Enpower Trading

A Summary of the Current Electricity Supply Shortage:

Unique and Innovative Solutions for a more Sustainable South Africa

Electricity Supply Shortage Solutions

10 November 2022 | Authors: Ethèl Teljeur, Fathima Sheik, Sarah Truen

Updated September 2023

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Glossary

BQ	Budget Quote
CoGTA	Co-operative Governance and Traditional Affairs
CEL	Cost Estimate Letter
CO_2	Carbon dioxide
CPA	Central Purchasing Agency
cPPA	customer Power Purchase Agreement (between trader and customer)
DMRE	Department of Mineral Resources and Energy
EAF	Energy Availability Factor
ERA	Electricity Regulation Act, 2006
ESI	Electricity Supply Industry
gPPA	generation Power Purchase Agreement (between IPP and trader)
GWh	Gigawatt hours

IPP	Independent Power Producer
IRP	Integrated Resource Plan
JETP	Just Energy Transition Partnership
MFMA	Municipal Finance Management Act
NDC	Nationally Determined Contribution
NEDLAC	National Economic Development and Labour Council
NERSA	National Energy Regulator of South Africa
NTCSA	National Transmission Company of SA
OCGT	Open-Cycle Gas Turbine
OTC	Over-the-Counter
PCC	Presidential Climate Committee
PPA	Power Purchase Agreement
RE	Renewable energy
REC's	Renewable Energy Certificates
REIPPPP	Renewable Energy Independent Power Producer Procurement Programme
RfP	Request for Proposal
RMIPPPP	Risk Mitigation Independent Power Producer Procurement Programme
SALGA	South African Local Government Association
SAPP	Southern African Power Pool
SOE	State Owned Enterprises
ToU	Time of Use
TSO	Transmission System Operator
UoS	Use of System
UoSA	Use of System Agreement

01

The electricity conundrum in SA

A problem statement

1.1 Introduction

Finding a single person, community, or business in South Africa unaffected by loadshedding would be very difficult in 2022. Newspapers, on-line forums, trade magazines, radio shows, apps and podcasts are awash with discussions of the frequency, imminence and impact of loadshedding on South Africa and South Africans.

Loadshedding defined:

Loadshedding occurs when demand (load) goes unmet (shed) as parts of the grid are switched off for several hours to reduce demand.

It all started in 2007/8 when there was a 6-month period during which the first chronic power shortages occurred. At the time the main cause of the shortage was related to coal supply to coal-fired power plants. When loadshedding returned in November 2014 it would last approximately 4 months, this time attributed to the collapse of a coal storage silo and the threat of a second silo collapse at the Majuba power plant in Mpumalanga, that prevented coal from being delivered to the plant. Another plant, Duvha, also in Mpumalanga, was already out of commission at the time due to an incident earlier that year.

Table 1 Loadshedding stages explained

Stage	Energy load removed from the national grid	Pattern of impact	Percentage of time no electricity supply is available
Stage 1	< 1 000MW	6 hours over 4 days (6/96)	~6%
Stage 2	< 2 000MW	12 hours over 4 days (12/96)	~12,5%
Stage 3	< 3 000MW	18 hours over 4 days (18/96)	~19%
Stage 4	< 4 000MW	24 hours over 4 days (24/96)	~25%
Stage 5	< 5 000MW	30 hours over 4 days (30/96)	~31%
Stage 6	< 6 000MW	36 hours over 4 days (36/96)	~37%
Stage 7	< 7 000MW	42 hours over 4 days (42/96)	~44%
Stage 8	< 8 000MW	48 hours over 4 days (48/96)	~50%

Source: https://loadshedding.eskom.co.za/LoadShedding

Later in 2014 loadshedding stage 3 was announced, indicating that up to 3 000MW of power generation was needed to prevent the national power grid from collapsing due to insufficient supply. In technical terms, the loadshedding level refers to the shortfall between the capacity required to produce electricity for the peak demand and the actual available capacity, which in this case was up to 3 000MW.

This time, the loadshedding was caused by diesel shortages that constrained operation of the country's Open-Cycle Gas Turbines ('OCGTs') and insufficient water reserves at the Palmiet and Drakensberg Pumped Storage facilities.

The next periods of loadshedding in 2019 and 2020 (February-March 2019 and December 2019-March 2020) would see loadshedding increasing from stage 4 to 6 in December 2019, for the first time in South Africa's history, this time representing a culmination of years of inadequate plant maintenance, and unusually heavy rains that resulted in a decreasing Energy Availability factor (EAF) for most of Eskom's ageing plant. Sabotage of the power utility was also alleged.

In March 2021 as many as 8 power plants experienced breakdowns at the same time and loadshedding returned. Since then, loadshedding has occurred during various intervals, leading to a stage 6 crisis in June 2022 when trade unions NUM and NUMSA participated in an unprotected strike at Eskom plants, leading to a loss of 2 766MW to planned maintenance and a staggering 17 395MW to unplanned outages due to breakdowns and strike-related safety precautions. At the time, the total installed capacity in South Africa was 53 700 MW, of which as much as 37.5% was unusable. As a result, stage 5 and 6 loadshedding returned in July 2022.

The economic cost of loadshedding has been estimated at R1 bln per stage of loadshedding, per day. For stage 6, estimates range from R4-R6 bln per day,[1,2] resulting in lower GDP growth, higher unemployment, dwindling fiscal resources and countless other negative impacts on the economy. South Africa's GDP was estimated to be *'between 8% and 10% smaller than it could have been if we were not plagued by Eskom's inefficiencies and inadequacies.'*[3] According to the Efficient Group, the economy in 2021 would have been between R360 billion and R450 billion larger (after adjusting for inflation) without load shedding and other electricity challenges, and would have one million more job opportunities. As early as 2007 it was clear that South Africa was on the cusp of an electricity crisis. Fifteen years on, the problem remains unresolved. This begs the question, how did we get here? And more importantly, what do we do now?

Energy Availability Factor (EAF) defined

Energy Availability Factor of Eskom plant. It is the difference between the maximum availability and all types of plant unavailability (Planned, Unplanned and Other Capacity Load Factors) expressed as a percentage. This excludes renewables, IPPs and international imports. (Eskom)

This White Paper aims to answer these questions and outline practical approaches that can be implemented in the short to medium-term to allow the South African Electricity Supply Industry (ESI) and the South African economy to regain lost ground and hopefully, put the country on a path to accelerated economic growth.

Enpower Trading Pty Ltd is a licensed electricity trader that wants to play a pro-active role in resolving the energy crisis. As an emerging, innovative and fully regulation-compliant energy services provider Enpower Trading has prepared this

position paper to engage with a wide range of stakeholders. For more information, visit www.enpowertrading.co.za, or send an email to: info@enpowertrading.co.za.

1.2 **A perfect storm**

As famously acknowledged by President Mbeki in December 2007 when he indicated that: "*Eskom was right and the government was wrong,*"[4] South Africa urgently needed new generation capacity. Indeed, significant investment in the country's generation capacity should have commenced 5-10 years earlier. The warning signs were there. In fact, Government's own White Paper on Energy Policy (1998)[5] indicated that Eskom's present generation capacity would be fully utilised by about 2007 and that timely steps would have to be taken to ensure that demand does not exceed available supply capacity and that appropriate strategies, including those with long lead times, should be implemented in time, with the first capacity decisions due in 1999.

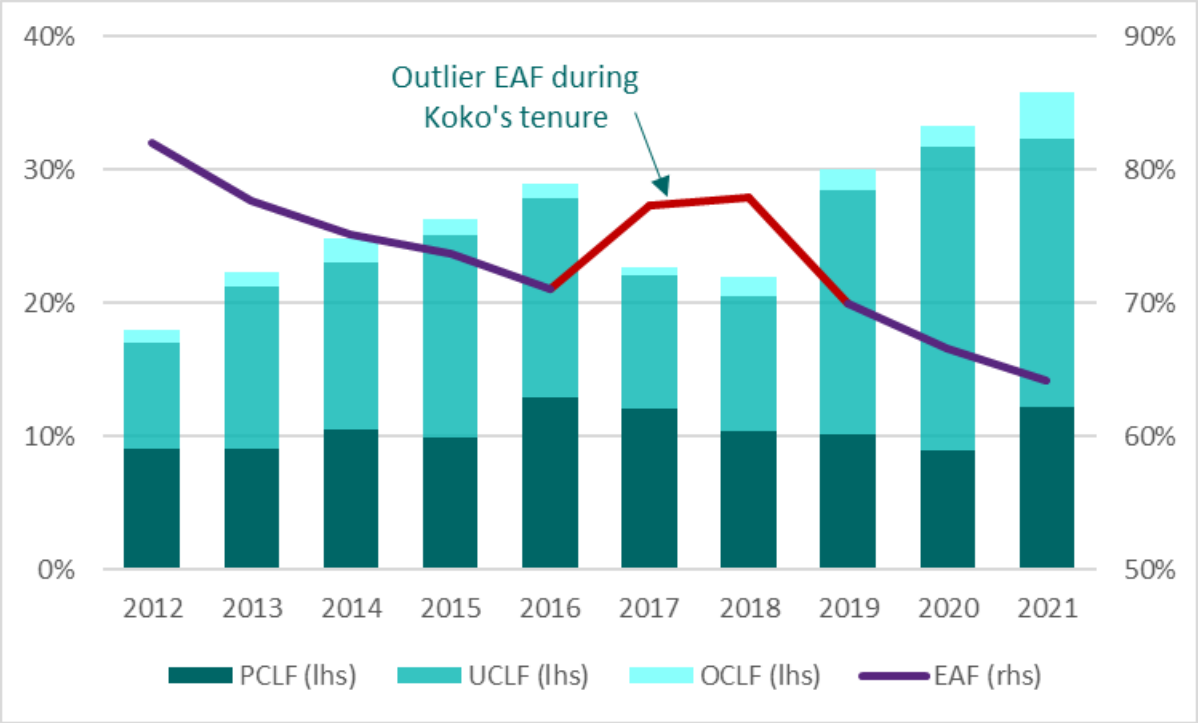
The policy that Eskom would not build any new generation stations for the capacity needed in the 2000s was not explicitly stated in the White Paper on Energy Policy, but emerged thereafter, based on the assumption that IPPs would enter the market to fill the gap.[6] IPPs were expected to build up to 30% of the total installed capacity. Unfortunately, as the enabling conditions for that to happen were not in place, market structure reforms were required, and Eskom's average electricity prices were considered too low to allow for any meaningful competition by new entrants in an unstructured ESI, the expected investment in generation did not materialise. When this became clear, Eskom was instructed to construct and fast-track two new power stations, Medupi and Kusile, which due to a myriad of factors were marred by cost overruns and construction delays, resulting in generation capacity shortfalls and a damaged balance sheet.[7]

The practice of delaying much-needed maintenance on Eskom's ageing fleet was introduced to keep the lights on for the FIFA World Cup that South Africa hosted in 2010.[8] The backlog was never eradicated as capacity shortages continued to haunt the ESI. Data suggests that after being repaired, half of power stations break down again within nine months, and the worst of these stations are out of service between 50-70% of the time, signalling problems with the maintenance services themselves, or the difficulty of maintaining prudent service intervals on rapidly ageing fleet.[9] During the tenure of Mr Koko between 2014 and 2018,[10] the management incentives were further skewed towards running the assets dangerously hard.[11] Over time, the reliability of Eskom's predominantly coal-fired plant inevitably dwindled, resulting in a rapidly declining EAF.

PCLF: Planned Capacity Load Factor
UCLF: Unplanned Capacity Load Factor
OCLF: Other capacity Load Factor

It must be noted that Eskom's EAF used to be above average in an international context, and was consistently above 90% in the late 1990s.[12] After 2001, it declined steadily to 71% in 2016, and apart from the outlier Koko years, continued declining.

Figure 1: Eskom's Energy Availability Factor and Loss factors

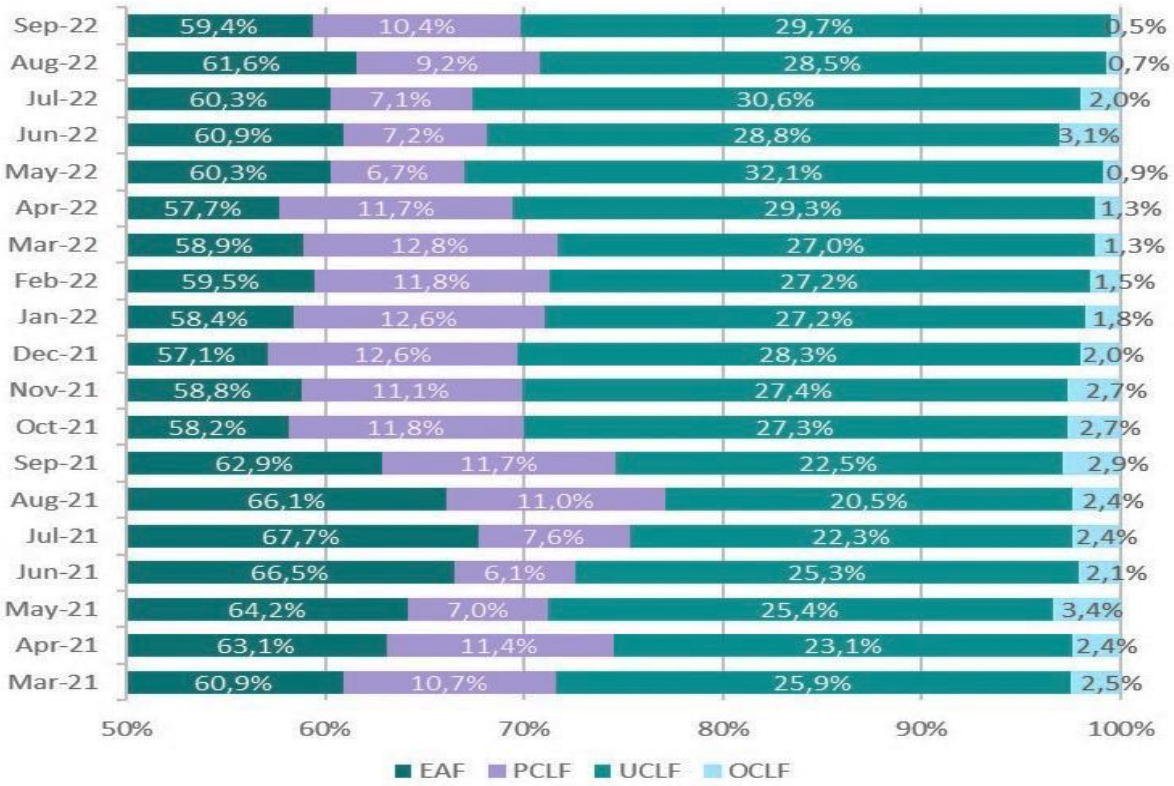


Source: Eskom 2021 Integrated Report

The EAF has consistently declined over the last four years from 71.9% in 2018 to 61.8% in 2021 (a 10.1% decrease). In 2020, Eskom's EAF was 65% with 11.2% planned outages and as much as 20.9% unplanned outages. The trend towards higher unplanned outages continued in 2021.[13]

The EAF has not recovered and is currently hovering around the 60% mark, which is a far cry from the early 2000s, when at times EAF approached 95%, and most outages were planned outages for maintenance.[14]

Figure 2 Eskom's EAF and loss factors in 2021/22



Source: Eskom data portal

Together with the falling EAF, and other problems outlined above, the country also suffered from widespread state capture in which the country's State Owned Enterprises ('SOEs') including Eskom were targeted and systematically plundered from the late 2000s onwards.[15]

State capture explained table 1

State capture is "a situation where powerful individuals, institutions, companies or groups within or outside a country use corruption to shape a nation's policies, legal environment and economy to benefit their own private interests" (Transparency International Plain Language Guide, 2009.)

"It is evidenced in South Africa in the actions of members of the Gupta family of Saxonwold, Johannesburg. It is documented widely in the news that this family has amassed a fortune through businesses that have, at various times, intersected with the state — for example, the decimation of the state-owned power utility, Eskom, through a series of deals aimed principally to directly and indirectly benefit the Gupta family and their associates. It is also evidenced in the inability of Eskom to do its job of providing safe, affordable, reliable electricity to all of South Africa." (Mail & Guardian, 14 September 2018)

A Judicial Commission of Inquiry into Allegations of State Capture, Corruption and Fraud in the Public Sector Including Organs of State was established in 2018, with its first comprehensive report published on 4 January 2022. (https://www.statecapture.org.za)

Eskom – which featured heavily in testimony delivered during the commission of inquiry – suffered around R3.8 billion in damages due to the unlawful actions of those implicated in state capture. The utility has since been trying to recover these funds, with some success. The damage done to the utility in terms of its balance sheet and reputation, resulting in a 'trust deficit' are likely to take years to repair. Eskom and the South African Government have implemented strategies to turn Eskom around and several equity injections have taken place, aimed at repairing Eskom's balance sheet. The social partners represented in NEDLAC signed the Eskom Compact in 2020, which outlines tangible interventions and assigns responsibilities to all parties to rescue Eskom from its crippling debt and decreasing plant reliability.

It has become clear however that the problem of insufficient generation capacity cannot be solved by Eskom alone, and that IPPs will be required to fund, construct and operate significant capacity in the next 20 years, this time supported by Government interventions aimed at unlocking several Gigawatts of independently built renewable energy capacity, in addition to greater private sector participation in other generation technologies.

We will discuss the state of South Africa's ESI, the current hurdles to increased generation capacity, the climate change urgency, followed by a review of the future multi-market in South Africa, the role of trading, and the impact of investment in RE, resulting in proposals for the achievement of the country's electricity policy objectives and the required enabling conditions.

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The state of the ESI

At 52.5 GW, South Africa's installed generation capacity is the largest in Sub-Saharan Africa. The electricity market remains dominated by Eskom Holdings SOC, the vertically integrated state-owned power utility that controls 88% of the country's installed generation capacity, the entire national transmission network and the bulk of the distribution network (the remainder of the distribution network is owned by municipalities). However, the private sector is playing an increasing role in electricity generation through the government's renewable energy Independent Power Producer Programme (REIPPP).

Eskom's ability to service the market has deteriorated over time and currently the country experiences frequent bouts of load-shedding coupled with rising electricity prices. To address the ongoing crisis in the ESI, the South African government has embarked on significant reforms of the industry to fundamentally alter the structure and operations of the industry. These interventions are aimed at improving the performance of the industry to ensure security of supply.

2.1 **Rising prices and supply shortages**

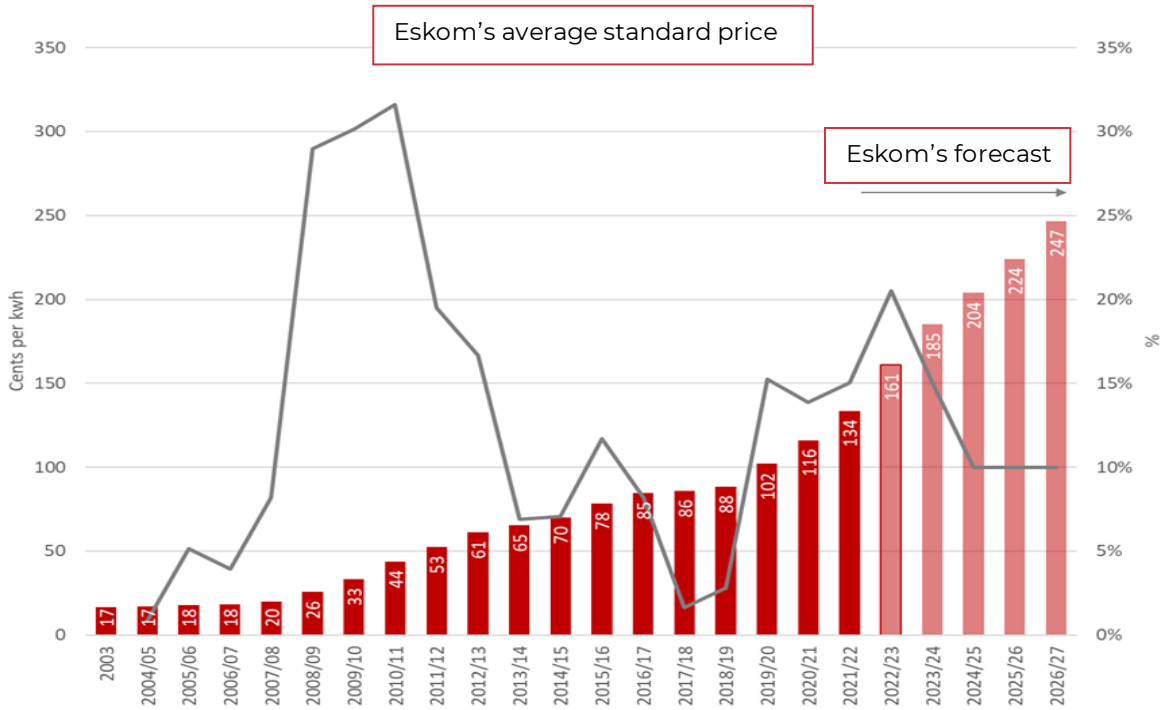
Rising electricity prices and supply shortages have characterised the South African electricity supply industry over the last 15 years. Eskom's fleet of predominantly coal-fired generation stations is ageing rapidly (the average plant age is 40 years) and on average its generation fleet has a low and worsening EAF with unplanned and planned capacity interruptions reaching up to 20 GW of installed capacity (approx. 40%).

The necessary bouts of loadshedding to maintain system stability has become an unfortunate characteristic of South African life. 2021 was the most intensive load shedding year to date with over 1 169 hours of load shedding resulting in 2 521 GWh of energy shed.[16] This reflected a 40% increase from 2020 where only 1 798 GWh was shed. The impact of the covid-19 lockdowns during 2020 on economic activity and the resulting demand for electricity and the reprieve it provided is likely the key reason for the drastic difference between the two years, indicating that the country was spared worse load-shedding due to a severe economic downturn.

In the meantime, prices started rising in the mid-2000s, reflecting both the significant budgeted capital expenditure involved in plant construction and the cost overruns in the construction of two significant new coal-fired electricity generation facilities (Medupi and Kusile), increasing coal costs, higher usage of the diesel-fired OCGTs to compensate for unplanned outages of coal-fired stations, and debt service costs. Coal costs increased sharply during the period 2005-2020 as Eskom's lower grade coal that was traditionally unsuited for export and for which its stations were specifically calibrated, became popular in emerging markets with rapidly increasing coal usage, such as China and India. This ability to export hitherto untradeable coal also gave rise to sophisticated coal theft syndicates and resulted in frequent coal quality related problems at Eskom stations.[17]

Eskom's average standard tariff is 134 cents/kWh (USD 8,77c/kWh) in FY2022 and is forecast to be 247 c/kWh by FY2027 (Eskom's forecast) (USD 16.1 c/kWh), representing an 85% increase.

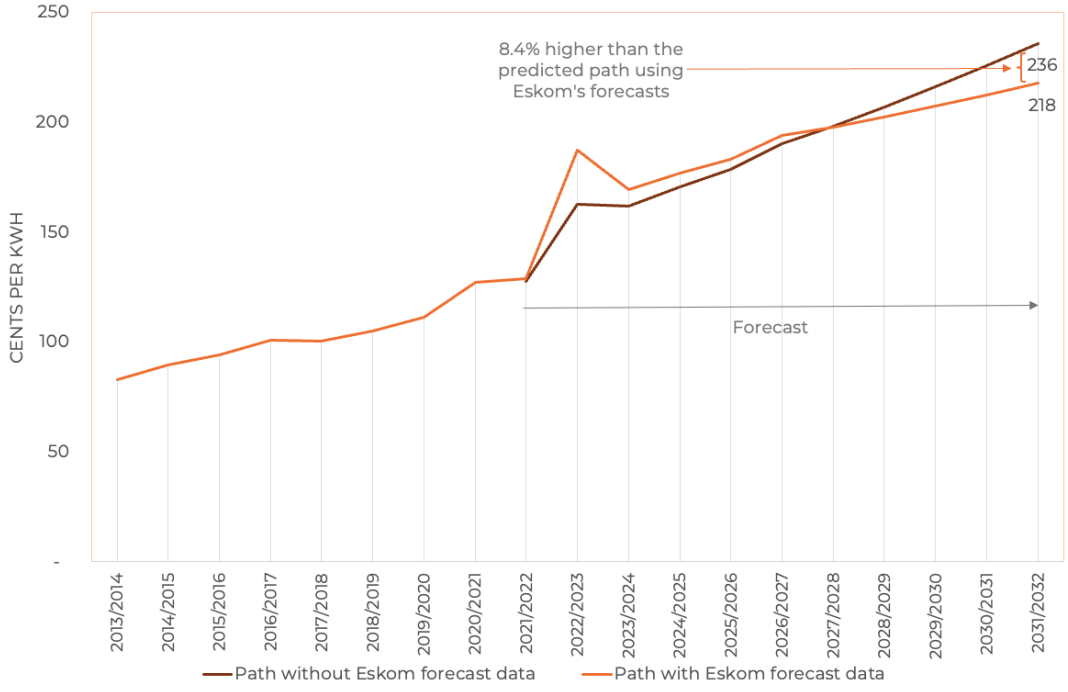
Figure 3: Eskom average prices 2003-2021 and forecast to 2027



Source: Eskom historical average standard prices available at: https://www.eskom.co.za/distribution/tariffs-and-charges/tariff-history/; Eskom Multi-Year Price - Determination (MYPD) 5 Revenue Application for FY2023 – 25, June 2021.

Independent forecasts predict even faster price increases over the next ten years. The higher prices primarily result from adjusting future cost trends according to Eskom's actual cost increases over the past ten years.

Figure 4 Average electricity price forecast 2022-2032



Source: Lungiswa Energy, 2022, South Africa's Electricity price path forecasts 2022-2032, Prepared for BUSA.

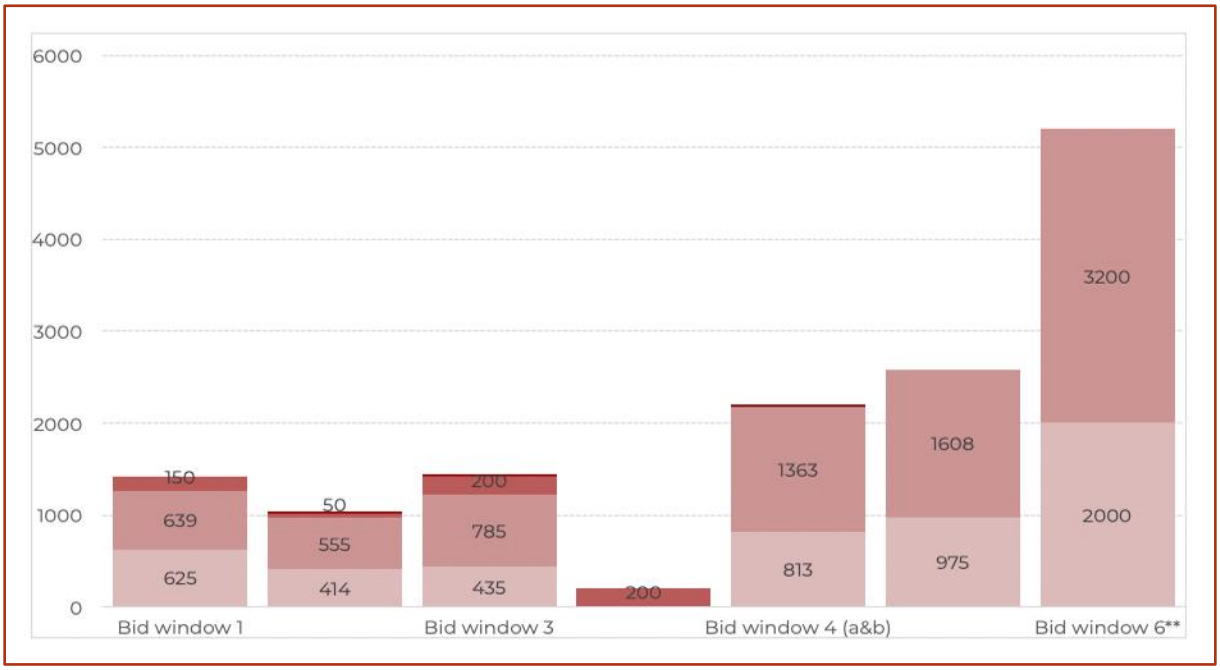
The steep increases in Eskom's average electricity prices, combined with the rapid decline in renewable energy generation costs have resulted in a situation in which renewable energy, particularly wind and solar, are competitively-priced vis-à-vis Eskom supply. This has contributed to the growth of renewable energy in South Africa's energy mix which is discussed in the following section.

2.2 The success of the renewable energy IPP programme

The one success story of the South African government's ESI policy is the REIPPPP. It was embarked upon in 2010 and over the first 5 Bid Windows yielded government procurement of primarily solar and wind generation, as well as some biomass, small hydro and landfill gas electricity generation capacity constructed and owned by IPPs.

Not all of the procured renewable energy generation capacity has been commissioned to date, and, currently (2022) approximately 6 000MW of the total installed capacity is classified as renewable. 6 380MW of renewable electricity capacity was contracted by government over the first 5 Bid Windows, from over 100 IPPs. The current Bid Window 6 is to procure another 5 200 MW of renewable energy capacity.[18]

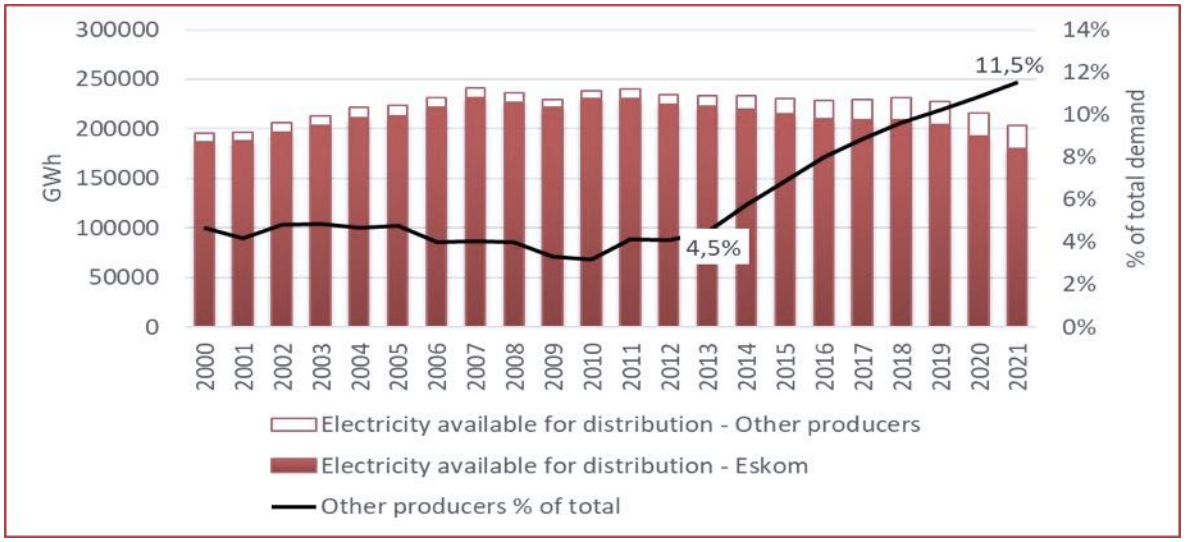
Figure 5: Renewable energy IPP procurement programme 2010-2021



* Bid Window 5 capacity is based on the contracted capacity from the list of preferred bidders announced in October 2021. ** Bid Window 6 was increased from 2600 MW to 5200 MW by the President in his July 2022 announcement on interventions in the electricity supply industry.

The graph below shows that the REIPPPP has seen a significant impact by IPPs on the national supply of electricity, more than doubling the GWhs supplied by IPPs in the last 10 years to a total of 11.5% in 2021.

Figure 6: Electricity available for distribution from Eskom and IPPs and growth in IPP supply



Source: Author's analysis based on Statistics SA P4141, data up to July 2021.

Due to Eskom's weak balance sheet all Power Purchasing Agreements (PPAs) entered into by Eskom are Government guaranteed, although a weakening fiscal position and an alarming level of government's contingent liabilities suggest this is unsustainable over time. This provides an opportunity not only for IPPs but particularly for traders to provide the much-needed liquidity in the private electricity generation market.

The underwriting of the REIPPP programme by sovereign guarantees has led to more competitive bid prices and has provided a strong impetus to the local renewable energy industry. One of the unintended consequences of the REIPPP programme is that the highly competitive process resulted in many bankable and well-structured projects being conceptualised of which only a share would be commercialised as winning bidders. This led to many potentially bankable projects being stranded. Stranded projects currently have the opportunity to be developed to supply power to the commercial and industrial sector due to two significant ESI developments. The first is the permission for private suppliers to wheel power through the national grid from a generation source to any consumer (capacity permitting). The second development is the removal of the requirement of a generation licence for new embedded generation.[19] As a result of these developments, the previously REIPPP stranded but shovel-ready capacity provides a significant opportunity for electricity traders (such as Enpower Trading) to connect these IPPs to creditworthy off-takers across the country.

A further impetus for increasing the share of renewables in the South African generation mix is provided by climate change and international commitments to reduce harmful greenhouse emissions. At the COP26 summit in 2021 international Development Finance Institutions pledged considerable concessional finance

contributions for South Africa's Just Transition, aimed at the accelerated decommissioning of Eskom's coal-fired plants, to be replaced mainly with renewable electricity generation capacity and gas-fired power electricity. Eskom will not be able to finance the required investment in renewable energy and gas-fired generation and therefore private generation of the required capacity will be required.

2.3 **Significant legislative, policy and regulatory reforms under way**

The ongoing crisis has precipitated the implementation of several extensive reforms of the legislative, policy and regulatory framework of the South African ESI. Although these interventions are not guided by a recent overarching policy statement (the last White Paper on Energy Policy was gazetted in December 1998), the objectives are clearly designed to ensure the long-term security of electricity supply.

The reforms are aimed at liberalising the ESI, facilitating further private investment in generation capacity and creating a level playing field between public and private generators of electricity. Eskom is currently in the process of unbundling its operations into three separate companies for generation, transmission and system operations and distribution. The restructured electricity supply industry will likely mirror liberalised electricity supply industries in other countries where private generation exists alongside public generation and fair competition is facilitated through an independent market and system operator. The required legislative amendments to facilitate the unbundling and restructuring of the industry is currently before the South African parliament. These include the Electricity Regulation Act ('ERA') Amendment Bill (2022) and the draft Electricity Pricing Policy (2022). The National Energy Regulator of South Africa ('NERSA') is currently reviewing the electricity pricing determination methodology to make it more applicable to a liberalised and competitive electricity industry. However, industry experts and stakeholders have identified a range of issues with the current draft and specifically its potential impact on the level of electricity prices.

The Integration Resource Plan ('IRP') is the planning tool used by the South African government to determine the energy mix and capacity to meet the country's electricity demand requirements.[20] It is periodically reviewed and updated. The IRP process has been criticised as being inflexible and review processes being lengthy. The last update was done in 2019 and took a period of 5 years to be finalised which means that by the time the plan is approved it is arguably no longer relevant. The DMRE is currently undertaking a review of the IRP2019 and it is anticipated that the draft for public consultation will be published towards the middle of 2023. Together with the ERA Amendment Bill and the Electricity Pricing Policy, the industry is poised for greater liberalisation, and significant private sector involvement in electricity generation and trading.

Integrated Resource planning

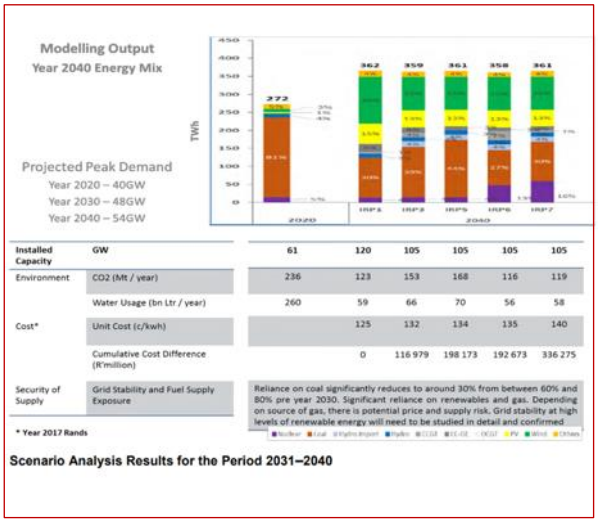
The Integrated Resource Plan refers to the co-ordinated schedule for generation expansion and demand-side intervention programmes, taking into consideration multiple criteria to meet electricity demand. The first IRP (2010-2030) was published in 2011, it was reviewed in 2016 but not Gazetted and a revised IRP was published in 2019 (2018-2030).

Integrated Resource Plan (IRP2019)

	Coal	Nuclear	Hydro	Storage (Pumped Storage)	PV	Wind	CSP	Gas / Diesel	Other (CoGen, Biomass, Landfill)	Embedded Generation
2018	39 126	1 860	2 196	2 912	1 474	1 980	300	3 830	499	Unknown
2019	2 155					244	300			200
2020	1 433				114	300				200
2021	1 433				300	818				200
2022	711				400					200
2023	500									200
2024	500									200
2025					670	200				200
2026					1 000	1 500		2 250		200
2027					1 000	1 600		1 200		200
2028					1 000	1 600		1 800		200
2029					1 000	1 600		2 850		200
2030			2 500		1 000	1 600				200
TOTAL INSTALLED	33 847	1 860	4 696	2 912	7 958	11 442	600	11 930	499	2600
Installed Capacity Mix (%)	44.6	2.5	6.2	3.8	10.5	15.1	0.9	15.7	0.7	

Installed Capacity
Committed / Already Contracted Capacity
New Additional Capacity (IRP Update)

Proposed Updated Plan for the Period Ending 2030



Scenario Analysis Results for the Period 2031–2040

Several regulatory requirements for obtaining generation licences have been eased. The threshold for the need to obtain a generation licence for electricity generation projects was removed for projects with a capacity of less than 100MW in August 2021.[21] Subsequently the President removed the threshold entirely in his July 2002 announcement. In effect, embedded generation developers will only

need to register the projects with NERSA and will not be required to obtain a licence. In addition, new regulations were issued to facilitate procurement of capacity by municipalities, although in practice, it remains challenging for municipalities to procure or construct electricity generation capacity, due to the dire financial straits of many municipalities and cumbersome procurement rules. The Government has issued a blanket approval for deviation from the country's Integrated Resource Plan, which up to that point in time rendered private generation high-risk due to the uncertainty associated with the required ministerial approval for self-generation. More recently, the Energy Regulator NERSA has relaxed some of its requirements for generation capacity registration to facilitate independent power generation.

In 2020 an Eskom Social Compact was entered into by the Government and representatives of the social partners (business, organised labour, and communities as represented in the National Economic and Labour Council of South Africa in which new policies and legislation is reviewed). The Eskom Social Compact outlines short, medium and long-term interventions aimed at ensuring Eskom is kept financially viable, its balance sheet able to be improved, and load-shedding is managed. Many of the interventions detailed in the compact have been achieved and many others are currently being implemented. The implementation of the social compact is monitored by a NEDLAC committee formed for this purpose.

As mentioned in Section 1, despite these developments, South Africa experienced the highest stages of load-shedding to date in July 2022. This prompted swift intervention by the South African President who announced several actions aimed at significantly improving the electricity supply shortages in the short term as well as more longer-term interventions. The interventions were aimed at improving the performance of Eskom's generation fleet, the purchasing and procurement of additional generation capacity, removing legal and regulatory obstacles to new generation capacity, the transformation of the ESI structure and investing in rooftop solar PV. The implementation of these interventions will be overseen by a National Electricity Crisis Committee made up of representation from all ministries and entities involved in the supply of electricity.

The President also established the Presidential Climate Committee (PCC) in 2020 which is mandated to oversee and facilitate a just and equitable transition towards a low-emissions and climate-resilient economy. Its mandate therefore is broader than simply developing the framework for transitioning the ESI from coal-fired generation towards more low-emissions and renewable sources (46% of South African's carbon emissions are from electricity generation).[22] Transitioning South Africa's economy away from coal-fired electricity supply in the context of an electricity supply shortage is a particularly challenging task which needs very careful consideration and management.

Figure 7: South African government's interventions in the electricity supply industry

Interventions by SA Government in the ESI

President's July announcement

- National Energy Crisis Committee to oversee implementation;
- Improved performance of Eskom's existing generation fleet;
- The purchase of additional electricity supply from existing sources;
- The development of a solution to Eskom's debt;
- The procurement of additional electricity generation capacity;
- Facilitating private generation capacity; and
- Investment in rooftop solar PV
- The transformation of the structure of the industry.

Policy, legislative and regulatory reforms

- ERA Amendment Bill and Draft Electricity Pricing Policy dealing with amendments to facilitate the unbundling of Eskom and a liberalised wholesale market for electricity;
- Integrated Resource plan review;
- NERSA's draft Electricity Pricing Determination Methodology aimed at revising the methodology used to determine electricity prices to accommodate a more competitive and open ESI.

Presidential Climate Committee

- Established in 2020 to support the delivery of the just transition in South Africa.
- The PCC is mandated to oversee and facilitate a just and equitable transition towards a low-emissions and climate-resilient economy.
- Key components of its work include:
  - Just Transition Framework
  - Just Energy Transition
  - Climate Finance
  - Mitigation
  - Adaptation
  - Communications and Outreach.

Eskom social compact

- Entered into by the social partners including government, labour, communities and business.
- Outlines short, medium and long-term interventions
- Interventions aimed at ensuring Eskom is kept financially viable, its balance sheet able to be improved, and load-shedding is managed;
- Implementation overseen by NEDLAC Committee.

Other interventions

- Renewable energy IPP programme since 2010;
- Establishment of Operation Vulindlela to remove regulatory hurdles in 2020.
- Increasing the threshold for generation licences;
- Regulations to enable municipalities to procure generation capacity;
- Relaxing of the requirements for registration of a generation project;
- President's announcement of the unbundling of Eskom in 2019 State of the Nation address

03

Hurdles to increased electricity supply

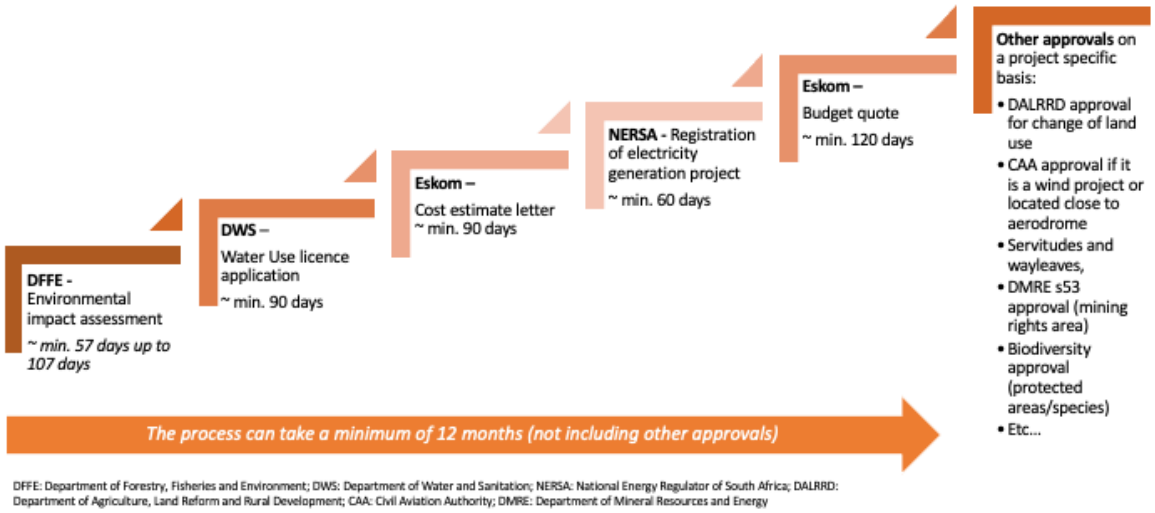
Despite the efforts by government to remove the hurdles to increased electricity supply, capacity is not being added to the grid fast enough. There still remain quite significant hurdles for new electricity generation projects.

3.1 Lengthy and cumbersome regulatory approvals process

The removal of various obstacles to increased generation capacity introduced by the government (as discussed in Section 2.3 Significant legislative, policy and regulatory reforms under way) has meant that it is now easier for companies to invest in electricity generation projects. The licensing requirements have been relaxed, Ministerial approval for deviation from the IRP provisions is no longer required, etc. However, there remain several regulatory hurdles that investors need to comply with prior to construction of their electricity generation projects.

There are lengthy and cumbersome administrative processes related to the licences, authorisations and other approvals that new generation projects need to obtain and comply with. These include approvals for environmental impacts assessments, water use licence applications, registration of the generation projects with NERSA, and obtaining access to the transmission grid, which requires a Cost Estimate Letter ('CEL') and associated Budget Quote ('BQ') from Eskom. Currently, the processes involved in obtaining these approvals and authorisations will take a minimum of 12 months even if some are undertaken concurrently. Water use licences can take 311 days before any appeals are taken into account. Other approvals required include a change of land use authorisation or approval from the civil aviation authority if the project is a wind project, etc. The complex nature of these processes including issues of concurrent jurisdiction between different authorities and co-dependencies between some approvals means that the approval process often takes longer than 12 months. This is particularly concerning given the need for additional generation to be brought onto the grid as soon as possible.

Figure 8: Simplified schematic of the regulatory and administrative processes required for a new generation project



Source: Lungiswa Energy, 2022

The complexity is even greater for municipalities intending to procure their own electricity generation capacity. In addition to the approvals cited above, municipalities will need to comply with municipal finance regulations and by-laws. In terms of the Municipal Finance Management Act ('MFMA'), municipalities require approval from National Treasury, DMRE and Department of Co-operative Governance and Traditional Affairs ('CoGTA') as well as a public consultation process for long term contracts such as PPAs. Municipalities will also need NERSA approval for any required changes to the electricity price and tariff structure due to, for example, the introduction of municipal supply of renewable energy or new distribution charges (wheeling tariffs).

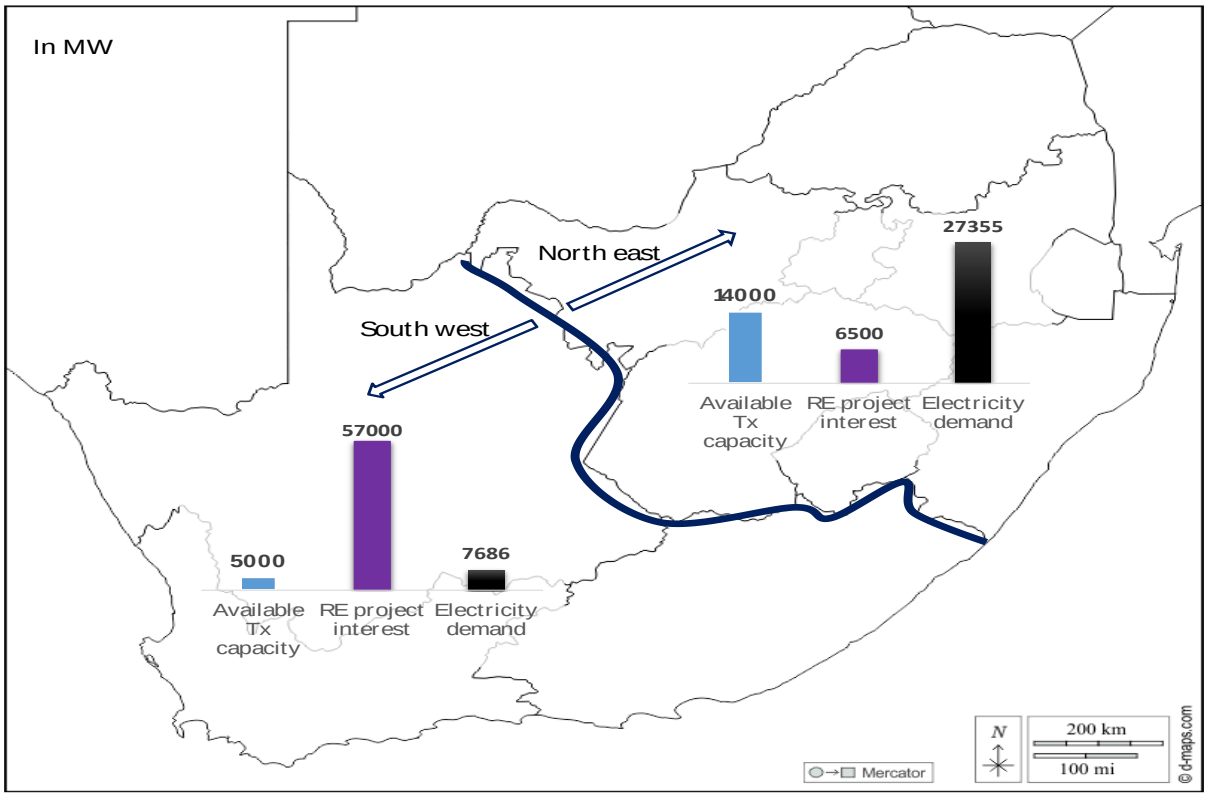
Several efforts are underway to simplify and shorten the regulatory approvals process for both private investors and municipalities. Operation Vulindlela, a programme initiated by the President in October 2020, is tasked with supporting the implementation of priority structural reforms in South Africa including that in the ESI. One of its tasks is to streamline and shorten the regulatory and approvals processes to enable projects to commence construction more rapidly. Further, in June 2022, the National Treasury released an MFMA circular to enable municipal procurement of generation capacity.[23] As this is a recent development, we are yet to see how this framework works in practice and whether it removes some of the hurdles to municipal procurement of electricity generation capacity.

It is important to also note an anomaly in South Africa's licensing regime for traders. At present NERSA licenses traders (to be further discussed in the next section) by issuing a national trading licence, in which the distribution and/or transmission areas in which trading is to take place, as well as the individual suppliers, customers, volumes and prices are contained in the schedules appended to the licence certificate and licence conditions. In practice this means that a trader needs to apply for a trading licence amendment each time a distribution area is added to its operations and must have its supplier and customer schedule updated each time before trading with the supplier or customer can take place. There is no need for this onerous approach, nor can a justification for the schedules be found in the ERA. Once a trader is licensed, its operations can only extend if it provides customers and generators with value for money offerings and if the network transmission and distribution operators provide access at regulated use of system tariffs. Non-discriminatory access to the grids is required as per the ERA, wheeling charges are regulated and customers are not barred from choosing their supplier by eligibility criteria. It is therefore not clear why trading in particular is regulated in this manner. With the lifting of the licensing threshold for generators, the generators are able to construct generation capacity, generate and sell electricity to customers, without requiring any licence. It is also clear that Eskom, itself a trader, is not licensed or regulated in this manner, thereby constituting an asymmetric approach to electricity trading regulation. We will come back to this issue in several sections of this discussion paper.

3.2 Capacity constraints on the transmission network

Another constraining factor is the limited capacity of the transmission and distribution infrastructure. Significant investment in the transmission and distribution network is required to support the expansion of renewable energy generation capacity. The conundrum that South Africa faces is that the areas with the strongest renewable energy resources (sun and wind) are in areas with relatively lower demand (compared to other areas) and where the available transmission capacity is the lowest. Eskom estimates that more than R 130 billion will be required for the expansion of the transmission network in the next 10 years. A further challenge is the funding for new and upgraded existing transmission capacity given Eskom's constrained balance sheet and government's limited capacity to provide sovereign guarantees. This investment is particularly crucial if South Africa is to replace its traditional coal-fired electricity generation concentrated in the north-east of the country with renewable energy generation capacity primarily located in the south-west.

Figure 9: Available transmission capacity, renewable project interest and electricity in the south west and north east of South Africa

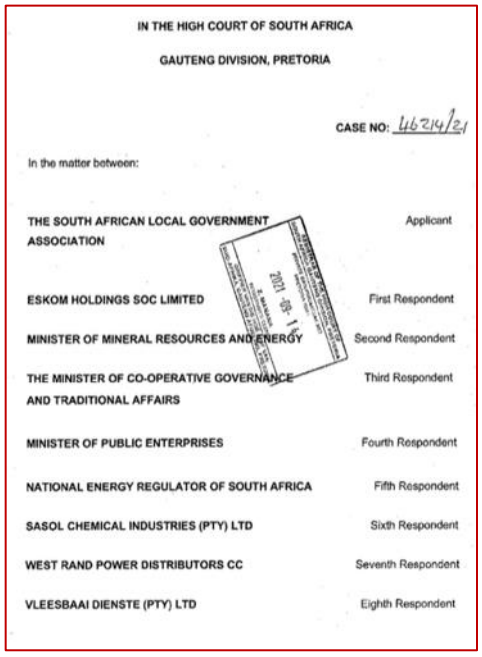


Source: Author's figure based on slide 5 and 11 of presentation on the importance of the grid by R Marais at the PCC Energy Dialogue on Grid Integrity and Planning, 4 August 2022.[24]

3.3 **Access to the transmission and distribution networks**

For additional generation capacity to be brought onto the grid, it is essential that IPPs and electricity traders can access the electricity transmission and distribution networks. There has been an unwillingness on the part of municipalities (and to some extent Eskom) to provide access to the distribution (and transmission) networks. The reluctance on the part of municipalities is due to the concern on the impact on its revenue as municipalities rely on electricity sales for much of the revenue they generate. This is reinforced by municipalities' belief that local government authorities have the exclusive right to supply electricity within their municipal jurisdictions. Despite a judgement in the matter of NCP Chlorchem vs National Energy Regulator and Others,[25] establishing that municipalities do not have the exclusive right to supply electricity within their municipal jurisdictions, the South African Local Government Association ('SALGA') applied to the High Court in September 2021 to declare that municipalities have exclusive authority to reticulate electricity within their jurisdiction.[26] The matter is currently sub judice.

It is important to note that the introduction of third party electricity traders into the municipal grid does not have to impact municipal revenue negatively at all. The trading business model can be designed to ensure that municipalities remain surplus (profit) neutral while achieving the benefits of diversified electricity supply. Enpower Trading has developed a bespoke municipal trading model that enables the municipality to attain surplus-neutrality, thereby safeguarding the funds required for cross-subsidisation of other municipal services, whilst providing customers with competitively-priced green energy. Enpower Trading has successfully implemented this business model in the Western Cape and is poised to introduce its approach in other Provinces.



IN THE HIGH COURT OF SOUTH AFRICA

GAUTENG DIVISION, PRETORIA

CASE NO: 46214/21

In the matter between:

THE SOUTH AFRICAN LOCAL GOVERNMENT ASSOCIATION	Applicant
ESKOM HOLDINGS SOC LIMITED	First Respondent
MINISTER OF MINERAL RESOURCES AND ENERGY	Second Respondent
THE MINISTER OF CO-OPERATIVE GOVERNANCE AND TRADITIONAL AFFAIRS	Third Respondent
MINISTER OF PUBLIC ENTERPRISES	Fourth Respondent
NATIONAL ENERGY REGULATOR OF SOUTH AFRICA	Fifth Respondent
SASOL CHEMICAL INDUSTRIES (PTY) LTD	Sixth Respondent
WEST RAND POWER DISTRIBUTORS CC	Seventh Respondent
VLEESBAAI DIENSTE (PTY) LTD	Eighth Respondent

Salga (2021); notice of motion; High Court of South Africa Gauteng Division, Pretoria, Case Number 46214/21.

Electricity trading in South Africa is a growing market where only three traders are currently licensed. PowerX was licensed in 2009 and was born out of a government initiative. PowerX supplies in one municipality, the Nelson Mandela Bay Municipality, where recently a second electricity trader, Neura Trading (name changed to Etana Trading), was licensed to trade in electricity. Enpower Trading trades in George Municipality of the Western Cape Province and has secured agreements with other municipalities in the Western Cape. In addition, it has entered a trading research project in the City of Cape Town and is in advanced discussions with municipalities in other provinces. These developments are likely to demonstrate to

municipalities the benefits of allowing third-party traders to trade on their networks.

Electricity trading also offers benefits to companies that want to self-generate. Due to the indivisible and modular nature of electricity generation capacity, companies may have to build larger generating units than those required to meet their demand. The ability of traders to purchase this excess capacity and sell it to other customers further enhances the bankability of the project particularly given the lack of credit-worthy municipal off-takers. The resulting excess capacity can be purchased by electricity traders and sold to other customers.

3.4 **Lack of a comprehensive wheeling framework**

A further complicating issue that is hindering the growth of electricity trading and constraining municipalities' ability to procure new generation capacity is the lack of a comprehensive wheeling framework. Wheeling enables generators to transport electricity to an end-customer over the existing transmission or distribution network. The lack of a framework means municipalities currently do not have the tools to enable them to effectively handle applications for wheeling. A comprehensive framework should provide a roadmap for handling applications, guidance on the determination of tariffs and application procedures and requirements.

04

The climate change urgency

Evidence is growing that climate change will impact severely on South Africa. To date, temperatures in South Africa are growing faster than the global average,[27] and the incidence of severe weather events is rising.[28] In an already arid country, it is likely that climate change will also affect the quantity and quality of water supply,[29] with major implications for social and economic wellbeing. It is thus vital that South Africa contributes effectively to the global imperative to reduce carbon emissions.

At present, however, the South African economy remains highly carbon-intensive. As at 2020, Climate Transparency estimated that South Africa in fact had the highest carbon intensity in the G20, at 76 tonnes of CO_2 per terajoule.[30] This high carbon intensity is closely linked to the energy mix in South Africa. As shown in the adjacent figure, 91% of energy is derived from fossil fuels at present, with only a 5% contribution from renewables. The share of coal is particularly high, reflecting the fact that coal powered plants supplied 87% of South African electricity in 2020.[31]

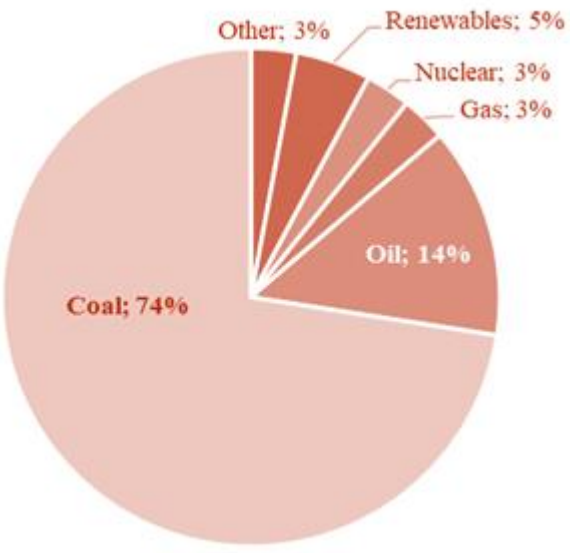
Climate change mitigation in South Africa will thus necessarily need to include the accelerated phasing out of coal-fired electricity plants. This is acknowledged in South Africa's 2020/21 update of its Nationally Determined Contribution ('NDC') under the Paris Agreement, which states that

"The long-term decarbonization of the South African economy will in the 2020s focus primarily on the electricity sector"[32]

Achieving the transition to clean power will require financial support and a carefully designed incentive system, to ensure that the much-needed investment in new generation assets is affordable and well designed. A key part of this framework going forward will be the Just Energy Transition Partnership ('JETP'), agreed between the governments of South Africa, France, the EU, UK, US and Germany in November 2021. The JETP aims to support the transition towards renewable energy in South Africa, while honouring social justice and equity objectives. USD8.5 billion has been committed to South Africa over the next three to five years, with a focus on the power sector.[33]

Decarbonisation and JETP are already a key part of Eskom's strategy going forward. Moving into 2050, Eskom plans to de-commission 13 coal-fired plants, with the process being put in motion before 2025 at Arnot, Camden, Hendrina, Komati and Grootvlei. Simultaneously, Eskom plans to add significant new clean generation and transmission capacity to the grid. The de-commissioned Komati plant in particular has been identified as a flagship project, which will be repowered and repurposed with, among other projects, a 100 MW solar photovoltaic plant, supported by 150 MW installed battery storage capacity.[34]

Figure 10: Total primary energy supply (PJ) by source, 2020



Source: adapted from Climate Transparency South Africa 2021 report, page 6. NB figures are rounded.

Private sector investment in renewables is also growing, facilitated by recent regulatory changes and a rejuvenation of the REIPP programme. As at time of writing, REIPP bid window 5 is expected to reach conclusion soon, and a new RFP has been issued for bid window 6. In addition, the delays introduced by the licencing process have been lifted for generation projects entirely, and attempts are being made to simplify the NERSA registration process in general. Municipalities are now able to procure power independently, and work is being done to implement municipal level wheeling frameworks and tariffs, to put into place the practical systems needed to facilitate these new arrangements.[35] These developments will reduce the barriers to private sector investment in generation capacity which have to date slowed supply responses to the electricity crisis.

A number of initiatives are also being put in place to spur a demand response to clean energy. The 2020 introduction of the carbon tax is an important component of this, as it begins to tie back the pollution externality costs to the polluting party. The carbon tax was introduced at a rate of R120 per ton of carbon dioxide equivalent emissions, for polluters that operate emissions generation facilities that are equal to or above the carbon tax threshold. The Carbon Tax Act 2019 further allows emitters to claim off-sets against their carbon tax liability.

One method of reducing one's carbon footprint, and reducing the need to purchase off-sets, is the renewable energy certificates (RECs) mechanism. RECs have been used internationally for over a decade, as a way of monetising the carbon benefits of clean energy, particularly by allowing trading in the associated certificates to be traded. Voluntary REC markets have now been established in South Africa. As it can be prohibitively difficult to connect directly to a clean power source, RECs provide a way of separately accounting for the carbon benefits associated with clean generation. A user that wants the benefits of clean energy can thereby use energy off the grid, and purchase the REC separately to show its commitment to decarbonisation. The REC's revenues return to the renewables generator, helping to further incentivise investment in green energy. It is clear that the impetus for clean energy investments is strong, and that the regulatory and investment environment in South Africa increasingly are enabling rapid growth in this sector.

05

The future is now

The imminence of the future multi-market for electricity

The principles of a restructured electricity supply industry and an unbundled Eskom were detailed in the 1998 White Paper on Energy Policy. These included introducing competition in the industry, specifically, generation, permitting open and non-discriminatory access to the transmission network, encouraging private sector participation in the industry and giving customers the right to choose their electricity supplier.[36] It also detailed the separation of Eskom into separate generation and transmission companies. These principles are only coming to fruition now, some 24 years after the White Paper was published.

The current reforms will lead to an unbundling of Eskom into three separate companies for generation, transmission/system operations and distribution. It will also establish a multi-market allowing willing buyers and sellers of electricity to trade using different contractual arrangements. The proposed reforms and their impact on the South African ESI are discussed below.

5.1 **An unbundled Eskom**

The President announced in his 2019 State of the Nation address that Eskom was to be unbundled into three separate subsidiaries – generation, transmission/system operations and distribution. Eskom is in the process of unbundling its operations according to the Roadmap published by the Department of Public Enterprises in the same year. The functional separation of the three entities was completed in 2021 and the legal separation of the transmission and system operations into the National Transmission Company of South Africa ('NTCSA') was completed at the end of that year. The legal separation of the generation and distribution operations will be completed in 2022. The structure of Eskom will be as depicted in the adjacent figure. It is expected that all three subsidiaries will remain state owned.

5.2 **The wholesale competition model of electricity sector reform**

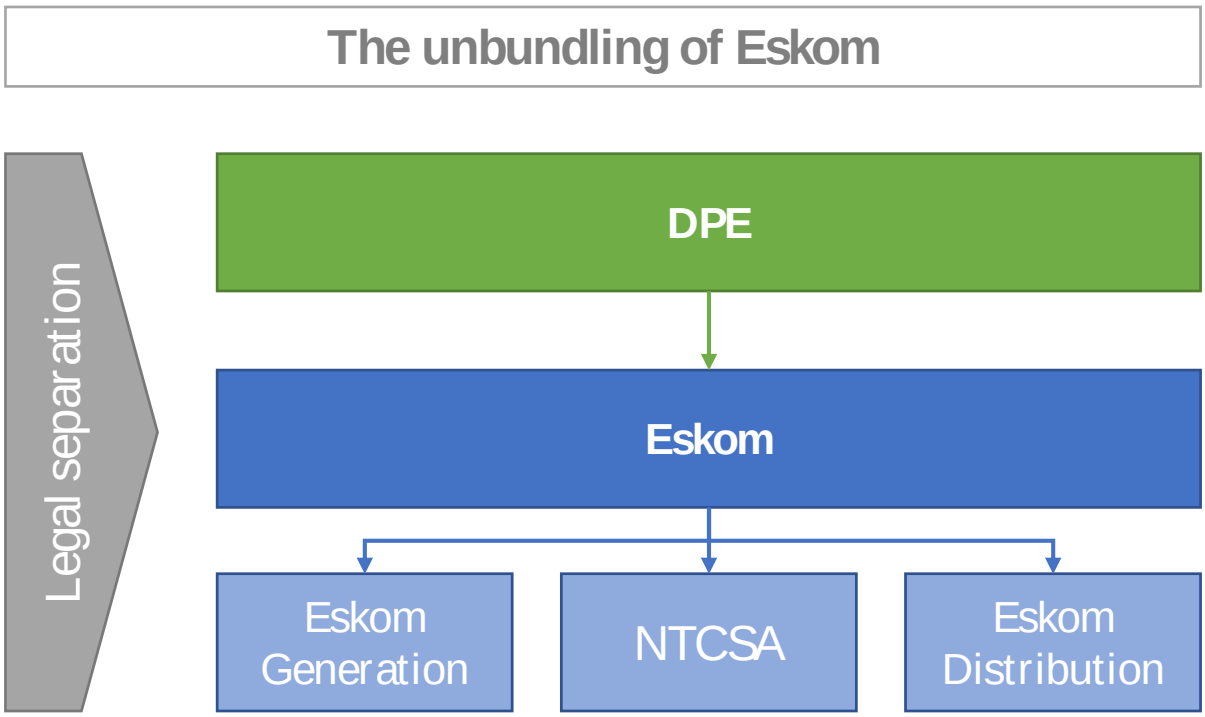
The unbundling of Eskom will therefore precipitate the restructuring of the ESI as well as changes in the way the wholesale electricity market operates. Thus far, the South African ESI has followed a single-buyer model. The proposed end state of the ESI appears to follow a 'wholesale competition' model of electricity sector reform. The main characteristic of this model is that transmission operation is separated

from generation activities thereby enabling competition in generation. There are two variations of this model:

01 The first variant is characterised by a power exchange pool where generators sell electricity to distribution companies, i.e. there are multiple buyers;

02 In the second variation, customers are able to purchase electricity directly from generators through long term contracts. Typically only those customers that consume above a pre-determined amount of electricity (that increases over time) are eligible to contract directly with generators. This enables greater competition between IPPs and incumbent generator/s.

Figure 11: The unbundled structure of Eskom



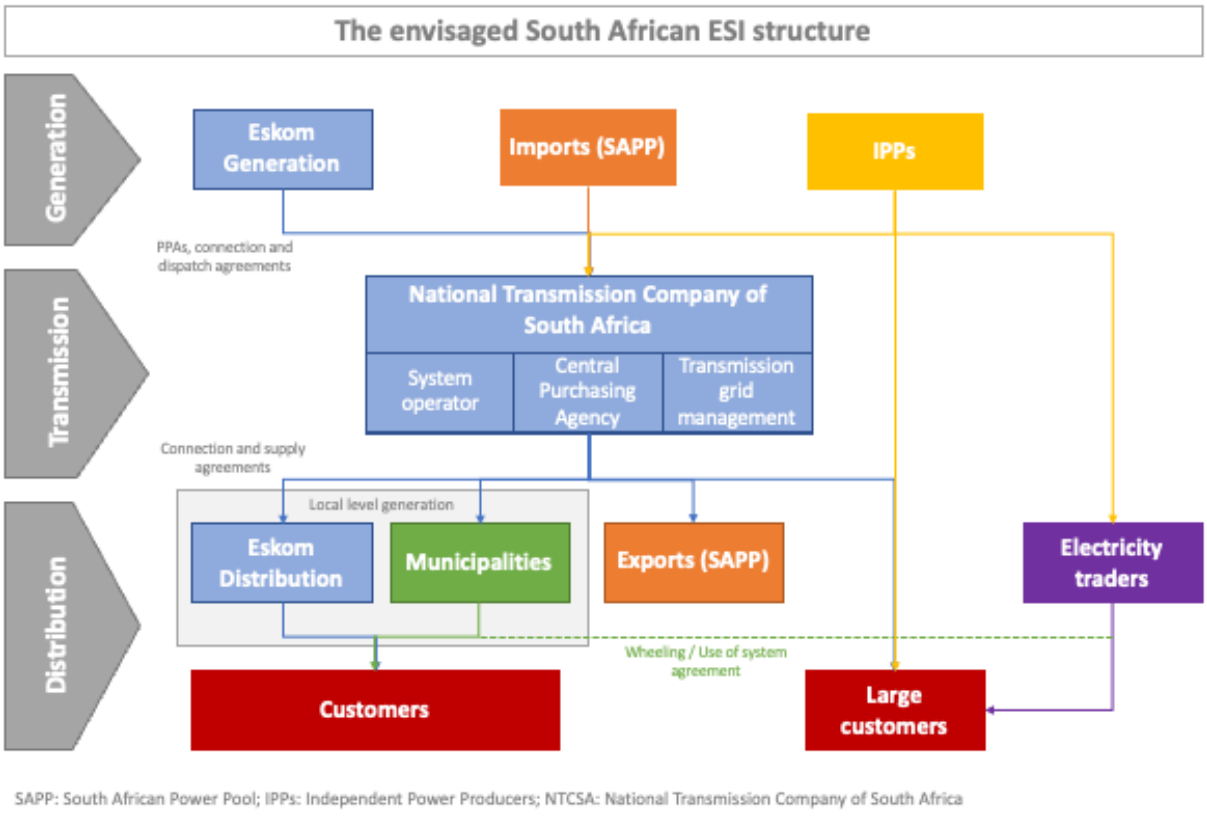
DPE: Department of Public Enterprises
NTCSA: National Transmission Company of South Africa

Source: Lungiswa Energy, 2022

Based on the current proposed changes to the ESI, the 'envisaged' South African ESI will be characterised by Eskom generation competing alongside IPPs, where system operations and transmission services will be undertaken by an independent entity and Eskom distribution and municipalities will supply customers together with 'independent' electricity traders as conduits between generators, distributors, and customers. Customers can procure electricity in via bilateral agreements with generators or traders, resulting in a so-called Over the Counter ('OTC') market, which is typically for medium and longer-term supply agreements. In addition, a Day Ahead market will be established in which short-

term electricity trading can take place. It therefore appears that South Africa has adopted the wholesale competition model of electricity sector reform, albeit using a hybrid between the two variations. Specifically, the South African wholesale competition model combines both the first (power pool exchange) and second variations (long term contracts between generators and eligible customers) of the wholesale competition model. Of particular interest is the establishment of a Central Purchasing Agency ('CPA') that will continue to play the role of the Single Buyer. The envisaged end state of the South African ESI is depicted in the figure below as follows:

Figure 12: The envisaged structure of the South African electricity supply industry

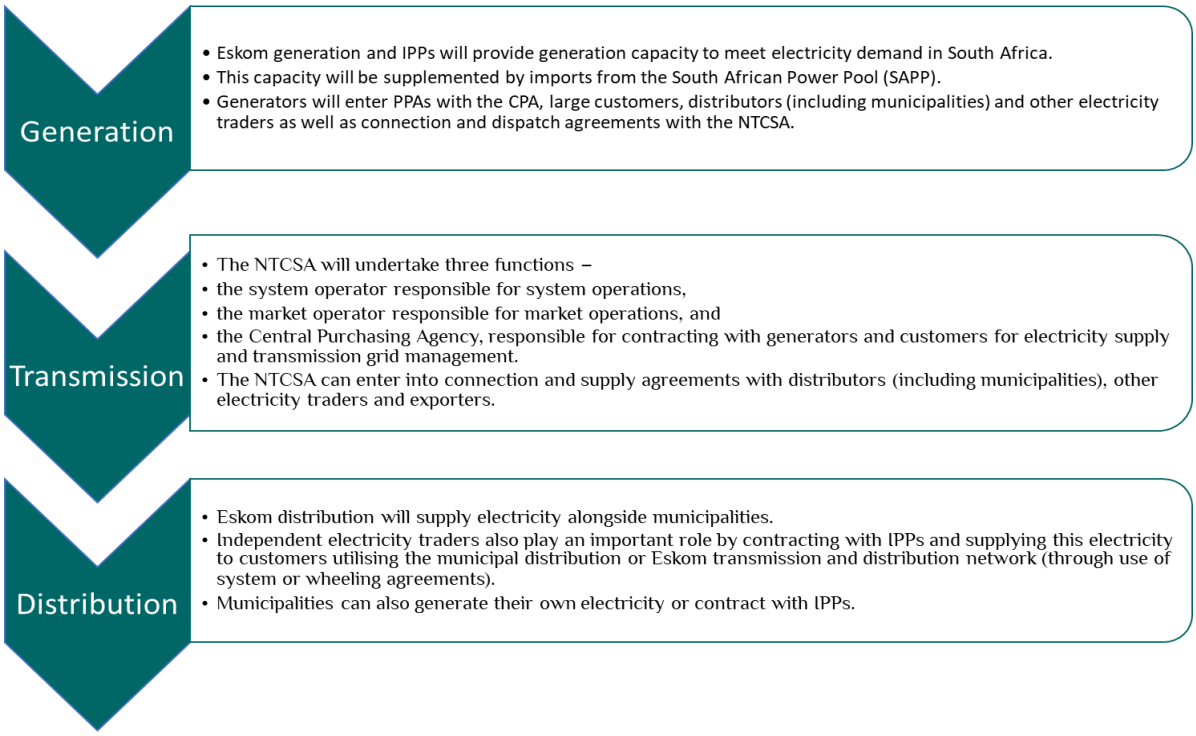


Source: Lungiswa Energy

It is therefore the policy intention that a regulated market, consisting of sales to and by the CPA, and an unregulated market, consisting of bilateral agreements and the Day Ahead market, will co-exist. Note that the Day Ahead market will include a Day Ahead reserve market.

At the various levels in the ESI value chain, the roles and responsibilities of Eskom as a vertically integrated utility will change fundamentally, requiring the unbundling process that is being undertaken by Eskom. the graphic below indicates the end-state of the ESI as envisaged by the ERA Amendment Bill.

Figure 13: the future ESI roles and responsibilities



Source: Lungiswa Energy

The unbundling of Eskom will require an amendment to the Eskom Conversion Act (2001), which, to date, has not been Gazetted.

Considerations for the implementation of a hybrid wholesale competition model

The proposed 'wholesale competition' model for the South African ESI may induce positive outcomes to address the current challenges faced by the South African ESI such as supply shortages and required increased investment in generation capacity and more efficient operation of generation facilities. Some of the advantages of the wholesale competition model centre around efficiencies. Firstly as generators compete in the market or 'power exchange pool' for sales, it creates a strong incentive for efficient operations of generation facilities. More efficient generators will be able to offer lower prices and therefore achieve higher sales. Secondly, there is an independent transmission/system operator which, if designed and regulated correctly, will not have any incentive to discriminate between incumbent generators and IPPs. This is likely to encourage entry by IPPs. Thirdly, as the market mechanism determines sales and prices, it can theoretically

send the correct signals to generators to invest in additional capacity. This investment is also likely to be efficient as there is no incentive to 'gold plate' facilities (the practice of overinvestment in capacity under a rate-of-return regulation methodology) in order for generators to offer the lowest price for the reasons described above.

Finally, as the transmission company is independent, it may have an enhanced ability to raise funding for upgrades to the transmission network. It is difficult at this point to indicate the extent to which each of these advantages will be experienced as the South African ESI is reformed. However, these effects are likely to be diluted to some extent as the split in the shares of the regulated and unregulated components of the ESI is currently undetermined. The idea that a market will exist alongside a Central Purchasing Agency that is to fulfil 'legacy' long-term contracts and presumably supply captive customers has not been fully developed in the ERA Amendment Bill and has been left up to Regulations and Rules to be developed under the future ERA Act by the Minister of Mineral Resources and Energy and the Energy Regulator, NERSA.

Wholesale competition itself is also not without its disadvantages. Competitive electricity supply can lead to shorter contracts between buyers and sellers. This could have the effect of creating a disincentive for investment in generation capacity as generators cannot justify long term investments on the basis of short-term contracts. In addition, this model has the potential to lead to higher and more volatile electricity prices due to the shorter contract lengths and competitive markets for short term electricity supply. Overall, the transition to a wholesale competition model is complex and needs to be carefully managed. South Africa needs to perform a balancing act, to ensure that the transition is handled carefully so that existing issues such as electricity supply shortage and high electricity prices are not exacerbated.

Critically, the successful implementation of a wholesale competition model for the electricity industry is reliant upon four pillars. These are (i) a sufficient number of generations and customers need to be active in the market; (ii) a reliable transmission network with sufficient capacity needs to be in place (iii) the power pool or exchange must be established and operational, with processes to authorise market participants having been put in place; and (iv) an efficient and effective regulatory framework for the market must be designed and implemented.

CPA: Central Purchasing Agency.

Entity to be established as a subsidiary of Eskom, responsible for procuring and selling electricity that arises from 'legacy contracts.'

The first pillar is the requirement for a sufficient number of electricity generators and customers to be active in the market to ensure it operates effectively and

efficiently. If one generator can dominate the 'market' this could reduce competition and act as a barrier to entry for IPPs. This is potentially an issue as the current market framework makes provision for a Central Purchasing Agency (CPA) that will be responsible for legacy contracts and this will trade this supply on the 'trading platform.' It is unclear in the current version of the ERA Amendment Bill what the precise role of the CPA is and how much of the existing generation capacity will be considered part of the 'legacy contracts,' specifically whether the existing Eskom generation capacity will be seen as 'legacy contracts' or if this only applies to existing REIPPP IPPs.

If the CPA accounts for a large portion of the electricity supply available on the trading platform this could potentially diminish the ability of the IPPs (and other generators) to effectively compete. Further, the CPA is also designed to be part of the NTCSA (which is also responsible for market operations), and this could undermine the perceived independence of the NTCSA and its incentive not to discriminate between the CPA and generators.

The second pillar is a reliable transmission network with sufficient capacity to ensure that all generators are able to compete for customers located at all ends of the network. Effectively, no generating capacity should be left stranded and no customers should ideally become 'captive' due to constraints on the transmission network. This is a critical issue for the effective reform of the South African ESI. South Africa is pursuing the Just Energy Transition to increase the amount of electricity produced from renewable energy sources. The renewable energy resources are strongest in the Northern Cape region which is located far away from load centres (electricity demand in this region is comparatively low). This is also where the transmission network is most heavily constrained. As discussed in section 3.2 Capacity constraints on the transmission network, significant investment in the transmission network will be required if South Africa is to achieve its aim of transitioning away from coal-based electricity generation.

The third pillar is that the power pool or exchange needs to be in position to enable the buying and selling of electricity capacity. Currently, such a market does not exist in South Africa and will need to be developed. It must be noted that strictly speaking, a Day Ahead market is not immediately necessary in South Africa, as bilateral agreements combined with non-discriminatory access to the transmission and distribution networks can achieve a large proportion of the envisaged benefits. As a licensed trader, Enpower Trading is able to buy electricity from IPPs and sell to customers, and is primarily constrained at present by the lack of access to the transmission and distribution grid (particularly involving municipalities), the transmission network capacity which is insufficient in certain Provinces to connect generators to the grid, and to some extent to the onerous regulatory requirements as discussed in section 3.1 Lengthy and cumbersome regulatory approvals process.

The final pillar is a regulatory framework governing the operation of the market that needs to be predictable, effective and efficient to ensure the market operates

effectively and there is sufficient competition. In our view, the unregulated component of the ESI will arrive at market prices, either on bilateral or Day Ahead terms. In addition to clarifying the bilateral market approach and ensuring regulated transmission and distribution wheeling charges are in place, the design of the Day Ahead market will be an important determinant of the liquidity and success of the future market. The key component to enable reaping the benefits of competition is the establishment of appropriate market operations for the Day Ahead market, with clearly communicated rules, responsibilities and requirements.

It is also necessary to clarify which part of the ESI will remain regulated and to what extent. As mentioned earlier, NERSA is currently reviewing the electricity pricing determination methodology to make it more applicable to a liberalised and competitive electricity industry. However, industry experts and stakeholders have identified a range of issues with the current draft and specifically its potential impact on the level of electricity prices. Therefore it is critical for NERSA to develop an appropriate and effective regulatory framework for the future regulated component of the multi-market.

5.3 **The envisaged 'multi-market'**

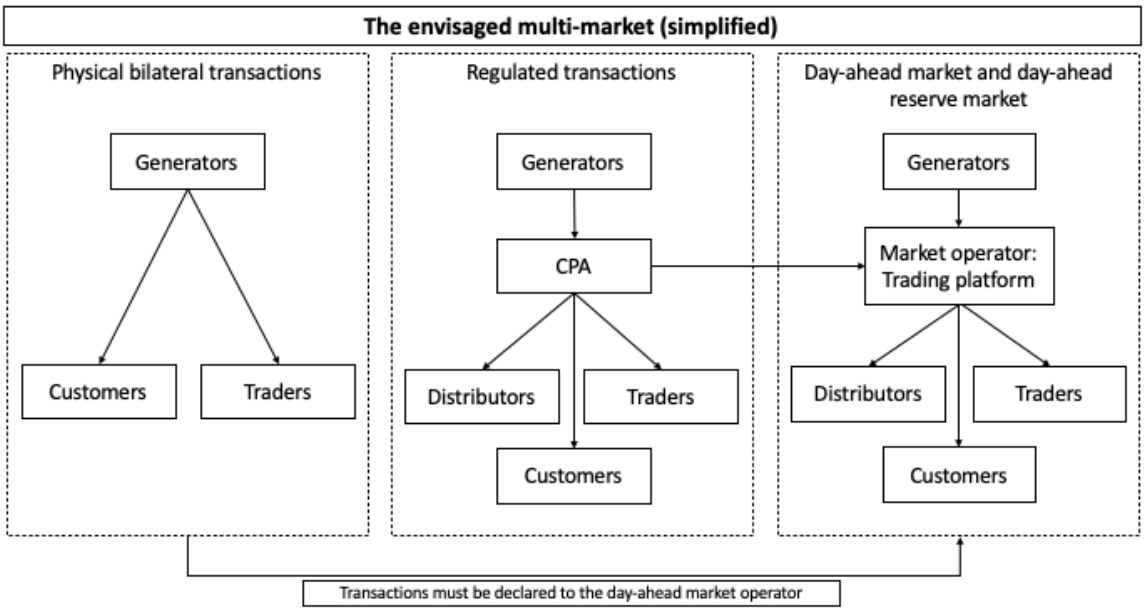
The proposed amendments to the ERA are to facilitate a more level playing field between Eskom generation and IPPs. The amendments indicate that the industry will transition to a 'multi-market' where a portion of electricity supply will be secured through direct contracts between generators and customers as well as a Day Ahead market where willing buyers and sellers are able to trade in short term electricity supply for each hour of the following day. (The 'multi-market' is discussed in detail in the following section.) As indicated, it appears that South Africa has adopted the wholesale competition model of electricity sector reform, combining the power pool and bilateral OTC trading in a wholesale competition model.

It must be noted that the use of the term 'multi-market' is a misnomer. Typically, the term multi-market refers to the existence of multiple markets for different types of capacity or electricity supply that is traded. However, it is used in this context to refer to the co-existence of a regulated component of the ESI, in which the CPA will operate, with bilateral contracts between generators, traders and customers, as well as a Day Ahead market for short term trades. As this terminology is enshrined in the draft ERA Amendment Bill, we will use it as defined by the Bill.

The figure below illustrates in a simplified form the three markets comprising the multi-market as described in the ERA Amendment Bill. The first is the market for bilateral electricity supply agreements (dubbed 'direct physical supply

agreements' in the ERA Amendment Bill), more commonly referred to as a bilateral market, where generators can contract directly with 'eligible customers' and electricity traders. The second market is for regulated transactions where the generators contract with the CPA for electricity supply and the CPA enters into contracts with distributors,[37] traders and customers.[38] The third market is a trading platform for the Day-Ahead and Day-Ahead reserve market. This is where willing generators can trade electricity or electricity reserve capacity with willing buyers of such capacity including distributors, traders and customers.

Figure 14: A simplified depiction of the envisaged multi-market



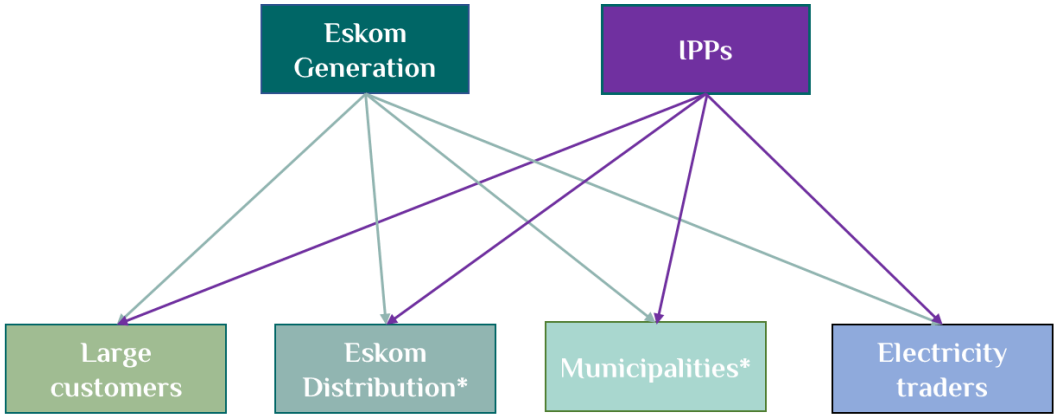
Source: Lungiswa Energy[39]

In the following sections, we describe in more detail how each of these markets will operate within the context of the restructured South African ESI.

Bilateral electricity supply contracts

Bilateral electricity supply contracts will be entered into between generators including IPPs and Eskom Generation and eligible (large) customers, municipalities, and electricity traders. These transactions do not involve the CPA or the trading platform. The outcomes of these transactions must be declared to the transmission system and market operator.[40] These transactions will be considered as 'must-run' in the scheduling and dispatch processes by the system operator. The residual demand will be met by the day-ahead market (in the trading platform). However, some uncertainty remains particularly regarding which 'customers' will be eligible to contract with the generators and which portion of the electricity supply is envisaged to be secured in this manner, compared to the regulated transaction market.

Figure 15: Bilateral trading market



* Eskom Distribution also comprises the trading activities and municipalities are also regarded as traders

Source: Lungiswa Energy

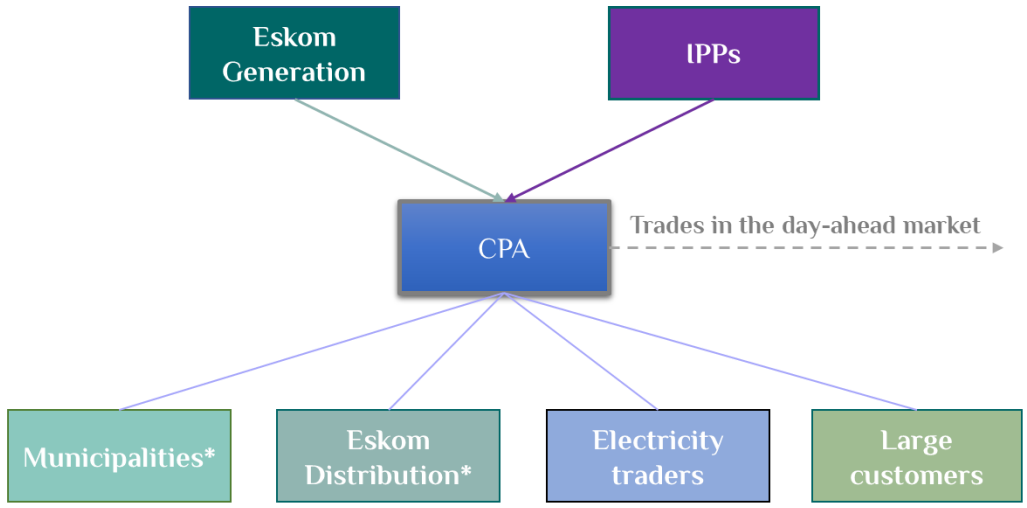
Regulated transactions

In the regulated transactions market, the CPA enters into PPAs with all generators ('gPPAs') and PPA agreements with distributors, customers and possibly traders ('cPPAs'). It is also the buyer of legacy PPAs. The CPA is expected to trade all the electricity purchased in terms of the PPAs in the day ahead market and acts as the balance responsible party. We believe this wording to be the result of an error as PPAs typically have a determined price and volume and it would be difficult to purchase the electricity at a certain price and then trade this electricity in a Day Ahead market, where it will attract a market clearing price. In our understanding the CPA would supply customers including distributors on long-term cPPAs and

only trade its excess volumes into the Day Ahead market, if at all. If all purchased electricity were to be traded at an uncertain market clearing price the price would either be higher than the purchase price, in which case customers would end up paying more after the introduction of the market, or lower than the purchase price, which would render an unsustainable outcome for the CPA.

The intention of the legislation is that effectively, the ERA Amendment Bill proposes that the CPA acts as a single buyer while allowing the market to transition towards competition. However, some issues remain unclear such as whether the CPA can also contract with large customers and whether all existing generation capacity including that of Eskom Generation will be considered as 'legacy contracts.'

Figure 16: The regulated transactions market



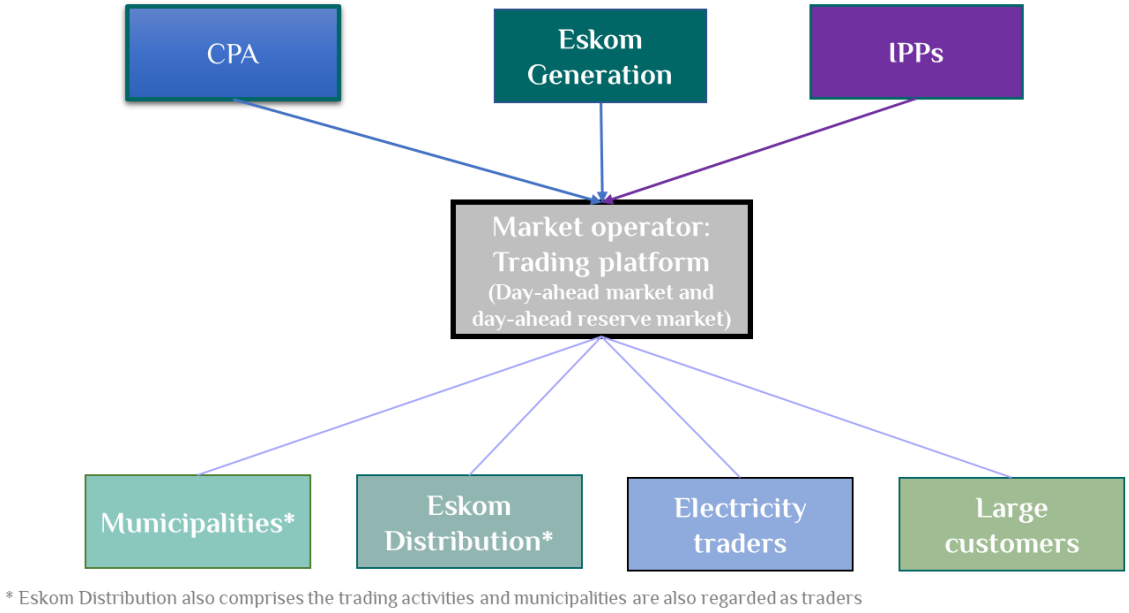
* Eskom Distribution also comprises the trading activities and municipalities are also regarded as traders.
IPP – Independent Power Producer
CPA – Central Purchasing Agency

Source: Lungiswa Energy

Day-ahead market and day-ahead reserve market

The third market that forms part of the multi-market is the Day-Ahead and Day-Ahead reserve market. The day-ahead market is expected to match the supply of electricity to the demand in each hour of a 24-hour trading day. Market participants will trade electricity in the Day-Ahead market and supply reserves in the Day-Ahead reserve market.

Figure 17: The day-ahead and the day-ahead reserve market



Source: Lungiswa Energy

The trading platform should be transparent and non-discriminatory. However, it is unclear whether large customers will be allowed to trade on the platform. Further, as discussed above, one of the key pillars for the successful implementation of a wholesale competition model is having a sufficient number of suppliers (with sufficient capacity to sell) and customers (with sufficient demand to purchase) active in the market to ensure it is effective and competitive. Given the multitude of avenues for generators and customers to trade, it is unclear whether there will be sufficient capacity available in the market to ensure it can operate effectively and efficiently in the short to medium term. Hence it may take some time for the market to become sufficiently liquid that it can be effective. It is important therefore that clarity is provided and trade-friendly market participation rules are developed, so as to instill confidence in market participants in the actual trading platform.

06

Trading

The lifeblood of any market

As South Africa moves into a future of competitive electricity supply markets, with considerable private sector participation in generation capacity, the structure of the market simultaneously becomes much more complicated, and potentially much more efficient. The way in which electricity trading is established, and the existence of a dynamic trading sector, will play a big role in determining the net impact of this market reform.

South Africa is currently in an initial phase of implementation of electricity trading, which will likely move into a second, more complex phase upon the implementation of the Electricity Regulation Amendment Bill. At present, electricity trading is possible on a fairly simple, OTC basis. Parties must contract on a bilateral basis with each other, as there is currently no central clearing mechanism. Trading licences do however allow traders to wheel electricity generated at one location, transport it via the existing transmission and distribution networks, and sell it to a customer at another site (transmission and distribution capacity permitting).

Even with this fairly simple market structure, a number of benefits can be realised by trading in electricity. Customers of wheeled electricity are able to achieve lower prices, and access renewable energy sources. Electricity generators can establish operations in favourable destinations, and by feeding into the grid, can sell to customers at remote or urban locations. Firms seeking greater security of energy supply are able to do so without investing in costly and long-term generating capacity. The overall impact of the introduction of trading is to facilitate investment into independent (and de-carbonised) electricity generation, by making it simpler to access customers for that energy.

Moving forward, substantial changes to electricity trading are envisaged in the Electricity Regulation Amendment (ERA) Bill, 2022. While the current version of the Bill is still likely to be significantly amended, it is nevertheless possible to gain insight into the likely scope of the proposed structural changes. As mentioned in section 5 The future is now – the imminence of the future multi-market for electricity, the ERA envisages three types of trading, namely market transactions, physical bilateral transactions and regulated transactions.

Excerpt ERA Amendment Bill

32 Market Structure

(1) In relation to the market structure,

(a) the structure will assume a competitive multi-market which will provide for: market transactions, physical bilateral transactions and regulated transactions;

(2) In relation to market transactions, the market operator:

(a) will provide for a transparent, non-discriminatory trading platform for market participants, allowing willing buyers and willing sellers to trade with each other on an hourly and daily basis; (...)

(3) In relation to physical bilateral transactions,

(a) licensed and registered generators may enter into physical bilateral contracts for energy production with customers and traders;

(4) In relation to regulated transactions, the CPA,

(a) will conclude PPAs with each generator to ensure sufficient supply to meet the demand (...)

The market operator that will provide the trading platform is the Transmission System Operator (TSO), which is also established by the ERA. The TSO will have a number of responsibilities with regard to the management of the transmission system and the maintenance of grid stability, as well as facilitating trade through, for example, setting up the administration of wheeling transactions and coordinating with transmission and distribution operators.

The creation of a central market platform, offering greater market liquidity and a transaction clearing mechanism, will substantially increase the ability of electricity trading to realise significant economic benefits for all market participants. Academic research suggests that much of the benefit of a centralised market comes via the facilitation of greater market liquidity. A more liquid market, simply put, has more buyers and sellers active in it. If the volume of trade is sufficient, then "*the ability to exercise a buy or sell order of any size at any time without the price being influenced by this order*" [41] is enabled.

Without market liquidity, it becomes more difficult to estimate what price can be realised, and it will often take longer to fully execute a buy or sale order. More liquid markets with intraday trading are also better able to respond to short term fluctuations in demand and supply. For example, while a bilateral wheeling contract enables an energy customer to meet their medium to long term energy needs, intraday trading would allow the same customer to also deal with short term fluctuations, for example due to unanticipated plant outages, or weather-related fluctuations in wind or solar energy output. Intraday trading also gives the system operator another tool to use to stabilise the grid, when demand and supply forecasts are unreliable.

The total efficiency impact of these effects of improved market design and greater efficiency can be substantial. For example, in a region of the Eastern United States that switched from a bilateral trade model to an auction market in 2004, some estimates suggest that total gains from trade associated with increased efficiency were around $163 million per year.[42] A 2015 study looking at the potential benefits of integrating European electricity markets and improving market design found that the potential benefits would be as high as €3.3 billion per year.[43] From a policy perspective, therefore, improved trading efficiency is an extremely desirable outcome of market reform.

On a more practical level, electricity traders play a particularly useful role as the interface between electricity generation and electricity customers. In markets such as the United Kingdom, a well-established domestic retail sector in gas and electricity, with 64 participants as at 2019,[44] provides energy customers with a wide range of choice in terms of their price structures, whilst allowing customers to tailor their demand in accordance with time of use (ToU) pricing to facilitate efficiencies and reduce energy costs. Innovation in terms of service quality is often a key component of competition in utility markets, and the emergence of multiple competitors in trading is likely to be associated with an improved ability to access bespoke contracting terms, and efficient prices, especially for larger customers.

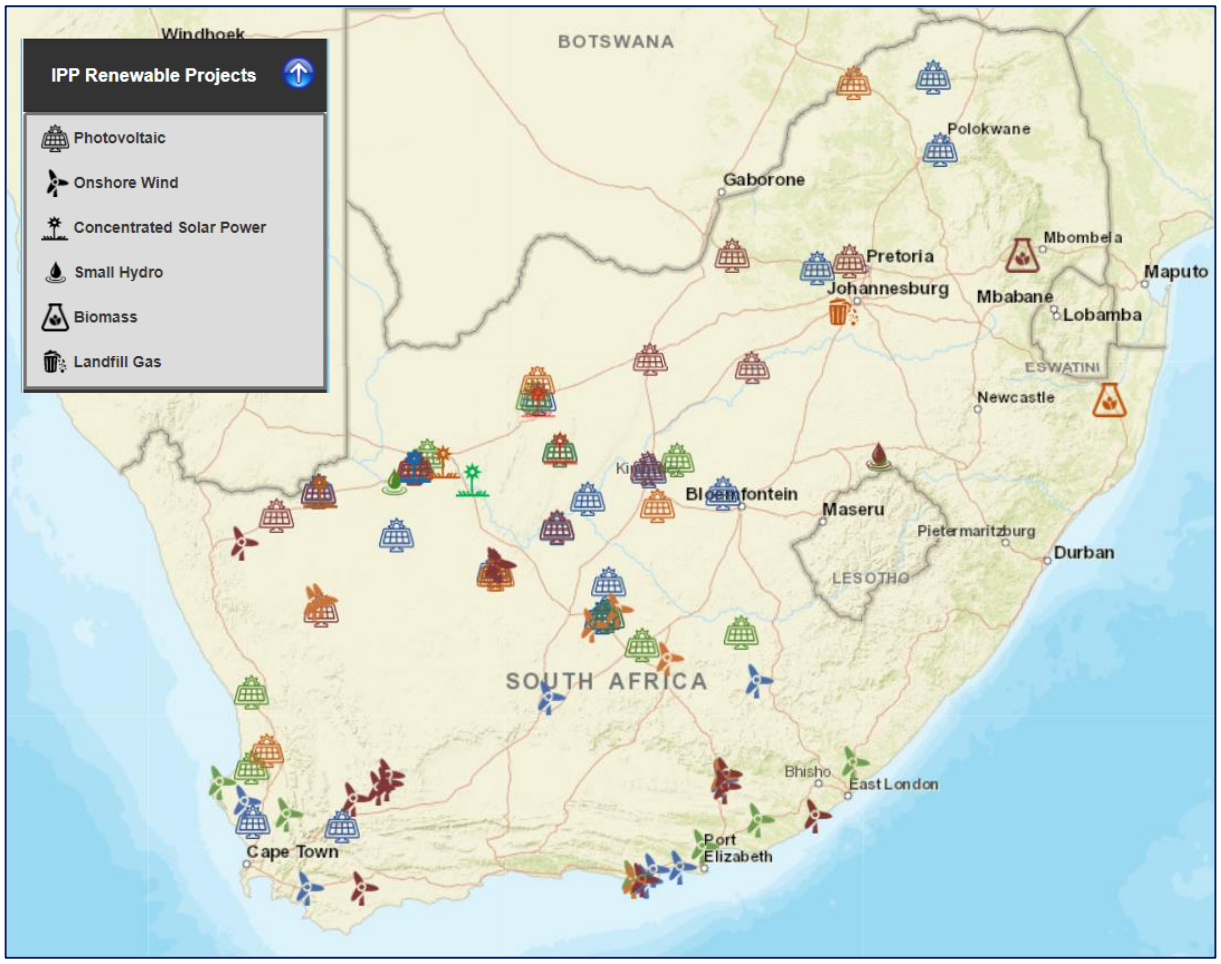
07

Investment in generation is an investment in the local economy

South Africa's electricity supply constraints and need to de-carbonise its energy supply, provide a strong motivation for investment in renewable energy capacity. However, these are not the only benefits which accrue from the renewable energy investment drive. These funds also have substantial potential to incentivise and accelerate local economic development, which should not be overlooked. Cost effective and sustainable energy is one of the most important contributors for economic development and is central to the growth of the South African economy, with far reaching impact into cultures, traditions, genders, incomes, community welfare, livelihoods, education and available natural resources. With the adoption of the Sustainable Development Goals and the (COP 21) Paris Agreement, the key message was that the transition to sustainable energy is based on the strong, positive linkages between access to clean, affordable, sustainable and safe energy and broad economic development. As Municipalities embark on future-proofing their services, affordable, accessible, greener energy and improved local energy security are key priorities and benefits for local economic development. The integration of energy costing into community /business design and public service provision, reduces or avoids capital costs, which in turn reduce local tax increases and encourage investment and business growth. Through business growth, there is improvement of local economic strength, resilience and competitiveness. The amount and variety of businesses and job opportunities is expanded, leading to the creation of new markets and opportunities for community individuals to earn an income and uplift themselves.

The core of South Africa's renewable energy programme to date has been the REIPPPP, which has been in operation since 2010, and has resulted in more than 6 000 MW of new generation capacity. A further 5 200MW is envisaged to be procured in the current REIPPPP bid window 6. As shown in Figure 18 below, these projects are widely distributed across South Africa, with solar concentrated in the interior and west coast, and wind projects largely clustered along the coast in the Western and Eastern Cape. Many of these projects are located in impoverished rural areas, which otherwise typically do not see much investment activity. The potential for these investments to change the geographical patterns of economic opportunity is thus substantial. Countries with the highest levels of poverty and underemployment tend to be those that lack access to adequate levels of energy services and the modern conveniences that they provide.

Figure 18: Independent Power Producer Procurement Programme



Source: adapted from https://www.ipp-projects.co.za/ProjectDatabase/Map, accessed 25 August 2022

These projects contribute to local economic development wherever they are undertaken. However, in order to entrench local economic development, such requirements were also made an explicit component of the REIPPPP program from inception. Bid scoring was based 70% on the proposed price, with the remaining 30% of the bid comprising a number of economic development requirements, weighted as follows:

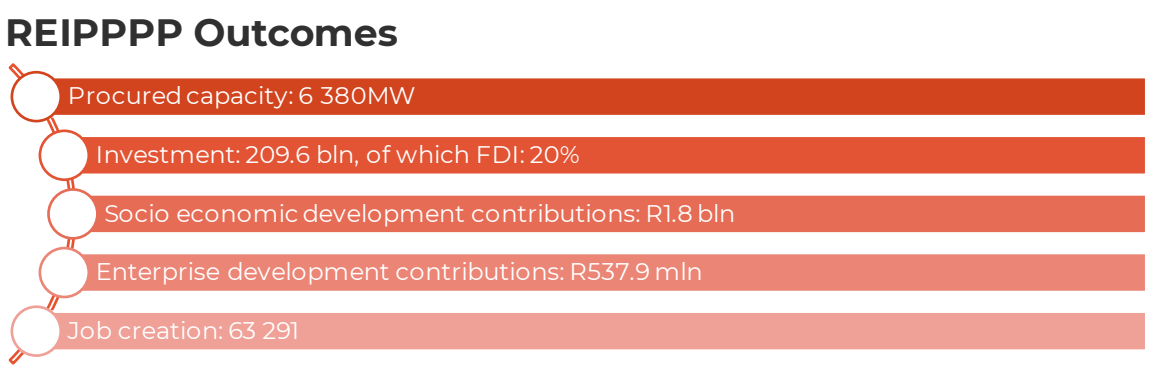
- Job creation (25%),
- Local content (25%),
- Ownership (15%),
- Management control (5%),
- Preferential procurement (10%),
- Enterprise development (5%) and
- Socio-economic development (15%).

These programs were required to be implemented within 50km of the generation

project site, to ensure local community upliftment. In Bid Window 5, however, bid scoring was 90% based on pricing, reflecting the increasing urgency of the energy supply crisis.

The IPP Project Office has reported a number of positive consequences arising from these commitments. The total investment associated with the first four bid windows is R209.6 billion, of which 20% is foreign direct investment. This then is reported to have been associated with socio-economic development contributions of R1.8 billion and enterprise development contributions of R537.9 million. The total estimated job creation to date is estimated at 63 291 job years for South African citizens. REIPPPP projects have been involved in funding initiatives as diverse as teacher training programs, bursaries for disadvantaged students, feeding schemes, and support for old age homes.[45]

Figure 19: REIPPP Outcomes



The impact of the REIPPPP on such outcomes is however not uncontroversial. Specific concerns have been raised, for example, about the increase in costs that is at times associated with localisation requirements, reported to be as high as 30% in some input markets. There has also been concern about whether local industry has the capacity and experience to service the requirements of the market, given localisation constraints. There is certainly a need, going forward, to ensure that attention is paid to bottlenecks in the system. Specifically, care needs to be taken to ensure that skills development and localization are facilitated.

Substantial additional investments will be associated with the REIPPPP program going forward, as South Africa adjusts its mix of generation capacity, and deals with the current supply deficit. In addition to generation capacity which has already been installed, bid window 5 projects are planned to add 2 583MW in capacity to the system, via 25 projects amounting to a total estimated R50 billion infrastructure investment, and the risk mitigation IPPPP (RMIPPPP) will add another 11 projects, amounting to R60.2 billion invested and 1 996MW of capacity. Bid window 6 for 5 200MW is currently open, and results from the bidding process are expected in 2023. As these investment continue to proceed, and experience is gained in the independent power producers sector, the efficiency and impact of projects is likely to continue to increase.

Investments in local municipal generation also have substantial potential to reduce the impact of loadshedding, which in itself provides substantial support for local economic development. The City of Cape Town's investment in the Steenbras Pumped Storage Plant usually allows the municipality to operate at one level of loadshedding less than the rest of the country,[46] and this model has considerable potential in other regions. Johannesburg in particular has recently announced plans to diversify its energy sources, in order to improve the reliability of energy supply.[47] Embedded or distributed generation capacity thus can impact on local economic development in multiple ways.

08

Proposed solutions and enabling conditions

Before proposed solutions are offered, it is important to highlight the business model and approach developed by Enpower Trading.

8.1 Enpower Trading innovative business model

Several innovations that Enpower Trading has brought to the ESI can assist in unlocking investment in renewable energy, lowering electricity prices and achieving the South African Government's energy policy objectives.

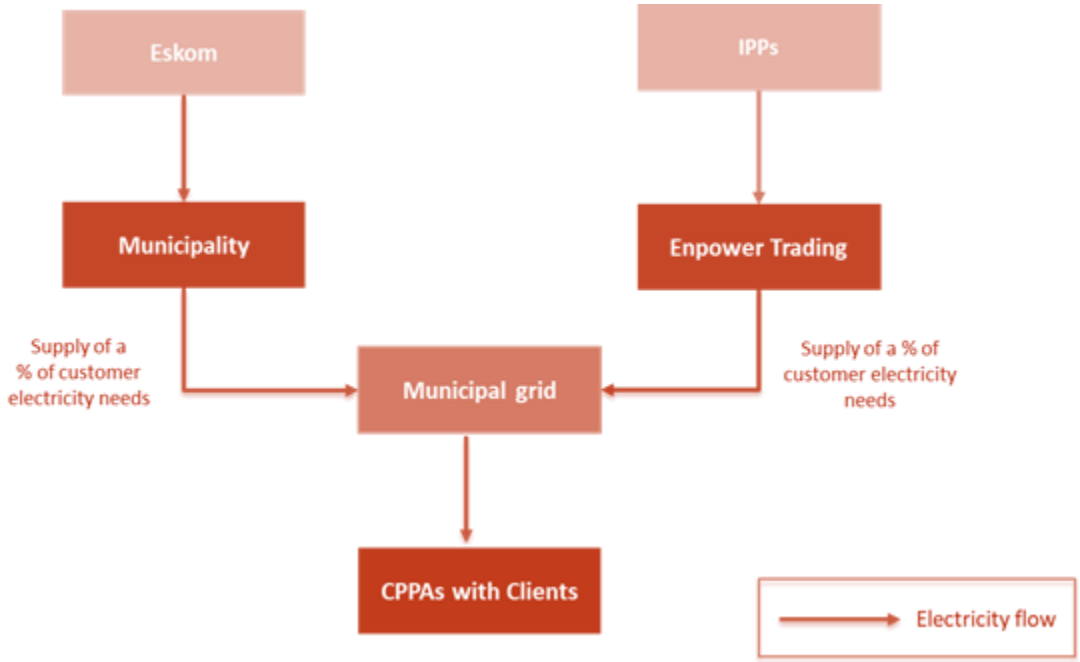
Whilst it is true that municipalities tend to be wary of both IPPs and traders as the municipalities depend on energy sales for their revenue, it must be highlighted that Enpower Trading's Business model is focused on **ensuring municipal surplus neutrality**, while **providing customers with cheaper energy and efficient service delivery**.

This is achieved by:

- Sourcing competitive IPP and embedded generation;
- Utilising a transparent pricing model for municipalities and customers:
  - The customer pays the normal municipal tariff minus a discount,
  - The municipality receives the Use of System charge (wheeling tariff) and a surcharge/'Unachieved Revenues' (calculated as the difference between the municipal tariff and the Eskom bulk supply cost) and remains surplus (profit) neutral.

The supply arrangements are schematically represented below:

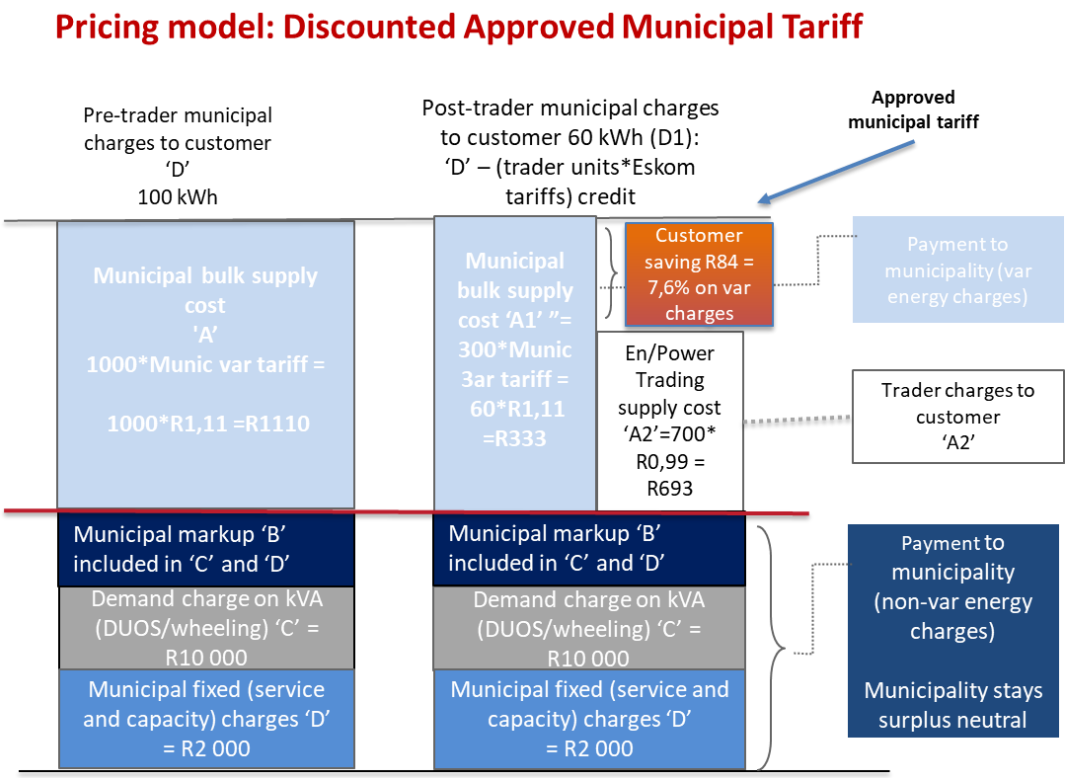
Figure 20: Supply arrangements



Enpower Trading 2021 ©

The pricing approach allows customers to benefit from lower prices, whilst the municipality retains its surplus as explained below.

Figure 21: Pricing model: Discounted Approved Municipal Tariff



Enpower Trading 2021 © NB Numbers used are fictitious

In the above example the approved municipal tariff has several building blocks:

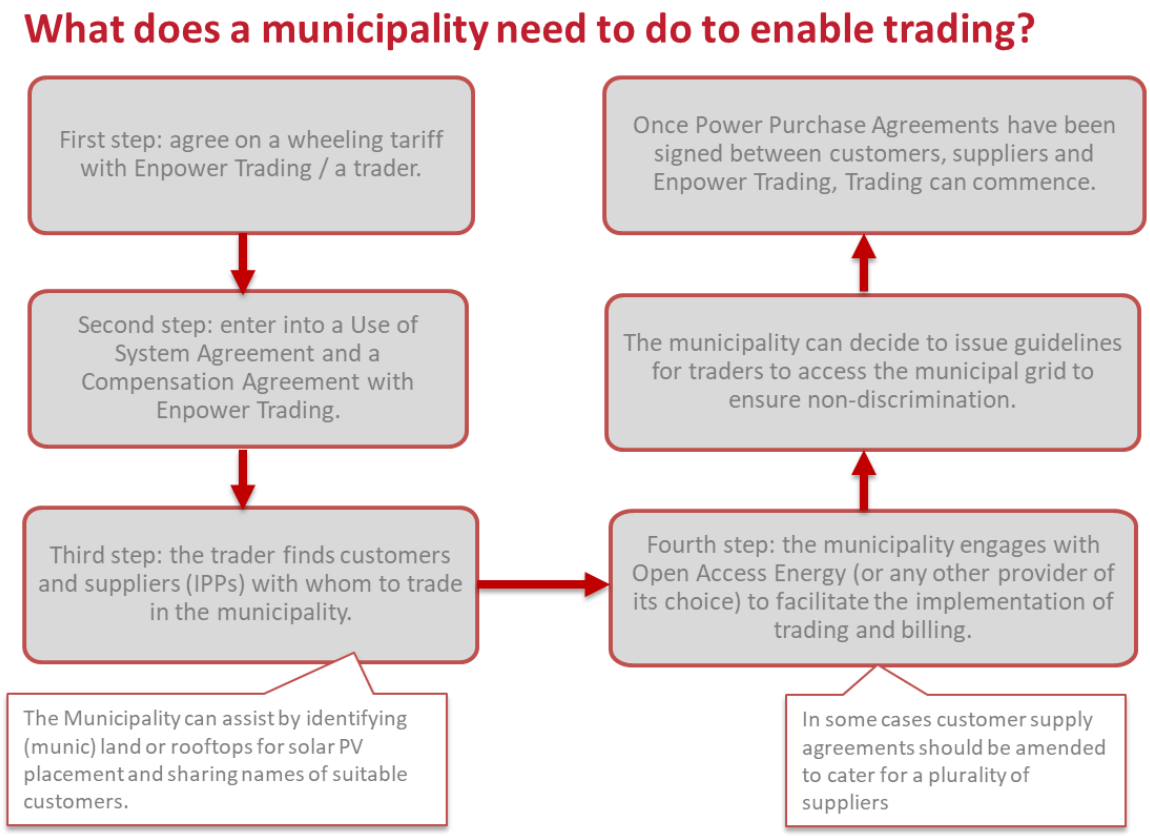
1. Eskom bulk supply costs;
2. A municipal markup;
3. Demand charges; and
4. Fixed charges.

Enpower Trading utilises its bespoke municipal wheeling tariff model to calculate the surplus that the municipality earns from its electricity sales and identifies the various elements. After the introduction of the trader, customers can continue to purchase a share of their supply from Eskom (reduced in the example from 1 000kWh to 300kWh) and procure a share of their supply from Enpower Trading (700 kWh). The customer continues to pay the municipal markup, demand and fixed charges but is charged less for the 700 kWhs purchased from Enpower Trading, resulting in a saving on the variable energy charges for the customer (in the example 1 000 kWhs at R1.11/kWh are replaced by 300 kWhs at R1.11 and 700 kWh at R0.99, resulting in a saving of R84, or 7.6% on the variable energy charges).

Municipalities can benefit from trading in their area in many ways, as this can lead to job creation, local economic development, investment in the municipality, lower

electricity prices and greater choice for its residents. The steps involved in enabling trading are captured below:

Figure 22: What does a municipality need to do to enable trading?



Enpower Trading 2022 ©

8.2 Proposed solutions and enabling conditions

After our discussion of the South African ESI and the urgent need for additional generation capacity, it is clear that a myriad of problems exist in today's electricity sector. This paper has also touched on the hurdles that are faced by IPPs, traders and customers that want to self-supply. These problems are not without solutions, some of which are quite straightforward. Whilst the problems of Eskom's EAF, and its balance sheet may take considerable time and effort to ameliorate, we believe that many interventions that can be actioned in the short to medium-term will assist in providing more generation capacity for South African customers whilst at the same time providing Eskom with the required breathing space to implement a rigorous maintenance programme.

Interventions that enable renewable energy projects:

- Urgent investment in transmission capacity by Eskom to connect a range of stranded generation projects in the Northern and Eastern Cape in particular;
- Introduction of shallow connection charges by Eskom for IPPs to connect (currently deep connection charges are incurred if a required grid reinforcement project is not on Eskom's radar, with associated prohibitive costs), funding can be provided by restructured grid tariffs and by diverting funds from refurbishments in case of accelerated decommissioning of certain coal-fired power plants;
- Added capacity to Eskom's IPP connection unit (involving Eskom Transmission or Distribution) to enable faster processing of generation projects that require connections (which involves a lengthy and cumbersome Cost Estimate Letter and Budget Quote);
- Unbundling Eskom transmission into an independent TSO will help in this regard;
- Relaxation of NERSA's IPP registration requirements.

Interventions that enable the development of a thriving trading activity and electricity market in South Africa:

- Eskom Transmission should be given clear instructions that as an independent TSO it is to enter into Use of System Agreements with traders, which it currently does not do;
- NERSA should enforce its requirement that municipalities provide non-discriminatory access to the distribution grid;
- NERSA should ensure that municipalities apply for wheeling charges, that these are set at reasonable levels and implemented without favour:
- NERSA can fundamentally alter the manner in which it licenses traders, that currently requires traders to apply for amendments for each municipality that it has entered into a Use of System Agreement with. This is not necessary, nor is it required in terms of the ERA. The licences issued are national licences and can contain a licence condition that indicates that a Use of System Agreement with a municipality is required before trading can be embarked upon in said municipality;
- The administrative, technical and financial abilities of the trader should be tested when the trading licence is applied for, not for every addition as a trader rolls out its business model with willing municipalities and customers.
- NERSA should reconsider its insistence on listing every IPP and customer for traders in the schedules to the licence before trading can commence, as this is clearly not the case for Eskom's licence. The schedules to the trading licence can therefore be removed. This will allow traders to expand more swiftly and will lead to the entry of more traders that are necessary to ensure demand and supply are perfectly matched in the liberalising ESI.

Several of these interventions can be implemented immediately, whereas others may need several months for implementation. None of the proposed enabling conditions is in contravention of any statute, or policy. Most of the proposed changes are already envisaged in the White Paper on Energy Policy (1998); or have been highlighted in various discussion fora, such as NEDLAC's discussions on the Eskom Social Compact (2020) or have been raised with Operation Vulindlela. Enpower Trading is ready to play its part in the ESI of today and of the future, connecting IPPs and customers and unlocking savings.

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technically termed 'traders' in the ERA Amendment Bill, this term is used to distinguish them from electricity traders that do not own distribution networks.

[38] The ERA Amendment Bill indicates that the CPA trades the electricity capacity contracted under the regulated transactions in the day-ahead and day-ahead reserve market. The trading of the CPA's procured volume into the Day Ahead market is in our view an error. This should be nomination of the traded volume to the system operator (providing information to the NTSC ahead of time), which should be combined with nomination of the traded volume arising from the Day Ahead and bilateral markets.

[39] Section 34D(2)(b)(b) of the ERA Amendment Bill refers to the requirement that "*the physical production and consumption positions arising from the physical bilateral contracts shall be declared to the market operator day-ahead*" which we assume to be an error, it should refer to the system operator.

[40] See section 34D(2)(b)(b) of the ERA Amendment Bill. As in the note above, we assume the reference to the market operator day ahead to be an error, it should refer to the system operator.

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