

Sponsor



BusinessDay

Special Supplement
March 2022

South Africa's energy revolution

*Shaping the
country's energy
sector for the future*

Photo: ????

In association with

intellidex 



INNOVATIVE

The key to business that's fit for society.
Visit [standardbank.com/cib](https://www.standardbank.com/cib)

We're all in

Standard Bank *IT CAN BE*™
Also trading as Stanbic Bank



CONTENTS



14



13



32



28



NEWS AND VIEWS

4 Introduction

The complexities and opportunities of funding renewable energy value chains, by Rentia van Tonder and Berrie de Jager.

6 South Africa's energy revolution

The country's energy market is in a tumultuous phase of transition but it is part of the wider revolution taking place that began by opening a small corner of Eskom's monopoly to the private sector.



9 Garob Windfarm

Maximising community benefits.

10 Opinion: Putting the "just" into the energy transition

The energy transitions of the 21st Century are set to be as disruptive as the transitions in mechanised transport, agriculture, manufacturing and communications in the previous century, writes Chris Yelland.

12 Getting to grips with the just energy transition

Eskom is reinventing itself towards a low carbon future as it gradually replaces its ageing coal plants.

14 Eskom champing at the bit but politics throws up hurdles

Political wrangling over the pace of SA's transition to a low-carbon future looks set to delay the flow of green funding pledged at the COP26 climate change conference.

15 Ticking clock puts pressure on speed of transition

Implementation delays will soon result in rising costs as the EU and other major economies introduce carbon taxes that will punish high emitters.

18 We can ensure no one is left behind

The transition to renewables does not have to leave ghost towns, with devastated local communities in its wake, writes André de Ruyter.

20 Matla Solar

Powered by community relations.

22 Eskom unbundling process is well under way

Restructuring, debt and pivoting from coal: a formidable set of challenges faces the state utility.

24 Hurdles remain but self-generation set to gain momentum

Applications to register embedded generation projects by the private sector have been underwhelming.

26 Nuclear and gas: do we need them?

Any energy technology except renewables seems to rouse public resistance.

28 Battery storage market presents ideal manufacturing opportunity for SA

SA is already one of the world's biggest markets for energy storage systems.



30 Boikanyo Solar

A gleaming opportunity.

32 Roadmap to a hydrogen economy

South Africa has ideal conditions to leapfrog into a global leader in the production of green hydrogen.

34 Renewables fit neatly into SA's industrialisation plans

PPPs, however, need to be streamlined.

38 Excelsior Wind Energy Facility

Blending with nature through wind power and a strong biodiversity programme.

40 How to integrate social justice into the energy transition

We have to address the social aspects of the energy transition. The burden of poverty and inequality is too great and too urgent to deprioritise.

43 Kangnas Wind Farm

Massive wind farm creates energy for thousands of homes.



44 The finance behind SA's renewable energy

Private sector appetite to finance SA's commitment to a future of net zero emissions is robust.

47 So, what exactly is "clean coal" ?

It has become quite clear that that none of the so-called "clean coal" technologies can meet the requirements in the IRP 2019.

ABOUT THIS PUBLICATION

This publication was produced by independent research house Intellidex, working in conjunction with Business Day.

Our effort has been supported by a sponsor and various advertisers. However, the editorial was developed independently by the Intellidex team, working with Business Day which held final editorial control. The opinions expressed are therefore theirs and not any of the sponsors'.

THE TEAM

Editor: Colin Anthony

Deputy editor: Janice Roberts

Consultants: Peter Attard Montalto and Stuart Theobald

Editorial contributors: Aurelia Mbokazi-Kashe, Mariam Isa, Charlotte Matthews, Zoheb Khan, Gershwyn Benjamin, Nxalati Baloyi, Chris Yelland, André de Ruyter, Rentia van Tonder and Berrie de Jager, Janice Roberts, Colin Anthony

Graphic design, layout: Eleonora Del Grosso and Colleen Mulrooney

Proof readers: Johann Barnard, Debbie Yach, Sthembile Masina

Advertising sales: Cris Stock

Administration: Tina Shika

Photographers: Christy Strever and Russell Roberts

Published by Intellidex (Pty) Ltd for Arena Holdings.

Intellidex (Pty) Ltd

1st Floor, Building 3, Inanda Greens Office Park, 54 Weirda Road West, Sandton, 2194
Tel: +27 (0) 10 072 0472 www.intellidex.co.za

Arena Holdings

Hill on Empire, 16 Empire Road, Parktown, 2193, Tel: +27 (0) 11 280 3000
www.tisoblackstar.com

© Copyright Intellidex (Pty) Ltd. All rights reserved.



ADDITIONAL COPIES

Additional copies of this publication can be purchased by emailing joburg@intellidex.co.za



The complexities and opportunities of funding renewable energy value chains

By *Rentia van Tonder and Berrie de Jager*

An abundance of sunny weather. A strong supply of wind. Numerous natural bodies of moving water. These environmental assets ideally position our continent to be a significant contributor to a low-carbon global economy.

Experts estimate that Africa has the potential to produce 10TW with solar, 350GW with hydro and 110GW with wind energy. In South Africa, with wind energy alone there is an annual offshore production potential of 2,387TWh with shallow and deep-water wind turbines.

Despite this potential, South African households and businesses alike regularly face the crippling effects of loadshedding. Although the number of households with a formal connection rose from 76.7% of the population to around 85% between 2002 and 2021, there is still room for improvement. Looking more broadly, fewer than 43% of people in sub-Saharan Africa have access to grid electricity.

Bright future for renewables

President Cyril Ramaphosa addressed the fragility of our country's electricity system in his state-of-the-nation address this year, attributing our electricity shortfall of 4,000MW to poor maintenance, policy delays and ageing power stations. He acknowledged that loadshedding "continues to have a huge impact on the lives of South Africans, disrupting businesses and placing additional strains on families and communities".

Fortunately, there is light at the end of the tunnel. During his speech, President Ramaphosa highlighted several new generation projects in the pipeline. These will include over 500MW still to come onstream from bid window 4 of the renewable energy programme and 2,600MW from bid window 5.

Combined with the technological advancements and lower tariffs (solar prices decreased by 45% from 2015 to 2021 and wind by 35%), renewable energy initiatives are clearly becoming financially significant opportunities to tap into as a country. Not only will the success of these projects enable SA to decrease its dependence on coal power, but create further long-term sustainable projects that, in turn, will

drive crucial environmental, social and corporate governance (ESG) objectives, aligned with climate change commitments.

Aligning renewables with policy objectives

Increased generation capacity from renewables should be developed in line with localisation objectives.

For South Africa to realise this scenario, some challenges need to be overcome at various levels, such as having a clearly defined regulatory framework, proper risk allocation and a solution for grid capacity issues.

One of the main barriers to accelerating local procurement in the renewable sector is a lack of consistency in terms of the rollout of renewable energy projects to enable local development.

When it comes to smaller enterprises operating in the energy environment, it is essential to consider the various value chains – not only that of generation, transmission and distribution, but also of related industries such as manufacturing, education and transport. Without policy certainty, SA's small and medium enterprises (SMEs) operate in a challenging environment in which it's difficult to develop long-term, sustainable business models. With an integrated approach, one renewable energy project can create a ripple effect in various business subsectors and have a positive impact on communities.

For these reasons, SA's renewable industry must be challenged to be more innovative and proactive when it comes to creating opportunities for players along the value chain. This will become increasingly important to ensure localisation of opportunities as new international players enter the market and create an even more competitive space for local investors and funders.

To date, there have been pockets of localised development in the energy ecosystem but a roadmap towards sustainable, local investment on a long-term and sustainable basis is crucial. More can be done to ensure adequate risk sharing that enables an optimal structure where local businesses can participate while



Rentia van Tonder, Head: Power, Corporate and Investment Banking at Standard Bank

optimising their value proposition.

Stimulating sufficient involvement from local players and creating local jobs in communities within the regions of renewable energy projects should be high on everyone's priority list. Fortunately, as government's Integrated Resource Plan is rolled out, we should see an increase in the number of SMEs aligning themselves across the renewable value chain.

Plugging into SA's potential

As a bank that is committed to facilitating African economies' access to energy and other critical infrastructure, Standard Bank sees the renewable power sector as an essential driver for sustainable and inclusive economic growth. It is with this perspective that we have been proactive in positioning ourselves as a leading funder in the energy transition.

We deeply understand the multiplier effect that a lack of access to reliable energy has from an economic and human development perspective. It is, however, encouraging to see that the industry is gaining momentum in developing sustainable finance solutions and proactively identifying opportunities to support government's objectives.

To realise these goals, it is critical that financiers find the right products



Berrie de Jager, Head: Natural Resources, Business and Commercial Banking at Standard Bank

and projects to align South Africa to international norms of clean energy. For us, this is central to the viability of every energy investment.

As our country's regulatory framework and renewable initiatives progress further and we see the market opening up to more decentralised energy opportunities, there will be a big uptick in corporate and industrial companies that develop their own energy-generation initiatives.

By providing businesses with the relevant funding options for alternative energy solutions, which also address their issue of rising electricity prices, reliability and sustainable supply, South African businesses will be empowered to create a decentralised electricity supply that complements the grid.

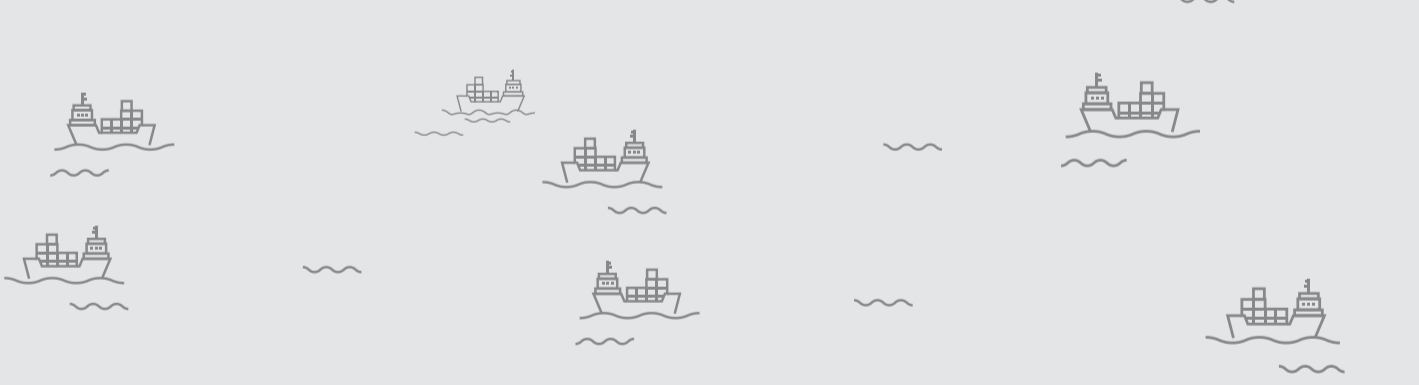
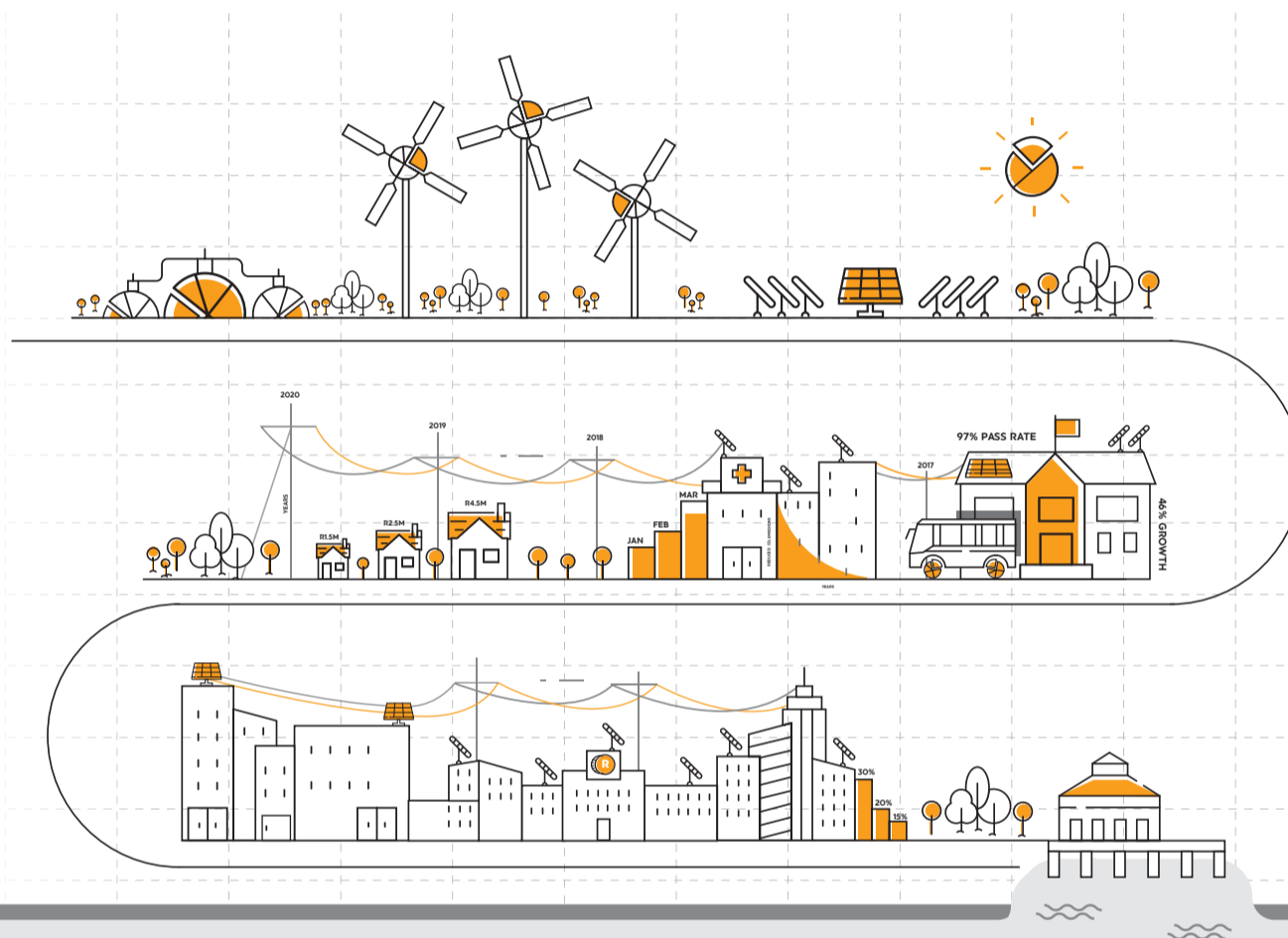
Ultimately, every successful renewable energy project is a step our country takes in the right direction to untap the vast potential lying on and off our shores. It is through the renewable energy sector that the power will be placed back in businesses' hands and money back into our economy.

■ *Van Tonder is Head of Power, Corporate and Investment Banking at Standard Bank*
De Jager is Head of Natural Resources, Business and Commercial Banking at Standard Bank



GENERATE RENEWABLE POWER FOR YOUR OPERATIONS

MAKE A MEASURABLE DIFFERENCE



New energy market regulations have opened the door for private partnerships through large scale generation projects, providing renewable energy sources to assist corporates in both diversifying their power sourcing requirements and meeting their net zero carbon commitments. Partner with us for sustainable, renewable power using our specialised finance solutions, with the support of our expert ESG Advisory services.



Partner with us
rmb.co.za/uf-esg

Traditional values. Innovative ideas.

RMB a division of FirstRand Bank Limited, is an Authorised Financial Services and Credit Provider NCRCP20. Terms and conditions apply.

**CORPORATE AND
INVESTMENT BANKING**



South Africa's energy revolution

The country's energy market is in a tumultuous phase of transition but it is part of the wider revolution taking place that began by opening a small corner of Eskom's monopoly to the private sector.

By Colin Anthony

The title of this publication was not chosen lightly. In the midst of our energy crisis it's easy to lose sight of the big picture that shows an energy sector that is undergoing radical transformation towards a largely liberalised market.

And it all began when, early in his term, then president Jacob Zuma astounded the world at the 2009 Congress of Parties (COP) 15th summit in Copenhagen when he committed the country to introducing renewable energy into its energy mix and opening the market to private producers of electricity. When South Africa hosted COP17 in Durban

in 2011, the country was ready to announce the first successful bidders.

It was a surprisingly "neoliberal" move by Zuma and while the first bouts of the loadshedding hit in 2007, nobody expected him to trigger the beginning of the end of Eskom's monopoly. He did have a penchant for saying whatever it was his particular audience at the time wanted to hear and perhaps it was simply that. Whatever his motivation, this is one of his few success stories because renewable energy was the one segment that remained untouched by the institutionalised looting that marked his presidency, with the Gupta family's tentacles snaking into just about every other state-controlled entity.

That's one small part of the amazing story of the revolution of South Africa's energy sector.

It began with Eskom's monopoly being prised open a fraction to procure new energy from independent power producers but, because the crisis of Eskom's insufficient capacity to meet demand was crippling the economy, it soon opened far wider, with private companies now allowed to produce up to 100MW of energy without requiring a licence. There is no stopping that momentum: Eskom will remain a powerful entity but within a liberalised market where it has to compete with private sector generators of electricity.

It's appropriate here to step a little

further back in time to the reason for the energy crisis in the first place.

A really, really bad decision

In December 2007, then president Thabo Mbeki apologised to the nation for the country's power problems as loadshedding hit the nation. Eskom had been repeatedly warning that massive investment was required to upgrade its capacity to keep up with the country's growth. Without the investment, power outages would become regular. That warning was repeated in Eskom's 2006/07 annual report but government never acted, allocating funding to what it considered to be higher priority areas at the time.

"Eskom was right and government was wrong," Mbeki famously told an ANC fundraising dinner in Bloemfontein in 2007.

It was a remarkable confession from any politician but particularly one who is renowned for never admitting he was wrong.

Having awoken to the energy crisis too late, government responded by approving two mega power stations, Kusile in Mpumalanga and Medupi in Limpopo, which together would add about 9,500MW to the grid. There are many reasons for what happened next – bad management, lack of oversight, incompetence, corruption. But these mega projects turned into disasters

with long delays and massive cost overruns.

Bearing in mind that with few exceptions every renewable energy plant built by private sector IPPs in South Africa has been constructed on time and within budget, the last of Medupi's six generating units came on stream only in August 2021, having originally been scheduled for completion in 2016. The total projected capital cost soared to R135bn from an initial budget of R80bn. Kusile, initially scheduled to be fully on stream in 2014, connected its fourth unit to the grid only in December last year at an estimated capital cost of R161bn from an initial budget of R81bn.

It was within that context that Zuma made the first move to lift Eskom's monopoly and open South Africa's energy market to independent power producers.

Taking notice

The first waves of renewable energy plants seemed to spring up almost unnoticed, scattered across the country but predominantly in the Cape provinces, whose northern areas are ideal for solar power while coastal areas are suited for wind.

Away from urban areas, these plants received little media attention but the global renewable energy industry was taking notice as prices plummeted from an average of R3.12/kWh in the

The success of the renewables programme has led to a new challenge: prices have been pushed down to such low levels that it threatens the viability of smaller players. Ironically, prices from the first bid window are now considered so expensive that the IPPs are being asked to lower their prices and some already have



first round of bidding in 2011 to just 82 cents in the fourth round. In the recently completed fifth bid window, the average price was 47c/kWh.

The revolutionary aspect of the South African approach had conclusively shown its merits and the model was being emulated globally. Instead of publishing a single tariff that the government was willing to pay, the Independent Power Producers Office, a unit within the energy department, conducted auctions in which potential producers bid a certain price per megawatt they were willing to sell at, sweetened with a 20-year power purchase agreement with Eskom.

By the fourth bid window, 6,800MW of renewable energy had been procured – though the energy procured through the fourth round would only start coming onstream in 2020 as politics interfered. A total of 2,205MW was procured in that round but because of the delay, only about 1,800MW is scheduled to reach the grid.

At the time, Abu Dhabi, using the South African model, announced a new world record low price for a photovoltaic solar plant of 2.42 US cents/kWh, equivalent at the time to SA34c.

Much of the success of those early rounds is a direct consequence of the rigorous processes instituted by the IPP Office – another amazing part of the story of the energy revolution as it was built almost on the fly, using temporary structures in the car park of Gallagher Estate for its assessment centre.

That first bid window was in 2011 with the fourth in 2015 – a period in which the malevolent empire-

building by the Guptas had been rapid and voracious. Every other week there would be a new revelation of brazen corruption at state-owned enterprises facilitated by Gupta-appointed executives. I highlight this to emphasise how remarkable

“Trouble was brewing though. Brian Molefe was appointed CEO of Eskom in April 2015, the very month that the fourth bid window opened. After the winning IPPs were announced, Eskom refused to sign the power purchase agreements and the entire process stalled for three years. Then things started happening quickly”

it was that the IPP Office was a shining beacon in those dark times. Auction processes were conducted transparently with rigid controls and strong oversight. Interested bidders were kept well informed of processes and developments and deadlines were strictly adhered to – which had IPPs across the globe scrambling to get their bids in on time.

Trouble was brewing though. Brian Molefe was appointed CEO of Eskom in April 2015, the very month that the fourth bid window opened. After the winning IPPs were announced, Eskom refused to sign the power purchase agreements and the entire process stalled for three years.

Then things started happening

quickly.

Jeff Radebe was appointed energy minister in February 2018 and the fourth-round bidders reached financial close soon afterwards. They didn’t hang about – despite the challenges thrown up by the Covid lockdowns, 16 renewable energy plants are already built and supplying 1,634MW to the national grid. Another 225MW will soon come on stream from three other plants.

Such efficiency is the hallmark of the renewable energy sector. With few exceptions plants were built on time and on budget. Intellidex has visited numerous renewable energy plants in preparation for this publication as well the previous two we’ve published with Business Day on the energy sector, in 2016 and 2018. Each plant is run efficiently, staffed with people who have the appropriate expertise. Programmes are in place to minimise environmental impact and often extend to protocols on rescuing and releasing wildlife. Each power plant also contributes substantially to socioeconomic upliftment in surrounding communities, which we discuss in detail elsewhere in this publication.

R250bn and counting ...

Including smaller auctions and the fifth bid window, the renewable energy programme has injected nearly R260bn into the economy, according to IPP Office figures, with more than R40bn of that from offshore. Energy Minister Gwede Mantashe has promised the request for proposals for the sixth bid window will be announced by the end of this month and if it’s similar to BW5 it will attract about R42bn.

It’s a remarkable success story during a period where other infrastructure projects and major construction activity all but dried up. But part of that success has led to a new challenge: prices have been pushed down to such low levels through the bidding format that it threatens the viability of smaller players. Ironically, prices from the first bid window are now considered so expensive that the IPPs are being asked to lower their prices and some already have.

These market dynamics accentuate the need to reassess the entire structure of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), particularly if government is serious about maximising its localisation and industrialisation potential, which you don’t do by squeezing out smaller local players. But they are getting squeezed through thinner margins: the average internal rate of return for IPPs fell from 17.3% in the fourth window to 11.35% in fifth.

This is an issue that government needs to consider. To protect the smaller players, should it institute a floor price? Many are arguing for that because our renewables are already among the cheapest in the world.

Round five’s 47c/kWh is the average price – the cheapest bids came in at 34.4c/kWh for wind and 37.5c for solar.

Only the big multinational power producers with financial muscle can win that race to the bottom – and they’re queuing up.

The fifth window was four times oversubscribed proving that even at such low prices, South Africa’s renewables market is a highly attractive proposition. That should

continue on page 8 >>>

Standard Bank Group’s sustainable energy contribution

55 MWp of green energy plants implemented over the past five years

Replacing approximately 79 GWh of coal-sourced power per annum

Supported 321 client sites in their transition to more sustainable operations

95 solution providers grew their businesses through partnerships with us

10 small-scale embedded generation independent power producers started their asset portfolios with the support of our innovative solutions

PowerPulse

Accelerating renewable energy solutions in Africa

Our PowerPulse offering

Benefits for electricity users:

- Saves time, reduces risk and helps select the right partners
- Provides ongoing support, client engagement sessions
- The ability to make informed decisions in the energy landscape

Benefits for electricity solution providers:

- Increases ability to access markets and clients
- Streamlines sales process, lowers acquisition cost and raises conversation rates
- Guidance on business models to ensure new business proposals are bankable
- Access to network of international equipment manufacturers and traders



continued from page 7 >>>

be weighed against Eskom's energy supply deficit, estimated to be between 4,000MW and 6,000MW. What's the fastest way to get new supply onstream? We tried the "emergency route" through the Risk Mitigation IPP Procurement Programme but that was botched from the beginning and it's now bogged down by legal and environmental challenges.

Holding successive rounds of bid windows through the REIPPPP has merits over the long term as part of our drive to become a low-carbon economy. But with our market being so attractive to IPPs should the next window not be expanded to procure the entire shortage amount? The situation is urgent: the CSIR estimates that loadshedding results in lost economic output of about R700m per loadshedding stage per day and in 2019 alone it cost the economy between R60bn and R120bn.

A sense of urgency, however, hasn't exactly been the hallmark of Mantashe's tenure as energy minister.

Turbulent times

The minister's repeated insistence on generating new coal projects to extend the life of South Africa's massive coal industry is understandable on the one hand in terms of protecting jobs but is illogical in terms of the primary reason for reducing our coal dependence – to protect the planet from global warming. But other issues make his stance irrational. Financial institutions won't go near any new coal projects and global investors are increasingly instituting bans on investing in projects linked to fossil fuels. Globally, protesters are starting to target high emission companies.

Mantashe also insists that by using "clean coal" burning technologies, his plans to develop new coal-generating plants are viable but the rationality of that is explored by energy market expert Chris Yelland on page 49 and is found wanting.

These are the just a smattering of the forces pushing and pulling South Africa's energy market in different directions against the backdrop of global warming imperatives. In the midst of the long-term revolution that the energy market is undergoing, these are turbulent times and it is these issues we explore deeply in this publication.

At the centre of the market is Eskom itself, a huge, archaic state-owned organisation that was gutted by state capture. The final amount looted from Eskom will probably be identified in Judge Raymond Zondo's third report into state capture but from testimony before his commission, it's estimated to be about R7bn.

Eskom is in the throes of its own, difficult transformation from the wreckage of state capture, trying

to become an efficient, competitive company while also pivoting away from coal to renewables. That is part of its own "just energy transition" that the entire country is also undergoing. At the same time it is restructuring, breaking into three separate divisions for generation, transmission and distribution while saddled with debt of R392bn.

CEO André de Ruyter on page 18 outlines the state utility's progress so far as well as his vision for Eskom to "kickstart the reindustrialisation of the country" by developing a strong base of local manufacturers of renewable energy components. Demand for their products will be generated by Eskom's repurposing its ageing coal-fired power stations into renewable energy plants. He integrates those and other plans with the "just" part of the transition "so that it does not have to leave ghost towns, with devastated local communities in its wake". He has a clear vision of how to get where we need to go and that's refreshing for a state-owned enterprise, particularly given Eskom's importance in enabling faster economic growth.

100MW projects slow to take off

Another force that will shape the future of the energy market is the 100MW self-generation limit. As dramatic as it was surprising when President Cyril Ramaphosa lifted the cap from 1MW when Mantashe had tabled a 10MW cap, things are taking a while to get going. Applications are trickling in and none are bigger than 10MW, meaning it's unlikely that new private power plants will come on stream in time to ease pressure on Eskom's supply shortage.

The repercussions of the move are still significant as it rolled back what was left of Eskom's monopoly. In future private companies will be able to wheel their energy across the grid to their own sites or sell it to private consumers or to Eskom.

It took some time before that wheeling arrangement was even approved. Ramaphosa lifted the cap in June last year but until there was clarity on the wheeling arrangement, companies couldn't proceed. A bit surprisingly, it wasn't the energy ministry that got things going but it was Public Enterprises Minister Pravin Gordhan who announced in December that a tariff for wheeling would be introduced.

At the same time Gordhan announced the plans to rent out 36,000ha of Eskom-owned land in Mpumalanga to private sector companies that wish to develop their own power generation plants using renewable technologies. Eskom land is generally close to the necessary grid infrastructure and has several

regulatory approvals in place to ensure the time to begin development will be far quicker than other land. In the midst of our energy supply crisis, this will support the rapid increase of the country's generation capacity

"The wheeling issue, however, still hasn't been finalised, with no agreement yet between Eskom and the South African Local Government Association for a standardised wheeling methodology. While that's expected to come soon, the delays typify how government keeps shooting itself in the foot"

Given Eskom's constrained financial situation which makes access to capital expensive, this is an innovative way to add new capacity to the electricity system, including leveraging Eskom assets to incentivise the expedited establishment of generation capacity. These assets include access to land (with established environmental approvals) and proximity to grid connection points, among others.

The wheeling issue, however, still hasn't been finalised, with no agreement yet between Eskom and the South African Local Government Association for a standardised wheeling methodology. While that's expected to come soon, the delays typify how government keeps shooting itself in the foot. Had things been efficiently organised, new privately owned power plants planned would be operational within two years, reducing the likelihood of loadshedding.

The demand is there though and it's another area of government inefficiency that's holding things up, according to the Minerals Council. It points to the more than 4,000 applications for mining and prospecting rights that are yet to be processed by the Department of Mineral Resources and Energy and says R60bn worth of renewable energy projects could release 3,900MW if inhibiting bureaucracy was removed.

It would be easy to take a swipe at Mantashe and blame him for the obstacles but he merely highlights the schisms in the governing party. It would be fair, however, to say that things would be happening a lot quicker if another minister were in place, one who was a bit more enthusiastic about protecting the planet. For example, the sixth bid window was originally scheduled to

be launched in September last year with a target bid submission date in February 2022. Yet the request for proposals has been delayed to this month with no reasons given.

The pro-coal lobby is strong and Yelland explains in his opinion piece on page 10 how new and emerging coal sector business owners have been buying up coal assets at fire-sale prices as established players exit the industry because of the global move from coal. That's just one more dynamic in South Africa's complex array of forces within the governing party that prevent it from progressing at anything faster than a tortoise at full canter.

But however slowly it seems to be at the moment, things are moving along. Mantashe has promised that bid windows 5, 6 and 7 will add about 7,800MW to the grid. With the shortfall at 4,000-6,000MW that means once round seven IPPs are producing their energy we will, for the first time since 2007, have a stable supply of electricity that meets demand. Loadshedding will be over. As long as Mantashe is in charge, however, I daren't predict how long it will take for that happy day to arrive.

That will be a momentous landmark in South Africa's history and by then Eskom's restructuring should be completed with the energy market transformed from a closed, inefficient one stretching back to when Eskom was formed in 1923. Then we'll be operating in a largely liberalised market.

Still, that will not mark the end of the country's energy revolution. More renewable power will be added to the grid through the REIPPPP, probably once a year, as more of Eskom's coal plants are decommissioned and repurposed themselves into renewable power producers. And the market is bound to open up further to take advantage of the country's natural endowments. Standard Bank's Rentia van Tonder and Berrie de Jager write on page 4 how in wind energy alone there is an annual offshore production potential of 2,387TWh with shallow and deepwater wind turbines – an entire segment of the renewable energy market that has yet to be exploited.

There is so much potential that could be realised far quicker if government were to operate more efficiently. As things are today, we're certainly heading towards a more efficient, liberalised energy market where we will have enough supply to meet demand. But everything is taking far too long,

The country's goal is to reach net zero in carb on emissions by 2015. I fear it will take longer.

■ Anthony is editor of *Intellidex Media Projects*



MAXIMISING COMMUNITY BENEFITS

By Aurelia Mbokazi-Kashe

Plant name: Garob Windfarm	
Key Facts	
Technology:	Wind power
Capacity:	145MW
Location:	Copperton, Northern Cape
Site area:	168ha
Commercial Operation Date:	December 2021
Project cost:	€200m
REIPPPP Bid Window:	4
Owner:	Enel Green Power (EGP) RSA and Khana Energy
Operator:	TBC

Once a thriving copper and zinc mining town, Copperton has turned to another of its natural resources. The Garob Windfarm is one of two wind farms in this small town and promises to bring about much-needed economic development to the Siyathemba Local Municipality.

The plant's owners were intent on using local labour as well as locally manufactured components to build the colossal 46 wind turbines that stand 100 metres tall. When construction began in April 2019, the work was undertaken by local contractors, providing employment for 511 people from the local communities at the peak of the construction phase. To increase local procurement of wind turbine components, concrete tower components were obtained from a factory in Prieska and assembled on-site – in preference to imported, prefabricated steel towers.

Deputy site coordinator Gary Harris is optimistic that renewable energy projects usher in significant positive changes to communities in areas such as Copperton through various investments from these projects.

Harris is a civil engineer with considerable experience in the renewable energy sector gained at numerous solar plants across three provinces and also in Zambia. He is excited about the developments at Garob, which recently began commercial operations. He says the journey of the plant from being just a sheep farm to becoming a commercial wind farm that produces 145MW for the national grid has been emotional.

"It's fun, it's stressful and it's work. There are crazy milestones and all sorts of happenings each and every day. Ultimately, from day one we looked forward to the day the plant would start producing its first batch of electricity," he says.

From the planning stage through to construction and beyond, not a single element was left to chance with the process being followed to the very last detail to protect the investment of the asset owner. A firm follower of procedures, he insists on full plant personal protective equipment (PPE) that includes safety boots, snake gaiters, a hard-hat

and a reflector jacket to be worn by everyone before a plant tour.

"Our biggest role in the plant is to oversee day-to-day supervision and monitoring as the plant is being put together to ensure compliance and that all the checks and balances are met," he explains. There were challenges that threatened to delay the construction phase, including the outbreak of Covid-19 which delayed the supply of components. Another challenge was the community protesters demonstrating against the nearby mine who often closed the main road from Prieska and blocked access to the wind farm.

Harris says SA is capable of producing home-grown skills to locally manufacture renewable energy components and lead solar and wind energy plants as clean energy production moves to become a norm in this country.

At Garob Windfarm there is still some construction activity around the substation. Once that process is over, there will be about 15 people coming in to work at the plant daily in 12-hour shifts. The project is forecast to generate 573,000MWh a year, enough to supply clean energy to 115,000

South African households.

Since going commercial in December 2020, the wind farm launched the Herbal Lean Incubation Programme as part of its enterprise development initiatives. The programme provides mentoring and support services to start-ups in the agro, bio and food technology fields. This is in line with agriculture, the town's main commercial activity.

From the construction phase, he explains, the company that owns the wind farm continuously invested in community projects, ensuring that some of the urgent needs of these impoverished communities were met through various initiatives. These included donating wooden pallets and cable drums to the communities for making furniture, issuing PPE to the health workers during the peak of the Covid-19 pandemic, providing digital tablets for educational use of 135 Grade 11 students, full scholarships to two learners to further their education at any university within South Africa and providing food parcels to 200 vulnerable families at the height of the Covid-19 lockdown.

■ Mbokazi-Kashe is an independent writer



Photos: Christy Strever

Putting “just” into the energy transition

The energy transitions of the 21st Century are set to be as disruptive as the transitions in mechanised transport, agriculture, manufacturing and communications in the previous century, driven by climate change, global warming and the need for sustainable development.

By Chris Yelland

Will South Africa’s energy transition be just? The transition from the dominance of fossil fuels, nuclear energy and coal-fired power generation towards increased distributed and embedded renewable energy, green hydrogen and its derivatives, energy storage, and battery and fuel cell powered electric vehicles, is already taking centre stage.

South Africa is still in the early stages, but the energy transition here is inevitable. The only questions now relate to its pace and whether it will indeed be a “just” energy transition or whether it will proceed in a way that leaves festering political, economic and social wounds in South Africa’s side that will come back to haunt us for decades.

Unfortunately, a just energy transition means different things to different people in South Africa, and there are strong vested economic interests in the status quo. To these economic interests, energy justice means extending the life of South Africa’s so-called natural endowments of coal and uranium, and the extraction, transport and processing of these non-renewable resources for as long as possible.

Outwardly, the public messaging and rationale from these interests – in government and the public and private sectors – for dragging out the energy transition for as long as possible is to protect the affected jobs, workers, families and communities at the very coalface of mining, transportation, processing and burning of coal. However, the callous disregard for the plight of the unemployed poor by government and public and private sector mining interests make this rationale highly questionable. This disregard is amply demonstrated by the unabated and life-threatening ground, water and air pollution, and the destruction of the environment on which poor people and communities are dependent, by the mining and power generation sector.

A further revealing example of the lip service paid to the plight of the unemployed poor is the allocation of about R10bn a year, calculated, budgeted and disbursed by National Treasury to local government structures for free basic electricity to indigent households. In full view of national government, the significant majority of this money is then misappropriated by municipalities throughout South Africa to fund their general operating expenses.

Far more credible than any real concern for the wellbeing of affected families and communities in declining coal mining areas is the concern by the new and emerging coal sector business owners for their own economic and business interests. Encouraged by government black economic empowerment policy to acquire coal mining assets from exiting coal majors at fire-sale prices, many of the new owners are mortgaged to the hilt and

dependent for their economic survival on rising share prices and a continued flow of profits and dividends from their coal assets for as long as possible.

After having delivered on government’s transformation agenda in the coal sector, the new owners of the coal assets now feel betrayed by an apparent about face by government towards an energy transition involving the phase-out of coal in the energy mix. There is thus intense pressure on government by the politically connected new owners to extend the life of coal.

Mineral Resources and Energy Minister Gwede Mantashe panders to these interests through an unwarranted commitment to exploring “clean coal burning technologies” and carbon capture, utilisation and storage.

Coal is only a “natural endowment” espoused by the coal mining industry to burn because many of the real costs are borne by others, as they take the profits. These cost externalities over the full life cycle of mining include transporting, processing, burning and reclamation, ground, water and air pollution, acid mine drainage, repairs to roads, and time and cost overruns during construction.

A just energy transition for South Africa needs to go far beyond simply extending the life or smoothing the inevitable decline of the coal mining industry and coal-fired power generation

They combine to lead to power supply shortages and loadshedding, environmental destruction, compliance monitoring, mine rehabilitation, health costs, carbon taxes, global warming and climate change.

We need to understand and account for the real costs of these externalities compared to the alternatives. South Africa’s so-called natural coal endowment is not just to be exploited by some at huge cost to society. Like asbestos, some minerals such as coal are best left in the ground when it is clear that there are in fact options that are cheaper, less water-intensive, cleaner safer and healthier.

While the focus so far has been on the future of coal in a just energy transition, it would be remiss not to cover the role of compressed natural gas (CNG) and liquified natural gas (LNG). Natural gas is often touted as a “game changer” for South Africa, with lower particulate, sulphur dioxide (SO₂), nitrous oxides (NO_x) and carbon dioxide (CO₂)

emissions when burned.

Natural gas is also touted as an important transitional fuel for combined-cycle gas turbine power plants while the use of battery and other emerging energy storage technologies mature, and their costs reduce further through economies of scale. However, this ignores the reality that the price of battery energy storage is already competitive with gas-to-power, particularly when accounting for the multiple revenue streams from auxiliary services provided by battery energy storage to power systems.

While natural gas does indeed have lower particulate, SO₂ and NO_x emissions, the leakage of natural gas (methane) during the extraction, liquification, transportation and regassification processes prior to burning releases significant carbon-dioxide equivalent (CO₂e) into the atmosphere, because methane is a greenhouse gas about 80 times more potent than CO₂. When taking this into account, the difference in carbon emissions between the burning of coal and natural gas – both of which are non-renewable fossil fuels – becomes marginal.

A recent case study in October last year by German government thinktank Agora Energiewende demonstrates the negative macroeconomic risks from an increasing dependency on natural gas. As an extracted non-renewable fossil fuel that is traded globally and priced in US dollars, natural gas presents significant economic and energy security risks from rising commodity prices, weakening local exchange rates and balance of payments, and rising carbon taxes – all of which are outside the control of the local economies and users.

The study finds that economic stability and energy security is best achieved by reducing the share of natural gas and increasing the share of domestically produced energy resources, especially renewable energy, in the mix. New renewables are usually cheaper than fossil-fuel based energy and renewables and energy efficiency measures are a hedging strategy against fossil fuel price fluctuations and the linked macroeconomic risks.

A third leg for a just energy transition in South Africa is the decarbonisation of the transportation sector by reducing the country’s dependency on imported fossil fuel-based liquid fuels – oil, diesel, petrol and kerosene (aviation fuel) – as well as by scaling back of synthetic liquid fuels produced locally from coal and natural gas.

This can be done by further developing the unique competitive advantages South Africa has in the form of abundant wind and solar resources, relatively low population density, the availability of relatively low-cost land and 50 years of commercial experience in the production of synthetic fuels and chemicals from coal. These competitive advantages can



Chris Yelland, managing director, EE Business Intelligence

be transitioned in coming years to the production of renewable hydrogen, green power fuels and other chemical derivatives such as green ammonia, green fertilisers and green aviation fuels, for local use and for export.

Significant saving of jobs, and indeed the growth of quality new manufacturing jobs in the automotive sector, can also be achieved by transitioning the existing, well-established manufacture of internal combustion engine-based vehicles to the manufacture of hydrogen fuel cell and battery powered electric vehicles – cars, taxis, buses, trucks and mining vehicles – for local, African and international markets.

Of course, this needs to be done alongside the development of the full battery storage and hydrogen economy ecosystem, which will involve massive scaling-up of renewable energy generation as well as production, manufacturing and assembly processes, together with storage, distribution and vending infrastructure. All this will also be necessary for the transitioning of other carbon-intensive sectors such as iron, steel and cement towards a low carbon future.

What is a just transition?

A just energy transition for South Africa needs to go far beyond simply extending the life or smoothing the inevitable decline of the coal mining industry and coal-fired power generation. The reality is that the mining, processing and burning of coal is fundamentally unjust and damaging to the health of people and communities, to the environment and to the economy.

If we are really concerned about the poor, and about affected workers, families and communities, we should not try to extend the life of the fossil fuels but should be planning on accelerating away from the burning of all fossil fuels as fast as possible, and certainly significantly faster than the current trajectory.

At the same time, we should be aggressively committed to working towards a future where wind and solar power, energy storage, green hydrogen and its derivatives, and fuel cell and battery-powered electric vehicles, make up the significant majority of the mix in a new green economy.

■ Yelland is managing director, EE Business Intelligence



RENEWABLE ENERGY INDEPENDENT POWER PRODUCER PROCUREMENT PROGRAMME: A DECADE OF DRIVING SOUTH AFRICA'S GROWING RENEWABLE ENERGY FOOTPRINT

Established in 2010, the Independent Power Producer Procurement Programme, or IPPPP, was shaped by government's policy to enable the introduction of the Private Sector in the energy market, and diversify South Africa's energy mix through the introduction of cleaner technologies. The IPP Office was established with a view of implementing the Integrated Resource Plan through an innovative procurement programme. The IPP Office was established as an entity through a joint memorandum of agreement between the Department of Mineral Resources and Energy (DMRE), National Treasury and the Development Bank of Southern Africa (DBSA).

The IPP Office manages the IPP procurement programme on behalf of the Department of Mineral Resources and Energy. The IPP procurement programme involves a competitive bidding process in accordance with the procurement prescripts as outlined in South African law. It is regarded as a rolling programme whereby IPPs are invited to bid in different phases known as Bid Windows. The Bid Windows are triggered by a determination by the Minister of Mineral Resources and Energy, in consultation with the National Energy Regulator of South Africa, in terms of section 34 of the Electricity Regulation Act of 2006.

IPPs play an important role in providing new energy capacity within the current energy constraints that is hampering our economic growth potential. IPPs provide all the required capital for the construction and operation of the power plants and bear all the construction risks associated with the project. Any delays or cost overruns are for the account of the IPP. IPPs have to commit to a specified date to start generating power and there are penalties if the projects are late. Once they are operational, IPPs then also manage at their own risk the operation of the power plant for the period of the contract, which is currently 20 years. IPPs can only start recovering their investment when the power plant starts generating power. The prices charged by IPPs are also pre-determined and are predictable throughout the term of the power purchase agreement (PPA).

Starting from very humble beginnings, the Renewable Energy IPP Programme, or REIPPPP, has been the flagstone programme of this initiative. The first Renewable Energy bid window under the REIPPPP was announced in December 2011 and the first projects became operational on 15 November 2013. By October 2021, 5 423 MW of renewable electricity capacity from 83 IPP projects had already been connected to the national grid and are supplying around 7% of the country's energy demand. Through the REIPPPP, a wide range of technologies have been deployed including solar PV, wind, Concentrated Solar Power (CSP) and small hydro. Perhaps even more impressive, the renewable energy projects have generally reached operations on-time, apart from a few projects that were specifically impacted during the COVID-19 pandemic lockdown.

The IPP Procurement Programme has leveraged this infrastructure investment to transform the economy, stimulate growth and economic development, and create jobs. Bidders in the IPP bid windows have to meet specified minimum thresholds and requirements in respect of certain economic development elements, including: job creation, local content, ownership, management control, skills development, enterprise and supplier development, and socio-economic development. These minimum thresholds and requirements are improved and adjusted every subsequent bid window, building on the lessons learnt from the past.

The IPPPP has been an innovative vehicle for promoting private sector investment from local and foreign sources, and has to date attracted investment to the value of R212.4 billion. Of this, around R42 billion is from foreign investment and the main participating countries include Germany, France, Italy, Spain, and USA. By introducing minimum participation requirements for local content, a percentage

of the project value is retained for local suppliers. To date, IPPs have spent around R 62.5 billion on local suppliers. The programme further plays a significant role in facilitating new services industries, as well as research and knowledge centers to support a rapidly growing local renewable energy industry.

In-keeping with worldwide trends, the renewable energy industry has stimulated significant local job creation. In the IPP procurement model IPPs have to meet specific requirements in terms of prioritising jobs for South African citizens, including the youth, women and citizens from local communities. Through this Programme, 61 858 job years have been created to date for SA citizens in the construction and operation of already existing projects.

Another significant requirement under the IPPPP is to ensure that IPPs promote local ownership and participation. The South African equity shareholding across all the IPP Programme bid windows equates to 52% (R32.4 billion) of total equity (R62.3 billion). Black South Africans own, on average, 34% of the Renewable Energy Projects that have reached financial close. This includes black people in local communities that have ownership in the IPP projects that operate in or nearby their vicinities, through local vehicles such as Community Trusts. Shareholding by black South Africans has also been secured across the value chain, and on average black people own 21% of engineering, procurement and construction (EPC) contracting companies involved in the construction of IPP projects, and 30% own shares in the operating companies of IPPs.

The IPP Programme has further created significant opportunities for women to participate in the traditionally male-dominated energy sector. Presently, 57 Females hold top positions in IPP Project Companies as CEOs or board members. Through the IPP Projects, 9 224 jobs have been created for women across the value chain, 144 black women have been employed in top management positions during construction, and 281 black women in top management positions during operations to date. Over R5 billion has been spent on procurement from women-owned vendors.

Another important focus of the IPPPP is to ensure that the build programme creates sustainable value for local communities to benefit directly from the investments attracted into the area. IPPs have made contributions of over R2 billion towards socio-economic initiatives in education, health, social welfare and enterprise development. In education, IPPs have awarded 1276 bursaries nationwide to students, an equivalent to R210.8 million in financial support towards education to date, which will increase over time. Major fields of study have included engineering, education, medical and ICT. IPPs have also stimulated local economic activity through support to the development and growth of local enterprises. IPPs have spent around R328 million on supporting the development of local SMMEs, the bulk of which has supported equipment suppliers, financial service providers, HR/payroll specialists, Training and Development providers and transport services.

It is evident that the IPPPP will continue to play a significant role in our country's post-COVID 19 economic recovery. The DMRE and IPP Office are currently in the process of preparing for financial close of preferred bidder projects appointed under the Risk Mitigation IPP Procurement Programme (RMIPPPP) and the latest Bid Window 5 projects under the REIPPPP, and the first of these new projects are expected to come on-line from 2023-24. More Renewable and Non-Renewable Bid Windows will be rolled-out over the next year in line with the Minister's determination of 13 813 MW under the IRP2019.

The IPP Office regularly updates the latest milestones and expected timelines on the IPPPP website at <http://www.ipp-projects.co.za>



Getting to grips with the just energy transition

By Mariam Isa



The sun sets on Komati, Eskom's oldest coal-fired plant

With a deafening hiss of steam, the last operating unit at Eskom's oldest coal-fired plant, Komati, was temporarily shut down to protect equipment after an unexpected malfunction – an event that's become a regular occurrence in the utility's ageing fleet over the past few years. The massive cooling towers and chimneys of the 60-year-old plant tower over an empty field earmarked for a small agrivoltaic plant, where vegetables will be grown beneath solar panels on raised gantries.

This pilot project will mark the start of Eskom's transition towards a low carbon future as it gradually replaces the ageing coal plants that generate most of its electricity with a combination of renewable energy, battery storage and gas-to-power projects.

This mix of rapidly evolving technology is seen as the cheapest and quickest way of building new generation capacity (though the issue generates heated debate).

The transition to green energy will also harness private sector finance and put South Africa in step with the global shift away from fossil fuels, keeping its exports competitive as developed countries begin to impose cross-border

carbon taxes and stop funding carbon-intensive projects.

Eskom's coal-fired plants have become increasingly unreliable after decades of neglect and efforts to catch up on maintenance have had limited success, leading to a worsening cycle of loadshedding over the past few years.

This has played a significant part in stalling economic growth and pushing the country's unemployment rate to a record 35%.

Eight of Komati's nine units have already been retired as planned due to their advanced age and the last will be permanently shut later this year, making the coal-fired plant the first of Eskom's existing fleet to be taken out of service.

But so far, all that stands in the empty field next to Komati is a shipping container that has been converted into a microgrid power supply, equipped with battery packs and covered by a slanting roof of solar photovoltaic panels.

The innovative conversion is easy to assemble and transport and will be able to generate electricity in remote rural areas that lack power – an estimated 13% of South Africans are still without electricity.

Komati's empty warehouses

are being converted into assembly lines that could produce 45 of the containerised microgrids a year, creating up to 400 alternative jobs for existing employees as well as for local communities.

Small though they are, the converted shipping containers are evidence of Eskom's intention to help drive South Africa's just energy transition (JET). This is a global term for the shift to a sustainable, low carbon energy system that addresses climate change, creates sustainable jobs and considers the communities most affected by decarbonisation.

Transition challenge

The challenge for South Africa is enormous. Coal still provides 80% of its power, making its economy one of the most carbon-intensive in the world. South Africa also has among the world's highest levels of inequality and unemployment and since the Covid pandemic, more than half of its population are living in poverty.

Creating jobs for people employed at Eskom's coal-fired plants, the industry's value chain, and in surrounding communities is crucial – particularly in Mpumalanga, where most of the plants are located.

"It's interesting, it's new, it's a technology revolution," says Bongani Mashimbye, the engineering manager overseeing the transition at Komati with a team of fellow engineers. "We are really excited and looking forward to it."

But not everyone who will be affected by the changes feels the same way.

According to the Minerals Council SA, the coal mining sector provides nearly 400,000 direct and indirect jobs while the coal value chain contributes more than R80bn to SA's gross domestic product. On average, each mine worker supports five to 10 dependents, which implies that two to four million livelihoods could be affected.

Nonetheless it has become clear to government and business alike that South Africa must wean itself off fossil fuels as extreme weather intensifies and rapid development in technology makes investment in cheaper renewable energy and storage compelling.

Most of South Africa's exports are of carbon-intensive commodities from the mining, manufacturing and agricultural sectors. They will be penalised in a future, decarbonised



Opposing viewpoints

In a way, Eskom's aged coal-fired plants present an ideal opportunity for a transition to low carbon energy and related industries – the utility plans to retire 22,000MW of its generation capacity, which is nearly half of its installed capacity, by 2035.

Retiring old coal plants makes sense as they have become increasingly expensive to maintain and it would cost Eskom R300bn to retrofit its fleet to meet minimum air emission standards

Research from many sources shows that if managed well, the energy transition will create new jobs, boost economic growth and protect both the environment and human health. But there are many disparate views and conflicting interests, including within government itself.

Minerals and Energy Minister Gwede Mantashe has described plans to phase out coal as “economic suicide” and insisted that the fuel remain the mainstay of South Africa's energy basket, and a job provider for the foreseeable future.

The Energy Intensive Users Group, (EIUG) whose members account for over 40% of the electrical energy consumed in SA, says that a gradual, controlled phasing out of coal-powered generation and replacement with green, renewable alternatives would have a positive impact on its members.

This is provided that the transition guarantees energy security with technologies that are flexible enough to close any gaps caused by variability in renewable energy sources, such as utility scale storage solutions or gas-fired generation.

It emphasises that solutions need to be cost-effective considering that members are already challenged by high electricity prices. But coal has to be replaced with low carbon energy as most members are under tremendous pressure to reduce carbon emissions in their areas of economic activity in order to compete globally.

The group's members collectively contribute more than 20% to SA's gross domestic product and provide more than 650,000 jobs, mainly across the resources, manufacturing, transport and agricultural sectors.

In a bid to manage the opposing positions and create a coherent framework for a just energy transition, Cabinet created the Presidential Climate Commission (PCC) in December 2020. It includes representatives

from government departments and state entities, business organisations, labour, academia, civil society, research institutions and traditional leadership.

“There are some widely different views on the energy transition but there are some common points that everyone seems to be agreed on,” says PCC Executive Director Crispian Olver. “The one thing not in dispute is that there is going to be a transition. We can discuss the pace of that transition but I think there's broad acceptance that there's an increasing climate constraint and carbon constraint.

“We need a combination of economic and fiscal and social measures that are going to create alternative value chains, build the green economy and build new skills for the labour force of the future. The modelling we are doing suggests that we will have a net jobs positive impact from this transition – and not just linked to the rollout of renewable energy.

“All of the research shows that this is possible – it's not just one set of modellers smoking their socks.” The important thing for SA is not to be left with stranded assets, particularly in the coal and petrochemicals value chain, Olver says.

In a report released in January, the PCC warned that SA lacked a universally shared and binding long-term vision to address climate change which could be defined as part of the new just transition framework. “The time horizon for the transition is quickly approaching and a coordinated response is needed,” it said.

Employment opportunities

Mandy Rambharos, the general manager of Eskom's JET office, says the transition to a low carbon energy system in South Africa could result in a net gain of 300,000 jobs.

This estimate is based on energy mix projections in the country's Integrated Resource Plan (IRP) 2019 and research by GreenCape, a non-profit organisation which supports business, investors and government to build a resilient green economy.

GreenCape is working with the Departments Mineral Resources and Trade, Industry and Competition to draw up a South African Renewable

Energy Masterplan (SAREM) to position the country as a “globally significant” producer of inputs used in renewable energy plants.

Using the IRP 2019 as a starting point, South Africa would need 14-million solar panels and 3,600 wind

turbines by 2030, which would equate to a cumulative R395bn to be invested in the country's infrastructure, preliminary work from SAREM shows.

This creates opportunities for localisation and 39,000 people could be directly employed in the construction, operations and maintenance of renewable infrastructure, it predicts.

SAREM reckons its forecasts could be conservative as the IRP 2019 outlines a restrained scenario for the energy transition – a view supported by many industry players and analysts.

They are calling for regular updates to the IRP, saying it fails to reflect prevailing technology costs and the expense of imposing artificial limits on the integration of renewable energy. The EIUG believes that the IRP should be updated biannually.

Another study shows that creating a new clean energy hub for Mpumalanga could compensate for a large share of the job losses that would stem from its declining coal sector.

The CoBenefits project, which is financed through the International Climate Initiative, predicted that up to 72,000 direct, indirect and induced jobs could be created in the province by 2030. This would be the result of accelerating the decommissioning of coal capacity to 17.8GW by 2030, rather than by the 10.6GW outlined in the IRP2019, it said.

However, the employment gain would fall well short of the 123,000 job losses it projects in that scenario.

Another issue is that the median income of coal miners is 35% above that for other formal employees, and the miners are more likely to have benefits and belong to a union, says Neva Makgetla, economist from research organisation Trade & Industrial Policy Strategies.

“The relatively high earnings in mining mean it will prove to be difficult to develop equivalent livelihoods when coal employment begins to decline,” she said in a September 2021 policy brief for the Presidential Climate Commission.

Makgetla is advocating a “go slow” approach to the energy transition, saying that it will take decades, with significant downsizing of the coal value chain only starting in about five years.

“If you don't want people to mobilise against you, you can say, ‘there is time, we can fix this’,” she said in an interview. “You don't want people to become complacent but you don't want to do it overnight.”

This approach is fraught with risks as the global energy transition is accelerating. South Africa was ranked 110th out of 115 countries in the World Economic Forum's Energy Transition Index published in April 2021, reflecting its slow progress towards a sustainable and affordable energy system.

■ Isa is an independent energy writer

world and that is likely to lead to further job losses.

However, South Africa has among the best renewable resources in the world as well as minerals that will be required to manufacture the new technologies globally. It also has the potential for large-scale production of green hydrogen, a fuel seen as crucial in driving the world's energy transition to achieve net zero greenhouse gas emissions by 2050.

Green hydrogen is produced using renewable electricity to split water into hydrogen and oxygen with an electrolyser, and global investment in the market has exploded as countries representing most of the world's economic output commit to net zero carbon targets.

There were several reports released in 2021 on the expected boost to South Africa's economy should the country establish itself as a global leader in the production of green hydrogen and derivative carbon-neutral fuels and chemicals.

Creating a hydrogen economy could add attract \$106bn in new investment by 2050 and support the creation of 370,000 direct and indirect jobs, according to research compiled by IHS Markit.

Photos: Russell Roberts

“The transition to a low carbon energy system in South Africa could result in a net gain of 300,000 jobs”



Eskom champing at the bit but politics throws up hurdles

By Mariam Isa

Political wrangling over the pace of South Africa's transition to a low-carbon future looks set to delay the flow of green funding pledged to the country at the COP26 climate change conference last November.

This is complicating Eskom's plans to retire and repurpose its oldest coal-fired plants.

The state-owned utility was quick off the mark to draw up its framework for a just energy transition (JET) in October, identifying a pipeline of projects to add substantial generation capacity to the national grid as it gradually shuts its old, poorly performing coal-fired plants and replaces them with renewable energy, battery storage and gas-to-power projects.

Eskom has said it can add 8,500MW of new generation capacity to the national grid within five years if it gets the finance. It intends to build 8,000km of transmission grid to connect the new power projects and to strengthen critical corridors on its distribution grid to accommodate more private sector generation.

But the entire programme will cost an estimated R400bn – money that neither Eskom, nor the government, has available. The funding needs to come through concessional finance and grants from international development finance institutions, as well as loans from the private sector.

Eskom CEO André de Ruyter set the process in motion at the UN COP26 conference in Glasgow last November, negotiating a ground-breaking \$8.5bn pledge for green funding for the country, which was seen as a model for helping other developing nations end their reliance on fossil fuel.

However, it was based on the understanding that Eskom, which accounts for about 45% of SA's carbon emissions, will retire its coal-fired plants faster than indicated in the country's latest Integrated Resource Plan (IRP). SA is the world's 12th biggest emitter of greenhouse gases.

Most of the projects Eskom has identified involve power generated by solar or wind installations, although there are two large allocations for gas, which is seen as necessary for peak demand periods until battery storage becomes less expensive and more advanced.

Conflicting policy signals

Minerals and Energy Minister Gwede Mantashe, meanwhile, has been championing the coal industry,

declaring that the fuel must remain the mainstay of SA's energy basket and insisting that the country must not be dictated to by developed countries with a climate agenda. This is at odds what President Cyril Ramaphosa and Environment Minister Barbara Creecy have stated.

Mantashe has also been advocating for more nuclear power, on top of which the Department of Minerals and Energy (DMRE) released a Gas Master Plan "base case report" for public comment in December, indicating its intention of pursuing significant gas development in South Africa.

"The clock is ticking and we need to get a move on – other countries are lining up similar proposals and the funding window won't last forever"

"There is a bit of policy incoherence at the moment and government is pulling in different directions, which I think is holding them back from taking up the offer that's been made," said Crispian Olver, executive director of the Presidential Climate Commission.

"I do think it's important that government be of one mind in considering the deal. But the clock is ticking and we need to get a move on – other countries are lining up similar proposals and the funding window won't last forever."

De Ruyter has said it is important for SA to respond to the climate finance offer "with speed and agility" to ensure the money remains available – not only this tranche of funds but further tranches of climate change funds.

The fact is that other developing countries – notably Indonesia, Vietnam and Chile – were among 18 new countries that committed not to build or invest in new coal power at the COP26 conference, and to retire coal plants faster than planned.

Indonesia is the world's eighth biggest emitter of greenhouse gases and the world's biggest coal exporter.



Its finance minister, Sri Mulyani Indrawati, has said that the country could phase out coal-fired power plants completely by 2040 if it

gets sufficient financial help from the international community.

The governments of France, Germany, the UK, US and EU formed a partnership with SA at the conference to mobilise the \$8.5bn over the next three to five years through a variety of instruments, mainly concessional finance.

Ramaphosa has appointed former Absa CEO Daniel Mminele to lead the Presidential Task Team, which with Treasury will analyse the offer and advise Cabinet on how to proceed, based on its composition, affordability and alignment with SA's regulatory environment.

But the process has made a very slow start – it took three months for government to even set up a task team to manage the finance. A key issue will be governance – the international lenders will want to make sure that none of the funds get siphoned off through corruption.

Eskom seeks own funding

Most of the money was intended for Eskom, as transforming SA's electricity system will be the most effective way of lowering the country's carbon footprint. Some of it will go towards

building infrastructure for electric vehicles and the production of green hydrogen.

Mandy Rambharos, general manager of Eskom's JET office, says the utility is continuing its talks with multilateral lenders and will raise funding on its own to push ahead with its decarbonisation plans, if disbursement of the COP26 funds takes too long.

"We have projects that are ready to go, and we want to get capacity in the ground as soon as possible," she said.

Eskom plans to take 22,000MW of coal-fired power – around half of its existing installed capacity – off the national grid by 2035. This goes beyond what SA's latest Integrated Resource Plan has targeted, but the catch is that Eskom's modelling extends all the way to 2050 while the IRP timeline is only to 2030.

According to its last Transmission Development Plan released in November 2021, coal-fired power will comprise 44% of the utility's electricity generation by 2030 compared with about 80% now. Wind will account for 23%, Solar PV 10% and gas 8%.

At present, renewables generate 6.7% of the utility's contracted electricity.

International lenders have already made funding available to Eskom for engineering studies at coal plants that will be the first to be repurposed and repowered. Work has also begun on

identifying and designing projects to support surrounding communities.

Rambharos says that lenders were keen to fund projects with social benefits and Eskom was working with the Department of Trade Industry and Competition to see what was required to grow local manufacturing.

It was also advocating for the Emalahleni area in Mpumalanga, where most of its coal plants are located, to be declared a special economic zone for manufacturing components for renewable energy generation and related sectors.

Eskom's power mix strategy

Rambharos says Eskom has not factored new nuclear projects into its energy transition plans as building a conventional plant would take years and small modular reactors are expensive and not yet commercially available.

"Three criteria are very important in our JET strategy – one is cost. The second is time – how long will it take us to get the capacity in the ground? And the third is that we need technologies which are commercially available."

She maintains that new coal-fired power is out of the question as it is no longer possible to get funding for new coal plants. The IRP indicates that there

will be 1,500MW of new coal by 2030 but plans for two approved plants – Khanyisa and Thabametsi – collapsed last year because they could not get funding or environmental permits.

China said in September last year that it would no longer fund new coal plants abroad, which means there is unlikely to be money to build another planned 1,320MW to 3,300MW coal-fired power plant for the approved Musina-Makhado special economic zone in Limpopo.

Generating more coal-fired power is in any case incompatible with SA's climate goals and would quash any chance of securing international climate finance.

Analysts say that gas will be an important part of SA's energy mix in the medium term, as a peaking fuel to stabilise the supply of electricity generated by renewables.

But it will take years to build the infrastructure and even longer to develop new gas resources. The PCC's Olver says the approach over how much to invest must be guided by the risk that it will have to be pulled off the system as the world approaches a target of net zero carbon emissions by 2050.

Burning natural gas produces about half as much CO₂ as coal for the same amount of energy, but it produces another greenhouse gas that leaks into

the atmosphere during natural gas production – methane. Methane has a warming effect up to 80 or 90 times more powerful than CO₂ over a 20-year timescale.

DMRE sends go-slow signal

The DMRE released a JET framework for discussion in November last year, a month after Eskom published its plans. But the DMRE plan does little apart from sending a "go-slow" signal on the country's energy transition and emphasises the need for consensus among all stakeholders – including politicians.

It is also adamant that the DMRE will drive the process.

Eskom is not responsible for the building of new generation capacity – that is the mandate of the Department of Minerals and Energy. But its management team is doing all it can – working with government – to enable private business and industry to generate their own power.

In December, the Department of Public Enterprises announced that Eskom would offer 20-year leases to private renewable energy developers on properties it owns close to existing power stations in Mpumalanga, where they can easily connect to the national grid.

Rambharos says there has been "lots of interest" in the offer and she hopes

that eventually it could add as much as 2,000MW to SA's electricity supply. But again, it will take time and the utility has said it hopes the first land leases will be approved by October this year, if not sooner.

The provinces with the best solar and wind resources, the Northern Cape, Western Cape and Eastern Cape, do not have the transmission lines to take on additional generation capacity. That constraint will be a priority when Eskom begins to expand and strengthen its transmission grid with at least 8,000km of new lines, new substation, and new transformers.

This will cost the utility an estimated R120bn. It needs another R55bn to strengthen critical corridors on the distribution grid to enable connection from independent producers. Lastly, Eskom is hoping to roll out enough of its microgrid solar power solutions to reach the 13% of South Africans who do not have electricity.

Despite the outcry about speeding up the closure of its coal-fired plants, Rambharos says that according to the IRP, Eskom is actually running behind schedule. The only difference between Eskom's latest plans and the IRP schedule is bringing forward the closure of Tutuka, one of its worst-performing plants.

■ *Isa is an independent energy writer*

Ticking clock puts pressure on speed of transition

SA's policy framework for a transition to a low-carbon economy is strong but implementation delays will soon result in rising costs as the EU and other major economies introduce carbon taxes that will punish high emitters such as South Africa

By *Mariam Isa*

On the policy front we're strong but the usual South African affliction of lack of implementation is plaguing our transition to a low-carbon economy.

SA has strengthened its greenhouse gas emissions target and is building one of the most detailed frameworks for climate change policy and legislation among developing countries, after more than a decade of preparation. But the outlook for implementation is far from certain given conflicting signals from government, particularly around the decarbonisation of the country's electricity system and the development of natural gas as an alternative fossil fuel.

An international climate action tracker rates SA's progress towards the globally agreed aim of holding warming well below 2°C as "insufficient", largely because of what it describes as the government's mixed messages on a transition to a net zero carbon energy system. This is despite the fact that just ahead of the COP26 climate conference last November, SA adopted a target of limiting emissions to between 350 and 420 million tonnes

of carbon dioxide equivalent (Mt CO₂e) by 2030, which amounts to a reduction of between 20% and 30%. The target forms part of the country's Nationally Determined Contribution (NDC), which is a non-binding national plan to reduce greenhouse gases and mitigate climate change.

The prior draft target was between 398 and 440Mt CO₂e, and the Global Carbon Atlas estimates that SA emitted around 480Mt CO₂e in 2019. The lower end of the new target range is seen as compatible with the Paris Agreement, a legally binding international treaty on climate change to limit warming to 1.5°C. But the higher limit is well above the trajectory.

Furthermore, SA has been ranked 110th out of 115 countries in the World Economic Forum (WEF)'s Energy Transition Index published last year, reflecting what the WEF describes as the country's "slow progress" towards a sustainable and affordable energy system.

Ironically, sub-Saharan Africa will be among regions hardest hit by climate change, with temperatures expected to increase 1.5 times more than the rest of the world by the end of this century,

and rain-fed agriculture is already affected by more frequent droughts and floods. Widespread poverty, weak infrastructure and lack of social safety nets will exacerbate the consequences of extreme weather, with constrained fiscal resources and the need for extensive relief work and rebuilding likely to overwhelm the ability of many countries to respond adequately.

South Africa is no exception. According to the Centre for Environmental Rights (CER), the country spent nearly R1bn on drought relief alone over the past five years. In January, the government declared a national disaster after torrential rains in several parts of the country resulted in deaths, flooding and damage to property and infrastructure.

'Blame China and the US'

Critics of SA's bid to lower greenhouse gas emissions point out that as the country contributes only 1.4% of the global total, it makes no difference what changes are made – what matters are steps taken by the biggest emitters, China and the US.

That is true up to a point. The problem is that SA is the 12th-largest

emitter of greenhouse gases globally and has the most carbon-intensive economy in the G20 group of industrialised countries, more than double the global average. This puts its economy in a very vulnerable position as the world shifts to a low carbon future.

Last year the EU, one of SA's main trading partners, announced that it would introduce a carbon border tax which will force importers and non-EU manufacturers to pay for carbon emissions associated with the goods and the materials they sell within the EU. The tax could boost the cost of materials made by carbon-intensive producers by up to 30%, with the biggest initial impact on inputs such as steel, cement, aluminium, chemicals and electricity.

Although it will only be fully implemented at the start of 2026, there will be a transition phase between January 2023 and December 2025 during which EU importers must calculate and report emissions. That doesn't leave South African exporters to the EU market with much time to prepare.



<<< continues from page 15

“We are certainly part of a very high emitting club and we are a very highly carbon-intense manufacturing sector,” says Andrew Gilder, a director of Climate Legal, a climate change, carbon markets and environmental legal consultancy. “It’s not about whether we think that it’s important that we commit to climate action. We are not going to be able to expand as an economy in a future carbon-constrained world where we are effectively at a competitive disadvantage because of our carbon intensity.”

A report published by the International Institute for Sustainable Development (IISD) on 1 February showed that the social cost of SA’s energy subsidies for fossil fuels far exceeds the revenues which government earns from their combustion, and is out of step with its climate targets. Energy subsidies more than tripled to R172bn from R58bn between 2017 and 2020, with the highest allocated to fossil fuels, mainly in the form of bailouts to power utility Eskom or foregone revenue in carbon taxes and value-added tax exemptions for the sale of petrol, diesel and illuminating paraffin, the IISD said. It estimated that pollution from fossil fuel now costs SA R550bn a year in environmental harm and public health.

“Fiscal policies — subsidies, taxes, and grants — are key tools that governments can use to reach their energy and climate targets, but right now in South Africa, billions are spent propping up the existing fossil fuel system,” the IISD’s Chido Muzondo said in the report.

SA’s carbon tax

SA introduced a carbon tax on 1 June 2019 to support its climate mitigation policy and achieve its NDC goals, compelling large carbon emitters to pay for some of their greenhouse gas emissions and to adopt cleaner sources of energy.

But Finance Minister Enoch Godongwana delivered an unexpected surprise in the Budget last month by extending the first phase of the tax, which offers taxpayers a substantial tax-free threshold and additional allowances which can cumulatively reduce an emitter’s tax liability by up to 95%. The date at which the second phase – which will gradually remove the support measures and boost the pace at which carbon taxes increase – will now take effect on 31 December 2025, three years later than initially planned.

Climate activists were alarmed, saying that SA still did not have a meaningful tax which could act as a deterrent to excessive carbon emissions and warning that the extension could make it harder for the country to attain its NDC targets.

Tracey Davies, executive director at shareholder activist organisation Just Share, described the first phase of the carbon tax as “laughably inadequate” saying it had not even made a dent in carbon emissions. “Once again, the fossil fuel lobby has managed to trump the already inadequate attempts by government to take action to reduce carbon emissions,” she said.

But Gilder says that the delay may not be a bad thing because it

allows taxpayers which have either ignored the carbon tax or given it minimal attention to grapple with the processes. He pointed out that Treasury had also signalled its intention to raise the base carbon tax rate faster than originally legislated, and to bring South Africa’s domestic carbon price in line with international best practice.

National Treasury has now proposed an annual increase in the base rate of at least US\$1 to reach \$20 per tonne of carbon dioxide equivalent by 2026, with greater escalations thereafter to achieve \$30 by 2030 and \$120 beyond 2050.

“That means that during the course of this decade the cost of carbon in the hands of an emitter is going to escalate very significantly and very rapidly – much faster than was originally intended in the Carbon Tax Act,” Gilder says. “Delinquent carbon taxpayers who have decided to avoid using the system or thought that it would be cheaper for them to pay the tax will have to rapidly reassess these positions.”

Treasury also made it clear that the carbon tax will eventually become the compliance mechanism for carbon budgets, which are effectively a cap on emissions and will become mandatory in the wake of the Climate Change Bill, passed by Cabinet in September last year and tabled in parliament in February.

Once budgets have been allocated, the greenhouse gas emissions included in a budget will be subject to the base rate of carbon tax while

those exceeding a budget will be subject to punitive levels of carbon tax, of up to R640 per tonne of carbon dioxide equivalent, Treasury said. The mandatory carbon budgeting system is scheduled to come into effect on 1 January 2023.

At present carbon taxes are administered by Treasury while carbon budgets will be allocated by the Department of Forestry, Fisheries and the Environment. Gilder says this means that the links between these two mitigation mechanisms are complex and require further policy and legal elaboration.

Climate activists do not believe the Climate Change Bill goes far enough in imposing penalties for companies that exceed their carbon budgets. “We need stronger targets, stricter enforcement, bigger penalties, more transparency and more urgency,” says Brandon Abdinor, climate advocacy lawyer at the Centre for Environmental Rights. “Given the timing of this bill, we are certainly hoping for a lot of public sector participation and are expecting a fair amount.”

On February 6, the Department of Mineral Resources and Energy published a draft framework for domestic carbon offset standards for public comment. Under the current carbon tax framework, businesses liable for the tax can have a 5%-10% rebate through carbon offset projects. Treasury said it would increase this amount by five percent.

■ Mariam Isa,
Independent Energy Writer



ADVERTORIAL

ADVERTORIAL



Scatec is a leading renewable power producer, delivering affordable and clean energy worldwide. As a long-term player, Scatec develops, builds, owns and operates solar, wind and hydro power plants and storage solutions. Scatec has more than 3.5 GW in operation and under construction on four continents and more than 600 employees. The company is targeting 15 GW capacity in operation or under construction by the end of 2025. Scatec is headquartered in Oslo, Norway and listed on the Oslo Stock Exchange under the ticker symbol 'SCATC'. To learn more, visit www.scatec.com or connect with us on LinkedIn.

Dispatchable Renewables - A smart play for South Africa.

With load shedding having already cost South Africa's economy around R25 billion to date, and no end to the power cuts in sight, the country is urgently looking for solutions.

The problem is not an "energy crisis", but rather a fossil fuel dependency crisis. South Africa's abundant sunlight and wind resources make renewables the obvious panacea.

Renewables-based projects are now quick to establish, and fully cost-competitive with fossil-fuel based ones. And with programmes like REIPPPP and RMIPPPP well underway, there is no shortage of investor backing, or state support.

Innovations in storage (battery) technology have allowed renewable energy plants to output completely stable, consistent and dispatchable power. The advent of these large-scale, long-duration storage solutions, propelled by innovations in lithium ion and other technologies, has finally dispelled the misconception that renewables' output is inherently intermittent.

Scatec is proud to have been announced as a preferred RMIPPPP bidder in July last year and is on track to add 150 MW of contracted capacity to the national grid with hybrid solar and battery plants in the Northern Cape. With 1 million individual PV panels installed across a 1100 ha area, and a CapEx of around 1 billion USD, the project is one of the most ambitious of its kind in the world.

Battery units allow for a previously unprecedented level of output control and dispatchability. PV capacity can be over-installed, and the vast excess of energy produced during the sunlight hours is stored in the battery packs and released as needed - safeguarding against prolonged periods of overcast weather and seasonal swings.

The significant global challenges on decarbonisation, affordability, and profitability suggest that the fossil fuel industry may not enjoy popular backing from banks and investors for much longer.

Global production, commodity, supply chain, and exchange rate risks are currently passed through to government and not borne by the IPP. Dispatchable renewables promise to deliver consistent power at a stable cost for the next 20 years - representing a far safer proposition for the state and companies involved in the national energy debate.

A greener future using renewables is not only possible; it is, in the short- and long-term, a better strategy.

Renewable dispatchable power in South Africa is not a pipedream. It is a reality, available right now.

Dispatchable renewables are a risk-free win for government, and the key to future-proofing South Africa's energy sector.

Scatec

www.scatec.com

We can ensure no one is left behind

By André de Ruyter

The global electricity value chain is rapidly evolving as a result of technological and environmental pressure. To remain relevant and to continue delivering on its mandate, Eskom too needs to adapt to the irreversible trends in global electricity markets.

Eskom is pursuing its just energy transition (JET) strategy to accelerate the repurposing and repowering of its power stations and is actively pursuing a share in renewable energy allocation in line with the Integrated Resource Plan (IRP) 2019. The JET strategy serves as a real-time response to the inevitable global shift to a green economy and gives impetus to government's commitment to the Paris Agreement at the UN Climate Change Conference in 2015, to which South Africa is a signatory.

It is critical that the energy transition should not ignore the very legitimate fears of communities and businesses that have invested in the coal value chain. The energy transition therefore has to be just and equitable, and cannot leave a rust belt of coal mines, power stations and communities in its wake. Eskom is by no means anti-coal: it will remain a large consumer of coal for a very long time to come. But our rapidly aging coal fleet and our environmental impact provide us with both the opportunity and the impetus to embark on the road to a cleaner and greener future, with energy security for the needs of a growing economy.

South Africa's economy, on a per capita basis, is 25% more carbon-intensive than China's and double

the global average. The country emits roughly half the total carbon emitted by the African continent and Eskom emits about 44% of the total South African carbon emissions. Climate modelling shows that South Africa is significantly more susceptible to the effects of climate change. We therefore cannot ignore our own carbon footprint.

As such, Eskom intends to transition to net zero greenhouse gas emissions by 2050 by increasingly introducing low- and no-carbon electricity generation technologies into the generation fleet, thereby greatly assisting in curbing the impact of climate change. Eskom will be shutting down up to a total of 22GW of generation capacity by 2035, or roughly half of its current total installed capacity. This will give us an opportunity to pivot away from the organisation's carbon-intensive history and lay the groundwork for a cleaner and greener electricity supply industry.

More importantly, through the legal separation of its transmission business, and the expansion of the national grid, Eskom aims to open up grid access to private investors in new generation capacity, to address our shortfall in generation capacity and to enable competition in an electricity market characterised by efficiency and energy security.

For this, Eskom will require significant funding. We are therefore optimistic after President Cyril Ramaphosa's appointment of Mr Daniel Mminele as Head of the Presidential Climate Finance Task Team to lead the mobilisation of funds for South Africa's just energy transition. Having initiated the JET financing facility, Eskom requires the lion's share of the \$8.5bn climate finance, with further tranches to follow, to implement its JET strategy. This is not intended to crowd out the private sector; on the contrary, it is intended to enable private sector investment.

Concessional financing will enable Eskom to deliver on its expansion plans in an efficient manner. This is important because committing to higher financing costs than concessional financing now will be baked into the cost of electricity in perpetuity to the detriment of the economy. Without an adequate grid, new generation capacity will not be able to connect to the market. And without a well-funded plan to repower and repurpose our old power stations, Eskom cannot play its part to ensure that the transition will be just and equitable.



André de Ruyter, Eskom Group chief executive

The Camden, Komati, Grootvlei and Hendrina power stations are scheduled for shutdown in the near term. The last operational unit of Komati, which has been generating electricity since 1961, is already scheduled to be shut down in September 2022.

To address the major concerns related to the shutdown of coal-fired stations, chief among those being job losses, Eskom has conducted extensive socioeconomic impact studies at Komati, Grootvlei and Hendrina to understand these impacts, and ensure that a robust plan is developed in collaboration with social partners to effectively manage these negative effects.

Further studies will be conducted for each of the coal-fired stations as they approach their end of life. As Eskom transitions away from coal, it estimates that nearly 300,000 net jobs could be created in the construction, operation and maintenance of new Eskom and non-Eskom wind and solar PV plants. This figure is based on the assumption that South Africa will grow the local manufacturing ability and attract the investment needed to produce wind and solar components.

As an added advantage, the costs of renewable energy technologies continue to decline, and renewables have the ability to add generation capacity sooner than other technologies, thus reducing the risk of loadshedding. For example, solar photovoltaic (PV) projects take between 18 and 24 months to complete, wind projects have a lead time of between 24 and 36 months, and gas requires 24 to 60 months. In contrast, coal projects take 10 and 12 years to deliver and nuclear projects

between 12 and 15 years.

It is critically important that South Africa's energy transition be achieved in a just and equitable manner. Through this, we do not only seek to repurpose existing electricity generation, transmission and distribution infrastructure to renewables, but we are also proposing using this opportunity to play our part in helping to kickstart the reindustrialisation of the country through the manufacture of the components required for the country's renewable electricity components.

The local manufacturing of renewable energy components can significantly reduce costs and increase local economic growth. The localisation aspect, together with the continued usage of power station infrastructure that would otherwise have been decommissioned, is the "just" part in the transition to renewables. This will afford the communities who have hosted Eskom for the past half-century and played a significant part in the industrial development of the country the chance to continue enjoying access to economic opportunities. We have already started manufacturing modular microgrids at Komati and will follow this soon with a facility at the same power station to reskill workers to qualify for work on solar and wind installations.

The transition to renewables does not have to leave ghost towns, with devastated local communities in its wake. By planning a just energy transition and implementing it through a coordinated policy approach, we can ensure that no one is left behind.

■ De Ruyter is Eskom Group chief executive

“Having initiated the JET financing facility, Eskom requires the lion's share of the \$8.5bn climate finance, with further tranches to follow, to implement its JET strategy.”

BOVA LAUNCHES INNOVATIVE ARC FLASH PPE RANGE

INHERENT DANGERS

REQUIRE INHERENT PROTECTION!



INHERENT
FLAME

Inherently Flame Resistant (FR) materials maintain their in-built FR qualities and cannot wash or wear away.



LIGHTWEIGHT

Lightweight fabric for better comfort and draping yet with the same, and often improved, thermal protection ratings than heavier weight competitors.



EVAPORATIVE
COOLING

Evaporative Cooling effect wicks moisture away from the skin and expels vapour into the air for cool, dry comfort.



ENVIRONMENTALLY
FRIENDLY

Environmentally-Friendly with sustainably sourced fibers from botanical origins and no harmful chemical treatments.

Introducing the revolutionary **Bova ARC PPE**, brought to you by **Africa's leading brand of safety wear**. **Bova ARC** is an innovative range of PPE, engineered for **specialised thermal protection against the hazards of an arc flash**.



**CONTACT US FOR ALL
YOUR ARC FLASH
PPE REQUIREMENTS**

Category 2 & 4

Suits, gloves, face protection systems, safety footwear, harnesses and socks.

www.bova.co.za/arc



POWERED BY COMMUNITY RELATIONS

**Plant name: Matla A Bokone Solar
By Aurelia Mbokazi-Kashe**

Key Facts

Technology:	Solar photovoltaic
Capacity:	75MW
Location:	Sol Plaatje Municipality, Kimberley, Northern Cape
Site area:	278ha
Commercial Operation Date:	March 2020
Project cost:	R1,5bn
REIPPPP Window:	4
Owner:	IDEAS Fund managed by Old Mutual (SA), Reatile Solar Power (ringfenced), Phakwe Solar (ringfenced), Business Venture Investments 1984, Cicada Community Trust
Operator:	Juwi Solar

Spread across 278ha of reclaimed communal land, Matla A Bokone Solar's glistening solar panels that lie in a perfect formation are a striking sight. Aptly named "Power of the Northern Region" in Setswana by the local community, the solar plant puts community development at its core.

"Having a Community Property Association (CPA) as a landlord is an important part of Matla A Bokone Solar. It was a first for us and is a good story in terms of transforming this community," says Nomzamo Landingwe, chief community operations officer at EIMS Africa.

When she joined the IPP asset management company in January 2019 during the construction phase of Matla A Bokone Solar, Landingwe says she hit the ground running, forging relations and raising awareness with various stakeholders, beginning with the landowners, Droogfontein CPA.

"Part of the benefit of our lease was for people who are part of the CPA to be considered first to gain employment at the plant, and thus transform lives of landowners. The contractor and the CPA had a memorandum of understanding to allocate work that would benefit the community to locals. During the construction phase, procurement of the local labour force was handled by the CPA, so we did not worry about any instability from the community," Landingwe says.

Nkaelang Mamapula, chairperson of Droogfontein CPA, whose beneficiaries are 104 families, says about 300 members of the CPA were employed in the construction phase of the plant between October 2018 and March 2020 and 45 CPA beneficiaries have five-year employment contracts on the site.

"If people do not benefit from the use of their land it will create a problem for the CPA and Matla A Bokone Solar. We must build a sustainable relationship with the plant because it comes with corporate social responsibility and enterprise development. We are in conversations with them on how we see enterprise development programmes going forward and how these can benefit members of the CPA and drive economic development in the area," says Mamapula.

Despite a good relationship with the Droogfontein CPA, Landingwe says one of the challenges they faced was the expectation from the communities that 30% of the plant's procurement would be set aside, exclusively for them.

"Communities treated us like a mining company or government. We had to manage their expectations in a strategic and consultative way and re-emphasised that IPPs are not bound by the 30% local procurement policy. We worked closely with the Department of Mineral Resources and Energy to unpack the Renewable Independent Power Producer Procurement Programme (REIPPPP) and the areas of opportunities it brought," she explains.

Matla A Bokone Solar was the first of EIMS Africa's six projects, which were approved in round 4 bidding in 2017, to reach commercial operation in March 2020. Even though this was just as the country was going into lockdown, she says disruptions were minimal.

"As an essential service provider, construction did not come to a complete halt during lockdown. We minimised certain services that were not considered essential to best manage delivery to the shareholders and still make some



Photos: Christy Strever and Matla

impact on the community while taking care of people on the site, ensuring that all health and safety protocols were followed,” says Landingwe, adding that the generation of clean electricity was not affected “because these machines work by themselves”.

Landingwe says the project’s reach extends to other communities beyond the CPA. This is due to IPP licence requirement to contribute a percentage of profits towards socioeconomic and enterprise development, local ownership and job creation to communities within a 50km of the project. To best serve these communities, they partnered with various stakeholders, including local NGOs, municipalities and government departments.

“The needs of these communities, which are mostly rural, are great. They range from access to education and healthcare. When it comes to educational needs of children from the communities, we begin from the foundation phase and move all the way up to tertiary level,” she adds.

Promise Land Day Care Centre, in an informal settlement near Galeshewe, is one of Matla A Bokone Solar’s social investment programme beneficiaries. The early childhood development centre received about R250,000 for upgrades and to install a playground for the 109 children at the centre.

“Our relationship with Matla A Bokone Solar is good, but like any marriage we have our problems and issues that we need to clarify. We must learn (from) and emulate good practices from other CPAs who have a similar relationship, because we want the very best for our community,” adds Mamapula. ■



Eskom unbundling process is well under way

By Charlotte Mathews

After 15 years of intermittent loadshedding, almost 400% of tariff increases and continuing emissions from old, dirty coal-fired power stations, the reforms transforming the energy sector are urgent but no less dramatic for being so.

We're in the midst of liberalising South Africa's energy market that began by opening a tiny portion of it to renewable energy power producers from the private sector in 2011 – the beginning of the end of Eskom's monopolistic grip on the energy market. That process has evolved to plans to unbundle the power utility into three separate entities: generation, transmission and distribution. But it is likely to take years before South Africans can enjoy cheaper and more reliable electricity supply.

Rationale for unbundling

Former Finance Minister Tito Mboweni told Parliament in July 2019 that unbundling Eskom would increase transparency and reduce opportunities for rent-seeking and corruption, address the systemic risk that SA faces in having one very large power entity, and reduce the need for government support.

"Lack of energy security remains the Achilles heel of the SA economy," Professor Raymond Parsons of the NWU School of Business and Governance says. "Among other things, Eskom needs to be restructured and streamlined in ways that inspire confidence that our security of energy supply is better assured in future."

Unbundling is not a new idea. Dr Grové Steyn, MD of Meridian Economics, says it was first mooted in the White Paper of 1998. The reason it is taking so long is partly ideological: some in government think a developmental state requires state monopoly of energy supply, while others think a more nuanced approach is needed to create a diverse, competitive market in power generation, with the state playing a more central role in the enabling platform – the national power grid. The delay is also related to the complexity of the process.

He says Eskom's successful unbundling will not on its own deliver cheaper energy or an end to loadshedding, but it will deliver the circumstances that are necessary for that to occur in the medium to longer term.

Dr Seán Mfundza Muller, a senior research fellow at the Johannesburg Institute for Advanced Study, says it is important for the public to understand the complexities and risks involved. Restructuring alone will not solve Eskom's operational and financial problems and will not halt the utility's death spiral. (The "death spiral" refers to the fact that as Eskom's power supply becomes more expensive, it loses customers, which means it can no longer cover its operating costs or raise funds for new generation, so it has to raise tariffs again.)

"This makes sense where the incumbent vertically integrated utility struggles to raise capital for new investments and where alternative power generators might be cost competitive"

Muller says the renewables lobby is urging Eskom through its unbundling to promote more renewables in SA's energy mix, but it is not necessary to facilitate private sector renewable energy generation. The switch to renewable energy is the result of technological change, which has reduced costs, and is necessitated by SA's climate change commitments, so it will happen anyway. "The issue, rather, is the pace at which it should take place and who will bear the costs – across countries and within countries."

He says splitting Eskom could create problems in getting the three divisions to interact in the public interest. Private investors will not take on the unattractive debt-ridden components.

Sithembiso Garane, head of listed credit at Futuregrowth Asset Management, says Eskom's latest proposal for a 20.5% tariff increase, if granted, will bring the total tariff increase to about 350% since 2010 when it was at 33c/kWh. He doubts

whether Eskom's unbundling will result in lower electricity tariffs in the short term. "In fact, there is likely to be an increase in tariffs for a while, until they plateau. This is because renewable energy costs are still not optimal, despite advances in technology which have brought construction and funding costs down, as we have seen in bidding round five of the Renewable Energy Independent Power Producer Procurement Programme. Coal remains one of the cheapest forms of power generation (not accounting for capex on the newly-built power stations), although obviously it is expensive to the environment."

In September 2019, the Development Bank of SA (DBSA) published a Briefing Note on a study into electricity utility unbundling across Africa. The researchers concluded that establishing an independent transmission grid and system operator could facilitate competition by allowing the entry of privately funded generators. "This makes sense where the incumbent vertically integrated utility struggles to raise capital for new investments and where alternative power generators might be cost competitive," the report said.

However, having examined other African countries that have restructured their electricity monopolies since the 1990s, the researchers conclude that sector reform on its own does not guarantee success. Other requirements are the strength of the private sector environment, availability of infrastructure and the independence of the regulator.

Progress

The process of unbundling Eskom is well under way, although the original deadline of 31 December 2021 for the full separation of transmission was not met because of outstanding regulatory issues.

On 19 April 2021 the National Transmission Company SA (NTCSA), a wholly owned subsidiary of Eskom, was registered. By late 2021, functional separation had already occurred, with the allocation of about 6,700 employees from various head office functions to the three entities, which also have separate boards and financial statements in place. On 17 December, the agreement to transfer Eskom's transmission division to the NTCSA was executed, but one of the conditions outstanding is consent from certain creditors.

"We are exploring legal workarounds to move forward with de facto legal separation, given these external constraints and dependencies, such as the wholly owned subsidiary acting as agent for Eskom in the interim," Eskom CEO André de Ruyter told a media briefing in December. He said Eskom has done everything possible to meet the original 31 December 2021 deadline for splitting off transmission. The deadline for separating generation and distribution remains 31 December 2022.

Some of the necessary legal steps outside Eskom's control are that government needs to amend the Electricity Regulation Act and Electricity Pricing Policy to reflect the new structure of the electricity industry. The National Energy Regulator of SA also has to grant a new licence to the transmission company, which could take some time as it is dealing with Eskom's latest application for a tariff increase.

Critical independence of the transmission business

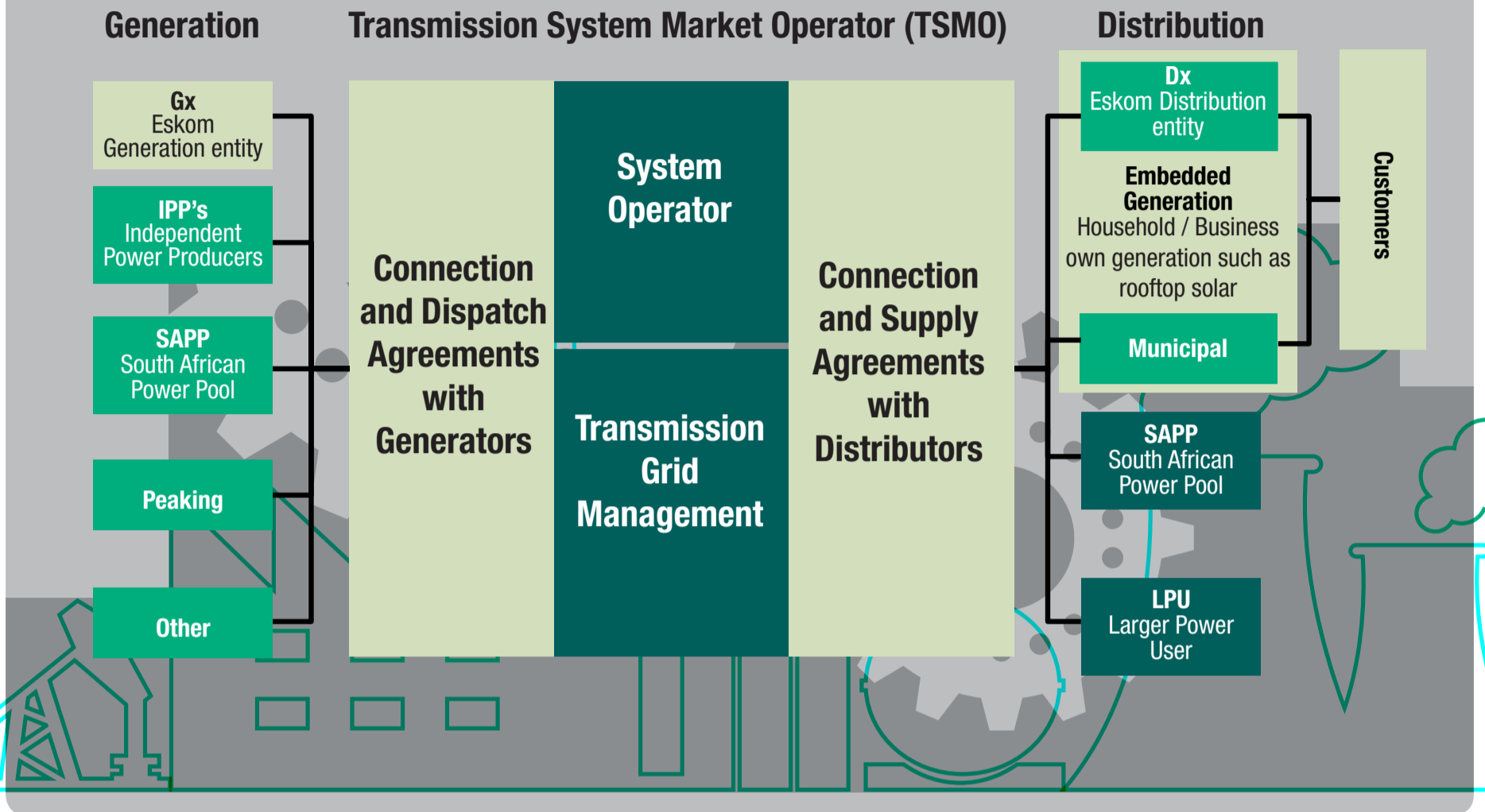
Garane says the separation of transmission into the NTCSA is the most important step in the unbundling process, because the NTCSA will not only procure from Eskom but also from other IPPs, which will increase and stabilise energy supply.

The NTCSA has to be a sustainable, revenue-generating entity, he says. "I expect that at first it will buy mostly from Eskom because Eskom is the largest generator of electricity in SA. But as more private entities start to generate power and Eskom decommissions its older coal-fired power stations, reliance on Eskom will reduce."

Peter Attard Montalto, head of capital markets research at Intellidex, says there's no clarity either from Eskom or the department of public enterprises on when the NTCSA will become completely independent of Eskom. "How does the NTCSA make decisions in an unbiased way over not buying future Eskom generation output when there are more renewables in the long run, for instance?" he asks. "Government and Eskom say there is no date here because it's a hard step, given the value of the asset and its credit quality and the complexity to spin it out fully – but instead we see key political, rather than logistical, blockages to this happening."

Attard Montalto says governance of the NTCSA is still not clear. New Eskom board positions have to be filled and the subsidiaries, especially the

Reformed Electricity Supply Industry



Source: Public Enterprises Department

NTCSA, will need independent non-executive directors. “We understand that many options have been vetoed, including offshore experts with commercial leadership experience. As such one must watch the long-term trajectory risks of unbundling, post-De Ruyter and post-[Public Enterprises Minister] Pravin Gordhan, with a very critical eye.”

Steyn says the transmission company has to be completely separate – it cannot be part of the same holding company as the other entities. “It doesn’t matter if it is state-owned, as long as it is fully independent,” he says. “By far the best option is to establish it as a separate state-owned entity, with a memorandum of association that states it is legally separate and that the government or external shareholders appoint the board. “The more independent the NTCSA is, the easier it will be to raise finance for it.”

De Ruyter reinforced the message when briefing the National Council of Provinces in May last year. He said it was essential to demonstrate that the transmission company and systems operator are independent, to encourage more private sector investment in generation. This independence could be reflected in the NTCSA having board members appointed by the relevant minister.

Asked at the briefing whether there would be any privatisation of these

three entities in future, Kgathatso Tlhakudi, the director-general of the Department of Public Enterprises, responded: “For now the message remains very clear: that Eskom remains a wholly state-owned business and so will its subsidiaries.”

At the same meeting, Eskom CFO Calib Cassim said the high-level estimated cost to complete the legal unbundling was R500m.

Dividing the debt

At end-September 2021, Eskom had cut its net interest-bearing debt by 15% to R392.1bn, a result of large-scale cash injections from government. But this level is unsustainable. Eskom does not generate enough cash flows to fulfil its debt-servicing obligations.

In January, Eskom’s creditors appointed Rothschild & Co to represent their interests during the restructuring, fearing that as Eskom splits into three units, the debt may be allocated to the weaker divisions.

Cassim said the principle Eskom would follow in allocating debt would be where the debt was raised – and it was mostly on the new build projects. “Most debt will follow generation and the remainder will go to transmission and distribution. We will have to engage with the lenders to ensure we are all aligned before we communicate any more detail.”

The weakest division of the three

is generation, which faces high maintenance costs for its ageing and unreliable fleet. In early February, Eskom said all its existing debt would remain on its balance sheet, including its bonds, after the transfer of transmission to the NTCSA.

De Ruyter told the NCOP that the transmission business was highly regarded by lenders because it has good assets and stable cash flow. It would be able to access more concessional debt, which was important because to accommodate all the IPPs it would need to build over 8,000km of new transmission lines, mainly to the Northern and Eastern Cape, over the next 10-15 years. This would cost about R120bn.

Meridian’s Steyn says it is vital to ensure that the NTCSA has a properly capitalised balance sheet because of the cost of expanding the transmission network to accommodate more private sector renewable energy. However, with a reasonably strong balance sheet, the NTCSA should find it relatively easy to raise commercial finance, so it would be better to use the concessional loans on offer for other areas of the business.

He says a properly capitalised balance sheet means that the NTCSA should also not be saddled with municipal debt arrears. Government should take back the municipal debtors’ book and inject that funding into the

NTCSA. The legacy municipal arrears represent a complex problem which is not only of Eskom’s making, and which Eskom lacks the political authority to resolve.

Communicating with the market

Attard Montalto says Eskom will discuss consent for its debt solution with required creditors – mainly banks plus some international financial institutions, but not domestic and global holders of medium-term notes. Market debt holders would be kept in the loop of these discussions.

“I’ve previously been highly critical of government’s inability to talk rationally to creditors of state-owned entities, especially in the Land Bank case, but this step with market debt holders is important and can build trust for more dramatic events in future – such as around a de-leveraging event,” Attard Montalto says.

Garane says that for noteholders the important issues around Eskom’s restructuring are not just the timing of it, but also communication. “Noteholders would like to know as much as possible but we have not had sufficient engagement with them and deadlines are often not met. We would like to hear more about Eskom’s plans and their consequences for noteholders. This would generate more confidence.”

■ Mathews is an independent writer



Hurdles remain but self-generation set to gain momentum

By Charlotte Mathews



Photos: Christy Strever

Applications to register embedded generation projects by the private sector have been underwhelming but the Electricity Regulation Act Amendment Bill published recently, which makes important clarifications on self-generation procedures and on the role of the transmission system operator, may accelerate processes. But numerous hurdles still remain and it will be at least a couple of years before self-generated power will effectively relieve pressure on Eskom's constrained supply. Surprise and delight greeted President Cyril Ramaphosa's announcement on 10 June last year allowing embedded generation projects of up to 100MW – double the 50MW that the business sector was lobbying for – without having to go through onerous National Energy Regulator of SA (Nersa) licensing requirements.

Demand for self-generation stems from Eskom's unreliable and increasingly expensive power supply combined with global pressure on companies to reduce their carbon emissions, which makes renewable energy sources far more attractive than Eskom's largely coal-fired power.

Charles Hlebela, head of communications at Nersa, says at the second week of January the regulator had received about 10 inquiries about self-generation licences but there were far fewer applications for registration of projects. Not all projects have to be registered with Nersa, only those that intend to connect to Eskom's grid.

Applicants do not have to commit to timelines but based on current information, the regulator expects about six projects will come on stream this year between 1MW and 100MW. The biggest of those projects so far is 10MW but bigger ones are on the way.

Mining companies have been preparing for bigger plants but policy uncertainty had been holding them back. The amendment bill does address those concerns but there are numerous remaining obstacles.

The bill caters for three kinds of transactions for generators including bilateral ones with customers and traders, and to sell through a central purchasing agency. It also provides for the establishment of the Transmission System Operator and outlines its functions.

Absa Corporate and Investment Banking said in a note after Ramaphosa's announcement that it

estimated R75bn of construction-related activity would be unlocked over the next few years as businesses embarked on self-generation projects.

The Minerals Council SA says its member companies have a pipeline totalling 3,900MW of potential renewable energy projects worth more than R60bn "that would, when implemented, substantially contribute to bridging the large country electricity supply deficit, diversify the country's supply, reduce the sector's carbon footprint and stabilise costs".

Administrative hurdles

"There are still a number of hurdles for IPPs and loads [consumers on the non-generation end of the network] to overcome before investments in IPPs take place, particularly if a municipality is involved," says Dave Long, the secretary-general of the South African Independent Power Producers' Association. "The municipalities are generally under-resourced and, with no national standards for wheeling, it's a very mixed bag depending upon which municipality one has to deal with. Nersa requires a Cost of Supply study to be undertaken in a municipality before it gives approval

for a wheeling deal, so this is an additional hurdle.

"In addition, there are all the other approvals needed – registration with Nersa, connection and use of system agreements, EIAs, land use etc. Only the well resourced are succeeding."

Niveshen Govender, COO of the South African Photovoltaic Association, is more encouraging. "Offtakers and suppliers may find that navigating procurement processes can be timely and complicated, but as with all new processes, it will take some time for new regulations to bed in," he says. "We would encourage stakeholders to have an open mind as they move complex renewable procurement projects forward."

Hlebela says if a company intends to connect its generation facility to the grid, in order to register it with Nersa it only needs to show a consent letter from the network service provider giving permission to access the grid.

A self-generator would need a grid connection if it intended to draw on Eskom power as a back-up, or if it intends to "wheel" power, in other words send it from one area to another. In that case it needs to pay Eskom and/or the municipality a fee for the

use of the local distribution network infrastructure.

Eskom spokesperson Sikonathi Mantshantsha says Eskom has 20 active wheeling projects and the number is expected to increase. These customers pay Eskom “use of system” charges, which cover costs, administration and other charges.

Private generators can sell to other private customers but they cannot sell surplus power back to Eskom. Mantshantsha says according to law, Eskom can only buy power through government mandated procurement programmes. However, Eskom does allow “net billing” (where a customer can export energy and gets a credit on its bill) for all tariffs except residential. Eskom expects Nersa will shortly approve its proposals for a net billing tariff for residential customers.

Katherine Persson, a former board member of the SA Wind Energy Association, says while clarity on wheeling charges would be helpful and municipal wheeling frameworks need to be finalised (and their tariffs confirmed as viable), Eskom wheeling is viable. “Wheeling from the Eskom network onto a municipal network may be slightly more complex and less tested than wheeling from an Eskom connection to an Eskom customer.”

Projects in the pipeline

Absa CIB says the most common model of self-generation is one where a company contracts with an

independent generator (eg, Amazon Group with SOLA Group). A less common model is where the company uses its own balance sheet to fund the cost of a project and retains the risks of constructing and operating it.

An example of the first model is Amazon Web Services, for which SOLA Group designed the 10MW Adams Solar PV project in the Northern Cape. SOLA has also signed agreements with ABInBev to supply seven breweries around the country with 8.7MW of renewable energy. The global ABInBev group is targeting 100% of its power from renewable energy by 2025.

An example of the own-generation model is Pan African Resources, which, even before the 10MW cap was lifted to 100MW, began work on a solar plant of 9.9MW to provide power for its Elikhulu Tailings Treatment plant during daylight hours. The goal was to provide reliable power, save CO₂ to improve its ESG ratings and materially reduce its cost of gold production over the long term. It also began looking at other projects to supply the planned underground Egoli Gold Mine and its Barberton Gold Mines.

Hethen Hira, head of investor relations at Pan African, says commissioning of the Elikhulu plant was slightly delayed because equipment was held up at Durban harbour and adverse weather

hampered construction, but was expected to come on stream at end-February/early March.

Pan African has upgraded its original plans, Hira says. It is now looking at building a bigger plant at Barberton, the ultimate size of which will depend on the area available. It also intends to increase the capacity of the Elikhulu plant to 26MW, which will provide enough power for underground organic growth projects at Egoli.

Hira says Pan African’s advice for other companies embarking on such projects would be to use specialist service providers and suppliers who have a track record of commissioning renewable energy projects. Pan African is using Arup Group and juwi, who are handling most of the administration and installation.

Big municipalities seize the opportunity

SA’s biggest municipalities – Cape Town, Johannesburg and eThekweni – have all announced plans to generate their own renewable energy after amendments to the act in 2020 allowed municipalities in good standing to procure energy in line with the Integrated Resource Plan 2019.

In October 2021, Johannesburg’s mayor, Mpho Moerane, announced the city’s Energy Sustainability Strategy which would add 500MW from solar and gas generation. This matches the city’s Climate Action Plan which

targets 35% of energy from clean sources by 2030.

In July 2021, eThekweni Municipality issued a request for proposals to procure up to 400MW of new renewable power from IPPs. It plans to have 40% of its energy from clean sources by 2030 and 100% by 2050.

Councillor Beverley van Reenen, the mayoral committee member for energy in the City of Cape Town, says the city is developing its own solar PV plant in Atlantis, which will have peak output of 10MW under ideal operating conditions. Execution is expected to begin in the second half of this year and it should be completed next year.

She says for a well-run city, projects like this which can provide secure electricity to residents, and the maintenance of infrastructure, are critical. The city’s target is to have 300MW of renewable energy generation by 2030, 50MW of which will be city-owned solar plants.

Last year, the city launched a floating solar PV pilot plant at its Kraaifontein Waste Water Treatment Works. It consists of a floating array of PV panels and a ground-mounted PV system, to determine the evaporation savings and relative generation performance of this technology. The data collected over 12 months will determine the design of a larger, utility-scale version, she says.

■ Mathews is an independent writer



Komati Power Station electricity distribution yard

Photo: Russell Roberts

Nuclear and gas: do we need them?

By Charlotte Mathews

In December 2021, demonstrators on Bloubergstrand chanted: “Down with nuclear!”. They were protesting against plans to extend the life of Koeberg Nuclear Power Station but public ire was not limited to that source of energy. From June to October 2021, protests were held from Durban to Saldanha against floating liquefied natural gas (LNG) powerships providing emergency power. Over the last six years, proposals to build two new coal-fired power plants, Thabametsi and Khanyisa, were rejected by the courts on environmental grounds.

Any energy technology except renewables seems to rouse public resistance.

SA has legacy systems that are largely fossil fuel-based and inflexible and policymakers have a strong conviction – which is not shared by all energy experts – that SA will always need “baseload” power and a diversified energy mix. This means that both gas and nuclear energy are still on the table.

South Africa’s 2019 Integrated Resource Plan (IRP), the roadmap for an energy mix to 2030, envisages that in the long term, SA’s energy mix will be based on renewables combined with gas and storage.

Nuclear

The IRP 2019 recommends that SA extend Koeberg’s life (providing 1,860MW) and take steps to procure

another 2,500MW of nuclear energy “at a pace and scale that the country can afford”. With this in mind, in June 2020, Minerals and Energy Minister Gwede Mantashe released a Nuclear New Build Request for Information for input on technologies and pricing.

Compared with President Jacob Zuma’s plans to spend R1tn on acquiring 9,600MW of new nuclear power, for which he had signed an agreement with Russian state-owned nuclear energy company Rosatom in 2014, this is comparatively modest. Still, Liziwe McDaid, of the Organisation Undoing Tax Abuse, describes these plans as “irrational and financially irresponsible”, given SA’s weak economy, while the DA’s Kevin Mileham describes them as “a reflection of misplaced priorities and policy discord on South Africa’s energy crisis”.

The 2,500MW of nuclear energy could be large- or small-scale reactors. Small modular reactors (SMRs) of up to 300MW each are relatively new technology. The International Atomic Energy Agency (IAEA) reports that SMRs are being built in Russia, Argentina, Canada, South Korea and the US. They have a smaller footprint and greater safety than the old, large-scale units and can be prefabricated, shipped and installed on site, which can make them cheaper.

Although the capital cost is less, the operating cost competitiveness still

needs to be shown in practice, the IAEA says.

Des Muller, director of NuEnergy Developments, makes the case for nuclear energy, saying that on its own it delivers the cleanest, safest, most reliable and affordable baseload electricity.

Koeberg is delivering energy at 40c/kWh compared with Eskom’s total cost for renewables on their own of R2.20/kWh, which gets passed on to the end-user or added to Eskom’s already over-burdened balance sheet, Muller says. To obtain 100MW of renewable baseload power entails building 400MW of renewable energy plants and a city block-sized battery to provide for the 70% of the time renewables do not produce power (assuming a generous capacity factor of 30% for renewables), he says.

“While it is technically possible, all this infrastructure will put the tariff into orbit and raise the CO₂ footprint of the overall plant, mostly due to the batteries. Then you lose your green status.

It has been proven worldwide that renewables simply cannot replace coal power, no matter what the vested interests claim. These plants only last 25 years, whereas today’s nuclear power plants last 80 years. Only nuclear energy and large hydro power plants are capable of delivering energy security and climate change mitigation at the same time.”

Muller favours a mix of large-scale reactors and SMRs to meet SA’s energy requirements over the next 20 years, complemented by a balanced portfolio of renewables and gas as SA moves away from coal. He says the most common public concern about nuclear power is disposal of waste, but the volumes of spent fuel generated are very low and can be recycled into new fuel for advanced reactors, with only 10% waste remaining for permanent storage.

Gas

SA currently has 3,830MW of gas and diesel power. The IRP 2019 proposes adding 1,000MW of gas by 2024 and another 2,000MW by 2027, so that gas contributes 1.3% of the energy mix – relatively little, but reflecting existing constraints on ports, transmission, etc.

On 15 December 2021, Mantashe released the South African Gas Master Plan: Basecase Report for public comment. It argues that “anchor” gas demand, in the form of a gas-to-power programme, is needed to develop a gas economy, the benefits of which would be to lower carbon emissions, improve energy security and promote industrial development. The gas-to-power sector could be developed by converting SA’s existing diesel peaking plants (Eskom’s Ankerlig and Gourikwa and the privately-owned Avon and Dedisa) to gas. Also, six coal-fired power plants reaching the end of their life before 2030 (Arnot,



Camden, Grootvlei, Hendrina, Kendel and Kriel) could be converted to gas. Tshwane is also planning to upgrade and convert its Rooiwal and Pretoria West power plants to gas.

Phinda Vilakazi, senior vice-president of commercial energy solutions at Sasol Energy, presents the case for gas. SA needs gas, he says, because while renewables are a cheaper source of energy, they generate power intermittently. Gas plants, which are quick to switch on, play a critical role in maintaining continuous electricity supply.

“Given the environmental pressures we face, natural gas is also the cleanest-burning hydrocarbon.”

Shell SA maintains that natural gas emits about half of the CO₂ and one tenth of the air pollution that coal does when burned to produce electricity. Still, for those who believe that renewable energy is 100% climate-friendly, gas is still a no-no.

Vilakazi says Eskom’s system is expected to remain strained over the medium term. Gas-to-power plants are quick to build, so they can produce electricity in the short term, and they can be built to the appropriate size to meet the unpredictable increase in SA’s demand for electricity.

“Building large-scale power plants may result in stranded assets,” he says. “Gas-to-power plants can be built and operated as base load in the short to medium term (during power shortages) and, as the contribution of energy from renewable plants increases over time, they can be run as peaking power plants to supplement renewables.”

He says gas to power is the only available short lead time, flexible generation option that will enable SA to maintain continuous power supply during periods such as the 2021-2022

summer season, when there were many days of cloudy weather around the country. In these circumstances, batteries would rapidly run out of power.

A domestic market already exists: a number of industrial and commercial businesses have converted from other energy sources to gas. There is also an existing pipeline infrastructure to supply them.

One concern about LNG is cost, he says, and how affordable it will remain for customers compared with other energy sources.

According to General Electric, gas plants can be converted to run 100% hydrogen, which would make them emissions-free.

Vilakazi says: “The ability to convert to hydrogen, once it becomes cost-effective, is important to prevent stranded infrastructure.”

Neither nuclear nor gas

Clyde Mallinson, an independent energy analyst, gives short shrift to both nuclear and gas, describing them as “yesterday’s technologies”.

“New nuclear is way too expensive and even if the risks of a meltdown are slight, the consequences are catastrophic,” he says. “Nuclear energy can never be flexible because it has a high capital cost, with low running costs, which means it has to be run at close to maximum capacity to justify the investment.”

“Peaking gas plants are the opposite of nuclear: low capital cost but higher running costs, so they are generally used only at peak demand times. At a 90% capacity factor, nuclear costs about R2/kWh; at 45%, it rises to almost R4/kWh.”

He says gas while gas is often touted as a transition fuel to see SA through the transition to renewables

as it retires its coal fleet, the reality is that gas is not needed. Energy storage systems can fulfil that role.

Mallinson does not see a future role for hydrogen in energy storage in SA. “It will certainly play a role in long-term storage needed in regions such as Europe where there is far greater inter-seasonal variability, with long periods of low renewable energy that need to be supported. In Europe, the primary role of hydrogen will be as feedstock for other industries, such as green fertiliser production, and hydrogen-to-power will constitute a small but important part of the market,” he says.

SA however, does not need seasonal energy storage. “Our maximum storage demand period is eight hours, because our complementary solar and wind resources generate energy year-round. For that, we can use other energy storage systems, which include batteries. SA’s peak demand is 35,000MW, which means it needs 35,000MWh of storage for eight hours, equivalent to 280,000MWh (megawatt hours).”

He says we can build different combinations of wind, solar and energy storage systems that can deliver this energy with no loadshedding. “A particular combination of wind, solar and storage will provide secure supply at the lowest capital cost. If we select to build more wind and solar and less storage, we can generate additional energy at very low marginal costs, and at the same time, still provide security of supply.”

Mallinson argues that SA should build 40,000MW of new wind, 230,000MW of new solar PV and 290,000MWh of storage between now and 2040, at a cost of about \$5bn a year. This combination would deliver three times SA’s current electricity

production at a factory gate cost of about 45c/kWh (prevailing exchange rates), compared with Eskom’s current factory gate tariff of 84c/kWh.

Building the cheapest combination of wind, solar and energy storage systems to meet peak demand during winter results in a surplus of power for the rest of the year, dubbed “superpower”. It has almost zero marginal cost and would stimulate demand from existing and new industries, Mallinson says.

“SA’s energy system would transition from one where generation is designed to meet demand to one where new demand will adapt to the new generation.”

The “wait and see” option

Given the rapid decline in technology costs for renewables and storage, could SA gain by deferring a decision on its technology mix? None of the energy experts is in favour of such a strategy.

Mallinson says SA’s delays in adding new energy have already cost the economy in unserved energy (loadshedding) and waiting any longer will cost the economy more than the cost savings that SA might gain from waiting for further technology advances and cost reductions.

SA simply cannot afford to wait, says Vilakazi, since implementing an LNG solution takes two to three years from the time the project is initiated, and a further two to three years for construction and commissioning. In parallel, the power plant must be ready to consume gas.

And if we hesitate over moving ahead with the nuclear programme, argues Muller, SA can look forward to chronic stage 6 to 10 loadshedding by 2030.

■ *Mathews is an independent writer*

Battery storage market presents ideal manufacturing opportunity for SA

By Charlotte Mathews

Remember the Sony Walkman? Back in the early 1990s, it was really cool to be able to listen to music from earphones leading to a portable cassette player tied to your waist as you exercised.

One of the problems Sony had to overcome in marketing Walkmans was the weight of the batteries. It turned to batteries made of lithium-ion (li-ion), which were rechargeable and lighter than any other battery available at the time.

The li-ion battery was revolutionary and its inventors recently won the Nobel Prize for chemistry. Today it is found in applications ranging from cellphones to electric vehicles, right up to utility-scale battery energy storage systems (BESS). Over the past decade, the popularity of electric vehicles has triggered a wave of innovation that has improved the energy density and reduced the costs of various battery technologies, especially li-ion, in

various applications.

According to Our World in Data, the price of li-ion batteries with 1 kWh capacity has dropped by 97% over the past three decades. Costs halved between 2014 and 2018, reflecting the widespread take-up of the technology.

This is benefiting private companies seeking to get away from reliance on Eskom by building their own renewable energy plants and will also help Eskom to make the transition over time from coal-fired power to a “greener” energy mix. In time, South Africa may develop its own battery manufacturing value chain, for local and export customers.

SA’s demand opportunity

The National Energy Regulator of SA (Nersa) approved the grid code for BESS in July last year. It said this would “allow the country to start investing in utility battery storage, which provides a good backup for wind and photovoltaic technologies”.

Currently, Eskom draws on pumped storage schemes at Ingula, Drakensberg and Palmiet to address peak demand. Batteries, however, offer advantages over pumped storage: they can be located anywhere and switched on and off as needed.

South Africa’s Integrated Resource Plan (IRP) 2019, which maps out the country’s energy mix to 2030, provides for an additional 513MW of storage capacity to be added in 2022 and 1,575MW in 2029, resulting in 5,000MW of storage capacity by 2030.

Bertie Strydom, MD of Futurus Advisory, says other government initiatives include a tender Eskom issued last year for batteries at seven sites (197.5 MW/927 MWh), on which the winning bids have not yet been announced. A concurrence with the Ministerial Determination on the procurement was only issued by Nersa on 11 November 2021. There will also be a phase 2 of that project but the timing of the release of those tenders

has not been confirmed.

Also, the Risk Mitigation Independent Power Producer Procurement Programme (RMIPPP) launched in 2020 for emergency power awarded some allocation for solar and wind power. Since a condition of the bids is that power has to be dispatchable between 5am and 9.30pm. Those IPPs will have to either add batteries or gas to their plants. The size of that storage opportunity is 640MW/2,475MWh, but these bids have not yet reached financial close, Strydom says.

Mikhail Nikomarov, co-founder of Bushveld Energy and chair of the South African Energy Storage Association, says SA is already one of the world’s biggest markets for energy storage systems (ESS). In 2020, residential energy storage shipments to SA made it the world’s sixth-largest market – the top five are all wealthier, developed countries. In 2021, SA contracted nearly 1,200MW of utility storage for



A container housing battery banks

Photo: Eskom



The battery bank housed inside the storage container

Photo: Eskom

installation in 2022, including the Eskom projects, the RMIPPP projects that have storage co-located with other generation, and the Integrated Resource Plan 2019 requirement.

“Unlike other large ESS markets like the US, China and South Korea, SA does not have a mature domestic ESS supply chain, creating a massive opportunity for a local energy storage industry,” says Nikomarov.

Strydom says that apart from the vanadium electrolyte plant that Bushveld Energy is building in East London, he is not aware of any local li-ion or flow battery manufacturers. There are several companies that import li-ion cells and package them with locally developed battery management systems for behind-the-meter applications in the local market.

Eskom tests batteries

For the past six years, Eskom has been running trials on battery technologies at its research, testing and development centre in Rosherville outside Johannesburg. Its goal is to improve the dispatchability of variable energy from the Renewable Energy Independent Power Producer

Procurement Programme plants and provide alternative grid support solutions for areas where the distribution infrastructure is restricted.

Nikomarov says there are legitimate reasons why this testing programme has run past its originally scheduled date for the first battery purchase. It is a first of its kind for Eskom, so there are a lot of learnings; there are “a lot of cooks in the kitchen”, with the involvement of the World Bank, National Treasury, the department of public enterprises, Nersa, etc; in the first bidding round, no-one met Eskom’s technical requirements; and there are regulatory issues. The DMRE has decided that batteries and other storage devices require generation licences (even though they are consumers, not generators of energy).

Eskom spokesman Sikonathi Mantshantsha says the facility was designed to test five batteries of differing technologies and sourced from different manufacturers under identical load/discharge profiles. Each 200kWh battery is part of a pack making up a single 1MWh unit connected to the grid.

So far, Eskom has tested a li-ion phosphate battery and a high temperature sodium nickel chloride (SNC) battery, but the SNC battery did not perform to expectations. Bushveld Energy and the Industrial Development Corporation purchased a vanadium-based battery (VRFB) from the US and supplied it to Eskom for testing, but it experienced some operational issues and is being replaced with another from China.

Last year Eskom put out a tender for the design and construction of a 320MWh BESS to be installed at the Skaapvlei substation in the Western Cape to store energy generated by the 100MW Sere Wind Farm. This is one of the elements of the first phase of a pilot project funded by the World Bank and New Development Bank (NDB) to test BESS solutions at seven different sites. The World Bank has approved \$320m and the NDB \$400m for both phases of this project, while the African Development Bank (AfDB) has allocated \$57.7m from the Clean Technology Fund.

In its Appraisal Report of the project in April 2021, the AfDB cited recent

studies by the Clean Energy Council in Australia that showed a two- to four-hour BESS would be cheaper than a gas peaking plant, in both its levelised cost of energy and levelised cost of capacity, owing to the BESS’s faster reaction time and flexibility. It would also provide cleaner energy than a gas peaking plant. It said the Eskom BESS trials would provide lessons for African power utilities.

Mantshantsha says the key criterion for Eskom in evaluating BESS systems is their suitability for the intended application. There’s also a need to stimulate localisation across the value chain, where there are various opportunities in beneficiation of raw materials, manufacturing, assembly, installation, maintenance and end-of-life disposal.

In the context of South Africa’s drive to develop its manufacturing capacity, the battery storage market presents ideal growth potential, particularly because much of the demand emanates from two high-growth sectors: solar energy plants and electric vehicles.

■ Mathews is an independent writer



A GLEAMING OPPORTUNITY

By Aurelia Mbokazi-Kashe

Plant name: Boikanyo Solar	
Key Facts	
Technology:	Solar PV
Capacity:	55MW
Location:	Siyancuma Local Municipality, Douglas, Northern Cape
Site area:	168ha
Commercial Operation Date:	April 2021
Project cost:	R1,4bn
REIPPPP Bid Window:	4
Owner:	IDEAS Fund managed by Old Mutual (SA), Reatile Solar Power (ringfenced), Phakwe Solar (ringfenced), Business Venture Investments 1984, Cicada Community Trust.
Operator:	Greefspan II O&M

Boikanyo Solar lies alongside the national road that connects the Northern Cape towns of Douglas and Prieska. With the closest settlement 50km away, the photovoltaic plant portrays a picture of gleaming serenity in the scorching sun.

The solar plant and nature have a symbiotic co-existence – there are more than 100 sheep that graze between the solar panels, complementing the serene atmosphere.

While nature in the form of the abundant sun is a gift to this plant, it can also be a burden. Disaster struck on 20 December 2021 when a windstorm blew off solar panels, affecting electricity production. Facilities manager Alro du Pisanie tells of winds that blew at about 104km/h. “It blew off 74 panels – they were uprooted off their structures. We worked long hours that week, and only managed to return the plant to full production after four days but in time for Christmas.” The affected blocks of solar panels had to be switched off, repaired and then returned to production.

To identify faults within the plant, SCADA (supervisory control and data acquisition) engineers monitor all panels and substations remotely. Once they pick up faults, such as an inverter tripping or a panel being positioned incorrectly, they report to the technical team to address it immediately.

Leaving no room for any breaches that could compromise the infrastructure investment of R1,4bn, the solar plant is fortified with roving cameras along the perimeter while security guards patrol the 168ha plant

every hour, Du Pisanie says.

While the sheep were brought in to control vegetation, the presence of wildlife is a concern that requires constant monitoring. Edward Kgomoeasera, Boikanyo’s electrical mechanical foreman, says that between October and December last year, six venomous snakes were caught and released far from the plant. While no one has ever been bitten by a snake onsite, safety at all times is a strict requirement.

He adds that birds, particularly large species, are a menace as their droppings reduce the efficacy of the solar panels. To remove the guano and dust from the surface of panels, a team of workers manually scrub each one of the estimated 184,000 panels with brushes, cloths and clean water twice a year. The cleaning cycle can take up to a month and it affects productivity because each section is switched off while being cleaned, explains Kgomoeasera.

The hours are long and Du Pisanie says it’s important for everyone working at the plant to like what they do and to have a keen interest in renewable energy and the opportunities that come with it.

“I like what we do here. To enjoy this, you must love the generation of electricity and be open to learn more about renewable energy. This is a place to be.”

In line with its licence requirements, Boikanyo Solar offers a bouquet of socioeconomic development (SED) and enterprise development (ED) programmes aimed at empowering communities of Douglas, Bongani and Breipaal. Pamela Matyeka, community liaison officer,



Photos: Christy Strever

says these programmes address social challenges, among them unemployment, skills development, access to education and primary healthcare.

Jocelyn Katz, 18, from Briepaal, is one of three recipients of Boikanyo Solar's Scholarship Fund. A B Ed Intermediate Phase student at Sol Plaatjie University in Kimberley, Katz says her family could not finance her tertiary studies. The best they could do was to send her to an FET college in De Aar. When she learned about the scholarship, which covers full tuition, educational equipment and a living allowance for the duration of her studies, she didn't hesitate to apply.

"This opportunity means a lot to me and my family. My dream is to make a difference to the community I grew up in. After graduating I will be returning here (Douglas) to teach because there is a shortage of teachers," she says.

The plant also partnered with business skills service providers to offer monthly workshops for entrepreneurs and empower them with a range of critical skills required to run successful businesses. These include being tax compliant, applying for funding, marketing and bidding for tenders.

The programme supports 28 micro business owners who attend weekly workshops while another 15 receive technical support through accredited skills training programmes in construction, wastewater treatment and solar supplying, which could see them become suppliers to Boikanyo Solar.

■ Mbokazi-Kashe is an independent writer



Roadmap to a hydrogen economy

South Africa has ideal conditions to leapfrog into a global leader in the production of green hydrogen. This is not a game-changer for the country's struggling economy but with the best-case scenario forecasting a GDP impact of close to R9bn, it does hold much promise with hydrogen storage in particular having the ability to supply baseload power, overcoming the intermittent nature of direct power from wind or solar.

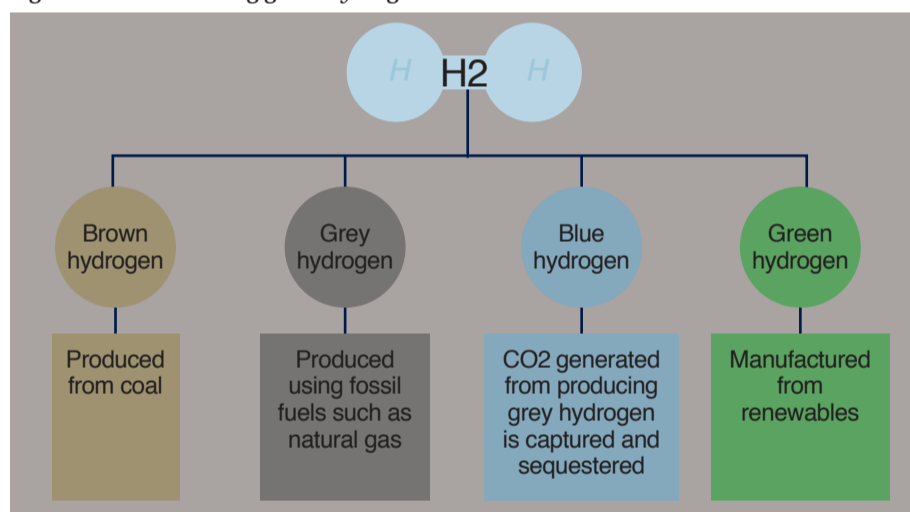
By Nxalati Baloyi

With the potential to create an estimated 14,000 to 30,000 jobs a year, the "hydrogen economy" is being pursued enthusiastically by government, particularly because it slots in neatly with both the country's carbon reduction goals and its drive to reignite SA's manufacturing sector. SA is one of the few countries in the world with very favourable conditions for the production of green hydrogen.

According to the Bloomberg's (2020) Hydrogen Economy Outlook report, over 99% of hydrogen was produced from fossil fuels in 2018, but hydrogen can also be produced cleanly using renewable electricity.

South Africa can produce renewable hydrogen competitively with other coastal countries. Green hydrogen is produced using renewable electricity to split water into hydrogen and oxygen using electrolyzers. It offers three times more energy per unit than fossil fuels. Green hydrogen and its derivatives play a key role in the decarbonisation of hard-to-abate¹ sectors of the economy as it can power long-haul and heavy-duty transport (mining vehicles, trucks, buses, trains, aircraft and maritime transport), and can also be used to produce green steel, green fertiliser and other green chemicals.

Figure 1: Understanding green hydrogen



Adopted from the World Economic Forum

While the green hydrogen economy is still in its infancy, recent developments reflect a growing interest in the sector and these initiatives could see South Africa leapfrog into a leading green hydrogen country over the short to medium term.

As fossil fuel and carbon-heavy power generation is phased out, hydrogen is widely recognised as the "go-to green fuel" and an important global economic driver of the future. The production of a substantial amount of hydrogen from renewable energy, along with hydrogen storage, will help provide long-term seasonal flexibility and bring stability and security to the global fuel supply system.

There is also a surge in demand for ammonia globally to meet agricultural, chemical, and mining requirements and this, together with the switch to green ammonia as the main fuel in the maritime industry and for coal substitution, makes it the perfect time to invest in this commodity.

SA is one of a few countries in the world with very favourable conditions for green hydrogen and ammonia production. Fortunately, government is committed to working with different stakeholders to advance the development of the green hydrogen economy and creating an enabling environment.

Government also aims to establish a sustainable local manufacturing sector for hydrogen production and PGM²-based fuel cells by benefiting local PGM minerals through appropriate mechanisms that can support a local and global market. Competitive localisation of the value chain and access to innovative green finance solutions are key enablers for success.

As a start, the Hydrogen Valley Consortium³ was formed to accelerate a local hydrogen economy and to collaborate on a study titled "South Africa Hydrogen Valley Feasibility Study" to discover ways to transform South Africa's bushveld complex, and a larger region between Johannesburg and Durban, into a hydrogen valley.

The report identifies three catalytic green hydrogen hubs that will make up the

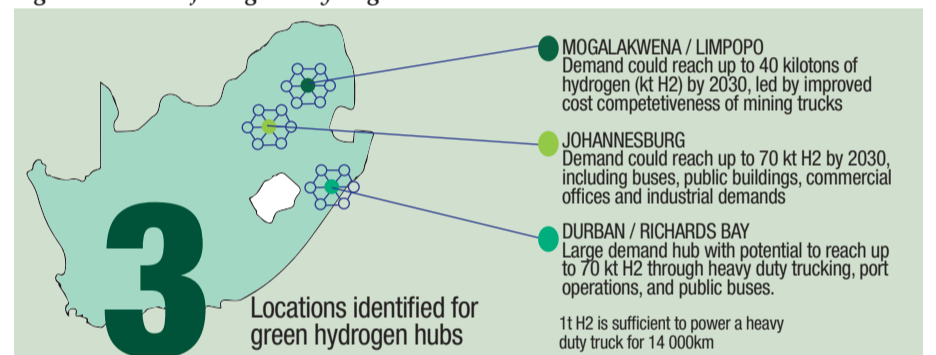
valley (see Figure 2), including the Mogalakwena hub in Limpopo (home to the largest open-pit platinum mine in the world), a Johannesburg hub (extending to Rustenburg and Pretoria); and a Durban hub (encompassing both Durban and Richards Bay).

Other key findings from the Africa Hydrogen Valley Feasibility Study included:

- The potential GDP impact, both direct and indirect, of the identified hydrogen projects is between \$3.9bn (low demand case) and \$8.8bn if the full vision is realised by 2050.
- Between 14,000 and 30,000-plus jobs could be created per year. This jobs growth is across the whole hydrogen value chain, starting at the sourcing of resources such as water resources management and platinum mining, production including electrolyser development, transport including the pipeline and trucking industries, storage such as liquefaction, and applications such as fuel cell manufacturing.

The report identifies nine promising pilot projects to kickstart the hydrogen valley in the mobility, industrial and buildings sectors.

Figure 2: South Africa green hydrogen hubs



Source: adopted from South Africa hydrogen valley feasibility study

Hive Hydrogen, Built Africa, together with Linde plc, through its wholly owned South African subsidiary Afrox, are also at the forefront of the commodity development. For instance, these organisations have teamed up to establish a \$4.6bn, 780 000 tonnes a year (t/y) green ammonia plant at the Coega special economic zone in Nelson Mandela Bay. The renewable energy and energy storage component alone will be the biggest project of its kind in sub-Saharan Africa and one of the largest globally.

The facility, with its own dedicated green power source, will be a significant response by South Africa to the world's need for green solutions to minimise the destructive effects of climate change and to meet COP26 obligations. The first phase is planned to go live in 2025, with full operation by the end of 2026.

Africa's largest salt producer, Cerebos, will supply desalinated, demineralised water to the project. InvestSA, a division of the department of trade, industry and competition, has been instrumental in assisting Hive Hydrogen with specific investment facilitation through its one-stop shop mechanism.

South Africa is also committed to forming strategic partnerships globally to help steer the green hydrogen economy. Key partnerships include the US, EU, Germany and Namibia.

SA-Germany:

- On the 17 January 2022, during a site visit to Port Nolloth near Boegoebaai in the Northern Cape, the German Federal Ministry for Economic Cooperation and Development (BMZ) commissioned its development agency, the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ), to spearhead the H2Global development initiative – in collaboration with the SA government. BMZ will provide \$14.2m in grant funding, as part of a larger \$45m commitment from the German government to support SA's hydrogen economy. Separately, German development bank KfW also pledged €200m in concessional loan finance for governmental and private sector green hydrogen projects.

Cop26 pledge:

- In November 2021 at COP26 in Glasgow, the governments of South Africa, France, Germany, the UK and US, along with the EU, announced an ambitious, long-term Just Energy Transition Partnership to support South Africa's decarbonisation efforts.

¹ These economic sectors are referred to as 'harder-to-abate', not because there is a lack technological solutions but because these solutions carry a higher abatement cost than current higher-carbon technologies.

² Platinum Group Metals (PGMs) are essential and precious metals which include platinum, palladium, rhodium, iridium, osmium, and ruthenium. They are widely used in industry given their unique catalytic properties. PGMs are a critical component across the hydrogen value chain and are key to unlocking a sustainable and zero-carbon future.

³ The Hydrogen Valley Consortium constitutes a Public Private Partnership, and the project partners include AngloAmerican, Engie, Bambili Energy, the South African National Energy Development Institute (SANEDI) and the Department of Science and Innovation (DSI).

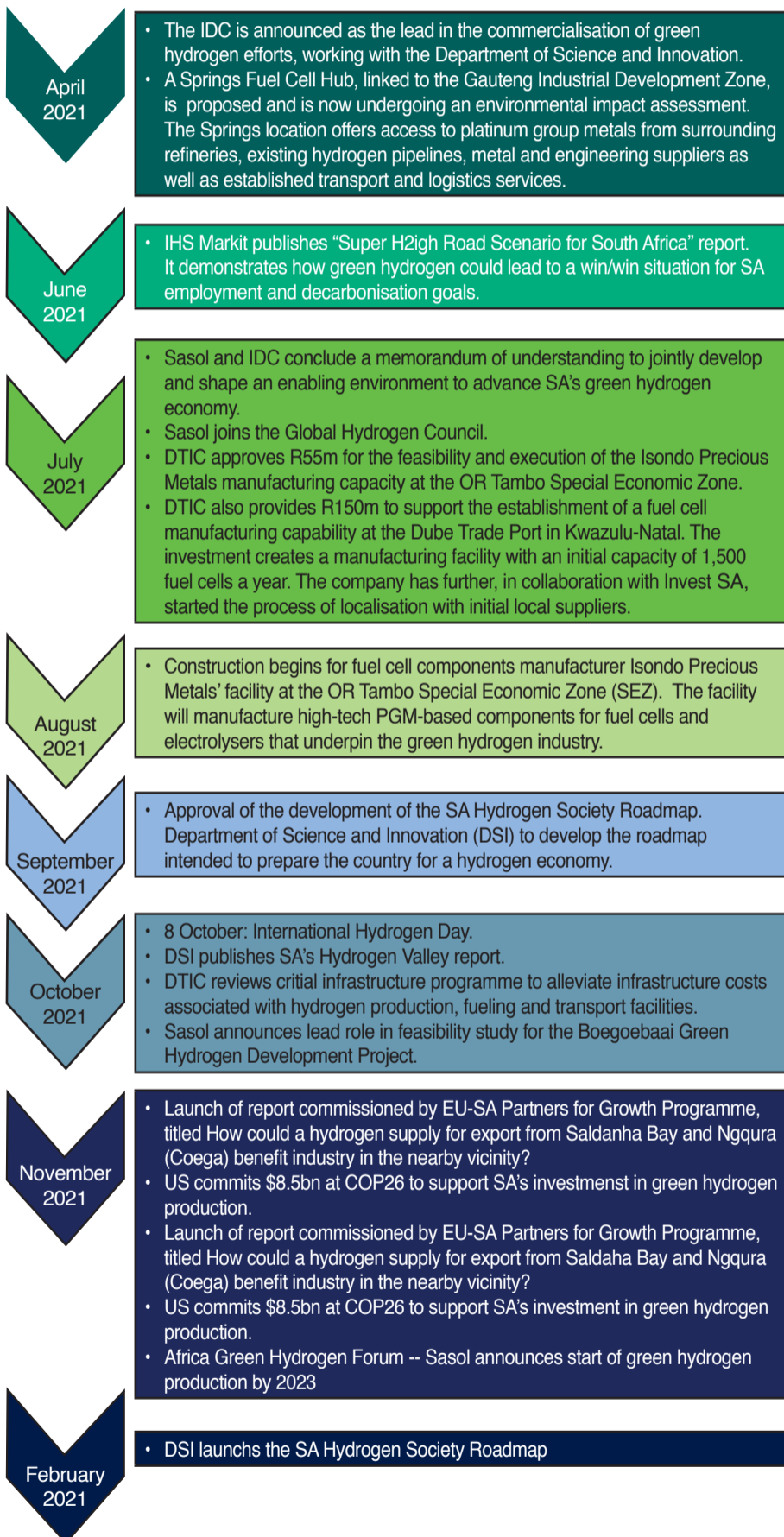


- The partnership aims to accelerate the decarbonisation of SA's economy with a focus on the electricity system to help it achieve the ambitious goals set out in its updated Nationally Determined Contribution emissions goals.
- The EU will also be funding a Green Hydrogen Study Tour to Europe for South African government officials active in hydrogen policy. The visit will be an opportunity to share perspectives, engage in policy discussions and visit hydrogen projects on the ground.

SA-Namibia:

- The two countries will co-develop the green hydrogen supply chain in partnership with South African companies. This collaboration could be an ideal strategic partnership enabling a climate-neutral SADC.

Figure 3: Timeline of SA's hydrogen developments



Saldanha Bay (Europe export) and Coega (Far East export) are two deep water ports recommended for hydrogen exports. These ports are also strongly encouraged to join the global ports coalition developed by the EU under the green hydrogen initiative -- the Rotterdam port is very advanced and is keen to assist South Africa.

To achieve economies of scale, the identified ports, in addition to exporting hydrogen, can also supply hard-to-abate industries within a 150km radius, providing fuel for rail, shipping, buses, airports, refineries and steel plants (see Table 1).

Germany and Japan are the two bulk importing countries of green hydrogen from South Africa. Germany requires 3 million tonnes per year (Mt/y) by 2030, but can only generate 420 kilo tonnes per year (kt/y), while Japan requires 300 kt/y @ \$3/kg (landed in Japan) by 2030 and 5-10 Mt/y @ \$2/kg by 2050.

Table 1: 150km radius of Saldanha Bay and Coega

Entity	Site	Process/Vehicle	Fuel feedstock switch
Transnet	Port of Saldanha Bay	<ul style="list-style-type: none"> Maritime shipping bunker fuel Forklifts, cranes, port vehicles, shore power. 	<ul style="list-style-type: none"> HFO to ammonia Diesel to H2(FC)
	Port of Cape Town	<ul style="list-style-type: none"> Maritime shipping bunker fuel Forklifts, cranes, port vehicles, shore power 	<ul style="list-style-type: none"> HFO to ammonia Diesel to H2(FC)
ACSA	CTIA	Airport ground vehicles	Diesel to H2(FC)
CoCT	Cape Town	MyCitibuses	Diesel to H2(FC)
PRASA	Cape Town	Metrorail locomotives	Electric to H2(FC)
Astron Energy	CALREF refinery	Desulphurisation of diesel	H2: grey to green
ArcelorMittal	Saldanha Works	Reducing iron ore	Coke to green H2

50km radius of Coega (Ngqura)

Entity	Site	Process/Vehicle	Fuel feedstock switch
Transnet	Port of Ngqura	<ul style="list-style-type: none"> Maritime shipping bunker fuel Forklifts, cranes, port vehicles, shore power. 	<ul style="list-style-type: none"> HFO to ammonia Diesel to H2(FC)
	Port of Gqeberha	<ul style="list-style-type: none"> Maritime shipping bunker fuel Forklifts, cranes, port vehicles, shore power 	<ul style="list-style-type: none"> HFO to ammonia Diesel to H2(FC)
ACSA	CDSIA	Airport ground vehicles	Diesel to H2(FC)
PRASA	Gqeberha	Metrorail locomotives	Electric to H2(FC)

As momentum picks up in SA, several green hydrogen projects are currently being pursued across sectors, mostly ranging from feasibility stage to pilot rollouts (see Table 2)

Table 2: Hydrogen project pipeline

Company	Description	Partners	Status
Sasol	<ul style="list-style-type: none"> Driving development of green H2 through repurposing existing assets and exploring greenfield opportunities in SA, incl. Anchoring local demand & setting up local industry value chains & demonstrating local abilities 	<ul style="list-style-type: none"> IDC Imperial CEF Gauteng and Northern Cape Provincial Govts. Mining entities H2Global First pilot (Linde, Enertrag, Navitas) Haldor Topsoe Port of Rotterdam 	<ul style="list-style-type: none"> Multiple catalytic projects in feasibility phase 3 projects shortlisted for KfW funding MoU signed with the Northern Cape Economic Development, Trade and Promotion agency to lead the Boegoebaai feasibility study with the IDC (detail below).
Chem Energy	<ul style="list-style-type: none"> Invested in a fuel cell manufacturing facility at Dube trade port Special Economic Zone Targeting the telecom sector 	<ul style="list-style-type: none"> Likely leveraging group expertise and capabilities 	<ul style="list-style-type: none"> Opened in March 2020
Busmark	<ul style="list-style-type: none"> Locally developed new hydrogen powered bus 	<ul style="list-style-type: none"> Hydrogen SA (HySA) CSIR 	<ul style="list-style-type: none"> Feasibility and test studies concluded Commercial rollout to follow
Gautrain	<ul style="list-style-type: none"> Proposed rollout of H2 and electric hybrid buses 	<ul style="list-style-type: none"> Greencape Enertrag Busmark HySA CSIR 	<ul style="list-style-type: none"> No clear visibility on progress or timeline
AngloAmerican	<ul style="list-style-type: none"> Creation of the first H2 powered large size mining truck Project in pilot phase Goal is to rollout 40 trucks by 2024 	<ul style="list-style-type: none"> Engie Nel Hydrogen Plug Power 	<ul style="list-style-type: none"> Pilot starting in H2 2021
Implats	<ul style="list-style-type: none"> Development and testing of the first hydrogen powered Forklift. Successful proof of concept and testing conducted in 2016 	<ul style="list-style-type: none"> University of the Western Cape HySA Hybrid4Mobility (EU H2 programme) 	<ul style="list-style-type: none"> Economic viability being assessed Rollout roadmap being prepared
Vodacom	<ul style="list-style-type: none"> Deployed fuel cells at off grid base sites (used as an alternative power source on a case by case basis) 	<ul style="list-style-type: none"> CHEM Energy Powercell 	<ul style="list-style-type: none"> 300 sites had been equipped with fuel cells by 2019



Renewables fit neatly into SA's industrialisation plans but PPPs need to be streamlined

Government may have to make short-term political sacrifices to secure a stable energy supply, which would lead to long-term economic and social gains. But this requires planning beyond just one election cycle.

By Gershwyn Benjamin

The energy market is almost unrecognisable from when South Africa suffered its first bout of loadshedding in 2007, with Eskom's monopoly effectively ended and 22% of our energy being supplied by renewable sources, with more to come.

While periodic blackouts persist, the renewable energy sector has contributed massively to SA's infrastructure development, with about R250bn being pumped into the economy in the first five bid windows. It also sparked the birth of a new manufacturing sector with a host of new factories producing components including solar panels and windmill turbine propellers.

But here is the tragedy of inconsistency in government policy: many such small manufacturers were killed off by the long delay in final approval for the fourth bid window.

Developing a base of small, black-owned manufacturers is core to government's entire industrialisation drive as well as its efforts to transform the economy, yet it displayed callous indifference to the plight of those small manufacturers.

Since then government has put on the table a R1tn infrastructure development programme that appears unable to take off. While there are numerous reasons

for this including lack of expertise in big infrastructure projects across government and complex approval processes that cut across numerous government departments, the government also has to regain the trust of the private sector.

But with the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) now up and running again with the request for proposals for the sixth bid window scheduled for later this month, this sector could be revived and certainly, it forms an integral part of government's drive to reindustrialise SA, supported by localisation policies that compel local procurement in certain areas.

To revive and develop this niche manufacturing sector, it's important for government to provide long-term policy certainty. RMB's head of power and renewables Daniel Zinman says this can be achieved through regular annual procurement rounds. If adhered to, he says "the development of local industry and consequent job creation will be successful".

Renewable energy as part of the wider infrastructure rollout

Government has rightfully outlined plans to reignite economic growth – the Economic Reconstruction and Recovery Plan (ERRP) places significant emphasis on

stabilising the energy grid, infrastructure development and industrialisation.

The case for industrialisation, which is expected to boost localisation, lies in government's aim to grow South African businesses and boost employment.

The REIPPPP forms a significant part of South Africa's path to stable electricity supply and reducing carbon emissions. In bid window 5, 25 preferred bidders successfully secured contracts to supply a combined 2,583MW of wind and solar power to Eskom. In addition, the construction industry plays a vital role in the engineering, procurement and construction of the infrastructure.

In 2020, government announced 51 projects worth R340bn that were being fast-tracked to kick off the infrastructure drive. The projects were gazetted as strategic in an effort on government's part to reach project bankability as soon as possible. Specifically, the announcement included that sovereign guarantees and approvals for increased borrowing had been secured and that funding agreements had been reached with development organisations and the private sector.

Allocations worth R58bn were made in the energy sector which is expected to create 6,000 jobs. The main feature of the allocation consisted of the emergency Risk

Mitigation Independent Power Purchase Procurement Programme – which has been stalled by legal challenges but aimed to increase capacity by 2,000MW. Further projects in the form of a small Independent Power Producer (IPP) power purchase programme (100MW) and embedded generation investment programme (EGIP) (400MW) were also included.

Investment in energy and by extension renewables forms part of the wider infrastructure needed to structurally alter SA's economic growth upward. Government's infrastructure drive announcement included targeted investment amounts for other sectors of the economy including R106bn in water and sanitation (11 projects), R47bn in transport (15 projects), R7bn in agriculture (three projects) and R4bn in digital infrastructure (one project). Human settlements is allocated the biggest chunk with 18 projects worth R139bn outlined for infrastructure investment.

While government secured its borrowing requirements and agreements for funding with private sector and development finance institutions, more needs to be done. The increased borrowing requirements place more pressure on the debt outlook and government needs alternatives – with private-public partnerships (PPPs) the obvious vehicle.

The financial pressure on general government and state-owned enterprises (SOEs) is intense. The accumulation of debt over the past decade, combined with sluggish growth and poor macroeconomic conditions, resulted in the loss of South Africa's last investment-grade credit rating in 2020, just as the Covid-19 crisis reached its shores.

In addition, underspending on budgeted amounts in government has contributed to the declining trend in capital expenditure by public sector firms. Findings from Intellidex's Infrastructure for South Africa report (2021) indicate that the state spent an average of 85% only on its capital budgets



during the 2015/16 and 2018/19 financial years. This happened as National Treasury enforced a new set of rules for supply chain management on public entities and national businesses.

The first of these changes was to the Public Finance Management Act (PFMA) in 2015, which led to the Standard for Infrastructure Procurement and Delivery Management (SIPDM) framework. Initial responses to the SIPDM framework were positive as it aimed to ensure value for money from infrastructure and emphasised efficiency in planning and implementation of projects. It also aimed to do so while balancing the competing forces of socioeconomic objectives, project time frames, quality and cost (Watermeyer and Phillips 2020).

However, the framework was difficult to implement and led to lengthy delays as well as a high amount of denial of approvals for projects. The framework also proved inefficient in allocating risk, with most of it placed on construction companies. Consequently, the SIPDM was replaced by the Framework for Infrastructure Delivery and Procurement Management (FIDPM). While an improvement on the SIPDM, the FIDPM did not address the main issue – government's inability to efficiently procure infrastructure. This, combined with the continued underspending on capital budgets by government, is indicative of a lack of skills and capacity to procure within the FIDPM framework.

This also reflects in the number of failed tenders. A National Planning Commission study finds that of the 17,599 tenders that were published during January 2018-September 2018, only 5,255 were awarded (29.9%) and 1,326 were cancelled (7.5%). A total of 10,132 tenders were not awarded, which is costly for bidders who tend to factor these costs into future bids, which in turn contributes to costly procurement and a lack of trust in the state.

Overall, government and SOEs are ill equipped to fund infrastructure off increasingly weak balance sheets.

PPPs resolve many of the issues. They differ from funding projects through SOEs or on-balance sheet infrastructure investment in that the private sector can take on the financial, technical and operating risk, while government and other users pay to use the infrastructure. IPPs, however, lead to contingent liabilities for the government's balance sheet. These are generally agreements for compensation in the event that the state does not stick to agreements related to compensation for the use of infrastructure assets. While this may be the case, contingent liabilities often decrease over the life of projects, which is positive for the state's financial position.

PPPs are governed by Regulation 16 of the PFMA which consists of a complicated set of approval steps. In addition, a corresponding set of regulations are in the Municipal Finance Management Act (MFMA) for municipalities to follow in procuring infrastructure projects.

The Infrastructure for South Africa report found that complexities of PPP regulation were hampering private sector investment into public infrastructure.

Specifically, projects delays through complex and onerous steps for approval are compounded by conflicts with other legislation, including Broad-Based Black Economic Empowerment (B-BBEE) and the Preferential Procurement Policy Framework Act (PPFA). Moreover, there is no overall mechanism that can be used to review infrastructure projects and channel them into PPPs – existing frameworks such as the SIPDM make this process difficult, which disincentivises government departments, making them more likely to go the on-balance sheet or SOE route.

The Infrastructure for South Africa report concluded that the ideal PPP policy includes ensuring that the PPP unit within government is able to provide knowledge, oversight and development of PPP projects with competencies including:

- Developing regulatory and legal frameworks that enable the formation of PPPs;
- Project initiation, solicitation, management and evaluation;
- Attracting investment and managing political risk by advocacy for PPPs within government and the general public; and
- Performance monitoring and contract management.

A World Bank study in 2018 ranked SA's PPP Unit within National Treasury as above-average for project preparation, contract management of unsolicited proposals as well as rating the country only slightly below average for procurement. However, it is important to note that legislation governing PPPs remains complex and other pieces of legislation (MFMA, PPPFA, FIDPM and B-BBEE), although useful for policy objectives, add to the complexity of delivering PPPs.

Treasury's review of the PPP framework

Finance Minister Enoch Godongwana's maiden budget speech provided some hope regarding the urgent legislative changes that need to be made to accelerate PPP adoption. The review recommends legislative changes to improve the selection, prioritisation, planning, financial support mechanisms, procurement, implementation and monitoring of PPPs.

At a national level, the review makes a host of findings, including:

- That there is no overarching infrastructure policy framework that mainstreams PPPs as part of a fiscally prudent planning process;
- From a legal and regulatory standpoint, there is a lack of accountability for procuring institutions, a lack of clarity on how to treat unsolicited proposals and importantly, there are multiple and time-consuming approvals;
- There is no centralised approach to identifying and screening PPPs;
- There is a lack of capacity and skills at procuring institutions at provincial and national levels as well as the PPP Unit; and
- The process is marked by lengthy, rigid and costly feasibility studies, poor PPP contract management and a lack of preparedness at exit management stage of PPPs.

The review subsequently recommends
continue on page 36 >>>





continued from page 35 >>>

quite a few amendments to legislation including:

- An integrated public investment management system and PPP policy;
- Clear time frames for approvals by regulators;
- Increasing the capacity of the PPP Unit;
- Exemptions for low-value projects of R1bn and below from procurement approvals; and
- Adjustment of B-BBEE requirements for PPPs.

What's particularly encouraging is that at a municipal level, Treasury recommends a professional unit dedicated to the implementation of municipal PPPs. This includes a municipal PPP championing body that can facilitate the building of a PPP pipeline. This is highly important because the provision of basic services, which government regularly bungles, takes place at a municipal level.

Importantly, the review also includes a section on managing contingent liabilities which the state may have to incur when taking on the risk of a project. This is particularly important in the context of the pandemic, which negatively affected economic activity and resulted in sizeable losses for both government and the private sector, depending on which party took on the risk. National Treasury currently rates

the risk of contingent liabilities to the fiscus as manageable. It will also issue a guidance note and standard reporting template this year as it aims to improve the quantifying of contingent liabilities to manage risk, given intentions to expand PPPs.

However, Treasury's aim to progressively implement these changes in consultation with other departments involved over two years is disappointing as it increases the risk of further delays or no implementation at all. This is especially relevant as government's finances will not improve drastically in the short term, making infrastructure investment through SOEs and on balance sheet close to impossible, as we discuss below.

Multiplier effects of infrastructure investment

Creating a clear and pragmatic regulatory framework for PPPs that is suitable to most project sizes (and types) and one that enables well-resourced evaluations of projects may be the best way forward, especially given SA's strained fiscus. Regarding the latter, a 2020 South African Reserve Bank (SARB) study finds that government's ability to stimulate the economy through expansionary fiscal policy is severely limited. The multiplier is generally defined as the change in

total output for a change in an economic variable, in this case being state spending.

For example, if a fiscal multiplier is 1, then each R1 spent by the state should lead to a R1 increase in economic output, especially if there are no leakages in the economy, such as imports. The SARB study, which analyses the different economic conditions of South Africa's economy over the last 10 years, finds that the fiscal multiplier declined to almost zero in 2019 from 1.5 in 2010.

Importantly, the study indicates that government spending is most effective at low debt:GDP levels, when there are output gaps and significant capital inflows into the economy. As a result, falling commodity prices post the global financial crisis in 2008, electricity shortages, muted private sector investment and the resultant tax hikes all combined to decrease the multiplier amount – which was accelerated by ballooning government debt. Finally, the study finds that the cost of fiscal consolidation will be less harmful to growth than is generally perceived.

Consequently, SA's ability to grow by expansionary fiscal policy, especially through consumption rather than investment, is limited. From an infrastructure perspective, crowding in meaningful private sector investment may

be one of the better approaches to fostering economic growth. In addition, more bid windows as part of the REIPPPP are particularly useful – however, an emphasis on achieving financial close and feeding the energy into the national grid should be more of a priority.

This is of particular importance to SA's wider ambitions to boost infrastructure investment as social infrastructure projects (schools, hospitals, etc) will benefit citizens and economic infrastructure will generate economic activity. During the 2022 state-of-the-nation-address, President Cyril Ramaphosa indicated that the legacy effects of state capture, policy missteps and Eskom's ageing infrastructure meant that SA still has a shortfall of 4,000MW. As a result, the President announced that a further 2,600MW of renewable energy will be sourced from bid window 6 which will soon be opened.

However, what is key after bidding and awarding of contracts for renewable energy supply is the prompt building of the relevant infrastructure. This is designed to close the gap between the time that significant amounts of capacity have been secured and when the actual energy is supplied to the national grid. Indeed, a hallmark of all bid windows has been that, with a few exceptions, projects were

Does your bank talk sustainable growth or walk it?

Voted Best Bank for Sustainable Finance in Africa at the Euromoney Awards 2021, we're committed to pioneering finance solutions that drive sustainable impacts for our clients' businesses, our society and our environment.

www.nedbank.co.za/sustainable-growth

see money differently



delivered on time and within budget.

Thoughtful localisation policy key to future IPP investment

When bid window 5 was announced, the Department of Mineral Resources and Energy (DMRE) initially aimed to procure 2,600MW of renewable energy – 1,600MW from onshore wind and 1,000MW from photovoltaic plants. Included in the request for proposals were the revised requirements for approval. A 90/10 evaluation scoring was used, with 90% consideration for price and a 10% consideration of a bidder's B-BBEE level. A Preferential Procurement Policy Framework Act (PPPFA) exemption was granted by National Treasury for bid window 5.

Specifically, the DMRE required bidders to demonstrate South African entity participation of at least 49%; at least 30% shareholding by black people in the IPPs as well as 25% ownership by black people and in particular 5% ownership by black women in construction and operations contractors. Apart from other commitments such as jobs, skills, enterprise and supplier and socioeconomic development, bidders also had to commit to local content spend of at least 40% of project value during construction, and

at least 45% local content spend during operations.

In contrast, bid window 4 projects were evaluated using a 70/30 weighting with 70% for price and 30% for economic development. Within the 30% weighting, local content had a minimum threshold of 40%-45%. Importantly, the maximum target percentage was 65%. Moreover, the target for local content increased throughout each bid window, with targets for onshore wind and solar power projects reaching 65% by bid window 4, from between 45% and 50% in bid window 1.

The requirements of the DMRE regarding renewable energy IPPs indicate the intention of localisation to benefit local businesses both during the construction and operational phases of projects. At a broader level (automotive, textile sectors etc), localisation is meant to increase the volume of goods produced locally for local consumption and export markets.

However, a study in 2020 by the EU Chamber of Commerce and Industry in Southern Africa finds that there is a lack of clarity on the definition of local content, which affects how companies approach localisation. Within the context of bid-window 4 of the REIPPPP, companies were affected by the ambiguity on how local content targets can be achieved, especially

due to project developers having different standards across the value chain, which made it difficult to achieve targets.

In addition, of paramount importance was that the lengthy delay in bid window 4 undermined localisation efforts. Specifically, many local firms invested in building up capacity during the first three bidding windows which meant that when bid window 4 was delayed, that the resultant lack of orders led to company closures and job losses. Another effect of this is a lack of local product availability in line with global standards and pricing – combining this with the high concentration of producers increases project costs and undermines localisation. Given this backdrop, the lengthy delay before bid window 5 took place and SA's weak economic outlook (which implies low demand) mean investment and procurement plans have been difficult.

Moreover, B-BBEE policy added another layer of regulation for EU investors given the already difficult challenge of meeting localisation and economic development targets. Investments needed to achieve local content requirement targets to boost local businesses add another layer of cost, while a significant amount of equity ownership has to be transferred to a domestic partner.

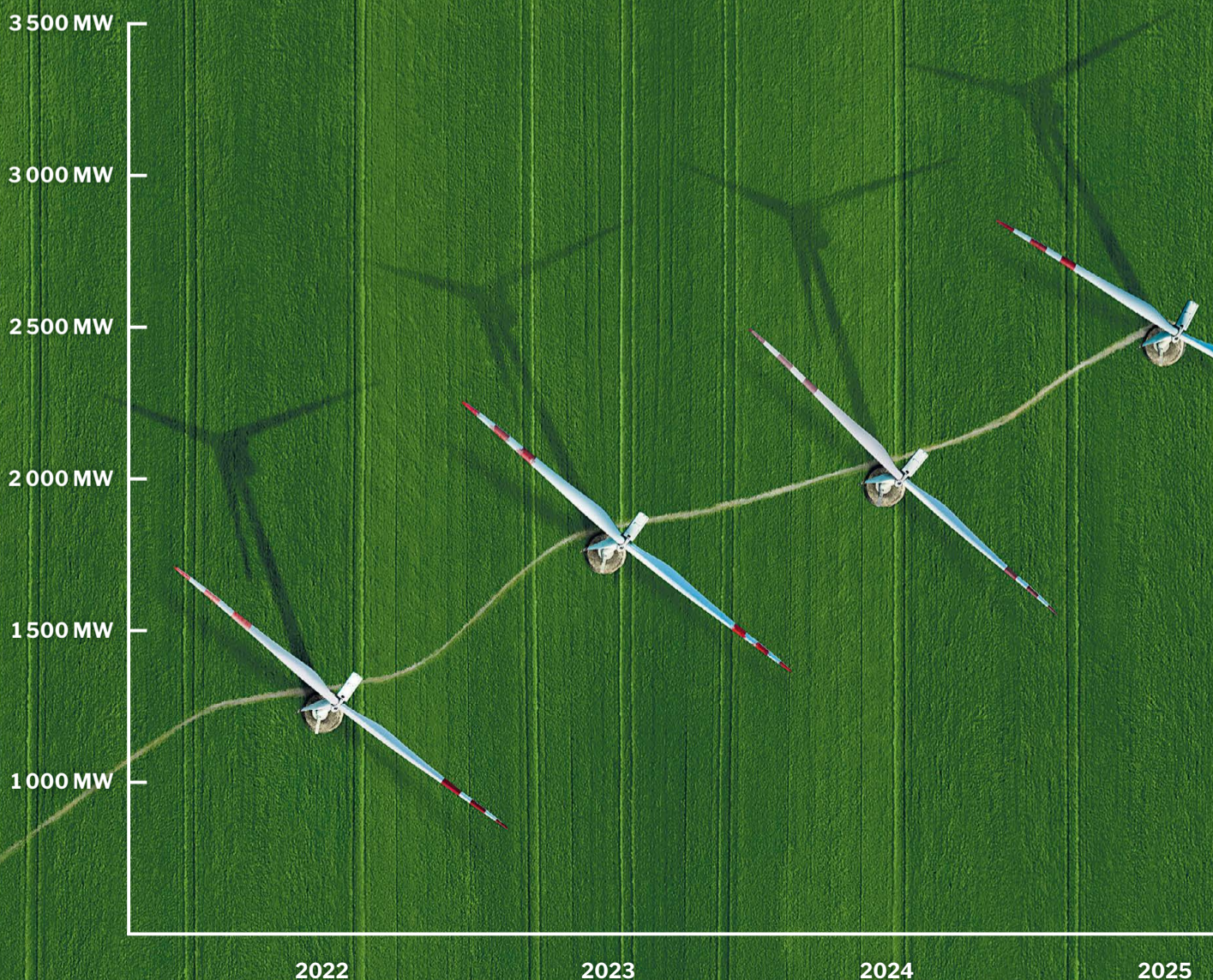
Urgent measures

The country's energy crisis requires urgent measures with the aim of getting as much new energy onto grid as soon as possible to stabilise electricity supply. Given government's fiscal constraints, a pragmatic and coherent policy framework that enables increased use of PPPs should be prioritised. The SARB multiplier study indicates that the investment multiplier has the largest positive multiplier effect over the long term, especially when there is a negative output gap, which is the case locally.

Local content requirements and socioeconomic developments are positive for domestic output and the growth of communities. However, SA's weak economic outlook and torn social fabric mean that government may have to make short-term political sacrifices to secure long-term economic and social gains – something that requires planning beyond just one election cycle.

Ultimately, the right policy and regulatory framework for localisation and socioeconomic development will ensure demand and policy certainty. This in turn will lead to investment and a revival of the construction and broader South African industries.

■ Benjamin is Intellidex's equity markets research analyst





EXCELSIOR WIND ENERGY FACILITY

Blending with nature through wind power and a strong biodiversity programme

By Aurelia Mbokazi-Kashe

Plant name: Excelsior Wind Energy Facility	
Key Facts	
Technology:	Onshore wind
Capacity:	32MW
Location:	Swellendam, Western Cape Site area: 2,300ha
Commercial Operation Date:	December 2020
REIPPPP Bid Window:	4
Owner:	Excelsior Wind Energy Facility is owned by BioTherm Energy (60%), Thebe Investment Corporation (37.5%) and a Local Community Trust (2.5%)

Apart from the towering wind turbines that are perched on hills, it's not easy to distinguish Excelsior Wind Energy Facility's parameters from the neighbouring farms. It occupies 2,300ha of two working farms, one for livestock and the other a canola plant farm.

In season, the ground surrounding some of the 13 wind turbines is transformed into a sea of yellow and green canola plants, says operational supervisor Jacques Redelinghuys. However, on arrival photographer Christy Strever and I are met by hundreds of fluffy sheep, causing a traffic jam on the gravel road leading to the facility's offices.

Co-existing with farming activities is part of the facility's commitment to the environment throughout the wind farm's lease period, says Redelinghuys, and developers were careful not to interrupt farming in any way, even during construction. "Only the area around each turbine, roughly 20 by 40 metres, and the eight roads are lost to agricultural production. Everywhere else, agricultural activities continue uninterrupted."

The owner of the facility, BTE Renewables, formerly BioTherm

Energy, also pioneered a strong biodiversity programme aimed at protecting birdlife at their wind farms across three provinces. At Excelsior, six species are protected against harm from wind turbines by a team of young biodiversity monitors, explains Libby Hirshon, BTE Renewables' sustainability director.

"When we started developing the wind farm in Kenya we realised there were lots of vultures in the area, so we committed to a mitigation programme for vultures. This biodiversity programme is a first of its kind in the world. When we bought Excelsior we undertook a study with a specialist to see if there were any endangered birds in the area. We discovered vultures and a couple of other endangered birds of prey and we also implement this programme here," she says.

In Excelsior the biodiversity programme, headed by Clarissa Mars, sees 10 youth from four local communities stationed at three viewing points, who if they spot protected species, immediately notify the control room to shut down a specific turbine to allow the birds to pass unharmed.

"Initially there were four protected species, Cape Vulture; Black Harrier;

Verreaux's Eagle and Martial Eagle. After observations we added White Storks and Blue Cranes. Even though White Storks are not a priority species, they fly past here in their hundreds and we have to accommodate them for three months of the year," she explains.

"We had one Blue Crane fatality, a juvenile, which went against birds specialists' assurances that this species does not fly at the height of the turbines, which stand at 90 metres. We added it to our protected list".

Hirshon says other wind farms are reluctant to introduce the biodiversity monitors programme, fearing they will lose valuable production time, which could diminish their profits.

"The objective of a wind farm is to produce energy, so they are reluctant to lose out. This programme is a big commitment in terms of workforce and logistics, managing and training the biodiversity monitors. We are being recognised for this project because nobody else is doing it."

Redelinghuys says the biodiversity programme did not affect Excelsior's profits.

"My priority is safety and taking care of the environment. Our total shutdown for the whole of last year was



*Excelsior's operational supervisor
Jacques Redelinghuys*

17,5 hours, costing less than R20,000 in production losses. We really are not losing by implementing the biodiversity monitoring programme."

Hirshon adds that BTE Renewables is purposeful in its commitment to conservation. She says the organisation funds various conservation projects that protect birds through collaborations with non-governmental organisations, including the Endangered Wildlife Trust, the Overberg Renosterveld Conservation Trust and the FiziPatrick Institute of African Ornithology at UCT.

"We are not just doing mitigation but are actually doing conservation. We work very closely with specialists in the field and have embarked on studies with UCT to have Cape Vultures tagged, among a number of studies into our priority species and we are helping to fund that."

Apart from strongly supporting conservation efforts, Excelsior also invests in 15 local communities through its socioeconomic development programmes which include a tertiary education bursary programme for learners.

■ Mbokazi-Kashe is an independent writer



Photos: Christy Strever

How to integrate social justice into the energy transition

By Zoheb Khan

The increasingly desperate struggle waged by South Africans against poverty and unemployment is unfolding in a rapidly shifting physical environment. In November 2020, northern KwaZulu-Natal experienced a heatwave so severe that birds and bats died. This January, parts of the Western Cape recorded some of their highest ever temperatures. Extreme heat and accompanying drought have led scientists to expect a day zero event in Gauteng by 2030, while the entire north-east of the country now finds itself, for the first time in recorded history, at risk of category five hurricanes – with windspeeds up to 200km/h making landfall. The Jacarandas bloom earlier, the sardine run happens later and, as these outlying data points accumulate, we won't see them as extreme events at all. Instead, they will constitute the everyday features of our new, harsher reality.

The social consequences of climate change and more extreme weather include damage to crops and livestock industries. That in turn leads to greater food insecurity and accelerated migration to cities as rural livelihoods collapse, leading to greater pressure on already strained urban public services and amenities including water, transport and housing.

It's not inconceivable that those conditions will trigger social conflict and destruction of property, particularly over increasingly scarce food and water resources (which is already a significant driver of migration in some parts of Africa).

The burden of these shocks will fall disproportionately on those who do not have the assets or stable incomes to cushion themselves and their families. Doing whatever we can to delay or avoid the worst should therefore be a top priority.

Our policymakers recognise the dangers. South Africa is a signatory to the Paris Agreement, which commits countries to reducing harmful emissions. These commitments are coded in Nationally Determined Contributions (NDCs).

South Africa recently updated its NDCs, committing to a more ambitious timeline for reducing its carbon emissions, but progress has been slow. SA's seventh National Greenhouse Gas Inventory Report 2000 to 2017 shows that emissions have increased by 10.4% over the 17-year period and we remain the G20's most carbon-intensive

economy (which is not the same as the most carbon-polluting).

This reflects the dominance of South Africa's gargantuan coal industry, that some within government are keen to protect whatever the cost. It is undeniable that the abandonment of South Africa's coal industry will cause many job losses: Trade and Industrial Policy Strategies estimates that there are 200,000 formal jobs in the coal value chain. And it remains true that only when *all countries* take climate change seriously can we mitigate the worst of its impacts. The concluding agreement of the recent COP26 conference in Glasgow is evidence of the continued commitment of many countries (including India and Australia) to supporting their national coal industries, despite the dire warnings of environmentalists.

Even if other countries drag their heels, it still makes economic sense to move away from coal. Based on data from the most recent round of the Renewable Energy Independent Power Producer Procurement Programme (REIPPPP), it is now cheaper to build new renewable energy projects than it is to build new or even maintain current coal-fired power plants.

Another study by the Energy Systems Research Group shows that potential job gains from fully committing to the growth of the renewable energy industry outweigh the job losses from the coal sector.

Besides being less job-friendly in the longer run, damage to health is another terrible legacy of coal that is rarely counted in cost-benefit analyses of the sector. The area around eMalahleni, for example, is estimated by the European Space Agency to have the dirtiest air in the world. The impacts this has on productivity, quality of life and life expectancy are profound.

REIPPPP

Thankfully, the REIPPPP is being reanimated. Since the first procurement round in 2011, 81 renewable energy utility-scale projects (the "Large REIPPPP") have become operational and added 5,250MW of generation capacity to the failing national grid, with various smaller projects contributing roughly another 1,000MW. This capacity is the result of over R200bn in local and foreign private investment. Winning bidders from the fifth bidding window in March 2021 are due to reach financial close shortly and they will add another 25 solar and wind projects while the request for proposals for the sixth bid window is scheduled for end-March 2022.

The five-year delay between bid rounds four and five was due to the concerns mentioned

above: job losses in a country that is already experiencing a crisis of unemployment and inequality that could lead to social collapse before the physical environment becomes unliveable. Less charitably, one could argue that cosy relationships between certain politicians and power players in the coal industry have prevented the development of a competing industry.

But the tension remains: we must balance two priorities that are sometimes directly opposed to each other. We *have* to address the social aspects of the energy transition. The burden of poverty and inequality is too great and too urgent to deprioritise. "Green" and "social justice" have to be pursued together. And indeed the construction of a new industry provides opportunities to break with our historical patterns of exclusion and exploitation and to build an inclusive new energy system.

The REIPPPP policy framework explicitly plans for this in ways that go beyond the normal Black Economic Empowerment (BEE) framework that

applies elsewhere in the economy. Bidders have been required to meet targets for job creation, local content, black and community ownership, black management control, preferential procurement, enterprise development and spending on socioeconomic development projects. These targets are formalised in an "economic development scorecard" which counts 30% of the evaluation alongside the technical aspects of proposed energy production. Successful bidders are awarded 20-year licences to operate and are monitored by the IPP Office in the Department of Minerals and Energy for compliance with their economic development plans.

To date, the IPP Office reports that the large REIPPPP has created 60,517 job years (that is, full-time jobs for one person for one year); IPPs have spent R1.6bn on socioeconomic development initiatives (such as feeding schemes during Covid-related lockdowns and on building early childhood development facilities) and R484.1m on small business development. In addition, black South Africans hold 34% of the shares across the complete supply chain (for projects in rounds 1 to 4).

These are meaningful contributions, though in many cases their impacts are short-lived. Jobs have mostly been temporary jobs during the construction phase of new facilities, and many of the socioeconomic initiatives address immediate needs (like hunger) without necessarily changing any of the structural issues that lead to hunger (like chronic unemployment, low access to quality education or unaffordability of nutritious food).

Moreover, when we look at black ownership, this appears to follow patterns of BEE in the rest of the economy. Black shareholding tends to be concentrated in a small group, rather than benefiting the broader black population. This is especially evident in bidding round five. The Daily Maverick reported in November 2021 that the winner of 12 out of 25 projects is the Ikamva consortium. The consortium is made up of Patrice Motsepe's African Rainbow Energy and Power, H1 Holdings (the two black shareholders), Globeleq, and Mainstream Renewable Power. Indeed, scholarly work shows that South Africa's RE sector as a whole is dominated by a handful of large firms.

The IPPs' enterprise development teams then assist community members to make plans for how these assets can be supported in the short term with the socioeconomic development spending, given that the trusts are still paying off loans

Transformative element

A potentially transformative element of the economic development scorecard is community ownership. This measures the extent to which local communities hold equity in the new renewable energy facilities and is typically fulfilled through a community trust. The trusts hold, on average, about 8% equity in the facilities. This has increased the asset base of many disadvantaged South African communities.

The mobilisation of communities around the use of the proceeds of these assets could promote social cohesion and spur local economic development into the long term – that is, long after the 20-year licences of their associated IPPs have expired. It could also fulfil the “broad-based” intentions of BEE policy by benefiting much larger numbers of people beyond those who are politically connected or who already have substantial business interests.

Intellidex carried out a study of these community trusts to investigate whether this potential has been realised to date.

Unfortunately, the trusts are typically hamstrung by a range of persistent yet preventable problems:

- **Debt:** the shareholding of local communities is usually financed with debt provided by development finance institutions. This debt has very high rates of interest that do not correspond to the risk inherent in building and then operating new RE facilities. For example, the rate of completion of wind projects in South Africa is 100%. This means that trusts spend a decade or more paying off these loans, during which time no community development work is done or only very little if trickle dividends are paid.
- **Lack of skill:** often, trustees are elected or selected who have no experience in project and financial management, organisational governance and community development, and/or they have no knowledge of the community they represent.
- **Long debt repayment periods,** sometimes in combination with unprepared trustees, leads to a lack of planning for when money does eventually become available.
- **The lack of planning and limited track record of community development work** typically leads to trusts being perceived as illegitimate by disillusioned and angry communities.
- **This disillusionment is often sustained by inadequate engagement with communities by trusts and IPPs.**

- Finally, very often where work is done by trusts, it resembles a traditional, charity-like philanthropic model that characterises the IPP’s socioeconomic development work. In this model, “givers” have preferences which dictate what money is spent on and who gets what. In the context of the trusts, the money that flows in from project dividends does not belong to the IPPs or to any individual trustee: the money belongs to the entire beneficiary community. This means that the community should decide how money is used based on its priorities. But more often than not, communities do not have strong roles in managing the money, in deciding which needs should be met, or in organisational or developmental planning. Communities are typically informed of plans by external parties who run and manage trusts on their behalf. These practices construct communities as passive and dependent recipients. This entrenches unequal power relationships promotes the perception of local communities as sites of need and deprivation and not much else.

But there is room for optimism. The problems listed above are primarily political in nature. If political will can be garnered to capacitate trustees through funding and professional development programmes, and to prevent predatory lending from the development financiers, the performance of the trusts will almost certainly improve. An encouraging development is the recent establishment of the Initiative for Social Performance in Renewable Energy (INSPIRE), which aims to professionalise the social development work in South Africa’s renewable energy sector through training and research.

Building more active roles for communities in the energy transition

Moreover, there are several cases where trusts are doing good work. A promising approach and alternative to traditional philanthropy is the asset-based community development (ABCD) approach. Economic development (ED) teams at some of the IPPs are deploying it in an attempt to develop communities’ capacities for more active custodianship of their shared assets (the trusts).

This approach recognises that it is unsustainable to maintain communities in a state of passive receipt of dividends and that their own capabilities need to be developed. Rather than focusing on the needs and problems within the often poor REIPPPP host communities, the ABCD approach seeks to build on community assets

and strengths. Workshops are held where communities identify these assets, which could include individual abilities, natural and cultural resources, interest groups or simply a shared vision for community development.

The IPPs’ ED teams then assist community members to make plans for how these assets can be supported in the short term with the socioeconomic development spending, given that the trusts are still paying off loans. The idea is that once the trust has paid off its loans, the community will be able to apply the ABCD methodology to the trust’s work as well, and plan for participatory and strength-based developmental work.

Communities as investors

Another avenue for more active community roles in the REIPPPP would be for trusts to act as investors in new RE projects. This would help to build the endowments of the community trusts and to diversify their sources of income away from the dividends

flowing from the single project they are attached to (none of the trusts that were part of our research had any other income stream).

In the longer term this could lead to the development of a cohort of self-sustaining community trusts managing substantial assets on behalf of disadvantaged communities, using the proceeds of those assets to promote sustainable and people-centred development. It would also lead to a more balanced, broader base of representation in the growing RE sector than that which we currently observe.

For this to happen, many trustees will require training in financial management and will likely need to devote some resources to investment advisers (or companies could provide these services at a discounted rate for the public benefit). Moreover, the regulations around public benefit organisations (which community trusts are) and the restrictions on income-generating activity that serves their primary purpose (serving the public

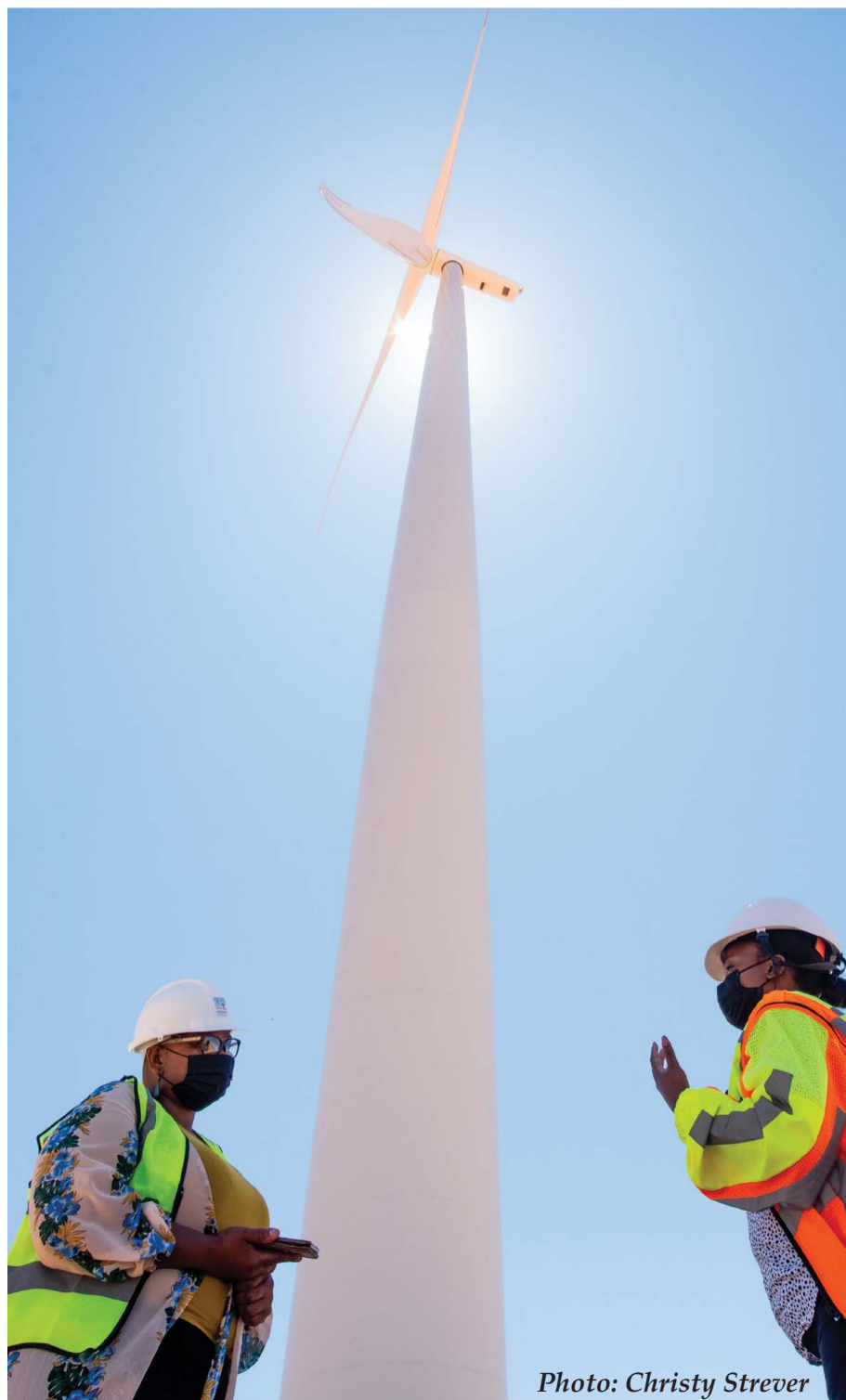


Photo: Christy Strever



<<< continues from page 41

good) will need to be clarified and simplified.

Finally, Community Renewable Energy (CRE) is a promising new area of development in South Africa's just transition.

The recent liberalisation of the energy market to allow self-generation and for generators to sell directly to buyers as well as to Eskom paves the way for this model to be implemented.

The idea that anyone can become an energy producer implies that not all new RE infrastructure needs to be built in the form of utility-scale, REIPPPP-style projects. The use of microgrids – using relatively simple and expensive solar panels, for example – is a feasible option for individual or groups of households and businesses. When integrated with Internet of Things (IoT) technology, where different parts of the microgrid communicate with each other to monitor demand and usage throughout the day, the efficiency of electricity usage can be improved substantially, thereby reducing costs. There are also potentially many thousands of jobs in operations and maintenance of microgrids and complementary technologies.

Community Renewable Energy (CRE) refers to projects where a *community* owns, develops and operates an RE project, rather than a business or household. Community members can take many different roles in CRE schemes, including as investors in new projects, as participants in the building, management and operation of the new facility, and as producers earning revenue from selling electricity, or as

consumers who buy this cheaper and cleaner electricity.

CRE is linked closely with the “energy democracy” movement, which seeks to increase popular control over the production and distribution of energy (see The Climate Justice Alliance <https://climatejusticealliance.org/>, for example). Energy cooperatives have proven to be a workable structure for structuring community participation.

In Germany, for example, Clean Energy Wire reports that there are over 1,000 energy cooperatives, which are supported by an enabling policy framework. There is substantial evidence from around the world that communities coming together to build and manage an RE project can not only enhance local energy security by providing cheaper and more reliable electricity, but also boost economic activity, develop transferable skills among participants, develop more informed and conscious consumption patterns, and build feelings of solidarity and norms of cooperation that can be put to other developmental uses.

It would be naïve to expect that these benefits come easily. CRE can be vulnerable to the same sorts of weaknesses that we have seen in the community trust arena, including inadequate consultations and lack of representativity, and capture by personal and/or political interests and ambitions. In addition, CRE participants will require funding, skills and dedication to ensure that projects succeed. In poor communities these problems may seem insurmountable (and indeed the bulk of the evidence

about CRE comes from rich countries).

But in Indonesia, case studies reported in the country's local environment journal of two rural communities where new energy cooperatives were initiated and supported by an intermediary public agency, Ibeka, show that civilians are capable of setting up a microgrid and then managing its operations. Revenues from sales of electricity generated through the micro-hydro projects have funded small business development and created new jobs. This has increased the demand for electricity and the ability to pay for it, in turn enhancing the cooperatives' abilities to cover ongoing operation and maintenance costs and become viable, self-sustaining entities.

The authors of the study also argue that ownership and management of successful projects has empowered communities and given them a sense of achievement and possibility for control over their own developmental needs.

In South Africa, where rural areas and small towns desperately need to boost job creation and local economic activity, CRE is an area worth exploring. It could also, alongside the acceleration of the very successful REIPPPP, improve and “green” our energy supply.

Conclusion

Facilitating the wider uptake of renewable energy is critical for social justice – the consequences of continued support of the environmentally destructive and relatively more expensive coal industry will be devastating for the people of South

Africa. For the renewable energy sector to become more inclusive and to get the maximum benefits to flow from the required contributions to community upliftment, the inefficiencies both in the approach by the IPPs and within the energy sector need to be addressed.

This can be achieved by empowering the REIPPPP community trusts to succeed, and by encouraging the development of CRE, which effectively builds human capabilities and promotes local development. A demonstration project that makes use of an intermediary organisation to build technical and entrepreneurial skills, as in Indonesia, would be valuable in determining the viability of CRE in South Africa. The REIPPPP community trusts could organise themselves into energy cooperatives, as could workers in the coal industry that need to be reskilled and deployed to new jobs. An enabling policy environment that liberalises the production and distribution of electricity and makes use of feed-in tariffs is also required, as are innovative new financial products that can drive the development of CRE and of microgrids more widely. Businesses and foundations could play a role as intermediaries, or by providing grant and non-grant support for skills training and the professionalisation of management and operations.

The RE sector is alive with possibility. With some imagination and dedicated, careful implementation, we could ensure that it becomes a booming sector that benefits us all.

■ *Khan is social economy research manager at Intellidex.*



Photos: Christy Strever

MASSIVE WIND FARM CREATES ENERGY FOR THOUSANDS OF HOMES

By Aurelia Mbokazi-Kashe



Photos: Christy Strever

Plant name: Kangnas Wind Farm

Key Facts

Technology:	Wind power
Capacity:	140MW
Location:	Springbok, Northern Cape
Site area:	3,591 hectares
Commercial Operation Date:	November 2020
Project cost:	R3.5 bn
REIPPPP Bid Window:	4
Owner:	Mainstream & Actis (Lekela), Old Mutual, H1, AREP, Community Trust
Operator:	Mainstream Asset Management South Africa



Nomfusi Mbiko, acting manager and plant technician at Kangnas Wind Farm

While perfectly located on the N7 between Pofadder and Springbok, relying on the GPS to get to Kangnas Wind Farm can be daunting. A trip meant to take under four hours from Upington ended up being a seven-hour adventure, with a solid three hours spent driving on secluded gravel roads.

A mega-wind farm with 61 wind turbines that stand 115m high, the project is located on two vast farms, boasting site roads that cover a staggering distance of 52km. On site, the team consists of 34 people, including four contractors, service technicians and monitors who remove bird and bats that have perished after colliding with the turbine blades.

The wind farm achieved high local content levels with about 45% of its components manufactured in SA, including turbine towers and the project's mega transformer.

The plant's acting manager and plant technician, Nomfusi Mbiko, confesses that she had never heard of the town of Springbok before applying for her position.

"This industry takes you places. I wanted to further my experience in the renewable energy industry. I saw an opportunity for growth and grabbed it," she says.

"I monitor the performance of the plant and manage the contractors. We have a system that monitors each turbine for faults and we bring in a planner for when a turbine needs to be stopped for maintenance," she explains.

Before joining Kangnas Wind Farm, Mbiko was a facility technician in a wind farm in Bedford, Eastern Cape.

An electrical engineer from King Williams Town, Eastern Cape, she had her sights set on working for Eskom after graduating from Walter Sisulu University. However, the crisis at the national power utility discouraged her from pursuing a career there.

Witnessing the rise of renewable energy, she saw a future for herself in the new South African sector.

"I found it intriguing how we were slowly

moving from Eskom's way of producing power (that relies on fossil fuels) to clean energy. I noticed that the sector was growing and I was curious to learn more."

Leading in a male dominated environment does not intimidate Mbiko, who grew up in a household with two older brothers.

At Kangnas Wind Farm, the 29-year-old's gender and youthfulness has not been a barrier and her team has been supportive of her leadership.

"As we evolve and more females join the industry, male colleagues are becoming used to working alongside women who are plant managers, plant technicians and artisans. My former plant manager here was a female. Some of my male colleagues are much older than my father but they support and respect the role I am in," she maintains, adding that "Mainstream (one of the project's owners) is big on diversity and inclusion".

The wind plant actively supports local communities of Nababeep, Springbok, Concordia, Matjieskloof, Bergsig, Okiep and Carolusberg through its social and economic development programmes.

Responding to the surge in mental health conditions resulting from the Covid-19 pandemic, Kangnas Wind Farm funds a holistic wellness programme designed to assist over 800 learners to stay in school and thrive.

Launched in July 2021, the programme assists learners between grades 3 and 12 with psychological, social, emotional and educational support. It is run in conjunction with the Northern Cape Department of Education.

Services offered to learners include counseling, motivation, mentoring and coaching, Covid-19 trauma debriefing, study skills and techniques, cognitive brain performance and career guidance. The programme is expected to run until March 2022.

■ Mbokazi-Kashe is an independent writer

The finance behind SA's renewable energy development

Private sector appetite to finance South Africa's commitment to a future of net zero emissions is robust, despite the long delay between bid windows 4 and 5 of the Renewable Energy Independent Power Producer Procurement Programme.

By Janice Roberts

Due to its transparency and efficiency as well as its government-backed power purchase agreements, South Africa's renewable energy programme (REIPPPP) continues to attract high levels of private funding and investment from commercial banks, development finance institutions and pension and insurance funds.

Committed investments stood at R209.7bn, consisting of both debt and equity, after REIPPPP bid windows 1, 2, 3, 3.5, 4 and small bid windows 1 and 2, according to the Independent Power Producers Office (IPPO). This included R41.8bn from outside SA, improving the country's balance of payments.

The 25 preferred bidders for bid window 5 were announced in October 2021, with the private sector collectively injecting about another R50bn into the economy.

Data from the IPP Office show that more equity has been put into bid window 5 than the last four bid windows. The debt margin is 2.5% on average, while the average internal rate of return (IRR) has come down from 17.27% in bid window 4 to 11.35% in bid window 5. The bid window sought to procure 2,600MW which includes 1,600MW from onshore wind and 1,000MW from Solar PV plants. A total of 102

“Bid window 5 opened over six years after the previous bid window, yet investors remained interested, mainly because investments in REIPPPP are viewed as stable and predictable”



Daniel Zinman: head of power and renewables in RMB's infrastructure sector solutions team

bids were submitted with capacity of 9,644MW, making round five extremely competitive.

Bid window 5 opened over six years after the previous bid window, yet investors remained interested, mainly because investments in REIPPPP are viewed as stable and predictable. “We've seen continued growth in appetite and interest from investors and sponsors alongside increased pressure to invest and fund renewable projects in line with climate change objectives,” says Rentia van Tonder, Head: Power, Corporate & Investment Banking at Standard Bank.

The downward trend of the costs of renewable technology has led to a competitor driven decline in the tariffs bid in each bid window, with pressure being put on lenders to bring down the cost of finance. The average cost of renewable energy projects in bid window 5 is R0.473/kWh compared with the R3.12/kWh of bid window 1.

“Bid window 5 featured some of the most competitive bidding between banks that I've ever seen,” says Daniel Zinman: head of power and renewables in RMB's infrastructure sector solutions team. “It wouldn't be unfair to say that it was cut-throat – it was almost a race to the bottom.”

He says bid window 5 having been nearly four times oversubscribed illustrates the pent-up demand in the

market. That in itself created such competition that equity returns and debt prices plummeted. Each aspect of these projects has been cut to the bone to the extent that South African renewable energy prices, while not necessarily at the absolute lowest in the world, are getting into that sort of realm.”

Yet banks aren't losing interest in financing renewable energy, says Peter van Kerckhoven, co-head: debt finance at Nedbank CIB. “Through the rounds there's been more and more competition that's been driven by the success of the programme and the fact that the projects themselves have been relatively successful in terms of their completion and their operation. But at the same time, it's an efficient market. So, banks, including Nedbank, will bid terms that work for them and



Vuyo Ntoi, co-managing director of African Infrastructure Investment Managers

than in prior rounds. “Demand from institutional investors to participate in green energy projects remains strong, which means that the bank's appetite to continue with its strategy to arrange, underwrite and distribute debt in the market is justified,” he says.

Now that bid window 5's IRR stands at just 11.35%, some investors could be asking themselves if they're comfortable with the lower equity return given the illiquidity of these investments. Semple is expecting a consolidation in the sector in terms of the bigger developers and sponsor groups being more successful and dominating future REIPPPP bid windows. “In fact, we probably won't see the smaller developers that have participated in previous rounds actually winning again, because of the pressure on margins and on financial returns.”

But investors remain satisfied that they have been provided with an adequate return on a risk-adjusted basis, says Vuyo Ntoi, Co-Managing Director of African Infrastructure Investment Managers (AIIM). “All the projects we've participated in pass muster from a risk-adjusted basis. We're still very happy with all the projects we've done in the REIPPPP, including the projects we are associated with in bid window 5,” he says. Furthermore, there are potential



Theuns Ehlers, head of resource & project finance, Absa Corporate and Investment Banking

that are acceptable to them from a risk and pricing perspective. The market will settle at a certain level – you'll never have a situation whereby banks will step away and there'll no longer be REIPPPP financing, because an equilibrium will be reached in every round.”

Theuns Ehlers, Head of Resource & Project Finance at Absa Corporate and Investment Banking, agrees that debt funding terms have indeed become more competitive in bid window 5



scale benefits that are coming through from the existing fleet of projects that are already on the grid.

Ntoi explains that AIIM manages its renewable energy assets through Environmental Impact Management Services (EIMS) Africa, a company owned by the AIIM IDEAS Fund. "This means that we're able to reduce overall project costs because we're splitting management activities over a wider set of projects. It's beneficial to the projects, to us and to end users because the economies of scale are recognised throughout the value chain and show up in the end tariff." There are nine projects under EIMS' management and work is being done to bring more on board in the near term.

A large part of the success of the REIPPPP has been the sovereign guarantees that Treasury provides, but talks are under way on possible replacements. "The IPPO has appointed consultants to investigate and research alternative options and there have been discussions with lenders and various stakeholders," Van Tonder says. "The key consideration will be the bankability of the offtaker and alternative structures and options that could be considered to provide comfort to stakeholders, including funders."



Paul Semple, head of unlisted credit at Futuregrowth

Zinman believes there are both internal and external options around these sovereign guarantees. "An external alternative may involve agreeing some sort of credit enhancement with one of the political risk insurance providers or multilaterals like the World Bank or one of its agencies." While this could add complexity to the REIPPPP process, he doesn't view this as an insurmountable problem as RMB has done a significant number of deals in other jurisdictions where the sovereign's obligations are guaranteed by a political risk insurance provider.

Paul Semple, head of unlisted credit at asset manager Futuregrowth and portfolio manager of the Power Debt Fund, emphasises that guarantees have been necessary to date in view of Eskom's weak balance sheet and heightened credit risk. "That's been the only requirement for those sovereign guarantees. It's not a reflection of the quality of the REIPPPP projects themselves or their credit risk, but rather the risk of Eskom not meeting its contractual obligations to these projects, to buy the electricity they produce and effectively underpin the cash flow generation of the projects. And because the REIPPPP is structured to only allow one power offtaker, which is Eskom, projects are inherently exposed to Eskom risk, but this is mitigated by the sovereign guarantee."

Without a guarantee, Semple believes there will have to be some changes to the structure of the REIPPPP, such as Eskom not being the only power offtaker to which projects can sell. This will mitigate the risk of the power utility failing to meet its commitments, thereby falling in line with the government's planned deregulation of the power sector.

Ehlers sees the guarantees as an important bankability consideration for both debt and equity providers, but emphasises that elsewhere in Africa, governments have moved to different structures and still achieved the commercial position of sovereign support for their utilities. "In Ghana and Nigeria the PCOA (Put-Call Option Agreement) structure has been banked extensively. It remains unclear if the South African sovereign will change the current arrangement."

Martin Meyer, head of power and infrastructure at Investec says several factors are considered before an investment is made in a REIPPPP project. "We primarily look to bank projects with strong sponsors, engineering, procurement and construction contractors and original equipment manufacturers. Thereafter, the project will need to have robust cashflows and an appropriately structured risk transfer."

When deciding whether to invest in a project, it's important to engage with developers that have had experience in the previous REIPPPP bid windows, says Semple. "They must have successful track records – that's probably first and foremost. The South African environment is different to Europe and America – we have our own specific development challenges. From a climatic point of view, SA is a country that has massive resources, but extreme temperatures in some areas that, for example, require solar panels and equipment that can withstand these climatic conditions in order to optimise the returns from the projects. So, we're looking for developers who have that experience."

He also stresses the importance of engaging with shareholders that have enough capital behind them to support the project if it comes under any form of stress. "We're looking for reputable shareholders who are aligned with the lenders. We've come across projects with operating challenges where the shareholders try to take money out of the project rather than inject additional capital to remediate the issues. We look very closely at 'skin in the game', including if the developer is also invested in the project as a shareholder."

Semple's Power Debt Fund also focuses on what impact projects will

"We've come across projects with operating challenges where the shareholders try to take money out of the project rather than inject additional capital to remediate the issues. We look very closely at 'skin in the game'"

have on job creation in communities. "It's one of the great features of the REIPPPP that the projects need to achieve criteria such as employment, local content and socioeconomic upliftment of the surrounding community and that is the biggest issue that we have with the Risk Mitigation Independent Power Purchase Programme (RMIPPPP)." Despite its intended urgency, Semple says the RMIPPPP implementation has been disappointing, particularly with the ongoing delays to the start of construction of the projects and the aspersions cast on the bid adjudication process.

The RMIPPPP – announced to the market in August 2020 – is intended to alleviate the present electricity supply constraints as well as to reduce the use of diesel-base peaking electrical generators, and is being funded by the country's major banks, including Nedbank. "We're pleased that the projects we're financing have a large element of renewable energy embedded within them, obviously supported by a small amount of

thermal just to enable them to meet the requirements of the round for the dispatchability of the power, but the base load is very much provided by renewable energy," says Van Kerckhoven.

"Investec is currently mandated on one RMIPPPP project in the programme," says Meyer, "while Standard Bank is participating as a lender in a few RMIPPPP projects." "We anticipate financial close during the first half of this year, depending on government processes", Van Tonder says.

Absa CIB "in general" supports the risk mitigation round. "We appreciate that Eskom and the DMRE need to find ways to address the current power supply deficit," says Ehlers. However, no firm or final decisions have been taken with regards to funding. "Final decisions around Absa's participation in the financing of any REIPPPP projects remain subject to relevant external due diligence and internal approvals, including a review of the project's compliance with the bank's internal lending policies and a review of social and environmental compliance," he adds.

The raising of the threshold for self-generation licence exemptions from 1MW to 100MW in June last year could be bolstered by Eskom's decision to make land available in the grid-rich Mpumalanga province for these developments.

"RMB has been successful in this space where the mining houses are leading the private power revolution – but other energy-intensive user industries are following," says Zinman. He explains that companies have the same three priorities when it comes to these deals – albeit in differing orders of priority, depending on the entity. "They want security of supply, certainty of price and they also have a decarbonisation imperative. Consequently, this is a very exciting sector for us."

Semple says Futuregrowth is also eyeing self-generation projects and is engaged with several while putting term sheets together and assessing credit metrics. Investec is also a keen player in this space. "We've already funded a number of embedded generation portfolios," Meyer says. "We have a clearly defined strategy for embedded generation and will be a meaningful funder for these projects into the future."

Nedbank was a very early mover into the embedded generation space, setting up an embedded generation business alongside its utility scale energy business and developing a number of products that were designed to support this sector, Van Kerckhoven says. "At the time, this was premised on the 1MW cap, so we built quite a significant portfolio of funding for embedded generation projects at the smaller end of the scale,



Arvana Singh, head of sustainable finance solutions at Nedbank

and that's heading towards a billion-rand book now; it's made up of a raft of many small projects that our developer clients have built for their clients."

He adds that the lifting of the cap to 100MW has obviously brought a new set of opportunities which stand between small-scale embedded projects and utility-scale projects. "These projects being undertaken by the mining companies and large industrial companies are big and they're funded very much on a project finance basis because of their size, whereas with smaller embedded transactions, financing needs to be much more fit for purpose, much more flexible and much easier to deploy."

Debt capital markets present an ideal mechanism of funding renewable energy, with Nedbank the first bank in the country to list a renewable energy bond in the green segment of the JSE in 2019 to finance new solar and wind projects, issuing R2.7bn in that year across two auctions, both of which were significantly oversubscribed. The bonds were developed in line



Lucy Chege, head of energy, environment and ICT origination, DBSA

with International Capital Market Association Green Bond Principles and the Climate Bonds Standard set by the Climate Bonds Initiative. Arvana Singh, head of sustainable finance solutions at Nedbank explains that there were several motivations for the issuance of the bonds.

"Firstly, we had a strategy to continue to finance green projects through our energy finance team and therefore to support lending into these projects in addition to servicing other clients; we need to constantly raise funding in the market to be able to on-lend this into the economy. While we could have approached the market to raise traditional vanilla funding, we identified the opportunity to raise green 'use of proceeds funding' as our market intelligence suggested that we would be able to unlock additional liquidity from investor mandates in addition to the traditional investment mandates through this mechanism – and there was an opportunity for us to potentially unlock value through pricing."

Singh adds that the country's banks are playing a key role in continuing to support high-impact opportunities in the economy which are aligned with the energy transition. "A green bond mechanism enabled us to attract funding flows from dedicated impact funds and infrastructure funds, which are looking for investment opportunities, and then channel this liquidity to support the financing of more green projects." "Foreign investors are participating, bringing foreign direct investment into SA. We pride ourselves on taking a leadership role in sustainability and using our financial expertise to do good."

Since the inaugural green bond issuance in 2019, Nedbank has had various multilateral institutions and commercial investors reaching out and expressing interest in partnering with it to drive the development of the green economy. "These institutions are looking for a transparent mechanism and framework to channel investment that will enable strategic unlocking of developmental priorities on the African continent," Singh says. "This led to us issuing a further R2bn of green bonds in 2020 in partnership with the African Development Bank and a further R2.1bn of green bonds in 2021 that will also serve to orientate capital flows, in addition to energy finance projects, towards financing green residential developments. This brings our total green bond issuance listed on the sustainability segment of the JSE to R6.78bn." Nedbank also entered into a USD climate loan with the International Finance Corporation (IFC) in December 2020, thereby bringing its total green "use of proceeds" funding lines across bonds and loans to R 9.8bn.

Standard Bank issued its first local Tier 2 capital qualifying green bond

in December last year. The 10-year, R1.4bn bond is listed on the JSE's sustainability segment and is the third bond issue under the group's Sustainable Bond Framework that was established in February 2020.

"We are consistently broadening our issue base under the Sustainable Bond Framework," says Ann Hunter, head of group strategic funding at Standard Bank Group. "Sustainable finance markets and products are evolving quickly and, as an issuer, we recognise the urgency and the opportunities as well as the responsibilities." The group's first green bond listed on the London Stock Exchange in March 2020 and was placed via private placement with the IFC. The \$200m bond, a 10-year facility, funds eligible green assets in South Africa.

The Development Bank of Southern Africa (DBSA) developed its Green Bond Framework in 2021. "This reiterates the bank's commitment to playing a role in the just transition to a low carbon economy with the framework being aligned to the International Capital Market Association Green Bond Principles," says the DBSA's head of energy, Lucy Chege.

In February last year, the DBSA launched its first green bond structured in alignment with the framework. The €200m bond was issued through a private placement with the French development finance institution, the Agence Française de Développement. "This inaugural issue under the framework was intended primarily to refinance select renewable projects under SA's REIPPPP," Chege says.

The DBSA has made a sizeable contribution to the REIPPPP, assisting what was then known as the department of energy with programme management as well as providing support in setting up the IPPO. The development institution has invested around R20bn in 34 projects, of which approximately R3bn went towards funding black economic empowerment parties and community trusts. "This critical DBSA funding enabled these parties to secure equity participation in the projects, as well as ownership by local communities. Such local involvement ensures inclusion and has contributed to the long-term sustainability of the projects," Chege says.

More pension funds are looking to invest in renewable energy now that Regulation 28 of the Pension Funds Act is in the process of being adjusted. Phathutshedzo Mabogo, acting joint chief investment officer at the Eskom Pension & Provident Fund (EPPF), says the fund's ideal investment is long-dated, predictable and indexed to inflation – and renewables offer all three. "Our vision is to become a sustainable and trusted retirement savings provider, positively



Phathutshedzo Mabogo, acting joint chief investment officer of the Eskom Pension & Provident Fund

impacting a change in society," he says. "Accordingly, we believe that renewable energy not only presents us with an attractive investment opportunity, but also enables us to leverage our investments in addressing the challenge of climate change and environmental sustainability as well as creating jobs and enabling economic growth in countries we invest in."

The EPPF's investment in renewables, particularly through the REIPPPP, has always been premised on risk, return, the ability of cash flows to match the fund's pension liabilities and positive social impact generated by the projects, Mabogo adds. In addition, the EPPF committed R350m of the total R2bn raised by renewable project investor Revego Africa Energy in 2020, alongside co-investors Investec and the UKCI. "The vehicle will build a renewable energy portfolio that is geographically diversified including diversification in the generation source, technology and income streams, giving the EPPF an indirect footprint into the sub-Saharan Africa energy sector," Mabogo says.

The release of the request for proposals for bid window 6 is expected towards the end of March. Zinman hopes that the country will see rolling rounds of REIPPPP. "You don't need to have one every six months although that would be great but maybe one every year. This will keep people interested because we really need to get local manufacturing going, for example, panel assemblies. There's a push down from the Department of Trade, Industry and Competition specifically to use local panels – but it's a bit of a chicken and egg situation. Manufacturers need to know that there'll be another REIPPPP round every 12 months and if those timelines are adhered to, the development of local industry and consequent job creation will be successful."

■ Roberts is deputy editor of *Intellidex media projects*

So, what exactly is “clean coal”

By Chris Yelland

The development and application of “clean coal” burning technologies is often suggested as a solution by those intent on continuing to mine, burn or process South Africa’s “natural endowment of abundant, low-cost coal”. But what are these clean coal technologies, and do they offer any promise for SA’s power problems?

First, one needs to understand what it is about using coal for the production of electricity, steel, cement, synthetic liquid fuels and other chemicals that makes this a “dirty” business. In short, the mining, burning and processing of coal for such purposes produces a number of dangerous and toxic waste streams (emissions), which result in ground, water and air pollution, and contribute significantly to global warming and climate change. Mining of coal for large-scale power generation and industrial use causes massive damage to land and water resources.

Washing and screening coal consumes significant quantities of water, which results in waste streams whose ingredients are a toxic soup of chemicals and heavy metals. These leach into groundwater and contaminate rivers, dams, waterways and aquifers with acid mine drainage (AMD).

The burning of coal in boilers, blast furnaces and kilns for power generation or process heat results in significant bottom ash and slag residues below the boilers, as well as fly ash recovered from the boiler flue gas by dust extraction systems. These massive waste streams of contain a mix of non-combustible, toxic chemicals, minerals and heavy metals, including sulphides, silica, aluminium, iron, calcium, arsenic, lead, mercury, boron, cadmium, chromium, radium, selenium and more.

This waste stream is transported, mixed with water and deposited onto massive dumps on adjacent land. The water drains or evaporates, leaving the ash on the dump, with the toxic chemicals in the drain water leaching into the groundwater via waterways, rivers and dams.

Fly ash that is not recovered via dust extraction systems such as electrostatic precipitators and fabric filters, goes up the chimneys and into the atmosphere as minute particulate matter visible as smoke. Particles with a diameter of 10 microns are referred to as PM10, and similarly PM2 refers to particulate matter with a diameter of two microns. In addition to the above, a number of invisible toxic gasses in the boiler flue gas are not captured by dust extraction systems and are emitted into the atmosphere. These include various oxides of nitrogen (NOx) and sulphur dioxide (SO2).

The serious negative human health impacts of air pollution from PM2, PM10, NOx and SO2 are well documented both globally and in SA and will not be covered here. Suffice be it to say that respected medical studies indicate

that the burning of coal by Eskom in Mpumalanga alone results in widespread respiratory disease and 2000+ premature deaths per year. Finally, the burning and processing of coal for the production of electricity, steel, cement, synthetic liquid fuels and other chemicals emits massive amounts of invisible carbon dioxide (CO2) which contributes significantly to global warming.

“None of the so-called “clean coal” technologies can meet the requirements in IRP 2019 of being proven in service, economically viable and deliverable in the timeframes required by 2030”

The promise of ‘clean coal’?

Gwede Mantashe, the minister of mineral resources and energy, often talks about the use of “clean coal” and high-efficiency, low-emission (HELE) coal-fired power generation technology. While little detail is provided as to the specifics, in addition to well-established pollution control technologies, HELE technologies may be taken to include underground coal gasification (UCG), integrated gasification combined cycle (IGCC), carbon capture utilisation and storage (CCUS), and power generation from supercritical (SC) and ultra-supercritical (USC) steam at elevated temperatures and pressures.

The extraction of fly ash from the boiler flue gas in order to reduce PM2 and PM10 emissions into the atmosphere can be reasonably effectively resolved by the installation of electrostatic precipitators and/or fabric filters into the flue gas waste stream.

While this is standard practice globally, Eskom seems unable to achieve the desired levels of performance necessary to meet even the weak minimum standards for PM2 and PM10 emissions in SA. This is evidenced by longstanding problems with particulate emissions at Kendal and other Eskom coal-fired power stations, and the criminal charges that Eskom is facing at present, brought by the environmental regulatory authorities.

The reduction of NOx can be addressed – at least to some extent and at reasonably

low cost – by the installation of so-called “low-NOx burners” in coal-fired boilers. Eskom indicates that it is in the process of installing these at all of its coal-fired power stations. However, if this is indeed the solution to NOx emissions, it raises the question as to why Eskom and Sasol in Mpumalanga are identified as having among some of the highest levels of NOx emissions in the world.

South African coal is generally noted for its high sulphur content which, when burned, results in high emissions of toxic SO2 gas. SO2 emissions also cause acid rain and associated damage to the environment and assist in the formation of particulates in the atmosphere leading to respiratory disease and premature deaths. Recent research indicates that the burning of coal in South Africa by Eskom alone emits more SO2 into the atmosphere than all the coal-fired generation in the US and China combined, despite SA having only a small fraction of their population.

Global best-practice to reduce SO2 emissions is the installation of wet flue-gas desulphurisation (FGD) plants in the flue-gas waste streams of coal-fired boilers. Indeed, this is what is being installed at the new 4,800MW Kusile power station, which is still under construction. However, FGD systems come at high cost, require significant quantities of lime and significantly increase water consumption, while reducing the efficiency of coal-fired power plants. As a result, Eskom is balking at installing an FGD plant at its 4,800MW Medupi coal-fired power station, despite a commitment to do this as a condition of a R45bn loan from the World Bank in 2010.

Mantashe is intent on forcing 1,500MW of new coal-fired generation capacity into South Africa’s national Integrated Resource Plan for Electricity, with 750MW of this scheduled to deliver electricity to the grid in 2024 and the balance in 2027. The minister also says that SA reserves the right to “experiment” with clean coal and HELE power generation technologies.

This despite the fact that two previous projects for new coal-fired power procured by the IPP Office of the Department of Energy is 2016 were abandoned in 2021, amidst multiple legal challenges in respect of climate change, water licence, air pollution and environmental concerns. Local and international development finance institutions and commercial banks now refuse to fund new coal-fired power plants in SA and abroad.

The minister is vocal about experimenting with CCUS, where CO2 gas is separated from the other gases in the flue gas waste stream, and either processed to extract the carbon for other industrial processes or transported as a gas and pumped deep underground to be stored indefinitely within suitable geological rock formations. However,

to date, after decades of effort, this has produced very few technically successful outcomes anywhere in the world. Furthermore, CCUS comes at an extremely high cost, adding to the already high cost of coal-fired power as a result of dust extraction systems, low-NOx burners and FGD plants. CCUS also requires specific geological conditions that are not readily available in SA except by long pipelines at massive further cost.

Similarly, despite decades of efforts internationally, and in a pilot underground coal gasification (UCG) plant at Eskom’s Majuba power station, the deliberate burning of coal seams underground for the production of combustible gases for power generation has proved to be both technical unsuccessful and commercially unviable. UCG also poses very significant challenges in respect of ground, water and air pollution and CO2 emissions, with serious negative environmental impacts. Clearly much further research is needed.

The use of supercritical (SC) or ultra-supercritical (USC) steam at elevated temperatures and pressures to drive the steam turbines and generators in coal-fired power plants can increase the efficiency of the overall thermal cycle by 10% to 15%. Burning 10% to 15% less coal to generate a particular amount of electricity correspondingly reduces the CO2 and other emissions by 10% to 15% per unit of electricity generated.

However, this is very far from what needs to be achieved in order to make any meaningful reduction in CO2 and other emissions in SA from the burning of coal. Furthermore, it is simply not possible for the coal-fired generation using SC or USC technology to be financed, let alone to be deployed in the timeframes envisaged in IRP 2019 in the years to 2030.

The only promising option

The most promising of the so-called “clean coal” burning technologies – and indeed the only answer that Eskom has on the table at present to address its ash, SO2 and CO2 emissions – is to burn significantly less coal. To achieve this, Eskom intends to decommission some 11,000MW of coal-fired power stations by 2030 and a further 11,000MW by 2035 – about half of the total generation capacity of SA – and to replace this with renewable energy, supported by flexible generation capacity in the form of gas-to-power and various energy storage technologies.

It has become quite clear that that none of the so-called “clean coal” technologies can meet the requirements in IRP 2019 of being proven in service, economically viable and deliverable in the timeframes required by 2030.

In fact, it is clear that now and for the foreseeable future, there is simply no such thing as “clean coal”, regardless of whether or not existing or new HELE technologies are used to minimise emissions from the mining, processing and burning of coal or gas derived from coal.

■ Yelland is MD, EE Business Intelligence



POWERPULSE: YOUR ENERGY SOLUTION FOR THE FUTURE.

PowerPulse connects your business to accredited and vetted solution providers who understand your energy requirements, and empowers you to make educated decisions regarding your solar project. The PowerPulse solution is built on transparency, trust and efficiency and is here to help drive the sustainability of your business.

To find out more contact the PowerPulse team at PowerPulse@standardbank.co.za

**SOUTH AFRICA BANKS ON BUSINESS.
BUSINESS BANKS ON POWERPULSE.**

Standard Bank *IT CAN BE*™