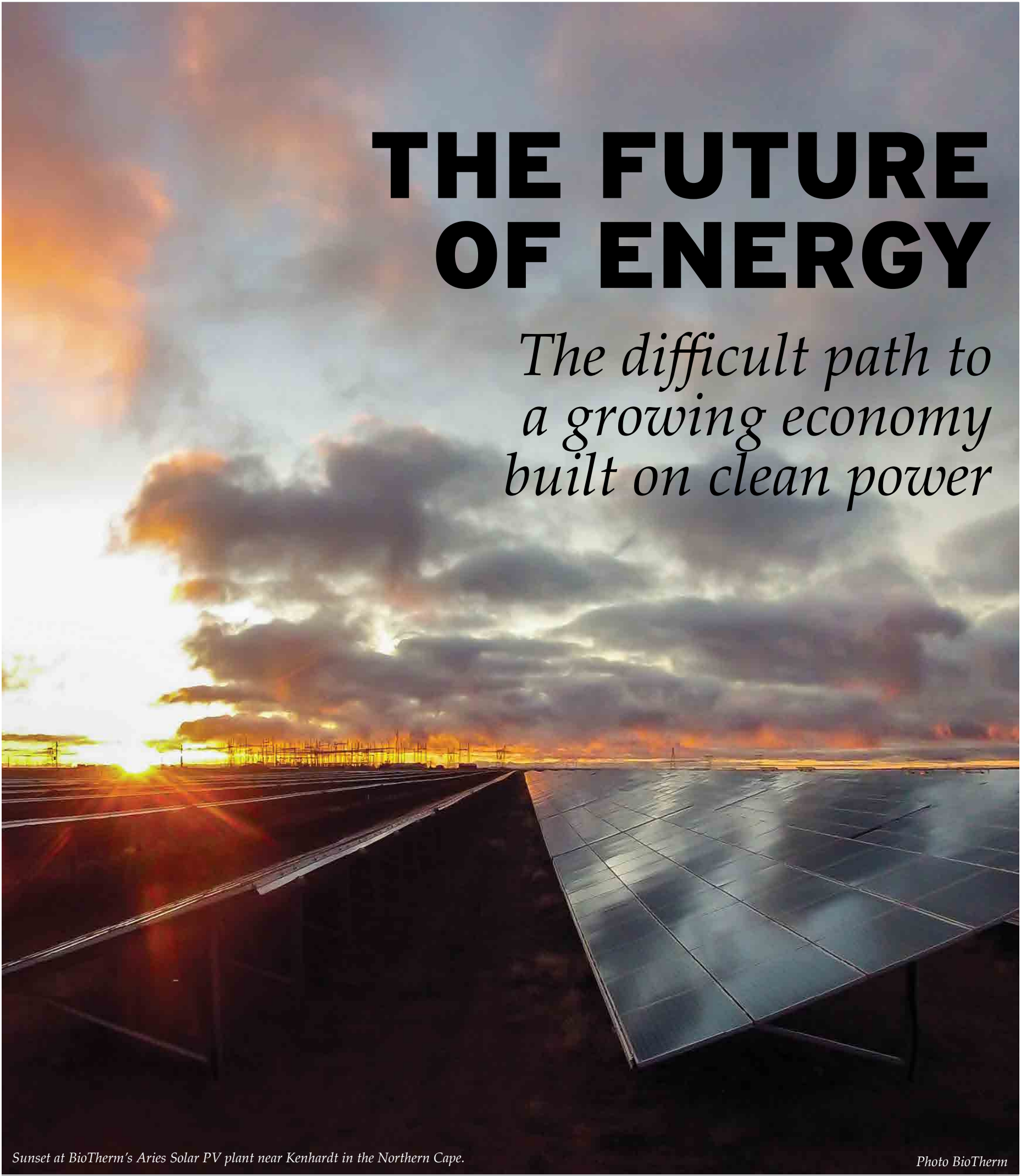


THE FUTURE OF ENERGY

*The difficult path to
a growing economy
built on clean power*



Sunset at BioTherm's Aries Solar PV plant near Kenhardt in the Northern Cape.

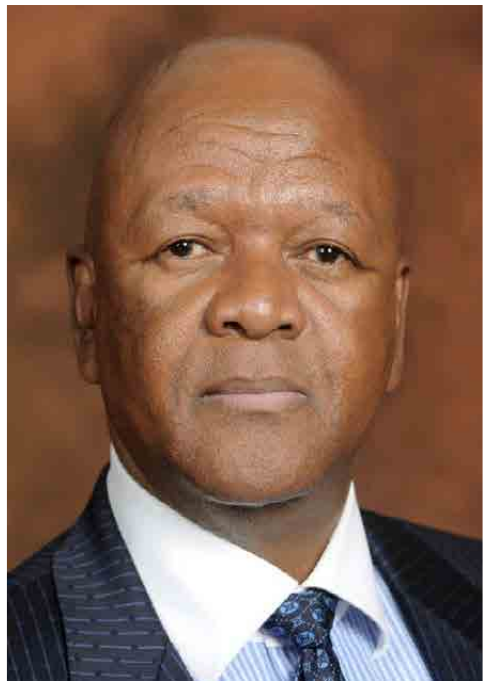
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BUILDING SOCIAL COALITIONS TOWARDS A STRONG, RESILIENT AND DIVERSE ENERGY

“Utilising South Africa’s abundant natural resources, the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has catalysed the formation of social coalitions towards a strong, resilient and diverse energy sector.”
Energy, Honourable Mr Jeff Radebe, MP.

The Renewable Energy Independent Power Producers Procurement Programme (REIPPPP) has catalysed, in 7 short years, a profound shift in South Africa’s energy market and the South African economy.

- REIPPPP has contributed to the diversification of the energy-mix and has catalysed the introduction of new technologies, changed the landscape of electricity generation, trading and access to the national grid and multi-party buyer interest.
- REIPPPP has generated clean energy and offset 27.2 Mton Co2 emissions, while saving 32 million kilolitres of water in relation to fossil fuel power generation.
- REIPPPP has been an innovative vehicle for promoting private investment from foreign and local sources, broadening ownership and participation in the energy sector, and has stimulated:
 - ▶ local production, manufacturing, and new services industries,
 - ▶ the formation of new research and knowledge centres amongst tertiary institutions, the private sector, and
 - ▶ economic activity / opportunities, particularly in rural areas.



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TRANSFORMATIONS TOWARDS A STRONG, CLEANER NEW ENERGY ECONOMY

*"The Department of Energy, through
the Enterprise Development Programme, is building
a cleaner new energy economy", Minister of*

Powering Change by Shifting the Economy

Apart from the stimulation of entrepreneurial development through procurement of goods and services, until now, the 62 operational Independent Power Producers (IPPs) have spent **R204.6 million** on the Enterprise Development of 930 Small, Medium and Micro-sized Enterprises (SMMEs) across a range of sectors, including farming.



Empowering Future Generations

To date, more than **600 bursaries** have been given by IPPs nationwide to students from the local communities which host the IPP projects.

This is equivalent to **R66.6 million** in financial support to date. It covers fees, books, accommodation and food. There is also mentorship programmes available for students. Of the bursaries **52 %** are given to female students and **48 %** to male students.



ALBERTINA SISULU
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2018



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ABOUT THIS PUBLICATION

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Photo: Christy Strever

Introduction

Standing proudly after a bruising ordeal

Colin Anthony

ambitions and a belief that the IPPs somehow undermined them. The industry's development was stopped in its tracks.

Today, the renewable energy programme is back on track but the environment is starkly different.

Back then there was perhaps a naivety in the sense of achievement in that there was little understanding of the extent of damage a few corrupt people in powerful positions could cause in pursuing nefarious agendas. Today that awareness is acute, honed by the near death of SA's renewables industry.

Now, there is a growing sense of confidence at having overcome those travails. Having been so close to the brink, things are up and running again. But there is cautiousness too; an awareness of how quickly things can change, of how close the industry came to being permanently stunted. The excited teenager has matured into a more world-weary adult, albeit one whose confidence in its abilities has been honed by its past successes, both in developing an efficient industry and in overcoming its political struggle for survival.

"When we started with renewables we just jumped in and swam," says Karén Breytenbach, who as head of the IPP Office has overseen the entire renewable energy process. "Now we know; we have learnt. We need to be ready for what is coming, not just jump in."

Much of the credit for rejuvenating the renewables programme can go to Energy Minister Jeff Radebe. He wasted little time in getting Eskom to sign the round four procurement agreements with the IPPs, notwithstanding continuing resistance from the utility – which introduced an element of absurd hilarity. Last-minute court applications failed to stop the process but Eskom continued to prevaricate and delay, right up to the signing ceremony. First they said they had no mandate to sign, which was immediately dismissed as nonsense. Then they tried to renegotiate prices and were again rebuffed. Finally, at the signing ceremony, the appointed Eskom official shifted in his seat patting pockets, saying he couldn't sign as he had no pen. The minister, with alacrity, produced one from his jacket pocket.

Those 27 round four projects, Radebe announced at the signing, will inject R56m of new investment into the economy, put downward pressure on the end price of electricity and provide 61,600 full-time

jobs of which 95% are for South African citizens, mostly during the construction phase. The local community equity shareholding in the 27 projects amounts to 7.1% or R1.6bn-worth, and those shareholders are likely to receive R5.9bn in dividends over the 20-year lifespan of the projects. Another R9,8bn will be spent on socioeconomic development initiatives and R3.4bn on enterprise development over the 20-year contract periods.

Radebe's next big achievement has been the publishing of the draft Integrated Resource Plan (IRP) 2018, again in the face of resistance, this time spearheaded by the National Union of Mineworkers. That maps a path for South Africa's energy future and instils a sense of certainty in the industry. Investment decisions can be made accordingly.

The main focus of this publication is on the future of energy in SA. It's an exciting time: the IRP opens the way for independent power producers within coal and gas, introducing new elements of competition for Eskom. Indeed, the future structure of Eskom is pivotal to the future shape of the industry, and we explore options that might improve operational efficiency and financial sustainability (page 10). And the renewables industry itself is ever-evolving, with technological advancements and falling costs making it a compelling solution to the ever-increasing urgency with which planet Earth has to address the consequences of global warming.

Now we know; we have learnt. We need to be ready for what is coming, not just jump in

The visual element is again an important feature of this publication. We visited renewable energy plants that have sprung up since our initial publication and carry photo essays of a handful of them. We also look at future projects: those that suffered from the delayed signing of round four. We tell the stories of the IPPs accompanied by images of their existing projects.

Intellidex chairman Stuart Theobald focuses on the financing structures (page 34) involved in the IPP programme,

showing how billions of rands have been mobilised to invest in renewables.

Finally, we look at the wider continent where the renewables industry holds so much promise. Many South African companies are doing business in the renewables space across Africa (page 30).

Given the inability to distribute electricity in rural areas across much of Africa due to lack of infrastructure, solar and wind plants make for an ideal solution. Plants can be built in remote areas at small scale and supply power directly to consumers. Many governments are committed to renewable energy programmes and are open to the private public partnerships that can make them happen. Asked if their state-owned, monopolist power utilities wouldn't feel threatened by the competition, one industry source said pragmatism was prevailing. Neither the utilities nor the governments have the balance sheets to take on such projects and the governments recognise that they need private sector involvement.

This publication, in a small way, has followed the travails of the IPP industry over the past two years. Plans to produce a second edition in 2017 were scuppered by the delayed signing of round four projects. However, that is insignificant compared with the anxiety and trauma that the industry players themselves had to endure. The IPP Office itself had to cut back to a skeleton staff contingent and, right up until the outcome of the ANC's elective conference at Nasrec in December last year, believed there was a strong possibility of being shut down.

We offer our heartfelt thanks to the IPP Office, not only for the support it has provided us in producing both editions, but also for its resoluteness and determination to get the job done. In the end it has achieved that.

While the IPP Office is a sponsor of this publication, the content was produced entirely independently and credit to it for not even attempting to influence the editorial. However, its staff have offered us much support when needed and our thanks go to the team members who so willingly – and cheerfully – gave up their time to assist us. Many others also assisted with producing this publication, including many at the IPPs themselves, from plant managers who took our journalists and photographers around to executives who agreed to interviews, and our thanks go to them too.

As always, we're interested in hearing your thoughts and feedback on the publication is welcome.

Email canthony@intellidex.co.za ■

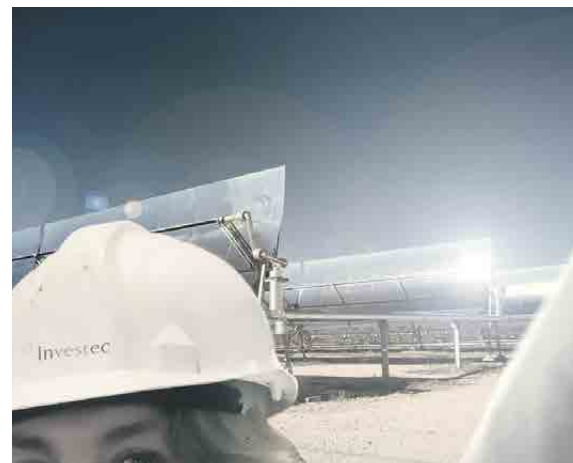
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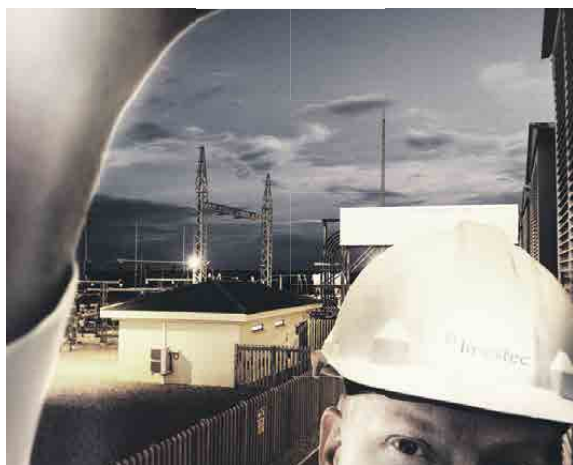
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Forging a new energy path

After developing so quickly in a process emulated globally, South Africa’s renewable energy industry has survived a near-death experience. Formidable challenges remain.

Colin Anthony

The mood in the renewable energy industry in South Africa is buoyant – things are back on track –but the scars from an agonising delay in signing off on planned new projects are still raw.

The three-year delay was a shock after five years of rapid development. The industry seemingly sprang up from nowhere, with the first plants being commissioned in 2012. Over the last five years, in a process admired and duplicated across the planet, it has generated 24,913 gigawatt hours of renewable energy, enough to power 750,000 houses for that period.

Over the course of four successive rounds of auctions, beginning in 2011, private power producers bid on the price at which they would sell electricity to Eskom. With each round, prices fell dramatically as competition heated up. But then it came close to being killed off entirely after the fourth round was put on hold, even though the auction had been concluded.

Now it has come back to life, under a new cabinet appointed by president Cyril Ramaphosa. Had a few more votes gone the other way at the ANC’s elective conference at Nasrec in December, it may never have been resuscitated. Now the challenge for the industry is to recover from the delays.

The renewable energy independent power producers’ programme (REIPPP) was born when former president Jacob Zuma committed the country to introduce renewable energy into its energy mix in a big way in 2009 during the Congress of Parties (COP) 15th summit in Copenhagen. By 2011, when South Africa hosted COP 17 in Durban, the country was ready to announce the first successful bidders. That was the culmination of months of frantic work in the background, led by a unit put together jointly by the energy department and National Treasury that is now called the IPP Office. The programme was a major success until it got caught up in politics around a purported nuclear build and Eskom’s own new build issues. The success of Ramaphosa at the ANC’s December 2017 elective conference broke the logjam, allowing the programme to proceed with its fourth round. Things now appear to be back on track.

Still, the programme faces formidable challenges. The National Union of Mineworkers (NUM) is gearing up for concerted protests after the draft integrated resource plan (IRP) was published in August. It targets a total of 20,000MW for wind and solar by 2030, making up 26.5% of the total energy mix. The union argues that this will wipe out jobs in the coal sector and it is determined to overturn the decision.

Other challenges come from within. The auction-based system, in which independent power producers (IPPs) bid at

which prices they will supply electricity to Eskom, resulted in prices falling to as low as 62c/kwh for solar and wind in the latter bid rounds. That dramatically undercuts the cost at which Eskom’s new coal plants will produce. But it also resulted in a race to the bottom, with margins so thin there are questions about sustainability. IPPs are now saying it is time to change to a feed-in tariff system in which prices are fixed for suppliers, providing them with a reasonable margin. That will enable them to improve their financial stability and develop into businesses that are sustainable over the long term, enabling them to grow, employ more people and improve the support they provide to their suppliers, helping to develop that market segment too. That idea will be resisted: the auction system was designed after government obtained legal advice that a feed-in tariff violates the constitutional requirement for government procurement to be competitive.

The low margins for IPPs extend to the entire value chain linked to the IPPs. Many suppliers were exactly the type of business the government wants to develop and the country so desperately needs to be successful: small black-owned start-ups. Typically, such businesses need debt financing with the repayments slicing another sliver from profit margins. And many suffered the concentration risk of having only one client. With the delay in signing on round four projects, suddenly there were no more orders. Businesses crumbled one after the other.

Karén Breytenbach, head of the IPP Office, says businesses that banked only

IRP 2030 targeted energy mix			
	Current (MW)	Total installed by 2030 (MW)	Installed capacity mix (%)
Coal	29,126	33,847	44.6
Nuclear	1,860	1,860	2.5
Hydro	2,196	4,926	6.2
Solar Photovoltaic (PV)	1,474	7,958	10.5
Wind	1,980	11,442	15.1
Concentrated Solar Power (CSP)	300	600	0.9
Gas/diesel	3,838	11,930	15.7
Other (co-generation, biomass, landfill)	499	499	0.7

on the South African market failed. While some stand a chance of being resuscitated, the manufacturing segment “died”. As time went on after round four winners remained unsigned, “there was no indication that we would sign. We tried and failed and tried and failed, so all of those jobs are gone.”

She says it is not feasible to manufacture just for the South African market. “You need to export. You need to do things where we have a comparative advantage. We shouldn’t do PV panels – you can’t compete with China. But there are areas where we are competitive such as valves and transformers. So there are things we can do in SA and should be doing, and in difficult times you should be able to scale down and still survive.”

Rebuilding the supply chain now needs to be a priority (see page 10). To achieve that – along with developing the renewable energy industry to its full potential – government consistency is needed, says

Jasandra Nyker, CEO of SA-based project developer Biotherm Energy. “I’m referring to a renewables programme being rolled out in a timely manner with a consistent frequency where timelines are adhered to. So in the first three rounds it was all good, they were held annually and essentially resulted in an industry being developed. But the delay on round four has really damaged the industry. That’s where the unhappiness is.”

She says IPP developers have to look at the bankability of large, capital-intensive projects, ensure the technology is bankable and that suppliers will be around for a long time – the latter needed to ensure that the IPPs’ warranties are meaningful.

Nyker believes that while the auction system was successful in lowering costs, it is time to change to a feed-in tariff system. “That’s the only way, I feel, that we are going to leverage the potential of renewable energy in order to develop a sustainable sector. We’re at a point now



where prices are highly competitive as a result of holding auctions. Set a feed-in tariff that is highly competitive but one that will enable the local industry to flourish.”

She points to the diverse range of benefits flowing from the renewables industry, including addressing black skills development and other socioeconomic problems in the country. “If you’re trying to push so many levers with one industry – which in the operational period does not offer that many jobs – it is difficult to continue to compete and ensure the local supply chain can flourish through meeting local content targets.

With that kind of certainty, IPPs, their suppliers and numerous other players could build sustainable businesses. The delays, she says, hit the suppliers particularly hard because often they have only one product. “That’s the issue: it hits local black businesses the hardest. They don’t have a balance sheet and are living from project to project.”

In response, the IPP Office says the lower prices from the auction system result in improved economic development impacts for society and market participants have continued to show significant interest, “while their confidence is entrenched by policy certainty in the future rollout of electrical energy capacity”. The IPP Office has also already introduced measures to bring uniformity to socioeconomic and enterprise development initiatives.

Rebuilding the supply chain faces another problem. Dr Anton Eberhard, emeritus professor at the University of Cape Town where he directs Managing Infrastructure Investment Reform Regulation in Africa at the Graduate School of Business, points out that the IRP only schedules the next tranche for solar and wind from 2025. “This would be disastrous for localisation, local manufacturing and jobs,” he says. “For example, a wind tower factory was forced to close with the delays in round four. It will now reopen but will almost certainly have to close again (perhaps permanently) with the hiatus

until 2025. So, it makes sense to bring the solar and wind procurements and spread them out evenly, starting with round five procurement next year.”

Despite the draft IRP’s outlook, Energy Minister Jeff Radebe announced at the signing of the round four agreements that a fifth round of bidding would be held in November this year, but most commentators believe this will be delayed until after the elections. The minister failed to respond to questions on this and other issues.

Radebe has achieved much in a short space of time. He was appointed energy minister in February this year. Two months later, he ended the punishing impasse, forcing Eskom into signing the power purchase agreements with the winners of the fourth round auction that it had resisted for two years. In August he finally published the draft IRP, taking the first step towards a coherent and agreed plan for future energy supply, no mean feat given that the document was caught in the political machinations of Zuma’s drive for nuclear power development.

The IRP, when it is approved by cabinet, will change things. First, it brings certainty to the renewable energy sector. Second, that certainty means a supply chain can be built up again with a focus on developing more sustainable business models. Third – and let’s not forget that this is what it’s all about – South Africa will go a long way to reducing its carbon emissions: it committed to cutting emissions by 25% by 2020 at the Copenhagen climate conference. That situation has become more urgent with the recent release of a report by the UN Intergovernmental Panel on Climate Change warning that there are only 12 years for global warming to be kept to a maximum of 1.5°C. Beyond that, it says, even half a degree will significantly worsen the risks of drought, floods, extreme heat and poverty for hundreds of millions of people.

The IRP’s increased allocation to renewables in the energy supply mix will

help reduce emissions. Another important aim of the energy policy document is to reduce the price of electricity for consumers. Eberhard believes it has the potential to deliver on that. “The objective function of the IRP model is the least-cost system mix to meet a specified reliability standard. The least-cost mix also has the best environmental profile and meets SA’s climate change mitigation targets,” he says.

However, the introduction of coal IPPs does not fit the least-cost model. “The energy department forced in two coal IPPs that were procured through a competitive tender but have not yet signed power purchase agreements with Eskom or reached financial close. The least-cost IRP case does not pick any more coal or nuclear,” he says.

The IRP’s plan to develop gas into a meaningful player in the energy mix, “is part of the least-cost mix and complements the variability of solar and wind energy”. Eberhard says the gas plans are viable and attainable for SA. “Many countries have achieved this through liquid natural gas imports or exploiting their own resources.” SA, he says, has still not exploited potential shale gas resources which could be accessed through the controversial process of fracking. Gas can add important flexibility to the overall power supply system. It can be switched on and off relatively quickly, so it provides an important backstop to solar and wind energy which depend on weather conditions. The IPP Office is now gearing up for a similar auction-based approach to purchasing power from gas IPPs.

The energy department is finalising its gas utilisation master plan (Gump) as a basis of supporting the objectives of the IRP. Breytenbach says the gas programme is still in the conceptualisation stage. “SA does not have the gas available right now and is looking to source from Mozambique and LNG imports. We need to have infrastructure to bring gas to those [approved IPP] plants and that will come at a cost.”

She hopes that the gas project will create a market for further drilling and exploration. “Gas is a very good energy source. As a country we don’t use our energy in the right way. Most of the time we use electricity for everything, or coal.” Gas she says, would be more efficient. “We’d use gas for the right reason and use electricity where it is required.”

Eberhard says solar and wind energy have broken through and are now the cheapest sources of electricity in many countries. “It makes sense to maximise their contribution and then build the rest of the system around them with flexible resources such as gas, storage and demand-side management to fill in the troughs and guarantee reliability. Many traditional engineers (who were schooled in baseload supply supplemented by peaking power) find this concept of solar + wind + gas hard to accept, but it’s the utility of the future and will provide least-cost, reliable electricity for all.”

Dr Rod Crompton, director of the African Energy Leadership Centre at Wits Business School, points to important contextual changes. “If you look at what’s happening in the background, the energy sector (which he emphasises does not

equal electricity but includes oil, gas and nuclear) is facing two transitions. First a “tsunami of change” in terms of technology is taking place. A wave of new technology is coming in, he says, including cheap renewable power generation, blockchain, Uber, Ride Share, electric vehicles, digitisation, many others and the fourth industrial revolution.

Second is the global move to decarbonisation of energy. He refers to Standard Chartered Bank’s recent position statement that it would “no longer directly finance any new coal-fired power plant projects, including expansions, in any location”. The bank said: “As a key part of our mission to be here for good, we only provide financial services to clients who manage their environmental and social impacts responsibly.” This would threaten the two coal IPPs, Thabametsi and Khanyis – and they may also face legal challenges from environmental groups.

The more competition there is, the better it is for the consumer and the economy

Along with those two transitions, Crompton says, customers are “voting with their feet” as electricity costs rise. “Manufactures are using their own power stations; office blocks are going partly off-grid with solar PV and the like. The whole thing is very dynamic and shifting by the day. So it’s hard to say if we have a supply-demand imbalance – it depends on price. The price moving off-grid is dropping but no one knows how far it will go.

“What we do know is that Eskom’s sales have been flat or declining over the past five years. How much of that is attributable to the low economic growth rate and how much to price requires urgent study.”

He emphasises that the modern-day consumer demands choice. “Yet our old-fashioned electricity market is like Henry Ford’s when he said, ‘you can have any colour car as long as it’s black.’

“The more competition there is, the better it is for the consumer and the economy.”

Crompton points out that the 2003 white paper on renewable energy requires the most efficient technologies to be used. “I take that to be the lowest-cost producers.” Because of this, he says the IRP is flawed in that it does not follow government policy because it selects specific technologies.

With the economy struggling to attain growth, he says, SA needs intermediate

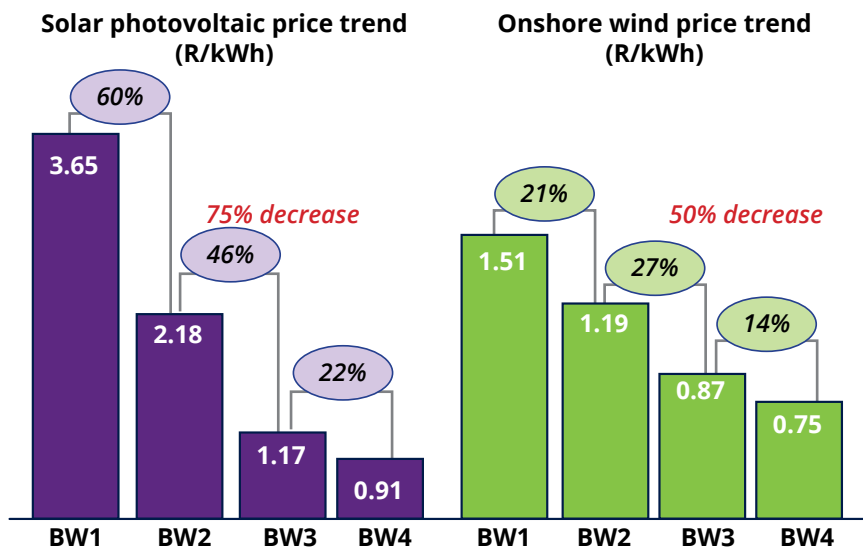


What the REIPPP has achieved so far:

- 6,422MW of electricity have been procured from 112 IPPs.
- 7.776MW of electricity generation capacity from 621 IPP projects have been connected to the national grid.
- 24,913GWh of energy has been generated by renewable energy sources.
- The REIPPP has attracted investment (equity and debt) valued at R201.8bn, of which R48.7bn is foreign investment.
- The REIPPP has created 35,702 job years for South African citizens.
- The programme’s contribution to socioeconomic development initiatives totals R573.6m.
- Enterprise development contributions total R188.8m.
- Emission reductions of 25.3 million tonnes of carbon dioxide have been realised.

The rapidly falling cost of renewable energy across the four bid windows (BW)

Prices in April 2016 terms



Source: IPP Office

inputs to be as cheap as possible. “I would prefer it if we just talked lowest-cost producers and didn’t specify a preference for one technology over another.” He points to prices in the early bid windows of the REIPPP, coming in at about 400% of Eskom’s average tariff for some technologies. “That’s what happens when you pick the technology.”

Radebe has said the government had one purpose in finalising the IRP, which

was to use energy as a catalyst to reignite growth in SA. Crompton, who previously served on the board of the National Energy Regulator of SA and was a deputy director-general at the department of minerals and energy, says the way that could happen would be to avoid trying to pick “winners” (technologies). “Aim to deliver electricity as cheaply as possible. If the concern is about jobs and job creation, it’s not just a question of

direct jobs in for example coal mining. It’s about jobs in the entire economy; the entire economy consumes electricity, in businesses, in homes. If electricity prices fall the consumer will have more disposable income to spend, which boosts the economy. If manufacturers pay lower electricity prices, they’d be able to produce their goods cheaper and be more competitive globally. That’s where to look for jobs.”

That, of course, puts Eskom centre stage. Even if the state utility is put on a sounder management footing and corruption is dealt with, it remains financially unviable with costs exceeding revenue. The fact that municipalities owe it more than R20bn and yet it is unable to recoup that money says enough. A restructuring is needed and the longer the status quo is maintained, the more damaging it will be to consumers and the economy as electricity tariffs keep escalating. (See accompanying article: Changes needed at Eskom.)

Crompton says that a recently published book by Tobias Bischof-Niemz and Terence Creamer, South Africa’s Energy Transition, has shown that switching electricity production from coal to renewables yields more jobs than the current coal-based setup. There are more jobs in the renewable energy industry than coal mining. “The inclusion of coal may be based on the mistaken impression that coal is more labour intensive than renewables, which is apparently not the case.”

That undermines the NUM’s main argument against renewables – it says

30,000 jobs will be lost in the coal mining industry. Radebe, however, maintains the job losses in coal were because mines were coming to the end of their lives. “The 30,000 jobs lost because of the IPP renewables programme: that perception is wrong,” he told Parliament’s portfolio committee on energy in May. “The IPP has nothing to do with job losses in the coal sector. They were not established as a competition.”

The NUM is also arguing that electricity from renewables is more expensive than coal. However, that pertains only to the first two bid windows and the union is silent on the fact that the in the latter rounds the prices were far lower than coal. Questions on these issues to the NUM were not answered.

Furthermore, the IPPs that secured contracts at the high prices are coming under concerted pressure to reduce those prices. Only one has done so but the pressure on the others will be cranked up, an industry source says. The argument is that SA cannot live with those high costs for the remainder of their 20-year contracts.

The REIPPP programme has the potential to achieve a trifecta of wins for South Africa: lower cost energy, lower carbon emissions, and employment. With the political will once again back to support the programme, difficult issues such as restructuring Eskom and finalising the IRP will need to be managed in order to ensure the REIPPP maximises its potential. The country would be the ultimate beneficiary. ■

Changes needed at Eskom – and needed soon

Phibion Makuwerere

Is there a case for splitting Eskom into three distinct entities – generation, transmission, and distribution? I think there is, though doing it is going to be an issue of major political contestation and doesn’t always work to reduce costs. There are plenty of examples around the world that prove it.

The generation unit in particular, which has been expanding its cost base far ahead of revenue, lends itself to being hived off as a separate entity.

The reality is that Eskom has let its operating costs get out of hand. Its primary energy costs have risen from 24% of its top line in 2003 to 47% in 2017. The IPP programme initially had the effect of raising the cost of generating electricity because power purchase agreements from the first bid window were as much as 400% of Eskom’s average tariff. But even if you take those costs – which have fallen since the initial bid window – out of the metric, it is still high, at 36% of revenue.

The distribution component has sections that are already divorced from Eskom, run by various municipalities. This model is cost-inefficient, particularly for the consumer who has to cover a margin charged by those municipalities which has become a key source of local government funding. Furthermore, numerous municipalities fail to remit revenue back to Eskom, making Eskom’s financial position more precarious. The Eskom board told parliament’s portfolio committee on public enterprises in April that municipalities owe Eskom a total of R13.5bn.

Eskom’s ability to recoup municipal debt was severely hampered by a court case involving chicken producer Astral last year. Eskom wanted to cut off supply to the Lekwa municipal region for non-payment but Astral, which had paid the electricity

bills for its Standerton operations to the municipality, challenged that. The North Gauteng High Court ruled that Astral had to receive uninterrupted supply – and Eskom had to pay all legal costs.

Research conducted by the World Bank in some African and Latin American countries makes a strong case for improving efficiencies at electricity utilities. It found the modus operandi for achieving efficiencies has been, first, to execute some form of operations-splitting (into generation, transmission and distribution), and then privatisation. It found that utilities that had done that showed improvements in labour productivity, efficiency and product/service quality.

Against this backdrop, disposing of the generation assets makes sense. Then alternative models for transmission and distribution can be tried. They could possibly remain in one entity, but with municipalities removed from the value chain. Another option could be to resurrect the now abandoned consolidated regional electrical distributors (REDs) that were proposed in the 1998 white paper on restructuring the electricity industry.

In 2003 the government established EDI Holdings as a subsidiary responsible for the distribution of electricity. It planned to establish about 180 municipal and six Eskom electricity distributors into six regional electricity distributors (REDs) to serve the entire country. However, the plan fell apart largely because a required constitutional amendment (Constitution 17th Amendment Bill) stalled. The motivation for creating the six REDs was to build enough capacity in terms of scale, finance and skills to ensure the orderly and equitable supply of electricity to the whole country.

The impetus for the restructuring was to use transmission assets as a platform to plug in private

power producers, which can produce the electricity at a more competitive cost – a model already in place through the IPPs. Eskom can make money from charging a transmission fee.

At this stage it seems viable for Eskom to retain both transmission and distribution functions. Removing municipalities from the value chain will be difficult politically but also legally: the constitution gives municipalities the right to distribute electricity.

Some municipalities rely heavily on electricity distribution to generate revenue, which they use to subsidise other municipal expenses. Statistics SA, using 2013 financial year numbers, demonstrated how the financial viability of many municipalities could be severely compromised if the electricity retailing role was removed. The situation is exacerbated by the fact that many municipalities do not expend any capital towards distribution infrastructure.

Whatever option the government goes for, it cannot wait any longer. Electricity is consumed by all elements of the economy: consumers, households, businesses, factories, mines. The damage to the economy due to the dramatic increases in electricity costs over the past few years is immeasurable.

To highlight but one example that shines a light into a sliver of the economy: a paper by the Centre for Competition Regulation and Economic Development showed that the high cost of electricity between 2007 and 2016 saw about 100 out of 265 foundries shut down due to high electricity costs, which form an important part of their cost structure.

That clearly goes against Eskom’s mandate of promoting economic growth. ■

■ Makuwerere is an Intellidex financial analyst who wrote an MBA thesis on a business plan solution for Eskom’s waning electricity sales volumes.



Lucy Chege, Head: Energy, Environment and Information Communications (ICT) at the DBSA

The Development Bank of Southern Africa (DBSA) originates, prepares, leads and finances infrastructure integration and development projects. As a development finance institution (DFI) its mandate is to promote economic and social development including alleviating poverty, and creating jobs and wealth by mobilising financial and other resources from both private and public investors nationally and internationally to enable sustainable development projects both in South Africa and on the African continent.

Its priority is to generate a developmental impact return as opposed to a commercial rate of return, both locally and on the continent – but particularly in the SADC region – by expanding access to development finance while at the same time integrating and implementing sustainable infrastructure development.

“We see the bank as playing a dual role,” explains Lucy Chege, Head: Energy, Environment and Information Communications (ICT) at the DBSA, “both in terms of providing project preparation support where we work with governments and project sponsors to help facilitate projects, as well the more traditional role of providing project financing to enable projects to succeed and be sustainable.”

The bank’s strategy, as a DFI, is to increase its developmental impact by creating opportunities for public-private partnerships and to leverage their own balance sheet by assuming institutional risk. Despite the fact that the DBSA’s balance sheet is just R80 billion, the organisation has set itself ambitious targets of catalysing R100 billion worth of infrastructure projects by 2020. Essentially what this entails is leveraging private capital using its own balance sheet in order to successfully enable more infrastructure projects. The bank then implements a cost-recovery model with the emphasis on sustainability and developmental impact.

REGIONAL INVOLVEMENT

DBSA is involved in a number of transboundary projects on the African continent, a number of which are in the renewable energy space. These include the Southern Africa Power Pool project (SAPP), which all members of SADC – with the exception of Mauritius – are signatories to.

SAPP aims to facilitate the development of a competitive electricity market in the SADC region, provide the end user with a choice of electricity supplier, and ensure sustainable energy development through sound economic, environmental and social practices. In addition to providing a forum for the development of a world class, robust, safe, efficient, reliable and stable interconnected electrical system in the region, one of SAPP’s specific objectives is to implement strategies in support of sustainable development priorities.

The membership of SAPP is made up both power utilities in member countries as well as independent power producers and transmission power companies.

The challenge faced by many countries in the region, reports Lucy Chege, Head: Energy, Environment and Information Communications (ICT) at the DBSA, is that many countries rely on their utility provider to ensure power purchase agreements for projects are bankable but as a result of financial constraints, currently some of the utilities are not in position to do so.

Some countries have an over-supply of independent power producers, and need to turn their focus away from power generation to transmission. “Through SAPP the intention is to strengthen the transmission network between SADC member countries so that countries with an over-supply of power can supply neighbouring countries with power,” she reports.

Ethiopia, for instance, is one country which has the potential for an over-supply of energy. The country embarked on an ambitious renewable energy programme more than a decade ago and currently generates the bulk of its electricity from hydropower with wind and geothermal energy generation facilities to offset seasonal differences in water level.

Ghana, meanwhile, has implemented plans to promote large-scale solar and wind projects. The country has signed a number of power purchase agreements as well as reviewed its Renewable Energy Act in order to attract investment to renewable energy programmes.

ITHEZI-THEZI HYDROPOWER GENERATION PROJECT

The 120MW Ithezi-Thezi power project is situated on the Ithezi-Thezi dam, which was initially constructed to serve as a reservoir for the Kafue Gorge power station. The first public private partnership in the power sector in Zambia, the hydro power plant was seen as a way to alleviate the country’s power deficit in the late 2000s. The project is owned by Indian power company, Tata Power and ZESCO, a Zambian power utility on a 25-year build-own-operate-transfer concession term. The DBSA provided project preparation funding for the development of a bankable feasibility study and is a co-financier of the project.

CENPOWER GHANA

DBSA was a co-financier for Ghana’s 340MW combined cycle gas to liquids power plant. The Cenpwer Kpone Independent Power Plant (KIPP), situated close to Ghana’s capital, Accra, came on stream in 2017. It accounts for approximately 10% of Ghana’s total installed capacity and approximately 15% of its available thermal generation capacity. A combined cycle gas turbine plant, it is Ghana’s most fuel-efficient thermal power station.

PROMOTING SA’S RENEWABLE ENERGY PROGRAMME

The DBSA has been instrumental in supporting South Africa’s renewable energy programme. The bank played a catalytic role in the programme by providing funding of R80 million which unlocked over R200 billion worth of investment as well as around 6,000MW of renewable en-

ergy. Of this investment, around 80% emanated from the private sector with approximately R50 billion coming from foreign direct investment.

The bank played a significant role in the establishment of the Renewable Energy Independent Power Producers Procurement Programme (REIPPPP), which has successfully channelled substantial private sector expertise and investment into grid-connected renewable energy in South Africa at competitive prices. In 2010 the bank signed a memorandum of understanding with the Department of Energy and National Treasury and served as the payment gateway for REIPPPP and provided local debt funding to the projects in order to facilitate black economic empowerment (BEE) and community participation in the deals.

LANGA

In South Africa the DBSA has been involved in a number of renewable energy projects including the Langa CSP1 project, a 100MW concentrated solar power plant situated in Karoshhoek, near Upington in the Northern Cape. The plant’s position allows it to benefit from some of the best solar resources globally. With capacity to store energy for 4.5 hours, the plant will be able to provide solar generated thermal electricity both day and night to around 80 000 households. The project has created in the region of 1 800 jobs during the construction phase and is anticipated to make a significant contribution to socio-economic development projects in the region over the next two decades.

The utility is the first phase of a significantly larger envisaged solar park complex. Shareholders in the project include Emvelo Holdings, the developers of the project, as well as the Industrial Development Corporation, ACS Cobra, the DBSA and a local community trust. Members of the surrounding townships will be beneficiaries of the community trust.

The R11 billion project, which reached financial close in February 2015, is currently under construction. The DBSA provided project preparation funding for the development of a bankable feasibility study and is the mandated lead arranger and underwriter for senior debt on the project, alongside other local commercial banks.

WEST COAST ONE WIND PROJECT

A 94MW wind farm located 130 km north of Cape Town, the site for West Coast One was approved in 2012 as part of REIPPPP. The project was conceived in 2007 in financial partnership with Investec. Current shareholders of the plant include Investec, ENGIE (formerly GDF SUEZ, France), Investec, Kagiso Tiso Resources and a local community trust. Project construction began in 2013 with commercial operations commencing in June, 2015. The construction phase of the \$246.4 million project created 600 jobs. A local community trust owns 2.5% of the project, with the benefits intended to support and develop the local community.

The DBSA provided funding for the BEE and local community trust and is the underwriter for senior debt on the project alongside local commercial banks.

JASPER SOLAR POWER PROJECT

The fully operational 75MW Jasper Solar Power Project, situated in Postmasburg in the Northern Cape, completed construction in October 2014. The project produces approximately 180 000 megawatt-hours of energy, sufficient to power around 80 000 homes. It is situated adjacent to the Lesedi Power Project and Solar Reserves Redstone CSP Tower project which offers integrated storage.

Shareholders of the project include SolarReserve, which partnered with local empowered infrastructure investors including the Public Investment Corporation and Kensani to develop a large-scale photovoltaic solar energy projects. The project was awarded by the Department of Energy in the second round of bidding under REIPPPP and included a financial investment from Google, the latter’s first renewable energy investment in South Africa. The DBSA provided BEE and local community trust funding and has underwritten senior debt alongside local commercial banks.

LEARNINGS

According to Chege, the DBSA – as well as other stakeholders – have come a long way since 2010 in terms of how they assess projects renewable energy projects, ensure their bankability and attract investment. “The industry has become significantly more adept at facilitating projects,” she reveals.

“One of our biggest learnings has been the importance of ongoing, consistent community engagement in order to manage expectations,” she reveals. “Ultimately, each project’s sustainability is key and to ensure that, local communities must be involved.”



The power of the sun

Key Facts	
Technology:	Parabolic trough with storage
Energy produced:	100MW
Location:	Poffader, Northern Cape
Site area:	1,482 acres; solar field area: 775 acres
Start of full operations:	May 2018
Project cost:	R9.4bn
REIPP window:	3
Owner:	Abengoa (40%); IDC (20%), PIC (20%); KaXu Community Trust 20%
Operator:	Abengoa Solar

Xina Solar One and another concentrated solar power plant, KaXu Solar One, stand adjacent to each other, forming a stunning blanket of curved mirrors on the flat, dusty plains of the Namaqualand. Each plant produces 100MW to form the largest solar complex in Africa.

The technology is impressive. The Xina plant has a five-hour thermal energy storage system using molten salts to overcome the problem of regular PV solar systems that cannot produce electricity constantly.

Abengoa stakeholder manager Rudolph van Rooyen explains that the parabolic trough collectors have curved mirrors inside that track the sun, concentrating the heat into a central receiver carrying heat transfer fluids (HTFs). The heated fluids are piped to power blocks in the centre of the solar fields then pumped either to the steam generation units for immediate use, or to the thermal storage area where a heat exchanger transfers the heat to the salt, where it is stored for use when needed.



The heaters for the heat transfer fluids are massive. The plant also has a diesel burner as a backup to heat the fluids in case of emergency. In extreme cold the fluids can solidify, “but we haven’t had to use them yet, we haven’t had Winters like that”, says Abengoa stakeholder manager Rudolph van Rooyen.

The salt storage system is developed by crushing solid lumps of salt and heating it with liquefied petroleum gas into fluid form. The molten salt gets added to the hot salt tank. There is second tank for cold salt. "We pump the salt from one tank to another and in process there is a heat exchange: so we can either heat the salt from the HTFs or use salt to heat the HTFs, for example in evenings when we need it."

"Salt is kind of our battery, a medium to store heat energy. Once we have that heat energy, we can use 'it' at any time it's needed, for example at peak time."

The portion for immediate use gets taken to the steam generation area where the heated fluids produce steam that rotates a turbine to generate electricity. "So instead of using coal to generate steam we use sun and liquids," says Van Rooyen. "The heat transfer fluids are our medium to relay heat/energy around the plant."

Once the electricity is generated at 15KV, it is

transmitted to a substation where a step-up transformer converts it to 132KV for transmission to Eskom. KaXu Solar One produces enough electricity to power 80,000 households while preventing the emission of 300,000 tonnes of carbon dioxide annually.

While its output to Eskom is 100MW, it actually produces more energy and that is used to feed the plant's auxiliary systems. "We meet all our own power needs on site," he says. "We could probably go up to around 105MW if Eskom raises our cap."

That self-sufficiency extends to all aspects of running the plant: it is completely self-sufficient in terms of recycling. "We have a closed system so the water is re-used," says Van Rooyen. The plant is also a zero-effluent site. "No waste is discharged into the environment, it all gets discharged through evaporation plants." The underlying philosophy in producing green energy is that it is more than just electricity, it is a total commitment to conserving

water and sustaining the environment.

The job creation and community development projects are also impressive. More than 1,000 people were employed in the construction phase while 80 are now permanently employed in O&M jobs. In terms of its commitment to the department of energy, 1% of the plant's income is spent on socioeconomic development and 0.0051% on enterprise development.

The focus of the enterprise development project, Van Rooyen says, is to train people in entrepreneurship so they can develop self-sustaining businesses. "We help small and medium enterprises with business plans, mentorships, assessments, training and workshops. We're also building an SME database for the local community. The socioeconomic development focuses on education, supporting local schools, providing after-care programmes and bursaries. It also contributes to housing development. ■



Glinting in the sun, the parabolic trough collectors tower above the the pipe carrying the heat transfer fluids, which gets increasingly wider the closer to the power block it gets.



The power block sits in the centre of the rows of parabolic trough collectors.



Photo Essay: GIBSON BAY WIND FARM

Ancient technology,

Key Facts	
Technology:	Wind
Energy produced:	Energy produced: 111MW
Location:	Gibson Bay, Eastern Cape
Site area:	Spread across three farms totaling 4,300ha
Start of full operations:	May 2017
Project cost:	R2bn
REIPP window:	3
Owner:	Enel Green Power South Africa 60%; Gibson Bay Community Trust 40%
Engineering procurement contractor and operations & maintenance:	Nordex Energy South Africa

Using technology first developed more than 2,500 years ago, there is a sense of serene timelessness as cattle graze on the fields with windmills all around them, rotating steadily in a strong wind. That belies the modern-day technology and efficiencies introduced to transform the windmills that were developed by the Persians around 500BC to power grain mills and water pumps into modernized, efficient generators of electricity.

Majority shareholder Enel Green Power, with engineering procurement contractor Nordex Energy, developed the Gibson Bay Wind Farm ahead of schedule and under budget. A total of 37 of the massive turbines were installed, capable of rotating at 1,500 revs per minute. Each turbine produces 3MW to generate a total of about 420GWh of power over a year. To produce a similar amount, a coal-fired power station would emit 383,000 tonnes of carbon dioxide.

The turbines start producing energy in what is nothing more than a breeze of 3.5 metres per second (m/s) – called the cut-in speed, says site supervisor Bongani Morika.

With winds of 12m/s or more, the rated output speed, they produce at capacity but cut out in strong winds of 25m/s for safety reasons.

The physics behind producing the electricity is pretty much what you learned in primary school: wind energy is transferred into kinetic energy and then into electrical energy. It is transported from each turbine into a transformer to produce 33KV. From there, says Morika, it travels via underground cabling to a substation where it is stabilised at 132KV, the voltage at which it is supplied to Eskom.

The disruption to the environment is minimal and the farm owners get a share of revenue for each turbine on their property. The farmers go about their business as normal but with an extra revenue stream. As with all renewable energy projects, the community benefits substantially – not only in terms of the Gibson Bay Community Trust holding a 40% share but also through initiatives backed by Enel. These include a school nutrition programme that has reached 2,850 children and free Wi-Fi to schools in disadvantaged areas reaching 1,000 children. ■



modern efficiency

Idyllic scenes as farming operations continue around the massive wind turbines.



Photo Essay: MULILO PRIESKA

Sunny skies, primary energy



Key Facts	
Technology:	Solar photovoltaic
Energy produced:	75MW
Location:	Prieska, Northern Cape
Site area:	121 ha; panels take up 10ha
Start of full operations:	July 2016
REIPP window:	3
Owner:	Mulilo; Sonnedix, Prieska Community
EPC and O&M:	juwa

Sunny skies in South Africa are being put to productive use with solar plants springing up across the country. Solar photovoltaic (PV) plants are establishing themselves as the primary form of renewable energy production in SA, with seven PV plants developed from bid window three and 11 more approved in window four. That brings the total to 45 across South Africa from all bid windows – plus there are seven concentrated solar power plants.

Mulilo Prieska was developed after a successful bid in window three. It is in a remote area, 240km southwest of Kimberley, where there is little other than farming activity.

The concept is simple: transfer solar energy into electrical energy. The technology behind that is impressive.

The panels convert the sun’s rays into electrical DC power which is captured and sent to combiner boxes. At Prieska, eight combiner boxes are connected to an inverter where the power is converted from DC to AC. Through a transformer, the AC power is stepped up from 400 volts to 22 kilovolts and sent to the substation

where it is stepped up again to 132kV – Eskom’s voltage for that distribution line. It then connects to the main grid at Eskom’s nearby Kronos substation.

Mulilo rents the land from famers in an area where the vegetation demands low numbers of livestock feeding on large tracts of land.

As with all renewable energy plants, there is a total commitment to environmental sustainability. At both plants, for example, snakes or any other wildlife found on site are caught by trained handlers, its condition is checked and recorded, then it is relocated to a suitable environment with the specific GPS co-ordinates provided by the department of environmental affairs. Any indigenous plant life that had to be uprooted for construction was replanted nearby and alien vegetation was removed.

The plants also operate boreholes. These are not for water consumption but a requirement from the department of water affairs: the water is for sampling and testing to ensure it is not contaminating the environment.

The attention to detail is fascinating: Deliege Kapongo, asset manager at Mulilo Prieska, says if a bird’s nest is found on site, the area is barricaded so that no one can approach it. “We then compile an awareness document instructing employees that it’s a no-go area.”

Prieska Mulilo has various local socioeconomic upliftment initiatives including a back-to-school campaign; supplying children with uniforms; supporting an early childhood development centre; assisting with renovations; and supplying an ambulance and medical equipment to the local community. ■



Deon Pye, operations & maintenance site manager.



The substation steps up the power from 22 kilovolts to 132KV, at which it is supplied to Eskom.



The solar PV plant at Prieska has a total of 275,760 polycrystalline panels, manufactured by Chinese company BYD Solar.



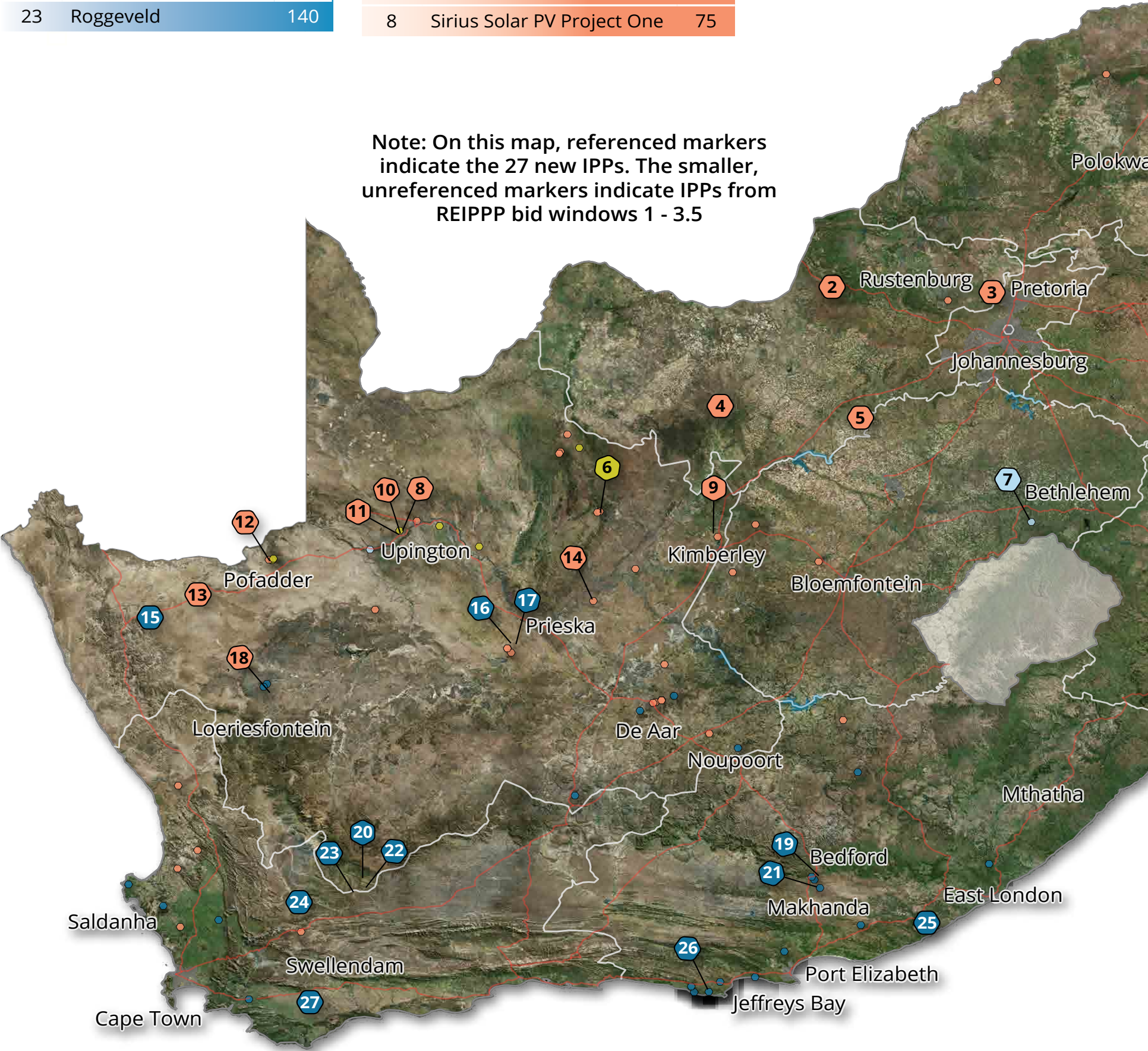
SA's new IPPs

Map	Name	MW
1	Ngodwana Biomass	62
6	Redstone CSP	100
15	Kangnas Wind Farm	137
16	Copperton Windfarm	102
17	Garob Wind Farm	136
19	Nxuba Wind Farm	140
20	Soetwater Wind Farm	139
21	Golden Valley	120
22	Karusa Wind Farm	140
23	Roggeveld	140

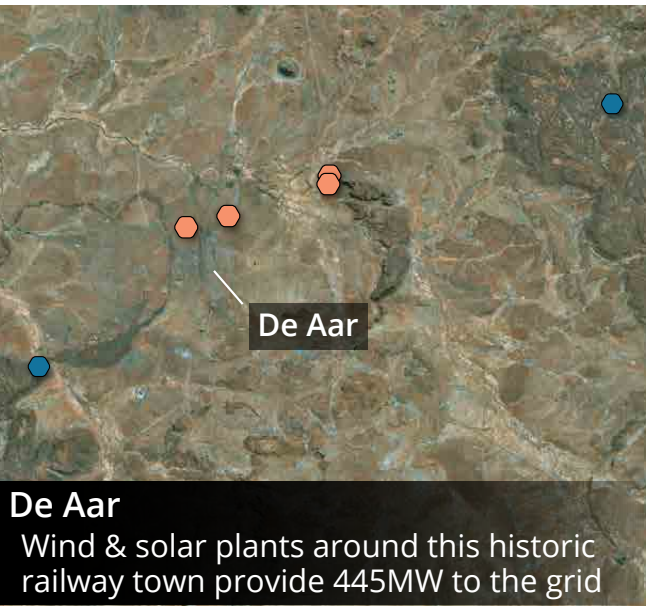
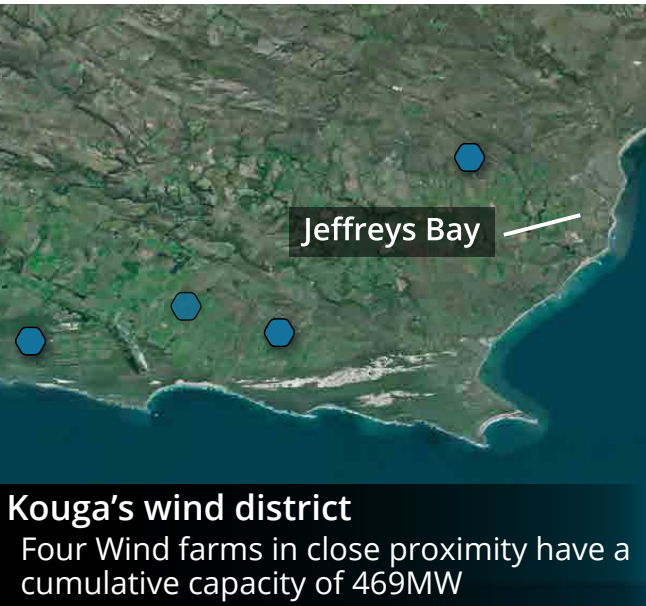
Map	Name	MW
24	Perdekraal East Wind Farm	108
25	Wesley-Ciskei Wind Farm	33
26	Oyster Bay Wind Farm	140
27	Excelsior Wind Farm	32
7	Kruisvallei Hydro	4.5
2	Zeerust Solar PV	75
3	De Wildt Solar PV	50
4	Waterloo Solar Park	75
5	Bokamoso Solar PV	68
8	Sirius Solar PV Project One	75

Map	Name	MW
9	Droogfontein 2 Solar	75
10	Dyason's Klip 2	75
11	Dyason's Klip 1	75
12	Konkoonsies II Solar	75
13	Aggeneys Solar Project	40
14	Greefspan 2 Solar Park	55
18	Solar Capital Orange	75

Note: On this map, referenced markers indicate the 27 new IPPs. The smaller, unreferenced markers indicate IPPs from REIPPP bid windows 1 - 3.5



Points of interest, REIPPP bid windows 1 - 4



REIPPP status in a nutshell - October 2018

	Number of Plants			Megawatts		
	Online	Nearly complete	Building starts 2018/19	Online	Nearly complete	Building starts 2018/19
Solar PV	33	–	12	1 501	–	813
Wind	21	–	12	1 988	–	1 367
Solar thermal	5	2	1	300	200	100
Hydro	2	–	1	14.3	–	4.5
Bioenergy	–	–	1	–	–	62
Landfill gas	1	–	–	18	–	–
TOTALS	62	2	27	3 800	200	2 346

Photo Essay: ADAMS SOLAR PV2

Energy amidst tranquility



Each row has 672 solar panels, grouped into ‘tables’ of 21 panels each.

	Key Facts
Technology:	Solar photovoltaic
Energy produced:	75MW, capacity 82.5MW
Location:	Hotazel, Northern Cape
Site area:	198ha
REIPP window:	3
Owner:	Enel Energy
EPC:	Enertronica

Adams Solar PV2 near Hotazel is located in the midst of the manganese belt in the Kalahari basin in the Northern Cape. The road to the plant is bustling with traffic from the mines – heavy laden trucks and double-cab bakkies are prevalent. The contrasting stillness and calm as you arrive at the solar plant is noticeable. Its 611,100 PV panels form a splendid sheet of silver as they absorb the sun’s rays. The energy is produced amid a quiet, almost



A carpet of solar: an aerial view of Adams Solar



Maxwell Sibanyoni, operations & maintenance supervisor at Adams Solar.

somnolent atmosphere. The solar panels are not intrusive on the environment and are aesthetically pleasing – they do not jar on the eye at all.

The plant began operations in January 2017 producing 75MW.

Its socioeconomic upliftment programmes are extensive. Adams Solar runs a bursary fund for local beneficiaries; is installing wifi facilities for the local community; has an SME training and incubation

programme; and runs an agriculture incubation programme that provides specialised training to grow export-quality herbs. It even supplies a small PV system for the herbal project while it also procures maintenance and other services from local SMEs, such as washing and replacing panels, and tendering the garden area. Even the on-site canteen is an SME operation. “Any way in which the community can plug into the plant for business opportunities, we

facilitate that,” says Maxwell Sibanyoni, operations & maintenance supervisor at Adams Solar.

The other 90 renewable energy plants in in SA that are up and running or still being developed have similar initiatives. While the benefits are localised around the plants, taken together they are improving the standard of living of multitudes of people, without which they would remain mired in poverty. ■



RENEWABLE ENERGY SET TO CREATE 58,000 JOBS



Droogfontein Solar Power assists in helping South Africa shift towards clean energy production. Arising from the first bid window, Droogfontein Solar Power supplies Eskom with 85,458MWh a year.

SOUTH AFRICA'S renewable energy industry offers huge potential now that it's commitment to establishing a viable, low-cost, sustainable energy mix seems to be firmly back on track, says Mike Peo, Head of Infrastructure, Telecoms and Energy at Nedbank CIB.

"The recent signing by Minister Jeff Radebe of the Renewable Energy Independent Power Producer Procurement Programme (REIPPP) caused a wave of positive sentiment, which was followed up by the actual achievement of financial close of all of the projects procured under round four of the REIPPPP," he says.

As a finance provider to 12 of the latest 27

renewable projects that can now proceed after lengthy delays, Nedbank CIB welcomes this significant step forward for the country's energy sector.

Radebe, in his speech at the signing ceremony, admitted that the delay in moving forward on the latest round of agreements had been detrimental to the health of the country's renewable energy industry.

"Importantly, there is a sincere desire by the new energy minister and his team to work with the private sector to turn the country's renewable energy landscape around and make it the economic powerhouse that it has the potential to become," says Peo.

He believes that the REIPPPP has clearly

demonstrated its ability to deliver employment opportunities. "The previous 62 independent power producer (IPP) projects that have been completed delivered almost 28,000 jobs during their construction phase – 58% more than initially projected. Since then, their ongoing operations have sustained over 6,700 jobs. Given this success in terms of employment creation, the projects coming out of rounds 3.5 and four are anticipated to deliver more than 58,000 more full-time jobs. When the immense value of renewable energy as a sustainable economic development catalyst is realized, the positive impact on South Africa will be evident."

The government has been procuring renewable energy since 2011. Nedbank interests involve about 45% in wind energy, 45% in photovoltaic and 10% spread between concentrated solar projects, hydro and biomass.

South Africa has about 43 gigawatts of total installed capacity, of which the REIPPPP renewable energy programme will equate to about 6GW. "The sincere hope is that the government will keep procuring renewable energy at a rate of at least one gigawatt a year which is critical to maintain the level of international and local investment required to build a long-term, sustainable industry."

Peo says the long-term

benefits of the renewed forward momentum in the renewable energy sector are not limited to fueling economic growth. "South Africa has an obligation to make every effort to reduce its carbon emission levels."

Aside from these vital social upliftment, employment creation and climate change mitigation impacts, another significant outcome of the agreements is the positive implications for public private partnerships (PPPs) in SA. "In our experience at Nedbank CIB, PPPs remain the most effective means of driving vital infrastructure development and ensuring sustainable economic growth that delivers benefits for all South Africans."

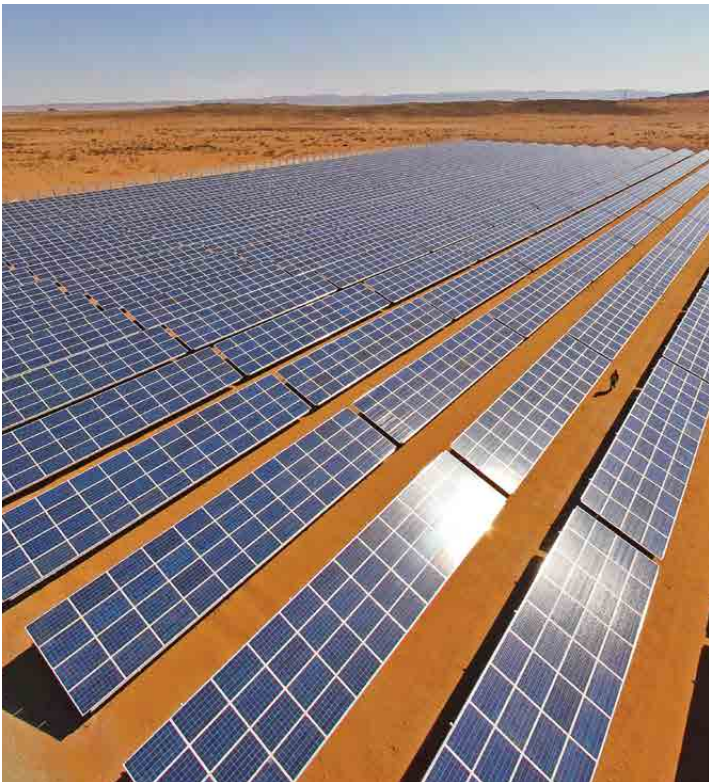
12 PROJECTS UNDER WAY

NEDBANK CIB’s Energy Finance team recently closed 12 renewable energy project deals in the round four bid window. In all REIPPPP rounds completed to date, Nedbank CIB has arranged and funded a total of 42 transactions, providing a total of R35bn of direct lending to these projects.

Its funding for round four amounted to R13bn provided to four of the larger portfolio developers, including Enel Green Power, Old Mutual South Africa, Biotherm and Sappi. These projects will add 1,145MW to the national grid. In this round, Nedbank CIB closed various projects using solar, photovoltaic and wind, but

also concluded a biomass REIPPPP project, which will use natural waste recovered from Sappi’s Ngodwana mill and surrounding plantations to produce 25MW of energy.

Round four also marked a significant milestone for Nedbank CIB in that its financing helped Enel Green Power reach financial close on the single largest transaction closed to date in the REIPPPP space, for five wind projects. This is attributed to an innovative approach adopted in financing the five wind projects with a total capacity of approximately 700MW – a project financing first for Nedbank and the country.



SOCIOECONOMIC UPLIFTMENT

NEDBANK is committed to a clean-energy future and 20.8% of its total group lending and finance commitments relate to the financing of renewable energy. Nedbank contributes through a combination of direct finance to individual projects which has a direct benefit in terms of socioeconomic development.

Procuring the cheapest form of energy has a multitude of significant consequences to the country, not least of which is the impact on the economy. By driving down the price of energy, industrial production,

manufacturing and mining are able to maintain competitiveness in an increasingly globalised world.

The other significant impact is on direct and indirect job creation, local community participation and BEE, as well as local community participation in the establishment of the projects. Communities get empowered as a result of the socioeconomic obligations required under the programme.

Examples of significant on-the-ground initiatives include the establishment of schools, clinics and

training centres as well as the training of technicians to be employed in the operations and maintenance of these projects.

There are about 100 renewable energy projects that have been procured under REIPPPP in the country and that have now been completed or are in development. Nedbank has financed 42 of these, making it the single largest debt financier under the REIPPPP programme. Within each of those projects there is a substantial socioeconomic development plan in place.



Future Projects: IPP: BIOTHERM ENERGY

To come on stream: Golden Valley Wind Farm; Excelsior Wind Project; Konkoonsies II Solar Project; Aggeneys Solar Project

Originally a business converting waste gas into electricity, BioTherm Energy decided to shift its strategy in December 2010 in lieu of the pending birth of the renewable energy industry in the country. The South African company won three projects in the first REIPPP bid window – “developed on time and under budget”, says CEO Jasandra Nyker – and four in the fourth window. It has also developed extensive operations across Africa.

BioTherm has become a South African success story, funded by US-based global private equity firm, Denham Capital. But in the initial stages nothing was assured; it faced fierce competition from large and experienced international bidders – and it hadn’t left itself much time to convert into a renewable energy company.

It made the decision to change strategy only eight

months prior to the first bid window opening. It went in search for the right person to build its renewable business and zeroed in on Nyker, then in the US running a \$680m green energy investment fund. Born and raised in SA, Nyker has more than 20 years of international private equity and investment experience, including 13 years in renewable energy investments.

She arrived in July 2011, two weeks prior to the first request for proposals being issued for the first round of bidding. “Round one was brilliant but chaotic,” she says. “But the projects have done very well.

The company failed to win any projects in rounds two and three and used the time to focus on its expansion into Africa. “We knew South Africa was getting highly competitive and wanted to diversify.” BioTherm is the preferred bidder in projects in Burkina Faso, Ghana and Ivory Coast. It is also focused on

Egypt, Zambia and Mozambique.

Nyker also focused on building local skills and 70% of BioTherm employees are black and about half are women. Asked how she’d achieve this given that numerous South African companies often complain about a scarcity of skilled black candidates, she says: “You build from the ground up, and you appoint people with the skill to do it.”

For the most part BioTherm gets them in young and develops them from within – 80% of staff are youth. It also looks for young graduates with potential, and marries this with experienced hires to complement the existing team.

“We give young people opportunity and responsibility,” she says. “If you give people exposure, they will flourish.” ■



Images of two of BioTherm's existing plants, the Dassiesklip Wind Energy plant near Citrusdal in the Western Cape (previous page and below); and (top and bottom) the Konkoosies Solar PV plant in the Northern Cape.



Future Projects: ENEL GREEN POWER

Enel Green Power (EGP) develops and manages activities for the generation of energy from renewable sources worldwide. Founded in December 2008 the group has a presence in Europe, the Americas, Asia, Africa and Oceania with a managed capacity of around 42GW across all technologies: wind, solar, geothermal and hydropower. In Africa EGP operates in South Africa, Zambia, Morocco, Ethiopia and Kenya.

EGP secured five projects in the fourth bid round of the Renewable Energy Independent Power Producer Procurement Programme, all of them wind farms that will generate a combined 420MW. They are Nxuba, Oyster Bay, Garob, Karusa and Soetwater. Each project has a capacity of about 140MW and the Enel Group is contributing about R3.9bn for the construction of the five wind farms. Construction of the first project, Nxuba, is expected to start by the

end of this year.

The company, with its headquarters in Rome, has five renewable energy plants that are already operational in South Africa. Approved in the third round, they generate more than 520MW. They are Nojoli wind farm (88 MW); the Gibson Bay wind farm (111 MW); the Paleishuewel Solar PV plant (82MW); Tom Burke Solar (66MW); Upington Solar (10 MW), Adams Solar (82.5MW) and Pulida Solar (82.5 MW).

EGP has started construction of its first plant in Zambia – the Ngonye Solar PV plant. The facility is in Lusaka South Multi-Facility Economic Zone, which is part of the World Bank Group’s Scaling Solar programme operated by Zambia’s Industrial Development Corporation (IDC).

Across the globe, the company has 1,293 plants that generate a combined 39,681MW. ■

Enel’s 8.9MW Upington Solar PV plant and 87MW Nojoli Wind Farm (top) were developed after successful bids in rounds two and three respectively.



SAB and AB InBev Africa harness renewable energy as good for the planet, good for business



The private sector has a clear role, alongside other stakeholders, in creating a better world for all. At SAB and AB InBev Africa, we're proud of what we've already accomplished in sustainability, but we know there's much more to be done.

Brewing our beers is reliant on a healthy, natural environment, as well as on thriving communities. That's why we're striving for a world where natural resources are preserved for the future.

Renewable energy provides one of the biggest opportunities for AB InBev Africa, as this is one sector in which we can support and create jobs, while responsibly growing the industry.

Fighting climate change by reducing energy consumption

Our goal is that by 2025, 100% of our purchased electricity will be from renewable sources and we will have a 25% reduction in CO2 emissions across our value chain. The challenge lies in making a measurable and meaningful difference through our commitment to renewables.

SAB and AB InBev Africa is committed to helping drive positive change and playing a leading role in the battle against climate change by purchasing energy in a more sustainable way. Africa has a largely untapped abundance of renewable energy sources, notably solar energy, that presents new economic opportunities and potential competitive advantages as they provide cheaper and cleaner energy sources for our facilities. But to effect this change requires a shift in both the mindset of the general public, and a push for supportive policy and regulation, crucial for the success of these initiatives.

In South Africa we have initiated a project to implement solar energy at five of our breweries in 2018 which, once complete, will account for approximately 10% of our annual country electricity purchases. To achieve this, we are exploring long-term, off-site power purchase agreements, assessing on-site feasibility for installations and working with industry associations to shape regulatory landscape. As it stands, our renewable energy flagship brand, Budweiser, will be 100% brewed by renewable energy at our Rosslyn Brewery by the end of 2018. In addition, we have begun engaging suppliers throughout our other operations in Africa to extend our on-site solar capabilities.

Using gas to reduce carbon emissions

In our distribution operations we are also researching alternative fuels, for example we have approved a pilot to retrofit several of our existing distribution trucks to utilise compressed natural gas (CNG).

Using this LNG to power our delivery trucks not only has the potential to drastically reduce our carbon emissions, but has the added advantage of improving the vehicle's lifecycle maintenance and reduces operating cost significantly.

The initial pilot will focus on fleet trucks in the Gauteng area, which will be expanded to a significantly larger fleet in 2019 if proved successful.

Alrode Brewery uses combined heat and power to save electricity

Gauteng's Alrode Brewery produces around 27% of SAB's 29 million hl of beer annually. SAB is using biogas from its anaerobic digester to fuel the brewery's US\$ 1.4 million co-generation plant. Of the brewery's seven kilowatt hours (kWh) of electricity per hectolitre (hl) of beer produced, the plant generates between one and 1.2 kWh/hl, a significant saving for the brewery. In addition to saving on electricity costs, the plant also helps SAB to reduce its carbon footprint by about 8 000 tonnes of CO2 per year.

This year, we will be undertaking in-depth country reviews in four of our markets across our Africa operations to help us better understand the opportunities, and define our strategy for renewable electrical energy to ensure we meet our 2025 targets. When SAB and AB InBev Africa achieves this target, it will be the same as taking more than a million and a half cars off the road every year. Through renewable electricity use, brewing efficiency, green logistics programs, and new innovation, we are already reducing our impact. As we look to the future, we will invest in new technologies for our operations and work closely with our suppliers to help them reduce their own emissions.



Future Projects: SCATEC SOLAR

Scatec Solar is a global solar energy provider headquartered in Norway with 357MW of installed capacity in South Africa, Rwanda, Czech Republic, Honduras and Jordan, and has another 1,057MW under construction across the globe.

Scatec entered the South African market in 2010. It was awarded three solar plant projects in rounds one and two with a total capacity of 190MW, which are all operational: Dreunberg

(75MW), Linde (40MW) and Kalkbult (75MW).

In round four bidding in SA, Scatec Solar was awarded an additional 258MW. It will operate the solar plants for at least 20 years. They are Sirius Solar One (75MW), Dyason’s Klip 1 (75MW) and Dyason’s Klip II (75MW). These projects are about to enter construction and are all based around Upington. Commercial operations are scheduled to begin in the first quarter of 2020. ■

Lightning forms a stunning backdrop to Scatec Solar’s Agua Fria solar plant in the Honduras.

Scatec Solar’s Linde Power plant in the Northern Cape.

Priority is to rebuild the decimated supply chain

Costa John

A reliable and predictable rollout plan is required to generate investment interest in the renewable energy supply chain that was decimated by the delay in Eskom signing power purchase agreements for round four projects.

The supply chain has been hit hard by the delay. The major components require substantial investment to manufacture, such as wind turbines and blades, solar photovoltaic (PV) modules, and inverters and transformers. These make up about two thirds of the cost of an energy plant and are generally imported. Then there are more general components that have also been affected such as steel, cabling, concrete and control buildings, as well as civil and electrical construction work.

South Africa has missed three years of renewable energy progression and the trends internationally have changed. "Historically a lot of high-quality PV modules were supplied out of Germany," says Rentia van Tonder, head of power for Standard Bank Group. "More recently most of the top five module manufacturers are now in China."

PV technology costs have also fallen over the past three years, she says. "The continuous development in renewable energy is, to a certain extent, driven by the decline in technology costs, scale and continued improvements, which makes it more sustainable for countries to use." But because of the delay, South Africa has not capitalised on this.

The bottleneck

After the initial Renewable Energy Independent Power Producer Procurement (REIPPP) programme was launched in 2010, a number of international component suppliers invested in setting up manufacturing facilities in SA. "At one point there were plants making modules, inverters and wind turbine components," says juwi Renewable Energies' EMEA operations director, Kobus Meiring. "But the stoppage of REIPPP round four led to more than two-year delay where no



GRI will be manufacturing the wind turbine tower sectors for the R3.1bn Perdekraal East Wind Farm in the Western Cape's Witzenberg local municipality, as well as the 140MW Kangnas Wind Farm in Springbok, Northern Cape. Both were approved in bid window four. Delivery is scheduled to begin in April next year.



contracts were signed at all." As a result, he says, local renewable energy plants closed down as it was not financially viable to run plants when there is no market.

Meiring believes that international investors have lost their appetite. "Due to the shock introduced by this stoppage, if the latest integrated resource plan (IRP) is implemented, it

will be a serious challenge to entice international suppliers to set up local factories again."

Local development

From when the first projects were closed to April 2018, there has been some level of local supply chain development, notes Van Tonder, "although it hasn't been as progressive and fast as we would have liked to have seen it".

When bidding for a renewable energy project, 70% is based on price and 30% is based on social and local considerations. "The sector has reached certain levels of localisation compared to the first round as a result," she says.

Initially requirements of local participation, in PV was around 40% and that has increased to over 60%. "It varies from wind to PV, and there are higher levels of localisation in PV," she says. "Moreover, there has been some progress, as the value chain has developed over the years, to include not only local balance of plant and services, but also a few assembly plants. There are already two or three that have been commissioned – two in Cape Town and one in Durban."

Hope of renewal

Davin Chown, chairperson of the South African Photo Voltaic Industry Association, (SAPVIA), says: "The slowdown in large-scale solar projects has had a marked impact on the sector. The majority of panel assemblers have closed down and relocated to other markets and the small- to-medium-sale market is serviced largely from outside SA. Creating an investment-friendly climate, with clear energy and procurement policies and objectives, along with incentives to match what other investment destinations are offering, is key. This will ensure we lure back the facilities we have lost and draw in the new ones that are eyeing SA."

There have been steps in the right direction, believes Brenda Martin, CEO of the South African Wind Energy Association (SAWEA). "Under the new national president and energy minister, the country's energy sector is starting to experience improved policy certainty, transparent decision-making and public participation. The value of the leadership currently being demonstrated by government cannot be understated – it is directly focused on the return of investor confidence, both foreign and domestic."

She says policy certainty and synergy requires consistent leadership of government and institutions, all committed to transparent and accountable decision-making that is in the national interest. "Provided the current level of public accountability is sustained and continues to improve, SAWEA does not foresee any obstacles to SA's commitment to least-cost energy investment going forward." ■

Wind tower manufacturers hit by delay

Two wind tower manufacturers, DCD and GRI, established at the onset of the REIPP programme, have been hard-hit by the delay in signing on round four bid winners.

DCD Wind Towers was an integral participant in South Africa's infrastructure development and played an active role as a partner of choice to government before the renewable energy drive was derailed. Built in the Coega Development Zone, DCD Wind Towers was a R300m state-of-the-art factory.

The wind turbine manufacturer was a joint venture between the DCD Group and the Industrial Development Corporation. The facility was specifically established in 2013 to support the localisation of wind tower manufacturing and marked a new era for South Africa's renewable power

generation. But the project was destroyed by the delayed signing and went bust in 2016.

DCD had been heavily involved in the development of South Africa's infrastructure, in particular with regard to power generation, having manufactured components for all 22 of the country's wind plants.

The factory was set up to produce 110 turbine towers annually, ranging up to 120 metres long, with a diameter of nearly five metres and individual sections weighing up to 80 tonnes. Manufacturing included intensive and highly-skilled processes like sub-arc welding involving numerous safety and quality controls. Once a project was completed, the tower was stored on site before being collected and transported.

DCD's wind power projects were set to provide green power for the national grid,

which would have brought much-needed skills development and job opportunities to the region. The construction of the facility was supposed to create 600 jobs including 150 skilled positions, and DCD was hoping also to export. The company had intended on partnering with government to ensure that local manufacturers got the opportunity to participate in assembling turbines and producing other components. The company had already given supply quotations to more than 10 clients.

The DCD manufacturing facility was more than just an investment in Coega; it was a legacy project that could have gone down in the history books as the first facility of its kind in Africa.

The Industrial Development Corporation (IDC) is reported to be looking for strategic equity partners to revive the facility.

GRI Towers is a 12,000m² manufacturer of wind towers, based in the Atlantis specialised economic zone in Cape Town. Built in 2014, the development amounted to an investment of €22m that was set to create more than 200 jobs in South Africa. Then the delay hit and GRI Towers had to retrench.

The Atlantis facility has capacity to produce 150 towers a year. It became fully operational in the second half of 2014, supplying wind towers to the South African market.

Spanish company GRI Towers has been following its main clients to key strategic markets, with state-of-the art facilities, to provide them with a global and efficient supply. It has a presence worldwide generating over 1,000 towers a year in Spain, Brazil, the US, Turkey, India, Argentina and South Africa. ■

The potential to electrify Africa

Mayo Twala and Colin Anthony

Renewable energy technologies hold massive potential to electrify Africa. The ability to develop wind or solar plants in rural areas at a fraction of the cost of coal-fired plants presents a viable means of overcoming the continent’s infrastructure deficit in relation to electrification.

The one crucial ingredient is governmental commitment.

“There are plenty of developers and investors interested in projects in Africa, there’s no shortage of interest,” says BioTherm Energy CEO Jasandra Nyker.

South African banks constitute a major part of that interest and have invested substantially on the continent, drawn by the high potential. The International Energy Agency (IEA) states: “Renewable energy will have a key role in African development, with growth of installed power estimated at 100GW by 2030.”

Andrew Wepener, who heads up Investec Bank’s power and infrastructure finance desk for sub-Saharan Africa, says that infrastructure development is long term by nature and to make it economically viable, banks and investors must be in a position to commit to funding such projects over a period of up to 20 years.

Renewable energy company Enel Green Power reckons that by 2022, the average annual growth of renewable energy in Africa will be about 8GW. Solar photovoltaic is playing the main part, with about 15GW to install in the coming years. Hydropower should reach around 13GW in production followed by wind with 10GW.

Beyond those statistics, the scope for growth of the renewable energy industry remain massive. The World Bank reports that globally, one-billion people still live without electricity and three-billion people use polluting fuels to cook, undermining their health, development prospects and quality of life.

Dario Musso, who heads Rand Merchant Bank’s (RMB’s) infrastructure finance team, says several countries have launched renewable energy programmes, assisted by multilateral and development finance institutions. Examples include the International Finance Corporation’s Scaling Solar programme in Senegal, Zambia and Ethiopia, and German development bank KfW’s GetFit programme in Uganda and Zambia. In West Africa, Musso says, several countries such as Ghana and Nigeria are in negotiations with potential bidders to deliver utility-scale wind and solar plants.

He points out that South Africa remains the renewable energy leader in sub-Saharan Africa.

Theuns Ehlers, head of resource and project finance at Absa, says several companies are making progress on addressing Africa’s infrastructure deficit, boosted also by the World Bank’s financial support of renewable energy projects in Africa.

There are a few challenges that Ehlers points to in developing renewable

energy projects in Africa. The first is that a country exposes itself to currency risk when the renewable energy project is financed in a currency other than the country’s local currency. (Most large-scale projects in Africa are financed in dollars or euros). Another issue relates to the credit quality of African utilities and their ability to pass the cost of power production on to the end user.

BioTherm’s Nyker says a challenge in developing renewable energy projects in Africa can be the long duration to make decisions. Governments carry the obligation to provide the requisite guarantees in order to provide security if in the event an offtaker does not pay.

Ehlers says the investment of local and international companies has seen a steady improvement in access to energy in Africa. A challenge, he says, lies in finding the right deals, while funding them takes time. “Even though there is certainly funding available, what takes time is the procurement element in the deals.”

Nyker does believe, however, that there has been an improvement in how governments are approaching renewables since they’ve seen its ability to deliver lower prices of electricity. “I think the falling prices through the first three rounds of bidding in South Africa resulted in the rest of Africa taking notice,” she says.

RMB’s Musso says while the rest of sub-Saharan Africa lacks the track record of South Africa in terms of large-scale coordinated renewable energy programmes, RMB is seeing strong moves towards promoting renewable energy in many countries. “For example, we recently financed a solar project under Namibia’s renewables programme and are actively looking at financing several other projects across sub-Saharan Africa covering hydro, solar, wind and biomass.”

Biotherm Energy, a South African company awarded three projects in round one and three more in round four, is the preferred bidder in projects in Burkina Faso, Ghana and Ivory Coast and is also active in Egypt, Zambia and Mozambique.

Nyker says the limited access of grid infrastructure in Africa has created opportunities in the off-grid space, with the potential – in SA and the rest of the continent – to supply power directly to industrial and commercial consumers. “This is a strategy BioTherm is pursuing.” Asked if there was resistance to this because most state utilities are monopolies, Nyker says: “In Africa, utilities usually don’t have the balance sheets to meet the need, so some are open to the concept.”

Meanwhile, South African banks are at the forefront of the industry’s expansion in Africa.

Absa Corporate and Investment Banking has green energy projects in Ghana, Zambia, Kenya, Uganda and Mozambique. Ehlers says other deals are still to be closed and the bank is perusing multiple opportunities across the continent.”

Musso says that a key sub-sector that RMB is also focused on is the proliferation of off-grid or “own-use” power generation facilities, which are gaining popularity across the continent as renewable energy prices continue to fall and corporations seek to reduce their dependence on state-owned utilities for their power supply. “This sector is well positioned to grow, particularly as battery storage efficiencies keep improving and costs keep dropping.”

Musso adds that renewables do not require fuel-supply contacts and so are somewhat simpler to deploy. They do, however, share the same challenges as thermal power projects on the continent, including: lack of creditworthy power offtakers; drawn-out risk allocation and price negotiations; very long lead times to financial close; and policy/regulatory uncertainty around the willingness and ability of state-owned utilities to sign up to long-term power offtake commitments.

The main benefit of renewable

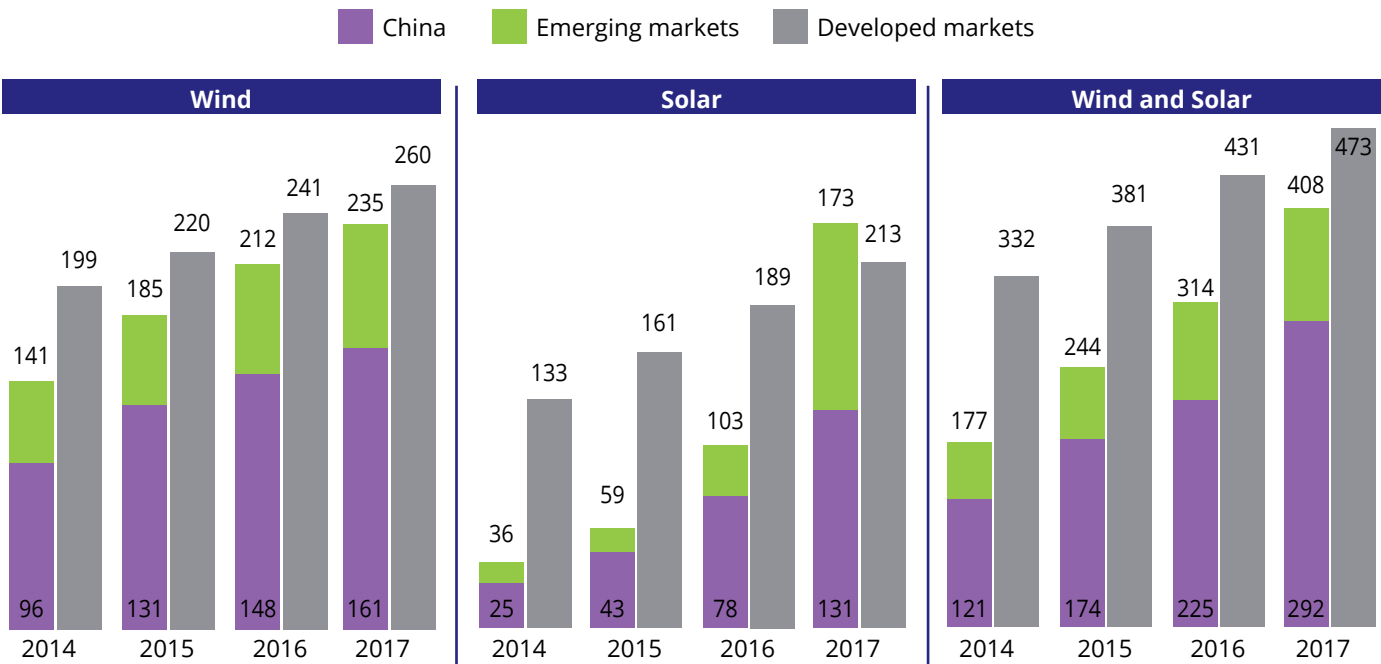
energy, says Ehlers, is the generation of relatively affordable electricity, especially in the more remote areas in Africa. “The cost of renewable energy has fallen substantially in the past few years, making it the cheapest form of new energy generation by some margin”. He says that in the long term, renewable energy in Africa secures power, drives economic development, benefits local contractors, promotes job creation and gives Africa the opportunity to compete with external countries.

The Deloitte Global Renewable Energy Trends report has found that the cumulative capacity of emerging markets to develop renewable energy is on the verge of surpassing that of the developed world. Emerging markets have helped bring down the cost of renewables and are innovating in ways that benefit the developed world. It states that Africa and South America, respectively, have the greatest solar and wind resources, but these remain largely untapped, with Africa having one of the highest costs for solar PV due to investment costs.

Musso says that while the cost of renewable energy is indeed falling globally, location and quality of resources remain key criteria in determining the viability and competitiveness of projects. “These include factors like strength and consistency of solar or wind resources, as well as proximity to grid connection and load centres. Certain countries are more suited to renewable energy than others, owing to their superior solar and/or wind resources or developed transmission or distribution networks.”

Despite these challenges Musso believes the renewable energy industry is set for significant growth on the continent as development finance institutions and commercial banks continue to move away from financing traditional power generation and focus on more climate-friendly alternatives. ■

Emerging markets are overtaking developed countries in solar wind capacity development



NOTE: All numbers are in thousand MW.

Source: Deloitte Global Energy Trends report; Irena; Renewable Energy Statistics 2018



Aerial images (above and below) of Scatec Solar's Gigawatt project in Rwanda.

Photos: Scatec Solar

Focus: Kenya; Morocco

Kenya and Morocco are two countries in Africa that have experienced strong growth in the renewable energy sector.

By Mayo Twala

Kenya

The World Bank has supported more than \$1.3bn of geothermal generation, transmission, distribution, off-grid and clean cooking investments. This support has helped Kenya increase electricity access from 23% of the population in 2009 to 42% in 2015. There has additionally been a \$150m Kenya Off-Grid Solar Access Project designed to provide service to another 240,000 households and to establish the framework for serving Kenya's remaining off-grid population.

Throughout 2018 there has been movement in Kenya's renewable energy development. In May London-based private equity company Actis took an 88% stake in the 100MW Kipeto Wind Power project after buying out most of the project's shareholders. Craftskills Wind Energy, one of the farm's founding firms, surrendered some shareholding to Actis and was left with 12% of the project from an initial 20%.

The UK has had a vested interest in Kenya as UK development finance institution CDC and power producer Globeleq secured a deal for a \$66m debt investment in Malindi Solar Group during July 2018. The long-term investment is said to provide power in the Malindi area in the northern coast of Kenya, which struggles with regular power shortages and relies largely on expensive thermal plants.

In September, Portuguese clean energy company RVE.SOL raised \$2.1m through international investors to provide solar electricity in Kenya's Busia County. The expansion would be channelled towards electrification and providing clean water for up to 50,000 people. The company was in talks with several other counties along the border for similar projects.

Morocco

Morocco launched its first utility-scale solar energy project in 2015 with the World Bank's support.

The Noor-Ouarzazate Concentrated Solar Power (CSP) complex is expected to achieve more than 500MW of installed capacity, providing power to more than one-million Moroccans. It is expected to help the country reach its goal of installing two gigawatts of solar power in the country and derive 42% of all its electricity through renewable sources by 2020.

This renewable energy project was constructed to help the country reduce its dependence on oil by about 2.5-million tonnes and reduce carbon emissions by 760,000 tonnes a year.

In February this year, French renewable power plants operator Voltalia obtained permits for two hydropower plants of 9.8MW and 7.2MW. The permits followed technical approvals from Morocco's National Office of Electricity and Drinking Water regarding the connection of the plants to the national grid. The electricity produced will be sold under long-term private power purchase agreements.

In September Blockchain Soluna and DMG Blockchain Solutions signed a partnership agreement to support Soluna's large-scale wind farm in Morocco. Soluna plans to develop a 37,000-acre wind farm in Dakhla in southern Morocco. DMG signed the partnership to provide Soluna with hardware procurement, data centre design, mining setup, remote hardware and systems monitoring. ■

Source: Intellidex; Leriba Africa



R20bn and rising: IPPs are making a difference

In remote areas across the country, impoverished communities have found their standards of living improving with the arrival of wind turbines or solar panels. The independent power producers (IPPs) are obliged to spend a percentage of projected revenue over the 20-year operation lifespans of the projects on socioeconomic upliftment and enterprise development initiatives. This is an almost hidden benefit to the renewable energy independent power producers' programme and the IPPs have embraced this, committing far more than the required minimum amounts.

IPPs are required to contribute a percentage of projected revenues – with a minimum of 1.5% – accrued over the 20-year project operational life towards socioeconomic initiatives. In the first four bid windows, the average allocation to socioeconomic initiatives was 2.2% of revenue – with a minimum threshold of 1.5%.

Across all bid windows, a total of R20.6bn has been committed to socioeconomic initiatives, according to figures supplied

by the IPP Office, a division of the energy department. Of that, R16.5bn is specifically allocated for local communities where the IPPs operate. Assuming an even annual revenue spread over the 20-year power period, the average annual contribution is R1,028bn.

The target for IPPs to spend on enterprise development is 0.7% of revenue over the 20-year project operational life and IPPs have committed an average of 17% more than the target, the IPP Office says. Enterprise development contributions committed so far amount to R6bn, which equates to R320m a year.

While business mentoring and coaching and education upliftment initiatives are the most common, IPPs do assess local needs. As a result there are diverse initiatives such as an alcoholic support programme, one that supplies sanitary pads to impoverished schools and an agri-incubator for small businesses. One IPP even arranged for a Nasa astronaut to visit 1,000 learners on Heritage day.

The adjacent case study focuses on a major enterprise development project. ■



Local school reading coaches in the Northern Cape are taking up the opportunity to further their careers a recently launched bursary programme, funded by De Aar Solar Power.



Jeffrey's Bay Wind Farm's enterprise development programme has benefited a local farmer, Mr Bosman, on the outskirts of Hankey in the Gamtoos Valley of the Eastern Cape. This enterprise is focused on the cultivation of land for growing vegetables under dragline irrigation.

CASE STUDY: Onseepkans Agricultural Development Project

The mechanics of a socioeconomic development project

Onseepkans seemed destined to be another failed government community development programme. A stretch of arable land running along the Orange River in Namaqualand, Northern Cape, lay neglected and overgrown. In 1987, when the land was still owned by white farmers, agriculture in Onseepkans was destroyed by flooding. By 2005, 118ha of land had been bought from the white farmers and transferred to 27 community-based close corporations, but the land remained unproductive.

In 2015, government attempted to kickstart the development again through disaster management interventions, aiming to develop vineyards to produce grapes, raisins and dates. It barricaded the river banks and started installing a pipeline to replace the canal, aiming for a more efficient, modern irrigation system. By August 2015, infrastructure had been installed on a handful of plots but things fizzled out and a few months later these were overrun.

The core problem, says Leon Taljaard, CEO of Talmar Impact Investments & Development, is there was a plan for infrastructure but little else in terms of implementation and providing extended support. Local communities were expected to develop vineyard enterprises but they weren't equipped

Purchase a panel to invest in solar

Costa John

A novel new mobile app enables the public to invest directly in renewable energy, with the promise of returns that are attractive compared with the flat returns over the past few years from traditional investment assets.

Fedgroup's Impact Farming app enables individuals to own physical assets such as solar panels. It is projecting returns of 10% to 16%.

Investors can own actual solar panels on urban solar farms by purchasing the individual solar panels through the app. This asset, along with the others purchased on the app, are installed on an approved urban solar farm to form a venture network that is managed by experts, who take care of the rest.

Fedgroup has contracts with partners to ensure that all the energy generated by these solar panels are purchased as they are produced. The owner of the solar panels then earns a regular income from the sale of the energy produced.

With solar panels you'll receive an income every month. Returns will increase over time in line with energy price increases. The cost of purchasing one panel is R5,000 and at the current rate of return investors can expect R15,000 per solar panel over the investment term of 20 years. Impact farming assets also qualify for a tax benefit associated with renewable energy.

Many landlords have installed

generators but these are expensive to run. A number of landlords of big shopping centres are now seeking an alternative solution. Fedgroup has partnered with Emergent to finance the urban solar farms. These farms are typically about 2,000 panels that together can generate enough power to cover 70% of a shopping centre's power needs, at a price that is at least 10% lower than the national grid. This gives landlords a cheaper and more reliable source of power.

As an impact farmer you can buy one or several of the solar panels on these farms. You receive a share of the profit from the sale of the electricity to the landlord. The actual collection, management and maintenance of the panels are managed by Emergent. You pay for the upfront purchase of the panel and its installation. The panel will last at least 20 years.

A dedicated site owner will consume all the power generated by the panel. It is therefore economically active at all times while the sun is shining. Direct ownership provides a share of that profitability.

Each solar facility is also insured to mitigate any risk of destruction, the cost of which is included in the purchase price. At the end of the investment term, you could take physical ownership of the panel or take advantage of Fedgroup's buyback offer.

The Impact Farming mobile app also allows for the purchase of individual beehives and blueberry bushes on farms, run along similar lines to the solar panels. ■

to do so. A “solution” was being imposed on them without the preparatory work.

Talmar develops projects from the ground up. “You first develop relations with the community then build a commercial proposition around it,” he says. “You do not operate on the concept of ‘buy-in’ from the communities, imposing the commercial structure on them. The communities must participate in the creation of solutions.”

The business plan, he says, has to match the needs on the ground. Getting to understand those needs is a long, slow process, one that includes building relationships and developing trust. Constant support is a prerequisite. “You need to take people on a journey enabling them to understand the issues and contribute to solutions,” Taljaard says. “Then they can choose: it should be their decision to commit to a project.”

Talmar has been putting in such groundwork for about two years, spending time with residents, understanding their needs, assessing their capabilities, determining what support structures are required and – as importantly – understanding any fears, resentments or misgivings they might harbour. “Without that the project would be misaligned and that would lead to its collapse,” he says. “Many projects in Africa have failed because those exercises were not thorough or were entirely omitted from the process.

The community groundwork is vital, it is a relationship-based exercise. Once residents have vented their feelings, including any misgivings or resentments, and once they feel those are accepted, they are enabled to see things

differently and can contribute to a working concept.”

The next important step is to develop a thorough understanding of the project, and for this endeavor Talmar sits with them to explain the risks and opportunities, it develops cartoons to illustrate concepts and continues with this process until it is clear the residents understand exactly what the project entails, including what their commitment should be. “For example, they will commit to supplying their product to a specific off-taker for 20 years. The business model is co-created with them and the commitment must be totally their choice.”

Many would have had no business experience, and Talmar established a central management hub that creates the market of buyers and sellers and also offers business support services.

Taljaard, having been alerted to the then-neglected Onseepkans project, initially visited the area in January 2016. He approached Abengoa, a Spanish company that has invested heavily in SA’s renewable energy sector. It has developed three solar plants, two of which are nearby: Xina Solar One and KaXu Solar One, outside Poffader.

“They wanted to leverage more funding to unlock greater value and generate a bigger impact.” Talmar committed itself to that and developed separate memoranda for donors and investors. Abengoa, through the KaXu plant, put up the preparation funding for the project. Government carried the initial capital outlay with a mandate to attract blended funding. It was up to Talmar to assist government to raise the rest, with the total development cost estimated at R304m. That initial

preparation funding “unlocks the investment flow”, says Taljaard, explaining that it is used for economic analysis, business planning, legal costs, social facilitation and other elements required to lay the groundwork for the project.

The plan is to develop water infrastructure and other support services to develop vineyards for 27 plots owned by community-owned close corporations. These plots, which cover 118ha, are already serviced by the pipeline irrigation system and 58ha are already under production. The 2018 harvest has already generated some sales income. Further development of 250ha for a community trust is planned.

Talmar’s involvement will continue beyond the point where the final hectare of land is under production, with the roles of impact measurement and ongoing business support becoming more important.

The Onseepkans Agricultural Development Project is a result of private sector involvement helping to meet a government need. It highlights the need for thorough groundwork but also accentuates the fact that with total commitment from all parties, meaningful and sustainable development is attainable. In this light, Taljaard doffs his cap to the government input. The Northern Cape department of agriculture, land reform and rural development, he says, has been excellent and hard-working throughout, and totally committed to the success of the project. “It’s been a refreshing experience to see the way they operate.” ■

Western Cape evolving into dynamic energy hub

Costa John

The Western Cape is evolving into a renewable energy hub of South Africa.

The main reason for investment in this location, says Kobus Meiring, Juwi renewable energies’ operations director for Europe, the Middle East and Africa, “is because the energy plants are placed where the climate has the most wind and sun resources”.

Renewable energy companies often have an international footprint as a wider geographic spread gives market stability. “The Western Cape is a preferred location for many international renewable energy companies and is used as a launch pad to expand into sub-Saharan Africa,” says Meiring.

Manufacturing

Mayoral committee councillor Xanthea Limberg says the Western Cape is an ideal centre for the renewable energy industry, including component and system manufacturing. “The City of Cape Town is committed to achieving carbon neutrality by 2050 and to construct carbon neutral new buildings by 2030 under the C40 Cities’ Building Programme, which focuses on delivering on the ambitions of the Paris agreement.” The C40 is a route map for signatory cities to meet the requirements of the

UN Framework Convention on Climate Change signed in Paris in 2015.

Concerted strategic efforts are being undertaken to further facilitate the growth of a competitive local renewable energy industry based on demand for green energy technologies and related knowledge and skills. “The Western Cape provincial government has set itself the target of becoming the green economic hub of Africa,” she says, “and Cape Town is the province’s centre for innovation and environmental business”.

The province is well suited to supply both imported and locally manufactured components. Wesgro, the official tourism and trade, investment promotion agency for Cape Town and the Western Cape says the province was home to some of the earliest investments into renewable energy manufacturing in the country, “propelling the region as a leader in the alternative energy sector. It was the first province to implement a sustainable energy strategy, a policy for solar water heaters and to set renewable energy targets”.

Ease of doing business

GreenCape, an investment research and promotions agency, says the province provides businesses and investors with prime locations, modern infrastructure, a skilled workforce, low operational costs and an abundance of natural resources.

“Furthermore, there is a supportive government that has made ease of doing business and the green economy key priorities. There are five universities with comprehensive research and development capabilities and dedicated green economy skills programmes, and a range of investment incentives and special economic zones”.

Special economic zones

The designation of the Atlantis Special Economic Zone has created significant opportunities for investors looking to take advantage of the growing renewable energy market in South Africa.

The City of Cape Town established the Greentech Manufacturing Hub in Atlantis in 2011 in response to the Department of Energy’s Renewable Energy Independent Power Producer Programme (REIPPP). The hub has already attracted four major “greentech” investors that are fully operational.

The Atlantis zone has now entered its implementation phase. Situated on the West Coast 40km from Cape Town, it capitalises on the province’s booming renewable energy and green technology sector. This includes renewable energy technologies, wind turbines, solar panels, insulation, biofuels, electric vehicles, materials recycling and green building materials.

According to Invest Cape Town, an

initiative launched by the City of Cape Town to attract and retain foreign direct investment, “special economic zones [such as the Greentech manufacturing hub] are key tools used by the South African government for driving industrial and economic development”. Furthermore, these zones are supported by a range of incentives aimed at attracting local and foreign direct investment.

Investment incentives

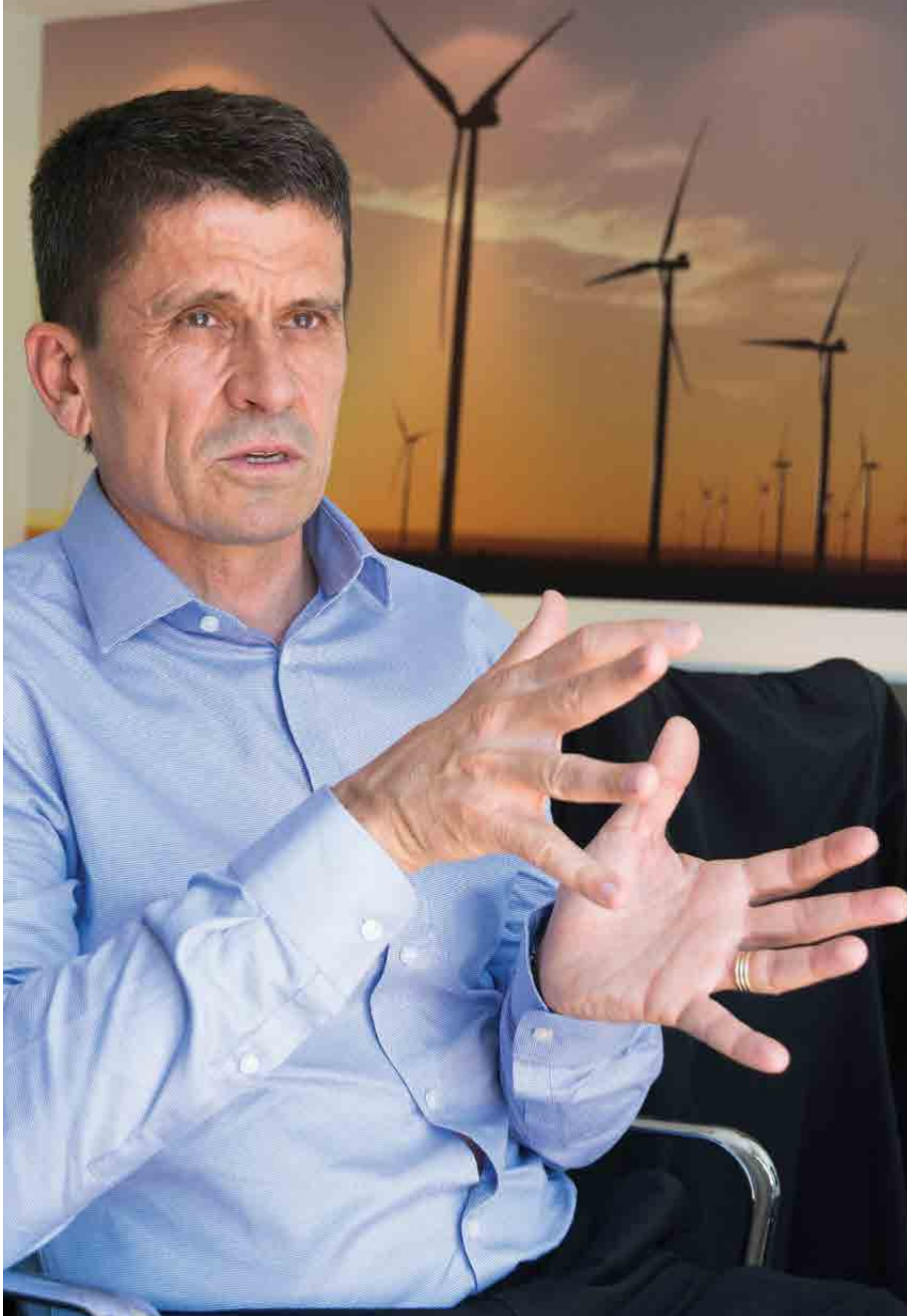
The regulatory environment has a direct impact on investment opportunities, market growth and job creation. An investor exploring renewable energy projects requires certainty about the policy approach before they invest. Incentives are in place to drive investment into the sector, including:

- Reduced corporate income tax.
- Employment tax incentives aimed at encouraging employers to hire young and less-experienced work seekers. This reduces the cost of hiring young people through a cost-sharing mechanism with government.
- Building allowance, which qualifies renewable energy companies to an accelerated-depreciation allowance on capital structures (buildings).
- VAT and customs relief for companies. ■

The finance driving renewable energy

Financing costs have fallen from rounds one to four as the lower prices at which the power producers supply electricity to Eskom have added to the pressure on them to cut their costs

By Stuart Theobald



Clive Elliott, chief financial officer of several IPP projects within Old Mutual's African Infrastructure Investment Managers.

For the first four rounds of the renewable energy independent producers' programme (REIPPP), R202bn in investment had been committed to independent power producers, according to data collected by the IPP Office. That represents about a third of total national gross fixed capital formation in any one year, so the IPPs have been a major contributor to total investment in SA. With round four projects now reaching financial close, construction and spending will soon begin on the development of 26 new IPPs with billions being invested.

Financing this major infrastructure rollout has been an important enabler for the whole project. The R202bn consists of debt and equity, with both foreign and local sources. South African lenders, particularly banks and the national development finance institutions including the Industrial Development Corporation and Development Bank of South Africa, have been important backers of projects.

But as competition has forced down the prices that projects have bid to supply

electricity in each round, the pressure has been building to find ways to cut costs.

"There are three ways you can improve returns on a project," says Rentia van Tonder, head of power at Standard Bank's corporate and investment bank. "First is the EPC [engineering, procurement and construction] package. To what extent can you negotiate that down but still have comfort that it will be built on time? Then the O&M [operations and maintenance] has to be factored in. Then the third leg is the finance package. How effectively can you negotiate that and get the best margin? Those three pillars are becoming so competitive," she says. It is the last leg where the banks and other lenders have faced increasing pressure to cut the cost of finance.

Local lenders have so far committed almost R120bn of debt to projects, with an average debt:equity ratio of 64:34. South Africa's banks have had to develop risk approaches from scratch after the IPP programme created the first ever financing opportunities in renewable energy in

SA. The successive bid windows have brought prices down, including the cost of finance, as banks and other lenders have developed their models and become more comfortable with the risks. At the same time covenants and loan conditions have shifted to be more favourable to borrowers.

Project owners are also now working on lowering the cost of finance for projects in the earlier rounds by refinancing them – essentially, paying off high-priced debt with lower-priced debt. That can be done, but only with approval from the IPP Office. The IPP Office has indicated, though, that it wants to see the financial benefits from refinancing being shared, particularly in enhancing the BEE status of projects.

The exact terms of the financing for any particular project is kept confidential, but anecdotally sources in the industry say the cost of funding has declined by about 100 basis points between rounds one and four. Financing is now generally priced at around Jibar plus 3.2 percentage points, which currently works out to 10.85%. Projects can be priced higher or lower depending on the specific features, including whether guarantees are in place from international partners, usually large foreign utilities that take the lead role in the projects.

But for project owners, the cost of finance is still substantial. As prices have come down from rounds one to four, so have the returns to the projects. The typical internal rate of return, a measure of returns to investors, in round one was above 20%. That level would please most investors, even in riskier projects. But those have come down to around 13% in round four. That's lower than the returns on equity earned by the JSE top 40 companies.

"We give attention to every single piece of our expense chain," says Clive Elliott, chief financial officer of several IPP projects within Old Mutual's African Infrastructure Investment Managers and IDEAS funds. Increasingly, he says, a key focus is on achieving economies of scale through consolidating services so that one

can handle multiple projects rather than having a separate team for each project. "In round one, lenders were insisting that each project had one CEO, one CFO, one community operations officer, and one technical head, whereas they are now comfortable for a management services team or company to oversee and operate a portfolio of companies. This immediately leads to synergies in overall operational costs. It also lowers risk as we have wider teams rather than a small group of individuals managing the companies.

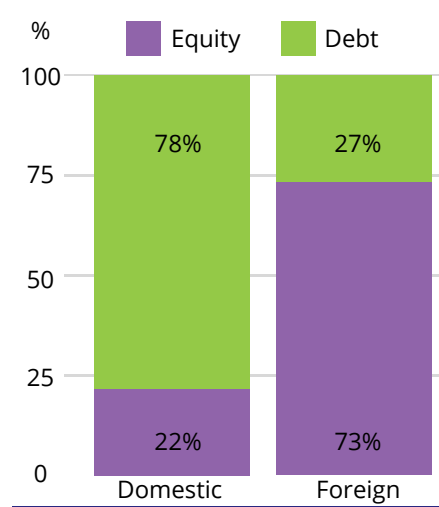
"Prices have reduced sharply due to a number of factors, and as actual and perceived risks in the projects have decreased, lenders and shareholders are more accepting of lower margins," Elliott says. "The continued viability and success of our projects will be through us driving financing and operating synergies, and in operating them smarter as a portfolio of projects."

That also suggests that consolidation would help the industry to improve efficiencies and ensure more sustainable profit margins. Some transactions have occurred with buyers taking over interests in projects that are now fully operational. Globeleq, for instance, this year acquired six different IPP interests from Brookfield that Brookfield developed from rounds one and two, giving Globeleq the largest portfolio in the programme. Globeleq also increased its shareholding in three projects last year by buying out Mainstream SA's minority shareholdings in three wind farms. Mainstream had been the initial developer and construction manager for the three projects.

This trend also indicates the fundamentally different risk and return profiles for projects during their lifecycles. Risks are highest during construction and the initial phase of production, when many things can go wrong including construction delays and equipment failure. Once a project is operating, the risks are substantially diminished, with production levels becoming clearer and the expected performance of the equipment now tested in reality. Also, the operations and maintenance role on the projects can be an additional source of profits which project owners can access by installing their own O&M capacity at the projects. It makes sense then that projects, once they are operational, would be sold either to investors looking for long-term stable returns, like pension funds, or to investors with O&M businesses that earn returns from keeping the project operating.

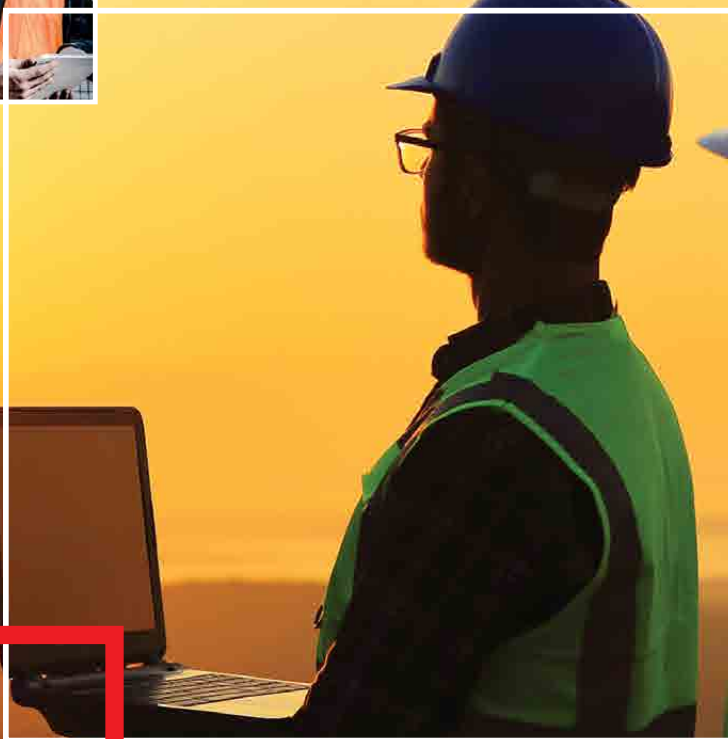
As the programme continues with more IPPs coming on stream, the pressure will stay on finding enhanced efficiencies. The financing arrangements will therefore be a constantly evolving aspect of the programme. ■

Debt and equity in IPP projects (Rbn)



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