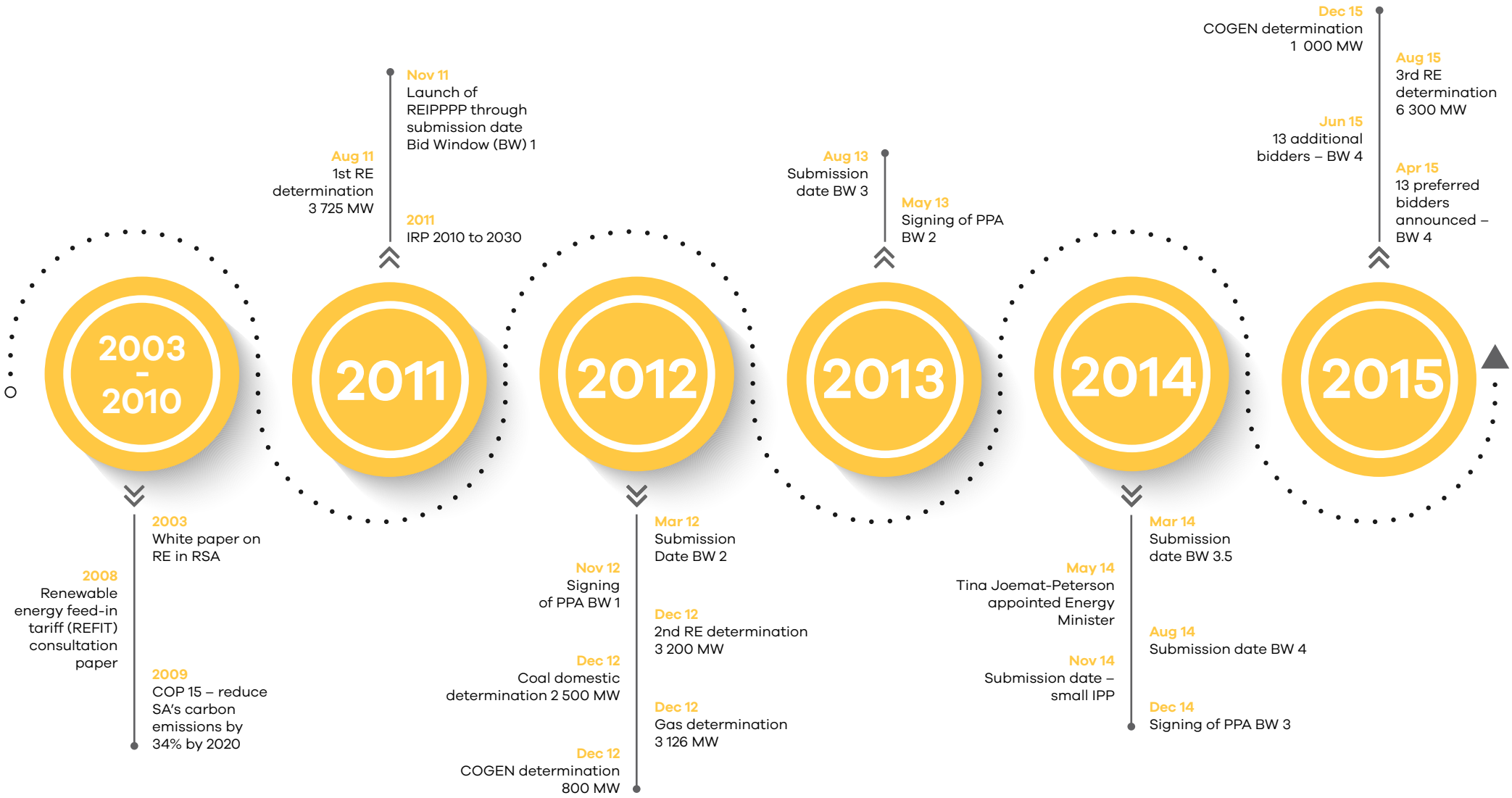


Figure 2: Continued...

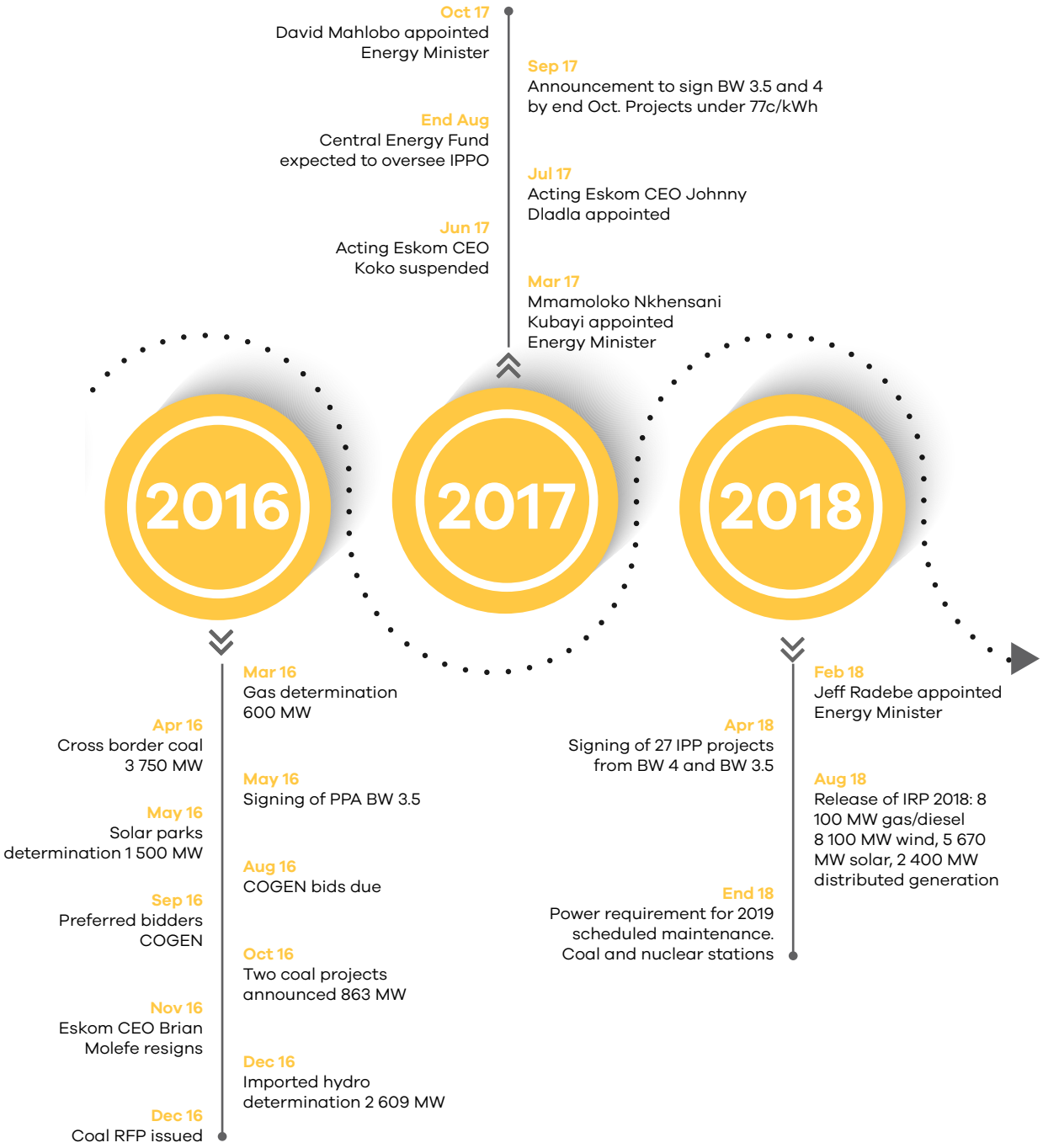
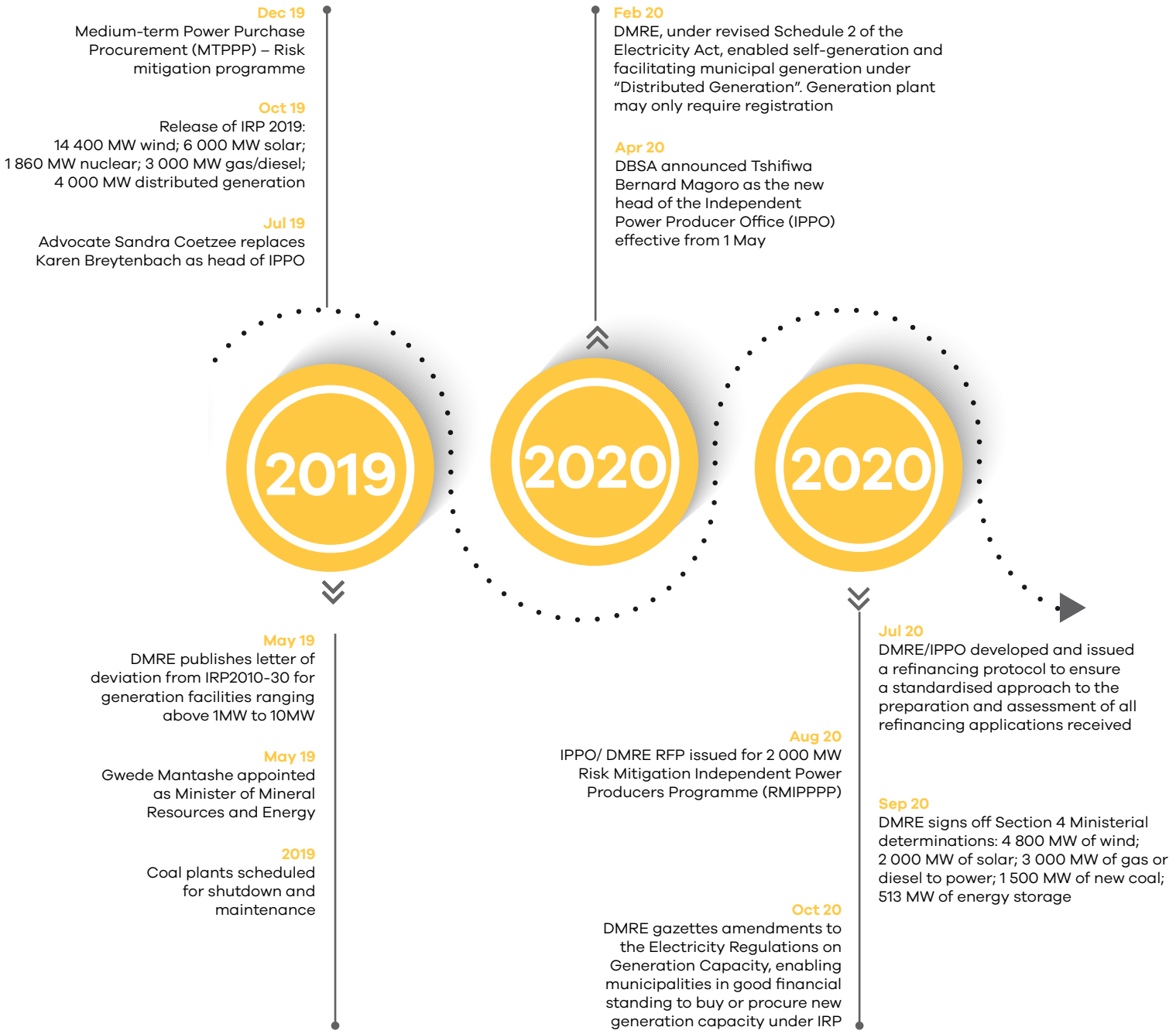


Figure 2: Continued...



Beyond these key milestones in the South African utility renewable energy market, Table 2 below details additional drivers that have moved the market forward.

Table 2: Additional drivers in the South African renewable energy market

Date	Movement
December 2016	CSIR Energy Centre Report highlights the actual tariffs from REIPPPP and coal IPP, showing how cheap renewable energy builds have been.
January 2017	Reason for not signing IPPs announced by the Minister of Energy — decreased growth below 2%, resulting in lower demand for electricity.
April 2017	Western Cape High Court judgement nullifies the government's nuclear agreements for failing to consult the public and undertake due processes. Minister of Energy decides to review all determinations after nuclear judgement. This is one of the main reasons for no response on municipal section 34 requests.[3]
July 2017	City of Cape Town files court application to purchase from IPPs.
Sep/Oct 2017	Public consultations for Atlantis Special Economic Zone (SEZ) for Green Technologies to inform best business practice frameworks for local manufacturing facilities keen to launch within the zone.
Dec 2018	Launch of Atlantis SEZ for Green Technologies, with national Department of Trade, Industry and Competition (dtic) encouraging Greentech investment through incentives.
October 2019	Department of Public Enterprises (DPE) announces official plan for the unbundling of Eskom into three separate entities, i.e. generation, transmission, and distribution, by 2021
August 2020	The City of Cape Town has been in dispute with government and NERSA on whether it has the right to contract directly with IPPs since 2015. The dispute was referred back to the parties in terms of section 41 of the Intergovernmental Relations Framework Act, 2005. All efforts to settle the dispute in terms of Chapter 4 of the Act were unsuccessful
2017/17 – 2019/20	Industrial Policy Action Plan (2020); Focusing on the manufacturing aspects of the green economy, namely green industries and industrial energy efficiency, and is aiming to support broad-based industrialisation, including more advanced manufacturing, encouraging cleaner, lower-energy technologies and green jobs.

[3] A Section 34 request entails a request to the Minister of Energy to make a determination against the IRP for the procurement of energy generation as detailed under section 34(1) of the Electricity Regulation Act 4 of 2006.

Although renewable energy in the South African context dates back to 1998 with the delivery of the 1998 White Paper on Energy Policy, it is still a relatively new market in South Africa, with the first commercial utility 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 4 276 MW generation capacity added to the national grid (IPPO 2020). Since the first project became operational in November 2013, 49 461 GWh of energy has been generated by renewable energy sources procured under the REIPPPP.

The growth of SA's renewable energy industry in recent years is the result of several factors:

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

The biggest development and driver of the utility-scale renewable energy market in South Africa was the establishment of the REIPPPP in 2011.

2.3. The Renewable Energy Independent Power Producer Procurement Programme

Over the last two decades, the South African utility-scale renewable energy model evolved, with some refinements. These include the IRP 2010-30, the establishment of the IPP office, and ultimate cancellation of the renewable energy feed-in-tariff (REFIT) programme. Key policy movements are summarised in Table 3 on page 19.

Assembling a wind turbine at Perdekraal, Western Cape.
©Mainstream Renewable Power

Table 3: Key policy movements in the establishment of the renewable energy sector in SA

	Initiation	Market Development	Transition	Consolidation
Pivotal movements	**RE policy uncertainty**	**Programme development**	**Bid Window 1-2 [nascent market – high returns]**	**Bid Window 3-4 [competitive market]**
Timeline	**1998 – 2008**	**2009 – 2010**	**2011 – 2013**	**2014 – present**
Government	1998 White Paper on Energy	2009 – Renewable energy feed-in-tariff (REFIT) [4] phase 2 launched by NERSA	2011 – Department of Mineral Resources and Energy (DMRE)[5] abandons REFIT for the competitive tender process	Nuclear debate
	2003 White Paper on RE	2009 – COP 15 commitments	2011 – 1st determination: 3 725 MW	Delay in Bid Window 4 (BW4) announcement – job losses as a result
	2007/08 load shedding	IRP 2010 – 2030	Aug 2011 – Issue of REIPPPP RFP	April 2018 – Sign BW4
	2008 – REFIT draft guidelines issued by NERSA	2010 – Establishment of IPP office	Nov 2011 – Bid submission period	August 2018 – Updated IRP released for public comment
	2008 – Eskom solar hot water rebate programme	–	Dec 2011 – Preferred bidder announcement	October 2019 updated IRP released
	2008 – Energy Act enacted	–	11 Dec 2011 – COP 17 in Durban	2020: • Determination based in new IRP • Issue of RMIPPPP RFP (2 000 MW)
	2008 – Commissioning of Darling Wind Farm	–	2012 – 2nd determination – 3 200 MW	**Expected in 2021/22:** • **Bid Window 5 announcement** • **Issue of REIPPPP RFP** • **Bid submission** • **The signing of PPA BW5** • **BW 5 commissioning**
	–	–	Nov 2012 – Signing of PPA BW1	
	–	–	May 2013 – Signing of PPA BW2	

[4] 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.

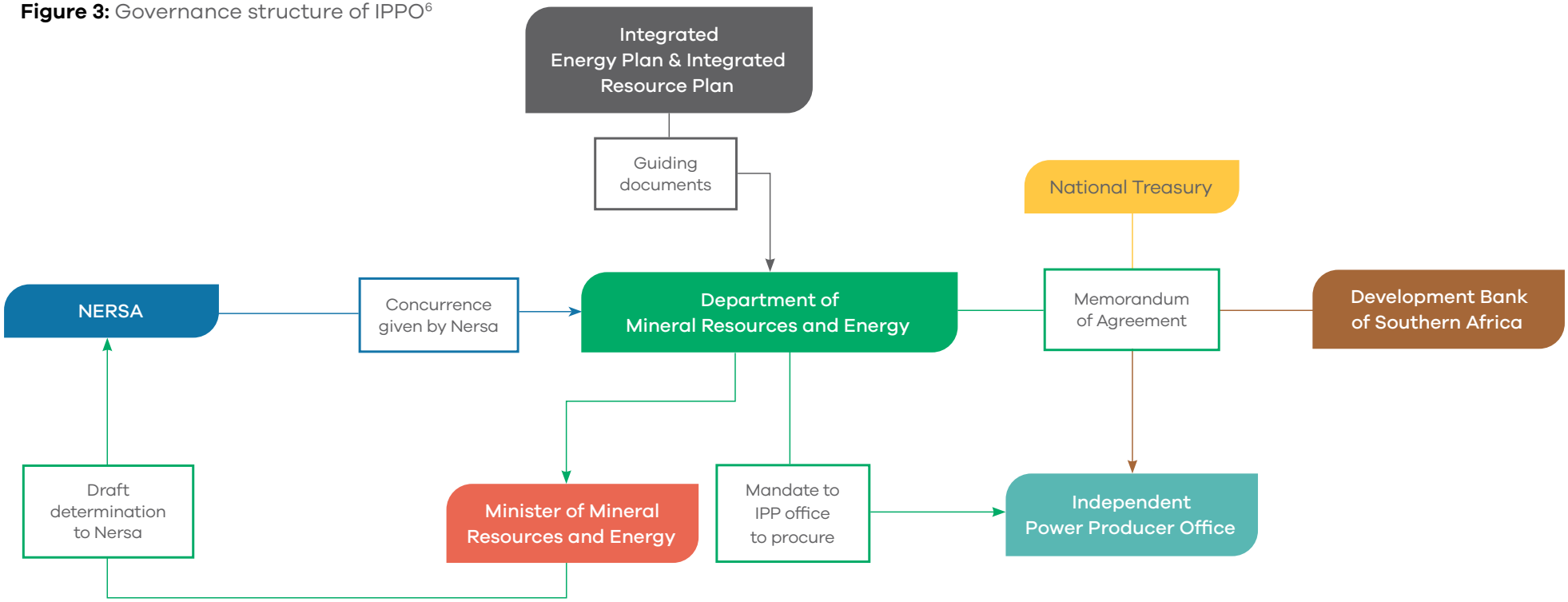
[5] Previously refered to as the Department of Energy (DOE)

The major goal with the establishment of a renewable energy programme was to ensure fair competition and independence, free from undue influence. With all previous generation, transmission, and share of distribution managed by Eskom, the programme had to have a clear separation of powers.

Central to South Africa'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 3), 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.

In 2016, the MoA was extended for a further three years, and then again in April 2019 for another year. The MoA has been subsequently extended to 2023.

Figure 3: Governance structure of IPPO[6]



[6] 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 IPP office is housed in the DBSA. It 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.

The formation of the IPP Office's procurement process, Figure 4, has been lauded as one of the key elements to driving success.

Figure 4: IPPO procurement process

Wind turbine construction at GRI, Atlantis. ©GreenCape

South Africa's renewable energy market grew exponentially from the inauguration of the Independent Power Producers Office (IPPO) in 2010 until 2015 when delays slowed market growth.

Up until 2015, the IPPO, with the support of the Department of Mineral Resources and Energy (DMRE), has procured 6 422 MW of renewable energy generation IPPO 2019). This has been managed through seven bid windows (BW)[7] in the large-scale REIPPPP, and through two bid rounds in the small REIPPPP. At the utility scale, IPPs are the mechanism through which renewable energy is currently added to the SA energy mix.
In the Western Cape, the IPPO reports that there are 14 utility scale renewable energy projects that have reached commercial operation date (COD) in the province between November 2013 and June 2020 (IPPO, 2020).

According to the IPPO, The Western Cape has been allocated 9% of total IPPPP projects procured in SA to date:

REIPPPP highlights to date:

- In the Large REIPPPP, 92 projects have reached Financial Close. Construction has not yet commenced on one BW3.5 project that reached Financial Close by end July 2019.
- One BW4 project started operations in the second quarter of 2020, bringing the total to four (out of 26) BW4 projects that have reached Financial Close.
- The Smalls programme and future bid windows are currently on hold, pending the implementation of the IRP 2019 and NERSA's concurrence of the associated ministerial determinations.

Energy supply capacity impact of the REIPPPP (by June 2020):

- 6 422 MW of electricity had been procured from 112 RE Independent Power Producers (IPPs) in seven bid rounds.
- 4 276 MW of electricity generation capacity from 68 IPP projects has been connected to the national grid.
- 49 461 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 2020):

- Investment (equity and debt) to the value of R209.7 billion, of which R41.8 billion (20%) is foreign investment, was attracted;
- Created 52 603 job years[1] for South African citizens to date;
- Socio-economic development contributions of R1.2 billion to date;
- Enterprise development contributions of R384.2 million to date; and
- Carbon emission reductions[1] of 50.2 Mton CO_2 have been realised by the programme from inception to date.

- 606 MW of renewable energy contracted in the Western Cape;
- 452 MW operational from 10 projects;
- 467 MW is onshore wind; and
- 134 MW of solar.

The Western Cape accounts for 606 MW (9%) of the national procured renewable energy capacity, of which 452 MW (11% of national total) is operational, with 6 047 GWh (12% of national total) electricity generated since inception. The technology breakdown allocations are as follows:

- **Procured:** Onshore wind (452 MW), solar PV (134 MW), and biomass (5 MW);
- **Active:** Onshore wind (452 MW) and solar PV (134 MW);
- **Operational[8]:** Onshore wind (318 MW) and solar PV (134 MW).

These projects have attracted approximately R15.0 billion worth of investment and created more than 11 000 job years in the province (IPPO 2020).

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

[8] Operational refers to capacity of projects that have reached COD and excludes projects in Early Operations Period (EOP)

Table 4: The 2020 breakdown of the large-scale and small-scale REIPPPP procured, determined, and operational capacity allocations across all renewable energy technologies (IPPO June 2020, NERSA determination)

Programmes	Large-scale IPP			Small-scale IPP		
Technology	Procured	Operational	Determined to date	Procured	Operational	Determined
Wind	3 357	1 980	11 160	9	0	400
Solar PV	2 292	1 774	8 225	80		
Concentrated solar power	600	500	1 200	0		
Landfill gas	13	22	540	0		
Small hydro	19			0		
Biomass	42			10		
Energy Storage	-	-	513	–	–	–
Total	**6 323**	**4 276**	**21 638**	**99**	**0**	**400**

2.4. South Africa utility-scale renewable energy market size

The South African utility-scale renewable energy market has grown significantly over the last seven years since the first project came online.

The market presents both current and future opportunities for investors.

2.4.1. The current South Africa utility-scale renewable energy market size

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, the programme's transparency, and strong government support.

The REIPPPP has attracted investment (equity and debt) to the value of R209.7 billion, with foreign investment constituting R41.8 billion (20%) of total investment attracted into SA. Some of the main contributing countries are Germany, France, Italy, Spain, and the USA.

2.4.2. The economic value of renewable energy facilities

A Council for Scientific and Industrial Research (CSIR) study (CSIR 2015) demonstrates that between January and June 2015, REIPPPP projects with some 800 MWp and 1 GWp of wind and solar PV respectively, generated up to R4 billion more in financial benefits than their cost. As projects from more recent rounds of the programme come online, the installed capacity and financial benefits realised will continue to increase as these projects offer much lower tariffs and costs than their predecessors (see Table 5).

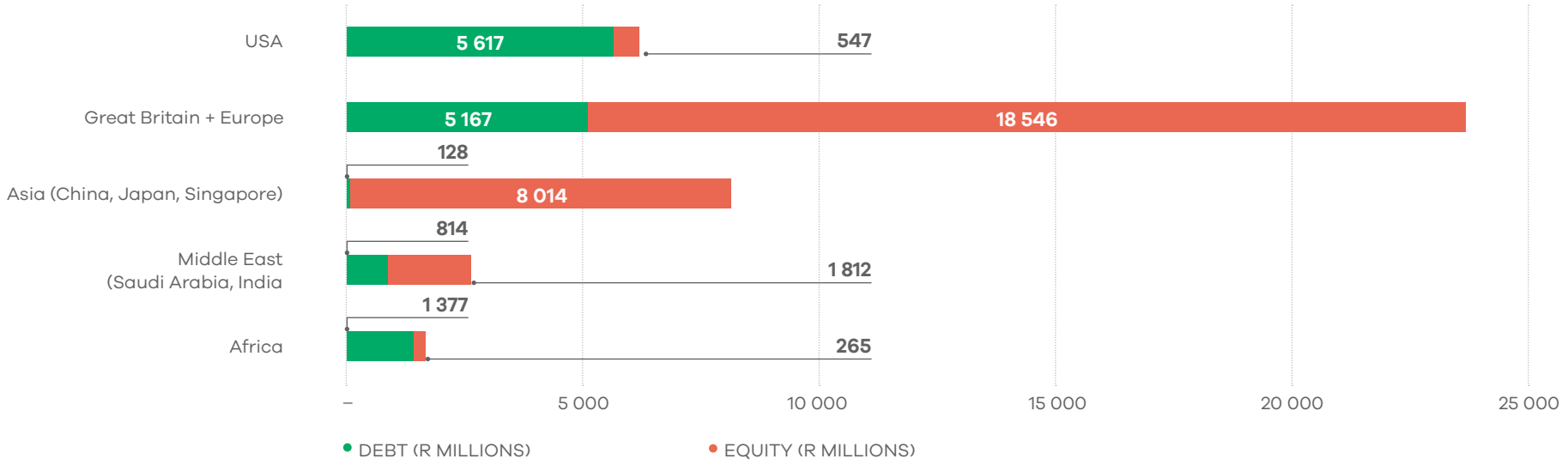
2.4.3. Investments made to date

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 2020 (IPP Office). This is split between domestic (80%, R167.9 billion) and foreign (20%, R41.8 billion) investments. The programme has been successful not only in attracting investments but also in attracting them from a wide variety of investment sources (see Figure 5.).

Table 5: Tariffs offered by solar PV, wind, and CSP projects over bid windows [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	S1	S2
Wind	1.51	1.19	0.87	–	0.75	0.62	1.15	–
Solar PV	3.65	2.18	1.17	–	0.91	0.62	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	–

Figure 5: Countries from which private investments in the REIPPPP were made (GreenCape, IPPO 2020)



Allocations of generation capacity: Table 6 presents final capacities per round, including the small IPP programme. As the table shows, wind and solar PV are the dominant technologies in terms of actual capacity procured. Future rounds of the programme will have to adjust their allocated technology because of favourable bid prices as well as high (over-) subscription rates.

Hopefield Wind Farm, Western Cape. ©GreenCape

Table 6: Actual procured generation capacities per REIPPPP bid window[9] (IPPO, June 2020)

Programmes	Large-scale IPP					Small-scale IPP	
Rounds	Round 1	Round 2	Round 3	Round 3.5	Round 4 a,b	S1	S2
Wind	649	559	787	0	1 363	9	0
Solar PV	627	417	435	0	813	30	50
Concentrated solar power	150	50	200	200	0	0	0
Landfill gas	0	0	13	0	0	0	0
Small hydro	0	14	0	0	5	0	0
Biomass	0	0	17	0	25	10	0

In the large-scale REIPPPP, 91 of the 92 projects have reached financial close. There is one BW3 project that has not reached financial close. The remaining BW 3.5 project that reached financial close by the end of July 2019 has not commenced construction. One BW 4 project started operations in the second quarter of 2020, bringing the total to four (out of 26) BW 4 projects that have reached financial close. The small-scale programme and associated future bid windows are currently on hold, pending a determination by the Minister of Mineral Resources and Energy based on the IRP 2019.

2.4.4. The integrated resource plan

The Integrated Resource Plan (IRP) is a national government document that aims to provide a clear indication of South Africa's electricity demand, 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, in consultation with NERSA, to make Ministerial Determinations for new generation capacity if they believe that it is required to secure continued, uninterrupted supply of electricity. The Ministerial Determinations may also outline the type of energy sources from which electricity must be generated. These decisions are based on the most up-to-date Integrated Resource Plan.

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.

[9] Determinations were made for 6 bid windows – 1, 2, 3, 3a, 4 and the expedited round. Energy has only been procured from 4 bid windows – 1, 2, 3 and 4

In May 2011, the then Department of Energy (DoE) – now the DMRE– released the Integrated Resource Plan 2010-2030 (IRP 2010) in respect of South Africa'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. However, this was never done and resulted in an energy mix that failed to adequately meet the constantly changing supply and demand scenarios in South Africa. Since the promulgation of IRP 2010–2030, the following capacity developments have taken place:

As indicated in the preceding section, a total of 6 422 MW under the REIPPPP has been procured, with 4 276 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, 1 588 MW of coal (Medupi), 800 MW of coal (Kusile) and 100 MW of wind (Sere Wind Farm). In total, 18 000 MW of new generation capacity has been committed to. 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 (ranging between 68% and 72% in 2020), and new technology costs. Since 2010, there have been several draft revisions of the IRP that have been distributed for public comment as tabulated in Table 7 on page 28.

Wind turbine base construction at Perdekraal East Windfarm. **©Mainstream Renewable Power**

Table 7: Summary of the developments and revisions of South Africa's IRP from 2010 – 2019, as well as key planning assumptions (Wright & Calitz, 2020).

	IRP 2010 – 2030 (Promulgated 2011) Target: 2010 – 2030	IRP Update 2013 (Not promulgated) Target: 2013 – 2050	Draft IRP 2016 (Public consultation) Target: 2016 – 2050	Draft IRP 2018 (August 2018) Target: 2016 – 2030	IRP 2019 (Gazetted October 2019) Target: 2018 – 2030
Expected energy mix	Scenario-based **Big:** Coal, nuclear **Medium:** VRE, gas **Small:** Imports (hydro)	Decision trees; **Big**: Coal, nuclear **Medium:** VRE, gas, CSP **Small:** Imports (hydro, coal), others	Scenario-based **Big:** Coal **Medium:** Nuclear, Gas, VRE **Small:** Imports (hydro), others	Scenario-based **Big:** Coal, VRE **Medium:** Gas **Small:** Nuclear, DG/EG imports (hydro), others	Scenario-based; **Big:** Coal, VRE **Medium:** Gas, DG/EG **Small:** Nuclear, Imports (hydro), Storage, others
Demand	454 TWh (2030)	409 TWh (2030) 522 TWh (2050)	350 TWh (2030) 527 TWh (2050)	313 TWh (2030) 392 TWh (2050)	307 TWh (2030) 382 TWh (2050)
Emissions (CO_2 eq)	Peak only, EM1 (275 Mt from 2025)	PPD (Moderate)	PPD (Moderate)	PPD (Moderate)	PPD (Moderate)
Nuclear options	Commit to 9.6 GW	Delay option (2025 – 2035)	No new nuclear pre-2030; 1st units (2037)	No new nuclear pre-2030; (pace/scale/affordability) 1st units (2036 – 2037)	No new nuclear pre-2030; (pace/scale/affordability) 2.5 GW (≥2030)
Import options	Coal, hydro/PS, gas (fuel)	Coal, hydro/PS, gas (fuel)	Hydro, gas (fuel)	Hydro, gas (fuel)	Hydro, gas (fuel)
Coal fleet performance	>85% EAF; 50-year decommissioning.	~80% EAF; Life Expectancy – 10 years	72 – 80% EAF; 50-year decommissioning. MES delay (2020/25)	72 – 80%; 50-year decom. MES delay (2020/25)	67 – 76%; 50-year decom. MES delay (2020/25)
New-build coal	1st units forced earlier 1.0 GW (2014) 6.3 GW (2030)	Displaced by LifeEx (10 yrs) 1.0 GW (2025) <3.0 GW by 2030	1st 1.5 GW (2028) 4.3 GW (2030)	0.5 GW (2023) 1.0 GW (2030)	0.75 GW (2023) 1.5 GW (2030)
New technologies	Uncertain VRE cost/perf. CSP (marginal); Annual constr.: 0.3 – 1.0 GW/yr (PV) 1.6 GW/yr (wind)	Uncertain VRE cost/perf. CSP (notable); Annual construction.: 0.3 – 1.0 GW/yr (PV) 1.6 GW/yr (wind)	VRE cost/perf. proven CSP (minimal); Battery/CAES (option) Annual constr.: 0.3 – 1.0 GW/yr (PV) 1.6 GW/yr (wind)	VRE cost/perf. proven CSP (minimal); Batteries (option) Annual constr.: 0.3 – 1.0 GW/yr (PV) 1.6 GW/yr (wind)	VRE cost/perf. proven CSP (minimal); Batteries (notable) Annual constr.: 0.3 – 1.0 GW/yr (PV) 1.6 GW/yr (wind)
Security of supply	LT (reserve margin); ST (hourly dispatch); Immediate ST need; Research: Fuel supply, base-load, backup, high VRE	LT (reserve margin); ST (hourly dispatch); Research: Fuel supply, base-load, backup, high VRE	Assumed similar Research: None highlighted	Assumed similar Research: Gas supply, high VRE, just transition	Assumed similar; Immediate ST need; Research: Gas supply, high VRE, just transition
Network requirements	Not considered; Tx/Dx research need	Not a concern (Tx power corridors) Dx networks research need (DG/EG)	None	Explicit Tx needs cost (per tech.)	Explicit Tx needs cost (per tech.)

In 2019, an updated 2019 IRP was gazetted. The IRP generally considers several scenarios, with the policy adjusted IRP being the primary plan.

Different scenarios that led to the new IRP 2019 can be seen below:

- IRP 1 — the least-cost scenario
- IPR 2 — including annual build limits
- IRP 2019 — the policy adjusted scenario

The least-cost scenario, labelled IRP1 (see **Table 8**), envisages no yearly limits on the integration of variable renewable energy to 2030. It includes only technology choices that represent the least cost to the country, and increased allocations as prices decrease.

By forcing annual build limits on PV and wind, i.e. the maximum limit of a specified technology that can be built in a given year, the plan brings procurement of renewable energy closer to 2024.

The idea behind forcing annual build limits is to create a consistent annual demand needed to create a market for local manufacturing of renewable energy components. The impact of adding build limits to the least-cost scenario can be seen in **Table 9**. The annual build limits bring forward PV procurement from 2027 in **Table 8** (no build limits) to 2024, **Table 9**.

Table 8: Capacities for least-cost plan by year 2030 (DoE 2019)

Year	PV (MW)	Wind (MW)	Gas (CCGT/CC-GE/OCGT) (MW)	Landfill Gas (MW)
2025	–	–	2 380	–
2026	–	–	750	250
2027	2 290	–	1 480	–
2028	1 640	2 500	2 200	–
2029	2 180	2 800	2 200	–
2030	1 710	3 700	1 930	–
Total	**7 820**	**9 000**	**10 940**	**250**

Table 9: Capacities for least-cost plan by 2030 with annual build limits on renewable energy (DoE 2019)

Year	PV (MW)	Wind (MW)	Gas (CCGT/CC-GE/OCGT (MW)	Landfill gas (MW)
2024	1 000	–	–	–
2025	1 000	1 600	–	–
2026	1 000	1 600	2 380	–
2027	1 000	1 600	1 650	–
2028	1 000	1 600	1 950	–
2029	1 000	1 600	3 000	250
2030	1 000	1 600	1 800	–
Total	**7 000**	**9 600**	**10 780**	**250**

The policy adjusted scenario as shown in **Figure 6**, on the next page, 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 will 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. It will help sustain the industry and the inclusion of 1 500 MW of coal-to-power aimed at minimising the impact of job losses resulting from the decommissioning. These policy adjustments will be retained, pending a report on the Just Transition strategy[10].

Solar PV installation. ©GreenCape

[10] Just Transition is a report to be drafted by the National Planning Commission (NPC). It aims to develop pathways and inform a strategy to transition to a low carbon society that also addresses the triple challenge of reducing poverty and inequality, and creating jobs.

Figure 6: Policy adjusted plan IRP 2019

	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	–

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

Table 10 below details the potential market growth that investors can expect based on IRP 2019.

Table 10: New additional capacity by 2030 based on IRP 2019:

Technology	IRP 2019 provisions by 2030 (MW)
Coal	1 500
Nuclear	1 860
Hydro	2 500
Storage	2 088
PV	6 000
Wind	14 400
CSP	0
Gas/diesel	3 000
Other	4 000

The other technology category includes distributed generation, co-generation, biomass, and landfill. The 2019 IRP increased the renewable energy capacity, not including distributed generation, to 33% by 2030. It also makes a strong statement towards encouraging new industries, job creation, and localisation across the value chain (IRP 2019).

An approximate market value per technology based on IRP 2019 allocations can be estimated by using an indicative R/MW overnight capital cost per technology in previous bid rounds as published by the IPPO. This is depicted in Table 11 to the right.

The renewable energy potential market is valued at R418 billion for solar PV, onshore wind, and distributed generation.

Table 11: Future pipeline based on IRP 2019 allocations

Technology	Indicative ZAR (million)/ MW cost	IRP 2019 new capacity (MW)	Potential market value
Solar PV	R16.5 million	6 000	R99 billion
Wind	R18.8 million	14 400	R271 billion
SSEG	R12.0 million	4 000	R48 billion

2.4.5. The potential of utility-scale renewable energy — beyond the IRP

In a study conducted by the CSIR for Meridian Economics, the IRP of 2019 was expanded to 2050 to evaluate potential growth opportunities (Wright & Calitz, 2020). This study was conducted utilising a high temporal resolution systems-level approach in a modelling tool that is widely used in South Africa (i.e. Plexos). **The South African electrical energy mix at the time of the study was 81% coal. This is expected to shift to 55% by 2030 and 11% by 2050 as a result of a least-cost approach.** According to this study, the least-cost new-build mix consists of the following 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, which includes coal, nuclear, and imported energy such as hydropower. This model showed that it is 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** (Wright & Calitz, 2020). In related work by Meridian (Renaud et al., 2020) it has been 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 Western Cape potential beyond the IRP

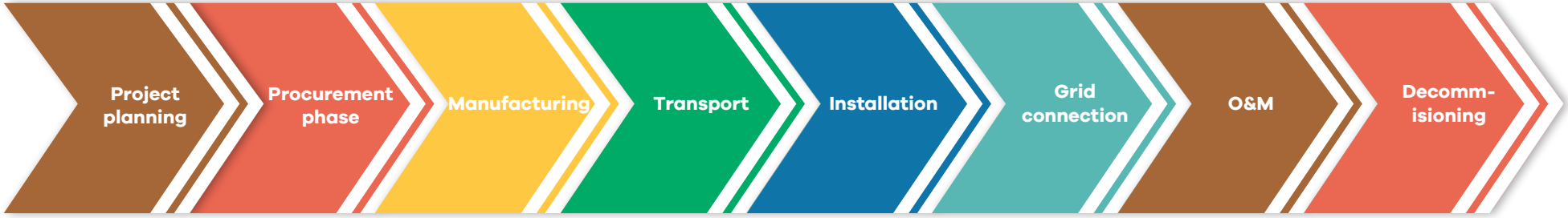
If the province can maintain its overall share of +-10% of the national procured capacity of renewable energy, a sustainable renewable energy build of 500 MW and 1 GW per year could be achieved.

2.5. South Africa renewable value chain

In South Africa, the renewable energy value chain is dominated by the global industry players with a typical structure as illustrated in Figure 7. 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, there are opportunities available for localisation. Section 4 will highlight some of the emerging market opportunities identified along the value chain, along with the investment and job creation potential. As the South African industry gears up to meet the 24.4 GW of new renewable energy build by 2030, the need for local value creation is increasingly growing to ensure the sector contributes of the country's infrastructural needs, Just Transition objectives, job creation in transitioning sectors, and establishing a local manufacturing base.

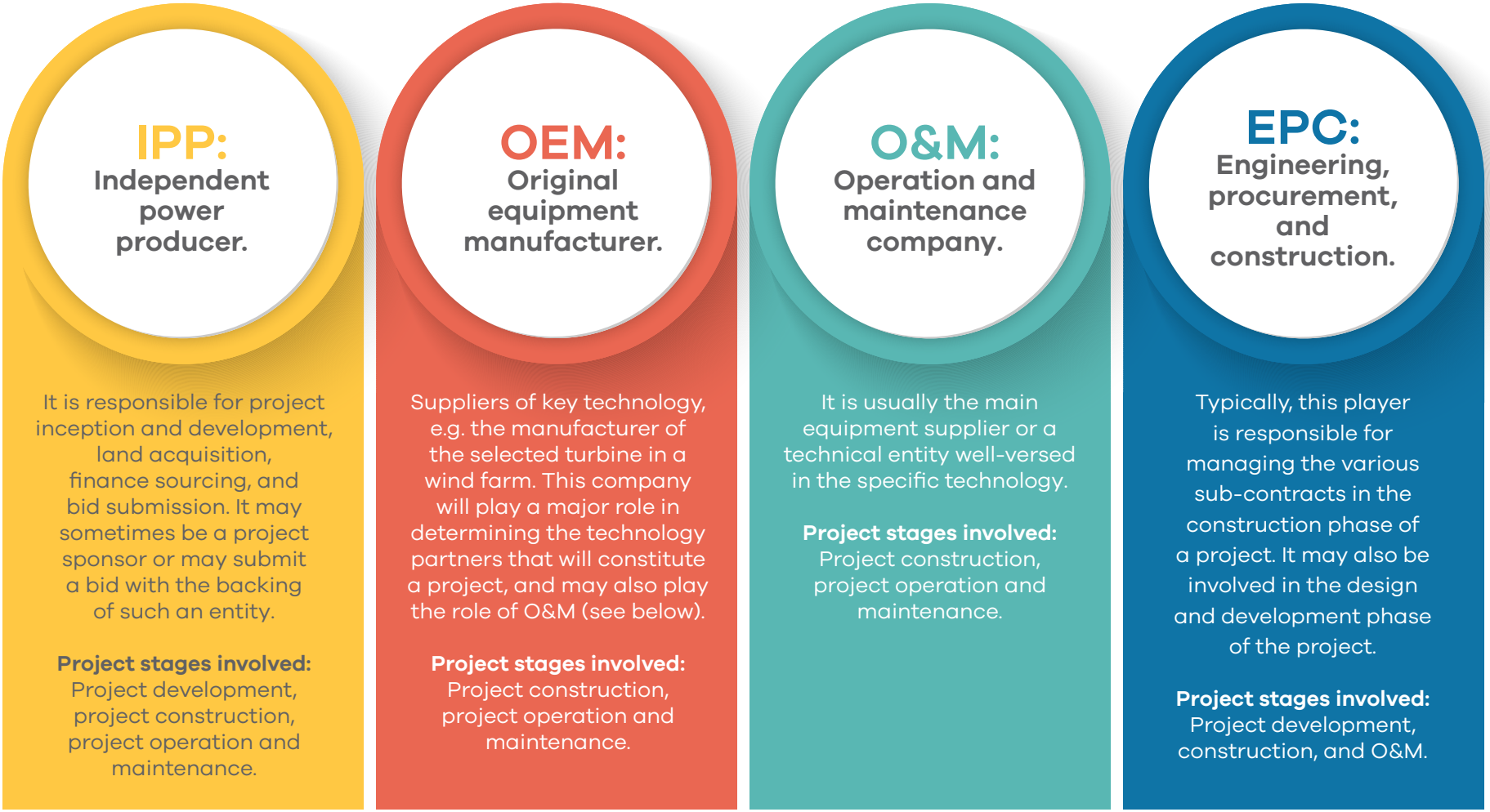
Figure 7: Renewable energy value chain (IRENA, 2017)



2.6. Key players in the South Africa renewable energy market

Stakeholders in the REIPPPP are best categorised according to the project development phases that the programme follows: development, construction, and operation and maintenance (O&M). Accordingly, the key players or company types involved in this market are described in Figure 8, with an indication of the project development phase in which they are typically involved.

Figure 8: 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

Sheep graze in harvested wheat fields at the Langhoogte Wind Farm, Caledon.
©Nicholas Fordyce

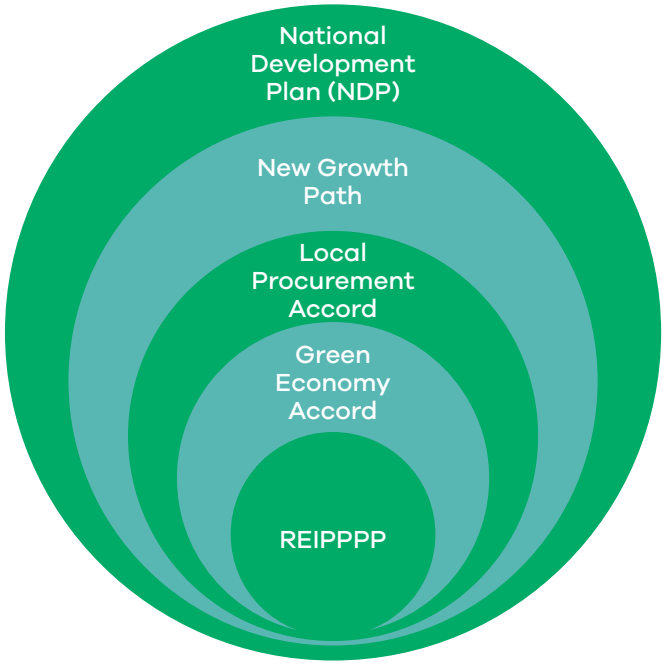
This section details the general legislative and regulatory framework governing renewable energy, with a specific focus on the REIPPPP.

3.1. Guiding policies

According to the national Economic Development Department (EDD), South Africa's economic growth is guided by several key policies, as shown in Figure 9.

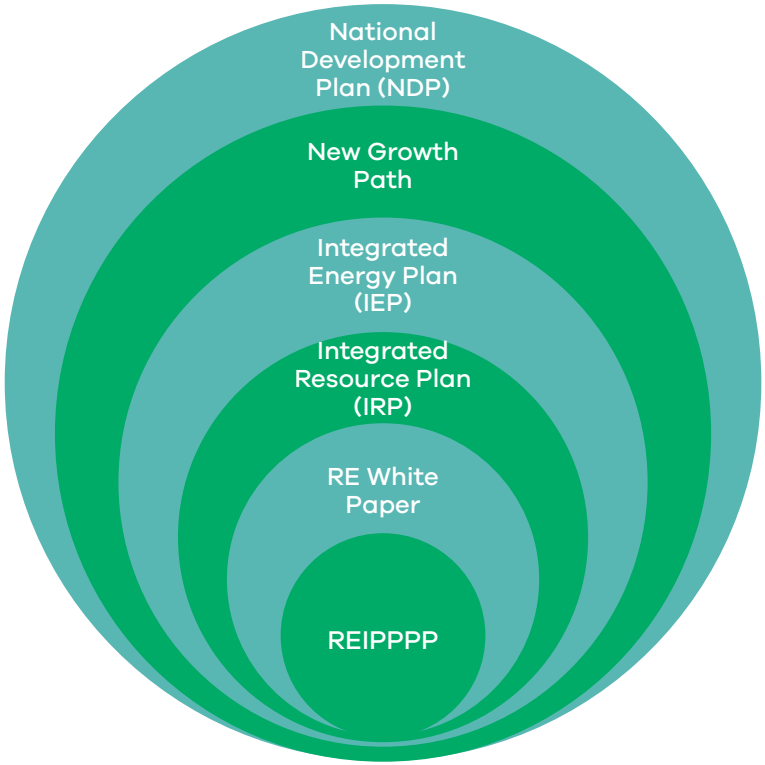
Of these, the policies highlighted relate directly to REIPPPP procurement (Figure 10). The economic development component ensures the REIPPPP creates sustainable value for the local communities, and ultimately South Africa's economic development, through revenue obligations to which the IPPs have committed. The design of the REIPPPP takes into account all these policies, making it a highly strategic infrastructure and development programme.

Figure 9: Policies guiding South Africa's economic growth trajectory



August 2012	**National Development Plan (NDP)** Aims to eliminate poverty and reduce inequality by 2030.
Nov 2010	**New Growth Path** Sets targets for creating jobs and identifies priority areas, with infrastructure development named as key to the success of this vision.
Oct 2011	**Local Procurement Accord** As the economy grows and the country industrialises, this accord sets an aspirational target of 75% of all products used in the country to be manufactured locally. This is particularly evident in the REIPPPP's local content rules.
Nov 2011	**Green Economy Accord** 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.
Dec 2016	**Integrated Energy Plan (IEP)** 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.
Nov 2019	**Integrated Resource Plan (IRP)** Specifically outlines the planning, sourcing, and quantities of electricity generation sources contributing to the county's generation mix.
Nov 2003	**2003 White Paper on Renewable Energy** Determines that a significant and equitable level of national resources should be invested in Renewable Energy, while also setting targets for renewable energy generation capacity.

Figure 10: 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 various capacities 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, which is governed mainly through the Electricity Regulation Act 4 of 2006. This department was previously known 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 Affairs (DWA)	DWA oversees water allocations and ensures that there is adequate water supply infrastructure, among others, for the South African electricity sector.
Department of Environment, Forestry and Fisheries (DEFF)	DEFF ensures adherence to environmental compliance and protection of rights relating to the prevention of pollution, ecological degradation, promotion of 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; as well as 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 embedded generation and energy efficiency markets.

Perdekraal Wind Farm.
©Mainstream Renewable Power

The following market drivers, emerging opportunities and market barriers have been identified through engagement with an array of green economy stakeholders. Each is outlined in greater detail in the sub-sections below.

4.1. Market drivers

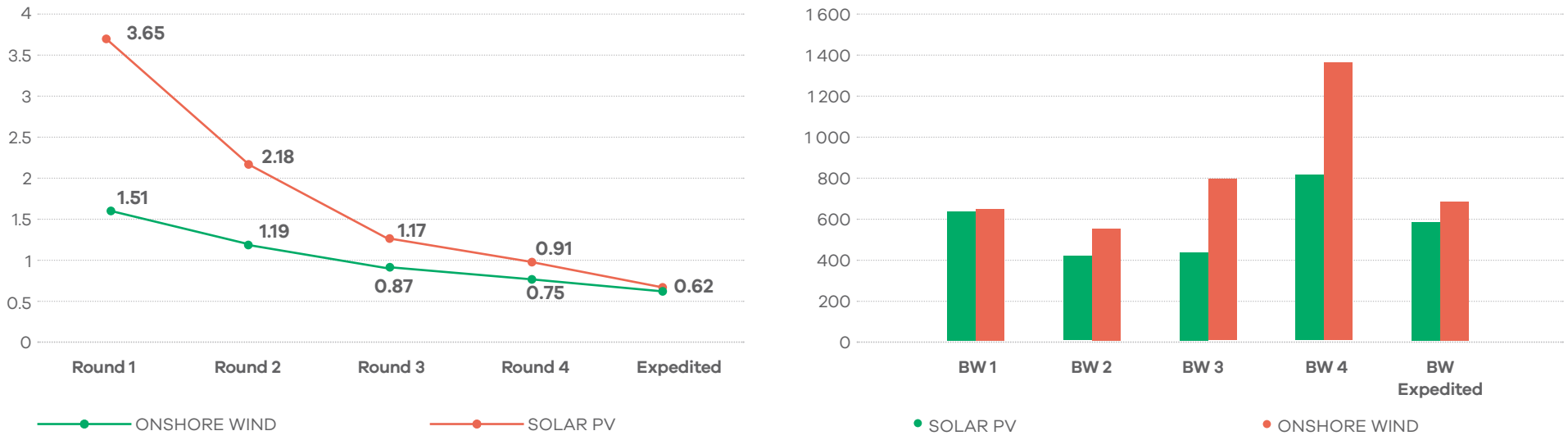
This section highlights the drivers and enablers that are ensuring the growth of the South African utility-scale Renewable Energy market.

4.1.1. The decreasing cost of utility-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 more than 150% over six years, with the levelised cost of electricity for wind and solar in the expedited round coming in at less than R0.62/kWh (see **Figure 11**).

Figure 11 illustrates the average tariff decline in the wind and solar PV sector over the four bid windows, plus expedited rounds that have been initiated, together with the capacity awarded for each bid window.

Figure 11: Tariff decline and capacity awarded for solar PV and onshore wind across all bid windows



Globally, the average global weighted-average levelised cost of energy (LCOE) of utility-scale solar PV and onshore wind potentially set to fall to USD 0.039/kWh and USD 0.043/kWh in 2021 (IRENA, 2020). The global price decline trends indicate the potential for further price drops in South Africa.

4.1.2. Policy drivers of market size

As stated by the national Economic Development Department (EDD), South Africa's economic growth is guided by several key policies.

The five main policies directly relating to the REIPPPP are: (1) the Green Economy Accord; (2) Local Procurement Accord; (3) New Growth Plan; (4) National Development Plan (NDP); and (5) South African Economic Reconstruction and Recovery Plan.

The economic development component ensures that the REIPPPP creates sustainable value for all communities across South Africa as well as the local South African economy. This is achieved through revenue obligations to which the IPPs have committed. The design of the REIPPPP takes into account all of these policies with the objective to be a highly strategic infrastructure and development programme. For more details on the policies guiding South Africa's renewable energy economic growth trajectory, see Section 3.

4.1.3. Other related drivers

South Africa 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 to combat climate change.

Table 12: Climate Change Agreements of which South Africa is a signatory

Policy Plan	Policy Aim and Description
The Paris Climate Agreement	A global temperature goal of staying well below a rise of 2°C compared to pre-industrial levels.
The 2030 Agenda	The adoption of the 2030 Agenda for Sustainable Development in 2015 signalled the universal commitment of the world's leaders together to confront challenges that must be successfully overcome if humankind is to survive on this planet.
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 South Africa 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, to assess the progress and implementation gaps in meeting already agreed upon commitments, as well as addressing new and emerging challenges.
Addis Ababa Action Agenda	A comprehensive set of policy actions by the member states, with a package of over 100 concrete measures to finance sustainable development, transform the global economy, and achieve the Sustainable Development Goals.

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 of water (seawater or water from secondary sources), and subsequent electrolysis for the production of hydrogen as an alternative energy carrier (either directly or through the production of synthetic fuels).

The latter two of these interventions are referred to as "sector coupling" that would enable a high share of variable renewable energy into power systems. The kinds of innovations required to enable the inclusion of high levels of variable renewable energy into a power system suggest that sector coupling would require an enabling policy environment and interventions that are wider than those relevant to electricity alone, e.g. enabling energy and transport policy.

4.2. Market opportunities

Changes in the country's electricity sector continue to present a variety of opportunities in the utility-scale renewable energy market. This section discusses the opportunities presented by the 2019 Integrated Resource Plan and other market conditions.

4.2.1. Continuation of the REIPPPP based on the IRP 2019 allocations

The substantial drop in solar PV and wind prices has had an impact on South Africa's future energy mix. Technology improvements, improved investor risk appetite, and the global renewable energy drive could result in solar PV and wind prices as low as R0.46/kWh and R0.56/kWh, respectively, by 2030 (Wright et al., 2017). Based on the IRP 2019, the government still expects to procure more than 24 GW of renewable energy generation capacity by 2030, with a total of 22 028 MW determined to date, including the small IPP programme (see **Table 13**).

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 small-scale embedded generation (SSEG) to be procured by 2030.

Using an indicative R/MW overnight capital cost per technology[11], the approximate 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 less than 10 MW).

[11] Price from the most recent bid window of South Africa's REIPPPP puts the capital costs used for wind and solar PV in the draft IRP 2018/19 at R18 847/kW and R16 555/kW respectively for large scale and R12 000/kW for small scale.

The Western Cape potential based on the IRP 2019 allocations

Wind projects are largely located along the coastal regions of the Eastern Cape and Western Cape provinces, based on the strong wind flows along these shores. There is also a relatively good opportunity for solar PV in the Western Cape. If the province can maintain its overall share (+-10%) of the nationally procured capacity of renewable energy, a potential market of approximately R41,8 billion exists in the Western Cape.

Table 13: Procurement outstanding based on IRP adjustments from 2010 – 2019

IRP adjustments	RE goal 2030 (MW)	Procured to date (MW)	Determined to date (MW)	To be procured (MW)
IRP 2010 – 2030 policy adjusted	17 800	6 422	22 038	11 424
Draft 2016 IRP base case	–			–
2030	19 647			19 647
Draft 2016 IRP carbon budget	–			–
2030	33 347			33 347
IRP 2018 draft	22 490			16 068
IRP 2019	30 630			24 208

A closer look at the programme's yearly rollout as per the IRP 2019 — specifically the dominant technologies of solar PV and wind energy capacity — demonstrates a market opportunity with a future market value of R50 billion/year (~2 600 MW of wind and solar/annum) when there are structured build allocations in the IRP.

An additional key outcome of IRP 2019 is the coal decommissioning schedule. According to 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. The extent of the planned decommissioning will provide space for an entirely different energy mix, with a focus on incremental capacity addition (modular) and flexible technology, to complement the existing installed inflexible capacity (IRP 2019).

It is also expected that by 2024, 1 800 MW of nuclear power generation (Koeberg) will reach end-of-life. Eskom has initiated preparations and processes to extend the life of this plant to 2044 (IRP 2019).

Risk Mitigation Independent Producer Procurement Programme (RMIPPPP)

A request for proposal for a short-term supply capacity of approximately 2 000 MW was issued in August 2020, with a last permissible commercial operation date (COD) before end of June 2022. The aim of the programme is to procure electricity from private producers that can be rapidly added to the grid to address the current electricity supply constraints. The RMIPPPP is a direct response to fill the supply gap and reduce the extensive utilisation of diesel-peaking electrical generators in the medium to long term. In March 2021, DMRE announced the eight preferred bidders totalling 1845 MW. The solutions provided by these preferred bidders include a combination of a range of technologies that are solar PV, wind, liquefied gas and battery storage. These eight projects will inject a total of private sector investment amount of R45 billion into the country's economy with an average local content of 50% during the construction period. South African entity participation from these projects is 51% with black ownership at 41%.

As the price points for successful bids bottom out, the strategic advantage for winning bids will shift to those with stronger, more innovative economic development programmes, involving:

- local content;
- preferential procurement; and
- community ownership and additional benefits.

There are, therefore, opportunities for:

- investors into local manufacturing of renewable energy technology components;
- local enterprises that supply into the renewable energy value chain; and
- community initiatives in and around selected project locations.

4.2.2. Increased local manufacturing

The REIPPPP has become the primary mechanism for renewable energy localisation and industrialisation through the use of local content requirements. Morris et al. (2020) provide a summary of the average local content achieved across projects in the four bid windows (BWs) of the REIPPPP (Table 14). This shows that for both wind and solar PV across all bid rounds, the local content thresholds have been well exceeded, with solar PV in BW4 coming close to the target (62.3% compared to a target of 65%).

The development of the South African Renewable Energy Master Plan (SAREM)

The national masterplan process falls under the reimagined industrial strategy for South Africa, led by the Department of Trade, Industry and Competition (dtic). The masterplan development approach is a collaboration between industry, labour, and government to develop an industrial plan for the sector. This includes setting out a vision for an industry in South Africa, identifying blockages and constraints, and proposing a set of key actions that need to be taken forward over the short and medium term. The masterplans essentially facilitate a process whereby industry commits to a certain amount of investment, creating a certain number of jobs against an industry masterplan. Government, for its part, undertakes to understand and remove impediments to these plans.

Table 14: Average local content as a percentage of total project cost versus threshold and targets (Morris et al. 2020)

	BW1			BW2			BW3			BW4		
	Min	Target	Average Bid	Min	Target	Average Bid	Min	Target	Average Bid	Min	Target	Average Bid
Wind	25%	45%	27.4%	25%	60%	48.1%	40%	65%	46.9%	40%	65%	44.4%
Solar PV	35%	50%	38.4%	35%	60%	53.4%	45%	65%	53.8%	45%	65%	62.3%

* Minimum obligation
Adapted from Eberhard and Naude (2017)

There is an opportunity in the REIPPPP for renewable energy Original Equipment Manufacturers (OEMs)[12]. They can improve their competitive advantage by aligning closely with the country's sector growth guiding policies (see Section 3), and with the dtic's Special Economic Zone (SEZ) programme, which in the Western Cape has translated into the Atlantis SEZ for Green Technologies.

There is also an opportunity now for local manufacturing to be established based on the future of IRP rollout and localisation requirements within the REIPPPP. The renewable sector has a significant local manufacturing investment potential but it is dependent on a long-term stable market outlook and the IRP to be implemented as is.

Comparable economies such as Turkey, Morocco, Brazil, India, and China have deployed a wide variety of local content initiatives to:

- attract investors into a new market;
- increase domestic value-add;
- stimulate renewable energy growth;
- develop diversified exporting bases;
- increase employment rates; and
- develop other manufacturing sectors

(UNCTAD, 2014).

There is also an opportunity to look beyond local content requirements in terms of enabling the increase of local manufacturing investments; financial and tax incentives, favourable customs duties, export credit assistance, and quality certification (CSIR-Riso-DTU, 2010).

Localisation studies have been commissioned by various industry stakeholders for solar PV, wind energy, and concentrated solar power (CSP) technologies between 2013 and 2015.

The purpose of these studies is to define which and how many components can be manufactured or assembled locally. These studies indicate that there is an opportunity for local manufacturing if there is a large enough utility-scale renewable energy programme.

Local PV panel manufacturing for the REIPPPP market

The South African PV panel industry is currently an importing market dominating downstream activities such as project development, EPC contractors, assembling, and O&Ms. International suppliers will continue to lead in the market, with a large portion of panels imported to locally set-up OEMs that supply to project developers participating in the REIPPPP auction programme. Beyond the REIPPPP delays, various stakeholders have remained resilient, confirming an appetite to invest in manufacturing facility expansion and upgrades, should there be a firm demand and project pipeline.

To further enable the solar PV sector to manufacture locally and off-set the current price competitiveness with international players, mechanisms such as import tariffs and raw material designations can be used to support more local manufacturing.

The local content requirements of BW4 aim to enforce local lamination and assembly in the solar PV manufacturing value chain. However, panel providers require a minimum market of 300-400 MW per year to justify a local production facility. The IRP 2019 indicates that there is a market of approximately 6 GW of solar PV by 2030, with 814 MW already committed over three years.

[12] Local content (65%) is one of the non-price economic development (ED) categories (see Table 14) that contributes to total weighting contribution of the ED score. It is also one of the categories (together with job creation, ownership, and socio-economic development) with a minimum threshold that should be met for a bid to progress to the next stages of evaluation.

Local designation in the South African renewable energy market

In December 2011, the revised Preferential Procurement Policy Framework Act (PPPFA) came into effect to empower the dtic to designate industries, sectors and sub-sectors for local production at a specified level of local content. To ensure discharge of local production and content on manufacturing activities, the components listed below in **Table 15** which have been designated must be included in bid invitations.

Table 15: dtic's and National Treasury designated sectors instruction number 2 of 2016/2017; list of solar PV components designated for local production

Solar PV components	Minimum threshold for local content	Conditionality
Laminated PV modules	15%	The local process will include tabbing and string of cells, encapsulation and lamination, final assembly and testing in compliance with IEC standards
Module frame	65%	Aluminium components: all minimum PV module frames, PV mounting frames/racks, clamps, brackets, foundation components and fasteners are to be manufactured from locally produced extruded, rolled, cast or forged products
DC combiner boxes	65%	Enclosures must be made from SMC and moulded in South Africa
Mounting structure	90%	PV mounting structures/racks, clamps, brackets, etc.
Inverters	40%	Must be assembled locally

Beyond the designated components listed in **Table 15**, glass, silicon, back sheet (plastics) and EVA glue are examples of content that can be considered for future designation. Glass and silicon are important raw materials used in solar cells, and have the potential to be locally sourced at scale. Furthermore, these materials have high local content thresholds to contribute to the domestic energy production market, and require pipelines to invest in expansion to meet the material demand.

Local wind tower manufacturing

At the time of writing, only one of the two steel manufacturers set up in South Africa over the past ten years as a result of the REIPPPP remain in operation. With increased competition and improvements in technology and meeting local content targets, concrete towers have become a viable option for new plants in BW 4a and BW 4b with a local concrete tower manufacturer supplying to some IPPs.

Large developers and EPCs such as Enel, Building Energy, Innowind and Nordex/Acciona are using concrete towers for their projects. The updated IRP 2019 provides a market of approximately 14.4 GW of onshore wind by 2030. There is a concern as to whether the local tower manufacturers will be able to meet the volumes needed to meet local content requirements in future rounds.

Considering the full value chain, South Africa is best placed in terms of the localisation of services such as project development, civils, grid connection, transport, installation, and O&M. Tower and generator manufacturing are most readily localised, followed by blades and electronics. **Figure 12** also considers the raw material and machinery suppliers and suggests that steel production is most readily localised, followed by carbon fibre and machinery.

Figure 12 Relative ease of localisation in wind value chain (CSIR-Riso-DTU, 2010)

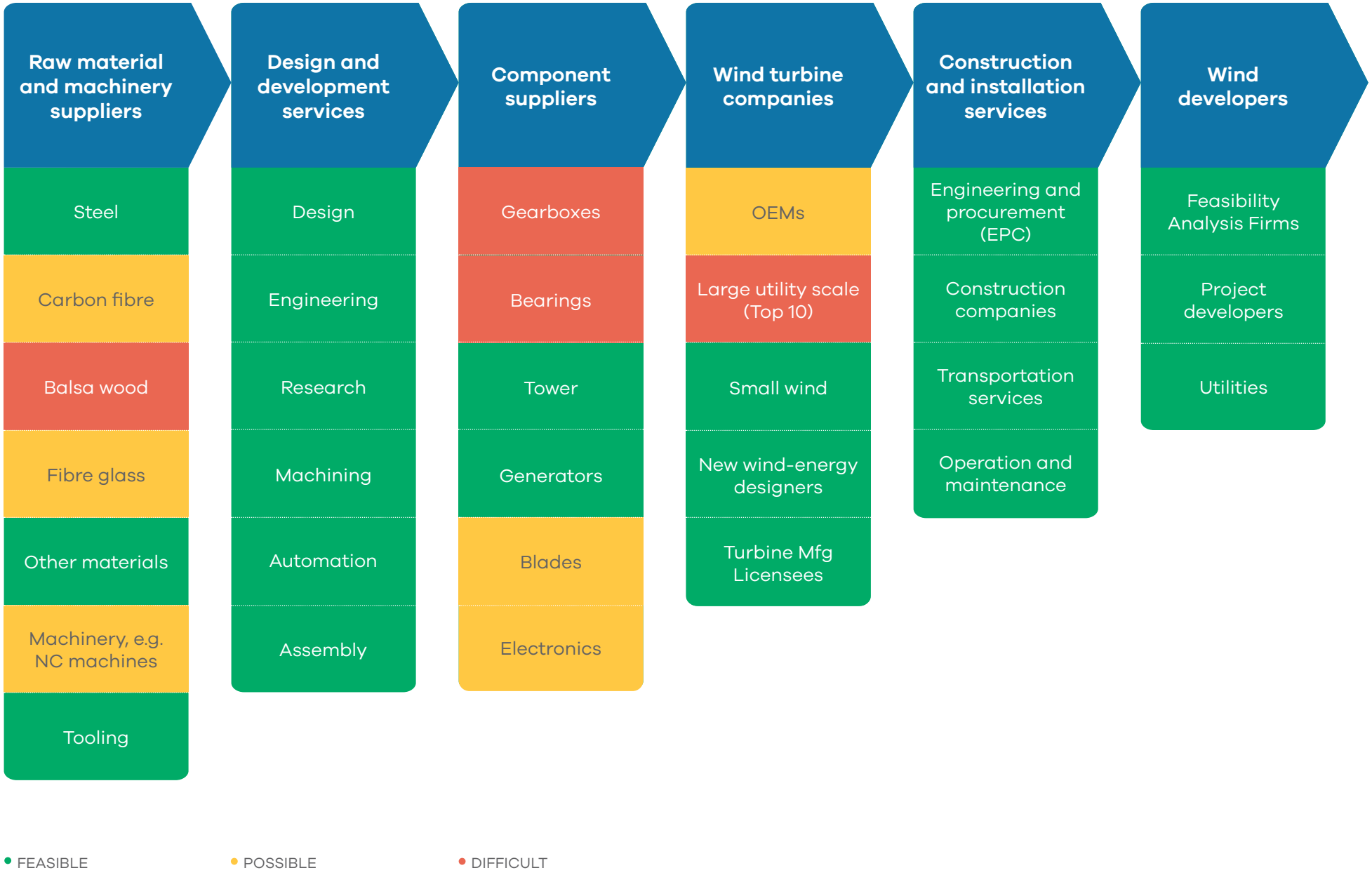


Table 16: Estimate of number of manufacturing facilities and job creation potential for wind turbine localisation for IRP 2019 build (extrapolation of data from Urban Econ 2015)

Component	Key Assumptions	Expected number of facilities	Job Creation Potential (FTE)
Balance of plant	Already localised	N/A	5 387
Towers	150-165 towers/facility; an average of 2.5 MW/turbine	One existing (steel towers) Three new	Existing 220 New 568
Blades	400 MW/year/OEM for a min of five years	Four new	899
Nacelle assembly	400 MW/year/OEM with a total market of 1 000 MW/pa over five years	Four new	604
Nacelle castings & forgings	Expansion of existing facilities	Expansion of existing facilities	994
Nacelle exterior	Expansion of existing facilities	Expansion of existing facilities	
Nacelle interior	Generators: 400 – 450 MW/year/OEM with a total market of 1 000 MW/pa over five years Converters: 400 MW/year/OEM with a total market of 1 000 MW/pa over five years Transformers: sourced from a local manufacturer	Four new	935
Total			**BOP: 5 387** **Manufacturing: 4 220**

A later localisation study (Urban Econ, 2015) also estimated the potential for localisation beyond what had already been localised through the REIPPPP Bid Windows 1 to 3, which were towers, balance-of-plant (i.e. civils, grid connection, transport and installation), meteorological masts, and anchor cages.

Local battery manufacturing

Beyond South Africa's conducive sun 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. These are used in the global energy storage sector and create an opportunity for new industry and localisation.

South Africa also has a developed metallurgical infrastructure that can expand into downstream capabilities to maximise localisation of battery manufacturing.

While the country currently imports Li-ion batteries, the Department of Science and Innovation (DSI) has supported the establishment of two pilot facilities aimed at facilitating 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 lithium-ion battery (LIB) cathode.

The competitiveness of the Li-ion batteries industry in South Africa 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, Metai Investments, Megamillion Energy Company, and Bushveld Minerals, invested in partnerships to manufacture Li-ion batteries and redox-flow batteries locally. Bushveld Energy, a Bushveld Minerals company, established a manufacturing base and locally produces vanadium flox redox batteries (VFRB), an alternative battery technology to Li-ion batteries.

To support local battery manufacturing, dtic's listed industrial lead-acid batteries as products designated for local production with a minimum local content threshold of 50%. Beyond such initiatives, dtic has suggested that the government implement a supporting policy to ensure alignment across the necessary spheres of industry. With strong policy commitments, opportunities for beneficiation of battery metal minerals for energy storage manufacturing industries can be created. Testing and certification facilities are required should the manufacturers expand into global exports markets, to ensure the local standards are aligned and recognised worldwide.

4.2.3. Distributed generation (1-10 MW)

In IRP 2019, battery energy storage had the highest learning rate of all the technologies in the IRP. This is likely to have positive implications for the cost of energy storage and electricity prices.

SAESA has called for a regular update of the IRP (every 18 months to 24 months) because the improvement in costs and technical performance in energy storage is more rapid than other electrical energy technologies. Economies of scale and sustained R&D initiatives to support local production with locally available commodities will drive down the cost of Li-ion batteries (TIPS, 2019).

The annual market size for this opportunity is reported to be ~500 MW as per the 2019 IRP, with unlimited provisions between 2019 and 2022, with an investment potential of R48 billion. This opportunity spans other technologies (biomass, landfill gas and co-generation) that are under-represented in the broader IRP 2019 provisions.

Sections 5.3.1., 5.3.2. and 5.3.3. further down highlight the emerging opportunities that have developed within this market segment. In March 2021, Minister Gwede Mantashe increased the licensing exemption threshold from 1 MW to 10 MW, for self-generating power plants.

This regulatory reform has the potential to unlock significant new capacity from distributed generators in the coming years and expedite investments into the distributed generation market segment.

Municipalities exploring the option to procure from IPPs

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 customer services to their consumers — have begun exploring options to procure electricity from Renewable Energy (RE) IPPs. One of the key market developments influencing the market in 2021 is the amendment to the Electricity Regulations on New Generations Capacity, which enable municipalities in good financial standing to procure or buy new generation capacity, and develop their own power generation projects.

This presents a market opportunity, potentially for utility-scale projects, and the distributed generation[13] sector. Until recently, the generation of electricity has been almost exclusively the mandate of the national government, through Eskom. The biggest hurdles facing municipal power procurement are the current national regulations governing generation licensing.

A specific ministerial determination, like the one that enabled the various IPP programmes, may still be needed to allow municipalities to purchase directly from IPPs.

Currently, there is no precedent for this. However, the City of Cape Town (CCT) has requested such a determination[14], and Ekurhuleni municipality released a request for proposal (RFP) for IPP generation in the second half of 2016, followed by Buffalo City in 2019. More recently, Merafong municipality in October 2020 published an expression of interest (EOI) for solar PV clusters. The success of such a programme would ultimately rest on a ministerial determination being made. Accordingly, the ongoing changes in legislation around generation licensing and own-use present opportunities for municipalities to increase their participation in the generation sector, and therefore their energy autonomy.

Municipal-owned generation facility

Distributed generation (1-10 MW) through biomass, biogas and municipal waste are areas holding great potential for improving municipal revenues. All municipalities have sites for processing waste and wastewater. Technologies are available for these resources to be added to the generation mix. The IRP makes provision for distributed generation with an unlimited allocation until 2022, and 500 MW per year from 2023 to 2030.

Electricity wheeling and trading

Beyond direct sales from IPPs to municipalities, electricity wheeling and energy trading provide opportunities for locally distributed generators to increase their access to off-take agreements. Electricity wheeling, as allowed by the DMRE and implemented by local municipalities, will allow generators to wheel their electricity to a willing buyer anywhere in the municipality or country. This is currently being implemented by City of Tshwane, Nelson Mandela Bay Metropolitan Municipality, the City of Cape Town, Stellenbosch, Drakenstein and Eskom.

The release of regulations that allow private sector energy trading[15] has opened the market to private sector power purchase agreements and on-sales to private consumers, using the national and local distribution networks. There is currently only one licensed energy trader in South Africa, but there are numerous other entities currently applying to the National Energy Regulator of South Africa (NERSA) for trading licences. It is expected that in 2021 there will be multiple electricity traders operating in South Africa.

Mining sector allowed to self-generate

South Africa's mining sector consumes 30% of Eskom's total generated electricity. The sector forms part of the energy-intensive user's group, which consumes more than 40% of the electricity produced in South Africa.

[13] Generation of 1-10 MW

[14] The City of Cape Town has committed to purchasing ±520 MW of renewable energy over the next 15 years, with the majority of the other metro-municipalities also having committed to purchases of a similar scale.

[15] Electricity trading is the transportation of electrical energy from a generator to a separate electrical load, by making use of municipal or Eskom grid infrastructure and power purchase agreements (PPAs). The difference is that a private sector electricity trader or third party will purchase the electricity, pay the local municipality/Eskom to wheel it over their network, and sell it to a willing customer.

The increasing cost of Eskom's electricity (more than 500% over the last decade), unplanned power outages creating a safety risk for underground operations, and clean energy consumption policies are key driving forces for the mining sector to pursue self-generation. The mining sector has reported a pipeline of renewable energy projects totalling about 1 500 MW that could be brought on stream in the next 36 months. The main technology of interest is solar power, alongside solar-diesel hybrid power projects for overnight operations.

Schedule 2 of the Electricity Regulation Act enables self-generation and facilitates municipal generation options under "Distributed Generation". Depending on the circumstances, the generation plant may only require registration and not licensing. This will help close the energy gap caused by Eskom's EAF restraints, and observe an increase in investments into renewable energy that have been put on hold over the last several years due to policy uncertainty.

One example, Gold Fields, has been preparing to build a solar plant in its South Deep site in Johannesburg for the last three years. With the Ministerial Determinations announcement by Minister Gwede Mantashe at the Investing in African Mining Indaba 2020 conference, Gold Fields can resume its preparation for its 40 MW generation capacity project. Moreover, the Gold Fields Ltd (GFI) application for Section 34 determination and licence for 40 MW is being considered by NERSA. However, there is sector-wide uncertainty in the licensing requirements for mining companies looking to procure larger than 10 MW of private generation capacity.

Currently, the majority of the mining companies plan to deploy renewable energy projects through the "over-the–PPA-fence" option: IPPs to build, own and operate the project. There is also an added benefit to this option: should the mining company choose the rental option (especially when there is a lack of capital to invest into the power solution) – there is the flexibility to review projects for a longer term without a permanent investment commitment to the power solution.

As load shedding is scheduled to continue for the next two years, self-generation will enable not only the mining sector but also other large industries to urgently respond to energy demands with a cleaner and cheaper approach.

4.2.4. Utility-scale battery storage

Globally, 2.9 GW of storage capacity was added to electricity systems in 2019 – almost 30% less than in 2018. This represents a market retraction. Large-scale ("grid-scale") installations dropped by 20%, while the behind-the-meter installations flattened. The factors behind this market trend highlight storage as an early-stage technology that is heavily reliant on policy support to grow until the price decreases further. Energy storage deployments in emerging markets are expected to increase by over 40% year on year until 2025, resulting in approximately 80 GW of new storage capacity (IEA, 2020). Lazard's value chain snapshot reported that energy storage projects are providing quantifiable returns which take the form of multiple sources of revenue (Lazard, 2020).

In South Africa, the energy storage technology based market in utility-scale sized batteries has emerged recently, driven by the IRP provisions by 2030. The market is forecast to grow to R33.4 billion by 2030. IRP 2019's power system simulations reported that in the long term, the country's power system would use a combination of renewable energy, gas, and storage to meet demand. Based on these results, the emerging long-term plan made a total of 2 088 MW allocation by 2030 towards storage, with the latest Ministerial Determination confirming the IRP 2019's 513 MW provision towards storage in 2022. Energy storage costs have been revised, taking into account the longer gas infrastructure lead time, deciding that the power systems need more energy storage, especially given the extent of wind and solar capacity in the IRP. Much like global markets, SA's energy storage market needs a consistent policy to promote local uptake and attract investments into this opportunity.

Lithium-ion battery chemistries continue to dominate short duration applications (i.e. 1-4 hours), with a 90% share of the market (Lazard, 2020). In 2017, lithium-ion accounted for nearly 90% of the large-scale battery storage additions (IEA, 2018). It continues to claim significant market share due to its commercial acceptance, declining costs due to technology improvements, and energy density and availability. It is considered a potentially safer technology, given higher temperature thresholds for the thermal runaway.

In SA, the battery value proposition is dependent on the service offering/value stacking: frequency and voltage control, peak shaving, deferral of grid infrastructure, and reducing renewable energy curtailment.

Table 17 gives a breakdown of the capital cost of the system (cost per kWh storage) per system size for Li-ion storage.

Table 17: South African pricing markers for Li-ion storage system sizes focused on smaller scale installations

System size	Capital cost of the system (cost per kWh storage)
< 15 kWh	R6 000 – R10 000
< 800 kWh	R5 000 – R9 000
> 800 kWh	R4 000 – R8 000

Eskom battery storage pilot project

In July 2020, Eskom issued a Request for Bids (RFBs) for the design, engineering, supply, construction, erection, testing, and commissioning of battery energy storage systems (BESS), due on 11 September 2020.

The BESS specification required a minimum of 80MW/320MWh usable in capacity, including five years O&M at Skaapvlei Substation at Vredendal in the Western Cape. The project duration includes five to nine months for the design, supply and installation, including five years of O&M services. The project is funded by the World Bank and African Development Bank. The tender features both stand-alone and co-locate specifications, with most of storage in Eskom's planned standalone.

Overall, the pilot will drive the upscale of renewable energy due to increased battery storage capacity. It could potentially eliminate the need for additional new power plants to supplement the coal plants to be decommissioned.

The value chain details pertaining the project/s and the opportunities available across the entire value chain will support manufacturing, supply of precursor raw materials, installation, assembling, etc.

The allocation of gas in the IRP 2019 can theoretically be replaced with battery storage if it becomes financially viable and can offer the same service as envisioned for gas. In addition, the impact of changing gas prices may deviate the electricity cost from the least-cost path. This may have led to the declined adjustment from previous drafts, where gas was more prominent than energy storage. When included with the storage allocation as per the IRP, this represents a total market share of ~5 GW between 2022 and 2030 — 1.2% of total energy will go through storage in SA based on IRP demand forecast. Based on usability assumptions and the 5 GW total expected, industries have derived the average duration required from storage (SAESA, 2019) to be:

- If 200 days per annum, then 19.2 GWh is used per day, equating to an average of four hours per GW;
- If 250 days, then it equates to 2.7 hours per GW.

The storage association also noted that the IRP 2019 regulatory interpretation of the stand-alone vs co-located storage with a generator was unclear.

Although the local market remains small, local manufacturing to provide battery storage for both grid services and utility-scale storage may represent a viable opportunity — if manufacturers access other markets from a South African base.

4.3. Market barriers and uncertainties

Delays in the rollout of the REIPPPP and statements made by Eskom and coal labour unions about the future of renewable energy have created doubt in the market. This has to some extent been addressed by statements in support of the programme by the Presidency, the Treasury, the DMRE, and signing of BW 4; however, the timing of future energy procurements such as BW 5 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 programme;
- efforts to **support the manufacturing base, attract new investment** and build confidence;
- prioritising the **reform of the country's electricity sector** to reflect South Africa's sustainable resources and market offerings; and
- the **availability of black equity players to participate** in meeting the 12.5% BEE shareholding requirement in each project developed.

4.3.1. Ensuring continuity and transparency

The success of the REIPPP programme has largely hinged on the market size and expected longevity that the programme affords investors, as well as the lauded transparency in the programme's execution. Substantial and consistent efforts are required to maintain these conditions, especially in light of programme delays. Furthermore, markets in other parts of the world are on the rise. Consequently, local markets are facing greater competition for investments.

For current players in the market, continued delays mean financial losses and idle manufacturing facilities, as well as losses in market confidence.

As a result of the market uncertainty, the sector has seen several international business closures, halted investment decisions, and manufacturers running on skeleton staff.

4.3.2. Maintaining the country's existing manufacturing base

Recognising the REIPPPP's success in attracting investments, it is important to ensure successful implementation of projects such as the dtic's SEZ programme. Likewise, to maintain and grow the local manufacturing base, the local content and enterprise development components of the REIPPPP have to be executed effectively. Again, a long-term market view — through certainty and clarity on the rollout of the proposed 20.4 GW of wind and solar capacity allocated to renewable energy generation — is crucial to sustaining investor confidence. Beyond the uncertainty experienced by manufacturers lies the risk of projects failing to meet their local content commitments as a result of constrained manufacturing capacity and programme execution. In turn, it will increase the REIPPPP's reputational risk and affect South Africa's investment potential.

4.3.3. Eskom unbundling — reforming the country's electricity sector

The South African government has decided to unbundle 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 to allow stakeholders a more efficient approach to addressing generation, transmission, and distribution challenges separately. The process of unbundling will take place over several years (2019 – 2022). In June 2020 the Eskom CEO presented to policy makers an adjusted timeline to the unbundling process; one different to DPE's timelines.

Hopefield Wind Farm.
©GreenCape

The presentation confirmed that Eskom's timeline will now be referred to as the "baseline going forward".

This process will ensure 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 the simplification of price regulation by maintaining a unified wholesale price, protection of IPP lenders from market risk, thereby making projects more commercially viable and bankable through PPAs, and preservation of the key role of the DMRE in decisions on investment in generation capacity.

Eskom's financial sustainability

Eskom's unsustainable debt status, including its failure to service even the interest payments on its debt, is the single biggest risk to the utility's continued operation. It contributes directly to South Africa'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 will allocate to Eskom 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 18** highlights key unbundling decisions and industry impacts to be expected from these decisions.

Table 18: Eskom unbundling highlights

Eskom unbundling decision	Industry impact
Revision of the early bid rounds tariff prices	Revising tariff prices of early bid window rounds may add to the risk that is already associated with the REIPPP programme. Risks have increased because of regulatory uncertainty and the delayed IRP. However, the plan highlights that there are ongoing discussions with the affected IPPs over PPA extension as a solution to offset the losses that will be incurred by the investors and to repair dented investor confidence.
Eskom 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. As a separately managed transmission unit, the TE and intra-company competition will stimulate the market and project finance (locally and internationally). 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, as this will allow 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 have to 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 that could lead to cheap and accessible clean energy to South African communities.
Eskom Generation Entity (GE) competition	Each power station will have its own PPA with predefined, fixed, and guaranteed tariffs with the TE. Eskom will then likely seek to broaden its business by diversifying into various sectors of energy production, including renewable energy.
Eskom financial crisis	It remains unclear how the Eskom debt issue will be resolved. 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 the country's governance. However, the TE establishment will over the short term hopefully stimulate the industry 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.

Waainek Wind Farm,
Makhana, Eastern Cape.
©Kervin Prayag

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[16].

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[17]. 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).

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

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

5.1.3. Finfind database

Finfind[18] 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[19] 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

[18] https://www.finfindeasy.co.za/

[19] https://alliedcrowds.com/

THE WESTERN CAPE: AFRICA'S GREEN ECONOMY HUB

The Western Cape is a world-class investment destination.

Solar PV Installation in Cape Town CBD.
©GreenCape

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.

CLICK TO VIEW THE ATLANTIS SEZ WEBSITE

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

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 ~R41bn of investments in renewable energy projects and manufacturing. From these investments, more than19 000 jobs have been created.

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

309 200 fossil GHG emissions saved (equivalent to the electrical usage of 39 800 households in SA);

Over R120 million generated in financial benefits (additional revenue, cost savings and private investments);

69 permanent jobs in member companies, as well as 25 temporary positions, and 218 economy-wide jobs in supply chains have been created.

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