



environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF THE SPECIALIST, DECLARATION OF INTEREST AND UNDERTAKING UNDER OATH

	(For official use only)
File Reference Number:	
NEAS Reference Number:	DEA/EIA/14/12/16/3/3/2005
Date Received:	08 October 2020

Application for authorisation in terms of the National Environmental Management Act, Act No. 107 of 1998, as amended and the Environmental Impact Assessment (EIA) Regulations, 2014, as amended (the Regulations)

PROJECT TITLE

The Proposed Gas to Power Powership Project at the Port of Ngqura within the Coega SEZ, Nelson Mandela Bay Metropolitan Municipality, Eastern Cape

Kindly note the following:

1. This form must always be used for applications that must be subjected to Basic Assessment or Scoping & Environmental Impact Reporting where this Department is the Competent Authority.
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Departmental Details

Postal address:

Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Private Bag X447
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Department of Environmental Affairs
Attention: Chief Director: Integrated Environmental Authorisations
Environment House
473 Steve Biko Road
Arcadia

Queries must be directed to the Directorate: Coordination, Strategic Planning and Support at:
Email: EIAAdmin@environment.gov.za

1. SPECIALIST INFORMATION

Specialist Company Name:	Political Economy Southern Africa NPC		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	Percentage Procurement recognition	
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Specialist Qualifications:	Master of Commerce in Development Theory and Policy (Wits); Bachelor of Commerce (Honours) in Development Theory and Policy (Wits); and Bachelor of Social Science in Politics, Philosophy and Economics (UCT)		
Professional affiliation/registration:			
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2. DECLARATION BY THE SPECIALIST

I, SIYADUMA BINIZA, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- all the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

Political Economy Southern Africa, NPC

Name of Company:

4 November 2022

Date

Details of Specialist, Declaration and Undertaking Under Oath

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, SIYADUMA BINIZA, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.



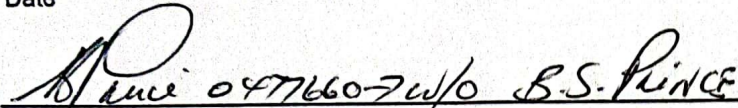
Signature of the Specialist

Political Economy Southern Africa

Name of Company

4 November 2022

Date



Signature of the Commissioner of Oaths

4 November 2022

Date





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1. SPECIALIST INFORMATION

Specialist Company Name:	Political Economy Southern Africa NPC		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	N/A	Percentage Procurement recognition
Specialist name:	Lungile Mashele		
Specialist Qualifications:	Master of Philosophy in Energy Studies (UJ); Bachelor of Science (Honours) in Energy Studies (UJ); and Bachelor of Commerce in Economics and Econometrics (UJ)		
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E-mail:	lungile@politicaleconomy.org.za		

2. DECLARATION BY THE SPECIALIST

I, Lungile Mikateko Muhlavasi Mashele, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
- All the particulars furnished by me in this form are true and correct; and
- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

Political Economy Southern Africa, NPC

Name of Company:

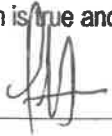
4 November 2022

Date

Details of Specialist, Declaration and Undertaking Under Oath

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, Lungile Mikateko Muhlavasi Mashele, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.




Signature of the Specialist

Political Economy Southern Africa

Name of Company

4 November 2022

Date



CS1
7232294-2
MAILA

Signature of the Commissioner of Oaths

4 November 2022

Date





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1. SPECIALIST INFORMATION

Specialist Company Name:	Political Economy Southern Africa NPC		
B-BBEE	Contribution level (indicate 1 to 8 or non-compliant)	N/A	Percentage Procurement recognition
Specialist name:	Jotham Makarudze		
Specialist Qualifications:	Master of Business Administration (UP); Bachelor of Commerce (Honours) in Financial Analysis and Portfolio Management (UCT); and Bachelor of Commerce (Wits)		
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E-mail:	jotham@politiceconomy.org.za		

2. DECLARATION BY THE SPECIALIST

I, JOTHAM MAKARUDZE, declare that –

- I act as the independent specialist in this application;
- I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
- I declare that there are no circumstances that may compromise my objectivity in performing such work;
- I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
- I will comply with the Act, Regulations and all other applicable legislation;
- I have no, and will not engage in, conflicting interests in the undertaking of the activity;
- I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
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- I realise that a false declaration is an offence in terms of regulation 48 and is punishable in terms of section 24F of the Act.



Signature of the Specialist

Political Economy Southern Africa, NPC

Name of Company:

4 November 2022

Date

3. UNDERTAKING UNDER OATH/ AFFIRMATION

I, SOTHAM MAKARUDZE, swear under oath / affirm that all the information submitted or to be submitted for the purposes of this application is true and correct.

[Handwritten Signature]

Signature of the Specialist

Political Economy Southern Africa

Name of Company

4 November 2022

Date

[Handwritten Signature]

Signature of the Commissioner of Oaths

4 November 2022

Date

[Handwritten Signature] 04/11/2022
COMMISSIONER OF OATHS
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71 Cowley Road, Bryanston
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Gas-to-Power Projects and the Just Energy Transition from Fossil Fuels in the South African Political Economy

COMPILED BY:

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RESEARCH TITLE

Gas-to-Power Projects and the Just Energy Transition from Fossil Fuels in the South African Political Economy

RESEARCH TEAM

The team of experts from Political Economy Southern Africa (PESA) is highly-qualified with technical skills from diverse backgrounds including development economics, law, finance and energy management.

Mr Siyaduma Biniza

Mr Biniza is an economist specialising in applied development economics, international finance, public policy, the political economy of development and regional integration in Africa. Siya has served in a variety of senior leadership positions in the South African government and the NGO sector.

Qualifications: Master of Commerce in Development Theory and Policy (Wits); Bachelor of Commerce (Honours) in Development Theory and Policy (Wits); and Bachelor of Social Science in Politics, Philosophy and Economics (UCT).

Ms Lungile Mashele

Ms Mashele is an award-winning energy professional and banker with over 12 years' energy experience on the continent. Lungile is an Energy Economist and performs technical due diligence services to close deals within the energy sector in Africa.

Qualifications: Master of Philosophy in Energy Studies (UJ); Bachelor of Science (Honours) in Energy Studies (UJ); and Bachelor of Commerce in Economics and Econometrics (UJ).

Mr Jotham Makarudze

Mr Makarudze is a qualified and experienced credit and project finance professional with over 16 years' experience in South African and other African markets, with 8 years at the senior level. Jotham is a Chartered Financial Analyst who has authored various articles focused on economic development on the African continent and has a particular interest in the energy sector.

Qualifications: Master of Business Administration (UP); Bachelor of Commerce (Honours) in Financial Analysis and Portfolio Management (UCT); and Bachelor of Commerce (Wits).

Dr Charl Swart

Mr Swart is a Political Scientist by training and specialises in constitutionalism and governance. His work focuses on ensuring that PESA publishes accessible research and analysis. Charl edited a number of peer-reviewed publications including most of the PESA publications.

Qualifications: Doctor of Philosophy in Politics (SU); Master of Arts in International Relations (SU); and Bachelor of Arts (Honours) in Political Science (SU).

EXECUTIVE SUMMARY

The debates about the global transition from fossil fuels to net zero have sparked great controversy. There are many areas of controversy including the potential impact of the transition on existing livelihoods that are dependent on fossil fuels and related value-chains, the correct pathways towards achieving net zero, or even the feasibility and reliability complete dependence on renewable energy. The many competing arguments also struggle with balancing between the need to resolve energy shortages while minimising the adverse impacts on the environment. This is certainly the case in South Africa, and the African continent more broadly, due to divergent interventions needed to deal with the severe energy shortages, transform the economy away from long-term dependence on raw mineral commodities, and reducing environmental degradation.

Ideally, the process of the integrated approach to environmental management is inevitably influenced by the political economy of each country. In this process, the various stakeholders assert their interests, negotiate and bargain with competing interests, and settle on various methods of attaining a common objective. In this way, the various competing interests are assured by the final “pay-off”, or gains, in varying degrees which determines the winners and losers in a democratic process that tries best to cater for all interests while pursuing a commonly agreed upon objective. The problem here is that the green lobby in South Africa have taken a unicentric approach and advocated for an energy switch (as the sole method of attaining net-zero) rather than an energy transition. By virtue of this, the green lobby oppose any oil and gas projects in South Africa, without considering or engaging around dynamics that this switch would have (economically and socially). This has been the primary characteristic driving the just energy transition both globally and in South Africa despite the government’s efforts to take an integrated approach to environmental management. This research report provides a political economy analysis of the role of gas-to-power in the just energy transition (JET) away from fossil fuels in South Africa and its impact on sustainable development in the country and the region. Sustainable development means the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure that development serves present and future generations.

In response to the South African energy crises, the National Development Plan (NDP) prioritised the need for energy infrastructure to be robust, extensive, and affordable to the meet the needs of industry, the commercial sector as well as households. Subsequently the Integrated Resource Plan (IRP) was developed, and numerous independent power producer (IPP) procurement programmes launched, to procure additional generation capacity through renewable energy, coal fired power, and more recently generation capacity from a range of dispatchable energy technologies, through the Risk Mitigation Independent Power Producer Procurement Programme (RMI4P). In December 2020, Karpowership submitted a bid in response to the Department of Minerals Resources and Energy’s (DMRE) RMI4P request for proposals. Karpowership was subsequently awarded preferred bidder status on 18th March 2021 for 1220MW of the total 2000MW allocated through the RMI4P (i.e., 450MW in Coega, 450MW in Richards Bay and 320MW in Saldanha Bay) for a contractual term of 20 years.

The South African gas sector development requires steady demand in order to provide a financial bases for development of crucial infrastructure needed to bridge the structural gaps in the market. Gas-power-power projects are identified as one the means to provide this reliable demand for gas in order to incentivise infrastructure investment and further development of the sector. This would lead to the development of further opportunities across the LNG and LPG value-chain and provide South Africans with a cleaner alternative energy source. Although gas-to-power may have a limited role to play in the just transition to net zero, the diversification of energy demand away from fossil fuels such as fire wood and paraffin will have a lasting impact on sustainable development. Providing the alternative of natural gas or any other renewable energy option will therefore have an invaluable role and lasting impact towards energy security and environmental conservation.

The Karpowership projects despite their shortcomings, are the quickest way to provide South Africa with the much-needed dispatchable power. This dispatchable power provides the flexibility to renewables that is necessary to ensure South Africa's short to medium term energy security. Some of the shortcomings highlighted by critics besides the perceived gaps on the environmental processes include that the 20-year PPA's are too long for an emergency power. This a rather simplistic view that does not account for the positive externalities which include supporting the growth of the local and regional gas industry in the medium to long term, augmentation to the transmission infrastructure and supporting feasible JET implementation. Reports like "Hot Air About Gas: An Economic Analysis of the Scope and Role for Gas-Fired Power Generation in South Africa" by Meridian Economics contend that gas on a large scale is uneconomical and will ultimately render businesses less competitive globally as consumers eventually would have to bear the cost of the disincentive to meet net zero targets. For South Africa this is not the immediate trade-off given our need to expeditiously resolve the intensifying energy crisis, which needs a solution now and not a decade in the future. While gas does provide a peaking solution on a limited scale, its role in supporting energy security by complementing the power system as a whole in South Africa cannot be overstated.



INTRODUCTION



This research report forms part of the Environmental Impact Assessment (EIA) being undertaken for the proposed gas-to-power Powership projects at the Port of Saldanha Bay, Port of Richards Bay and Port of Ngqura. Political Economy SA (PESA), have been appointed by Triplo4 Sustainable Solutions (Pty) Ltd (Triplo4), (who have been appointed by Karpowership SA (Pty) Ltd (Karpowership), to undertake the EIA), to provide a research report on gas to power projects and the Just Energy Transition (JET), in the political economy of South Africa. This research report is intended to add to the polycentric analysis of additional specialist reports that are relevant to the EIA.

The debates about the global transition from fossil fuels have sparked great controversy. There are many areas of controversy including the potential impact of the transition on existing livelihoods that are dependent on fossil fuels and related value-chains, the correct pathways towards achieving net zero, or even the feasibility and reliability of complete dependence on renewable energy. The many competing arguments also struggle with balancing between the need to resolve energy shortages versus minimising the adverse impacts on the environment. This is certainly the case in South Africa, and the African continent more broadly, due to divergent interventions needed to deal with the severe energy shortages, transform the economy away from long-term dependence on raw mineral commodities, and reducing environmental degradation. Due to the many trade-offs and sometimes conflicting interests, it is clear that there is no single correct approach to resolve the complex challenge of sustainable development.

South Africa takes an integrated approach to economic planning, environmental management and sustainable development. Sustainable development is defined as: “the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure that development serves present and future generations”¹. The approach takes a polycentric view to sustainable development and emphasises social, economic, environmental and political economy factors that are crucial for sustainable development. A polycentric view allows for

more than one centre of development or control, which allows various stakeholders to play their part or cooperate towards the central objective of sustainable development. Hence, the integrated approach to environmental management and economic planning has led to the development of the just transition approach to the global transition from fossil fuels as a way to ensure that the many diverse developmental needs can be consolidated around the common objective of sustainable development. This can be contrasted with a unicentric approach which only allows for one centre of development or control and prejudices this at the expense of all others.

In South Africa, in this instance, the broader objectives that constitute sustainability are often reduced to a single objective. For example, broader objectives of approaches such as the triple bottom line or “ESG” (environmental, social, and government) have been reduced to a very polarised single objective of attaining net-zero or complete decarbonisation². This has been spurred on by the rise in environmental activism resulting in skewed outcomes for development proposals meant to improve and transform ailing economies and ensuring universal access to goods and services³. This has been unfolding while the country grapples with a crippling and devastating energy crises affecting the livelihoods of millions of citizens and businesses. The all too familiar term known to many as “loadshedding” comes to mind which strikes a sense of despair into the hearts and minds of its populace exacerbating the deleterious conditions of economic decline, joblessness and poverty.

The integrated approach to environmental management is inevitably influenced by the political economy of each country. In this process, the various stakeholders assert their interests, negotiate and bargain with competing interests, and settle on various methods of attaining a common objective. In this way, the various competing interests are assured by the final “pay-off” or gains in varying degrees which determines the winners and losers in a democratic or at least a constitutional process that tries best to cater for all interests while pursuing a commonly agreed upon objective⁴. One of the problems is that the green lobby in South Africa have taken the unicentric approach and advocated for an energy switch (as the sole method of attaining net-zero) rather than an energy transition. By virtue of this, the green lobby oppose any oil and gas projects in South Africa, without considering or engaging around dynamics that this switch would have (economically and socially). This has been the primary characteristic driving the just energy transition in South Africa despite the government’s efforts to take an integrated approach to environmental management.

Political economy refers to the interdependent linkages between economic and political systems. In South Africa the just transition from fossil fuels and integrated environmental management are governed by various legislative acts and regulatory processes administered by various stakeholders. The outcomes should therefore be understood as the result of complex interaction (i.e., conflict, cooperation, bargaining) between civil society, economic actors and political authorities who bargain for their competing interests with varying levels of influence. Thus, it is important to understand the political economy of energy management and planning in South Africa as a backdrop to analysing the energy transition from fossil fuels. This research report provides a political economy analysis of the role of gas-to-power in the just energy transition (JET) from fossil fuels in South Africa and the region, and its impact on sustainable development.

THE KARPOWERSHIP PROJECTS



In response to the South African energy crises, the National Development Plan (NDP) prioritised the need for energy infrastructure to be robust, extensive, and affordable to meet the needs of industry, the commercial sector as well as households⁵. Subsequently the Integrated Resource Plan (IRP) was developed, and numerous independent power producer (IPP) procurement programmes launched, to procure additional generation capacity through renewable energy, coal fired power, and more recently generation capacity from a range of dispatchable energy technologies, through the Risk Mitigation Independent Power Producer Procurement Programme (RMI4P).

The objective of the RMI4P is to satisfy the short-term electricity supply gap, ease the current electricity supply constraints and reduce the wide-scale usage of diesel-based peaking electrical generators using alternative energy technologies⁶. RMI4P is part of an attempt by government to procure a net increase of more than 23 900 megawatts (MW) of energy over the next eight years (i.e., short term) during which time, and as assumed in the IRP 2019⁷.

In December 2020, Karpowership submitted a bid in response to the Department of Minerals Resources and Energy's (DMRE) RMI4P request for proposals⁸. Karpowership was subsequently awarded preferred bidder status on 18th March 2021 for 1220MW of the total 2000MW allocated through the RMI4P (i.e., 450MW in Coega, 450MW in Richards Bay and 320MW in Saldanha Bay) for a contractual term of 20 years⁹.

The Projects

In brief, the Karpowership projects entail the generation of electricity from Powerships moored in the Ports of Saldanha Bay, Richards Bay and Ngqura, fuelled with natural gas supplied from a Floating Storage & Regasification Unit (FSRU). A Liquefied Natural Gas Carrier (LNGC) will bring in Liquefied Natural Gas (LNG) to the FSRU, which stores the LNG onboard and turns the liquid form into gaseous form (Natural Gas) upon demand from the Powership (Regasification). Natural gas will be transferred from the FSRU to the Powership via a gas pipeline. The power generated is evacuated via a powerline which will interconnect the Powership to the National Grid.

THE POLITICAL ECONOMY OF THE JUST ENERGY TRANSITION IN SOUTH AFRICA

Politics and economics are often intertwined and cannot definitively be separated in practice. Political and economic systems of development and control inevitably interact with each other and very often overlap in terms of operations and interests. For example, in the energy sector, there are various stakeholders that are involved including civil society as consumers, government or state-owned entities as regulators and major producers, and private sector as minority producers. Civil society will inevitably interact with the private sector as consumers of energy products, government will inevitably interact with both civil society and private sectors as market regulators, while the private sector produces energy products for consumers and their operations that are regulated by legislation passed by government and enforced by state-owned entities. The various stakeholders have their own interests which define their interaction in each instance and these interests may differ depending the role played by each stakeholder in the interaction. This political economy analysis provides an overview of the various stakeholders and institutions involved, the economic incentives that actors respond to, the bargaining power and power relations amongst actors, and the policy options available to policy makers.

The global JET is the result of collective efforts of various movements aimed at expanding the way in which governments and firms conceive of sustainability and corporate governance. This process has not been smooth nor consistent at all times, as very often the commitments made by political authorities or private sector on public platforms sometimes competes with national interest or the “bottom-line”. Some of the global movements or principles that have influenced the global JET include good corporate governance; environmental, social and governance sustainability; stakeholder capitalism; and shared value capitalism. This culminated in various engagements at the international level including the COP26, where countries made their Nationally Determined Contribution (NDC) towards reducing or containing the rising global temperatures within a specific range¹⁰. At this level advanced economies made various pledges to assist developing and least-developed countries with financing the transition from fossil fuels¹¹. In addition, least-developed and developing countries have been beneficiaries of climate change adaptation financial assistance from advanced economies. Over time, these NDCs are expected to translate into national transitional frameworks for the JET in each country. On the basis of the NDC and the transitional legislation developing countries are expected to seek financing for their JET-related projects from creditors in advanced economies.

In this context, South Africa entered into a partnership with the governments of France, Germany, the United Kingdom, the United States and the European Union to support a transition to a low carbon economy and a climate resilient society¹². Ahead of the COP26 conference, South Africa submitted a revised NDC to reduce domestic carbon emissions by approximately 25.0% by 2030¹³. The partnership aims to provide ZAR 131.0 billion (approx. USD 8.5 billion) through a range of instruments, including grants and concessional finance, to support implementation of the revised NDC in South Africa over the next 3-5 years¹⁴. However, the level of grants and concessional financing seems negligible and it is doubtful whether the commitment of USD 8.5 billion will be met¹⁵. Germany, which was a front-runner in the Just Energy Transition Partnership (JETP), has only made its first contribution of USD 800.0 million towards the committed USD 8.5 billion in June 2022¹⁶. Approximately half of these funds are expected to go towards implementation of the National Climate Change Adaptation Strategy, which includes interventions such as: enhancing the early warning, vulnerability and adaptation monitoring system; promoting

research and development in application, localisation, transfer and adoption of technology within key climate-sensitive sectors; mainstreaming climate considerations in all policy frameworks and enhancing the national system of reporting; and strengthening institutional capacity for climate change from 2021 to 2030¹⁷. With all the potential green climate financing from advanced economies, there have been different debates about what is considered clean energy versus what is considered renewable; and what is practically implementable.

Clean energy refers to the sustainable use of all known alternatives to fossil fuels. In addition to renewable energy sources that are naturally replenishable such as solar or wind, clean energy includes the use of all less-carbonised sources like natural gas and zero-carbon sources like nuclear energy¹⁸. In addition to the distinction between clean and renewable energy – there are some carbon-based energy sources that are designated as transitional¹⁹. Transitional energy sources, may be carbon-based but they reduce GHG emissions and therefore represent an improvement on the status quo. Due to the technological viability of converting some old coal-fired power stations into Open Cycle Gas Turbines (OCGT) or Combined Cycle Gas Turbine (CCGT) plants – natural gas and gas-to-power are considered transitional sources of energy. The carbon intensity of power generation varies widely amongst countries and regions²⁰. In South Africa, the energy sector contributes close to 80% towards the country's total greenhouse gas emissions of which 50% are from electricity generation and liquid fuel production²¹. In North America, carbon intensity and CO₂ emissions have decreased significantly due to both a switch from coal to gas for power generation and an overall decline in the share of fossil fuels in electricity production (from 66% in 2010 to 59% in 2018)²². Since 2007, Europe's carbon intensity improvements have been driven by the steady expansion of renewables in the share of electricity generation (medium evidence, high agreement)²³. South-East Asian and Asia-Pacific developed countries stand out in contrast to other developed regions, with an increase of regional carbon intensity of 1.8 and 1.9% /yr., respectively²⁴. These countries have made progress in reducing their CO₂ emissions by prioritising energy security as a crucial element for development as well as environmental conservation.

The JET in Africa and SADC

In Africa the issue of the JET has also been very controversial and the debates have been divisive. Some have argued that Africa accounts for only 2–3% of the world's carbon dioxide emissions from energy and industrial sources²⁵. Hence, these proponents have argued that constraining the ability of African countries to invest in carbon-based energy is an unfair obstacle against the development of African countries²⁶. Even if African countries reached net-zero, we would only be reducing global emissions by 3% at most. Universal access to reliable, sustainable and affordable energy is a central challenge affecting the quality of life, health, productivity and development in Africa. More than 640 million Africans do not have access to electricity putting the continent at the lowest access rate globally²⁷. In addition, many African countries have rolling power cuts or loadshedding that can impose additional costs on firms such as inactive labour, production losses or equipment damage. This can severely affect industrial investments, productivity and economic development more broadly. African countries need to resolve the problem of universal access to electricity, and insufficient and unreliable electricity supply, in order to industrialise and ensure sustainable development.

Africa has high potential for clean energy with an estimated solar photovoltaic (PV) capacity to generate 660,000 Terawatts per hour (TWh) of electricity per year²⁸. Hydropower is the most developed and widely used renewable energy source in Africa and the Democratic Republic of Congo has the greatest potential with an estimated hydropower potential of 100 GW which could generate 774 TWh per year²⁹. The potential of renewable energy could



more than satisfy the continent's annual energy demand of 705 TWh per year³⁰. Among others, due to low incomes many African countries cannot afford to invest in clean energy, despite the enormous potential³¹. After having repeatedly missed their target, developed countries reaffirmed their commitment to mobilise USD 100.0 billion per year in climate finance to support developing countries³². African countries need to take advantage of clean energy financing in order to industrialise. By investing in clean electricity generation and transmission infrastructure, African countries can resolve the problems of universal access and electricity supply. African countries also need to develop industrial policy that supports sustainable use and investment in energy systems.

There is often a disconnect between stated national climate ambition and finance flows, and overseas direct investment (ODI) from donor countries may be at odds with national climate pledges such as NDCs³³. One study found that funds supported by foreign State-Owned Enterprises into 56 recipient countries in Asia and Africa in 2014-2017 went mostly to fossil fuel-based projects not strongly aligned with low-carbon priorities of recipient countries' NDCs³⁴. Similarly, other studies found that even within Multilateral Development Banks, 'public- and private-sector branches differ considerably', with public-sector lending used mainly in non-renewable and hydropower projects³⁵. Political leadership is therefore essential to steer financial flows to support the JET through support for transitional sources as well as renewable sources of energy. In addition to the financing mismatch and lack of domestic financing for investment in the JET in Africa, the JET in Africa has been driven by two major shifts.

One shift is at a regional level where regional economy communities are coordinating the consolidation of regional power pools to establish the continental power pool. The Economic Community of West African States (ECOWAS) held a regional validation workshop on the updated ECOWAS Energy Policy, from 7 to 9 September 2022, in Accra, Ghana³⁶. The workshop aimed to review the vision, strategic objectives and implementation plan of the updated ECOWAS Energy Policy and subsequently to validate the document. The updated ECOWAS Energy Policy is part of the USD 32 million technical assistance programme for energy sector governance in West Africa funded by the European Union. Once adopted, the ECOWAS Energy Policy will drive energy investments in the region and position West Africa as the leading to a Single Electricity Market on the continent.

In the SADC region, the process is more developed due to the long existence of the Southern African Power Pool (SAPP). There are five regional power pools that coordinate the planning and operation of the regional electric power system among member utilities in Africa³⁷. The regional power pools rely on strong trust and cooperation between national governments, utilities and IPPs; even though they may have different capacity scales,



governance structures and effectiveness. The most established power pool is the Southern African Power Pool (SAPP) which operates four competitive electricity markets trading approximately 17.4% of the member countries' demand in 2019³⁸.

The second shift is at a national level where governments are passing legislation to allow them to take advantage of green climate financing. In this context, the South African National Treasury has published a framework for prioritising climate change, in addition to return on investment, in financial institutions' lending and investment decisions. The framework is aimed at ensuring that all financial institutions embed and improve their capability for identifying, managing and disclosing environmental and social risks in their portfolios³⁹. Government hopes that it will encourage a transition to a lower carbon, greener and climate-resilient economy by strengthening the regulatory framework applicable to banking, retirement funds, insurance, asset management and capital markets. Climate change planning is being incorporated in the budget process, fiscal risks monitoring, and tracking of climate-related expenditure by National Treasury⁴⁰. More recently, the South African cabinet has approved the implementation of the Framework for a Just Transition in South Africa on 31 August 2022⁴¹. The Framework affirms that the JET to net-zero by 2050 must support national development aspirations, including decent work for all, social inclusion and the eradication of poverty⁴².

The JET in South Africa

The JET in South Africa is governed by various policy frameworks that fall under different departmental mandates and requires significant levels of cooperation between them. The overarching policy is the Framework for a Just Transition in South Africa. This framework for the JET in South Africa was developed by the Presidential Climate Commission (PCC) and it deals with practical issues relating to jobs, local economies, skills, social support, and governance. The PCC unanimously adopted the Framework in May 2022 following months of research and intense consultations with various social partners and communities across the country. The JET Framework is a planning tool to achieve a just transition in South Africa, setting out the actions that the government and its social partners will take to achieve a just transition, and the outcomes to be realised in the short, medium, and long term. The overarching plans of the JET Framework are summarised in the table below.

At a sectoral level, electricity planning in South Africa is governed by the IRP which is mandated to the Minister of Mineral Resources and Energy. The most recent iteration was gazetted in October 2019 (IRP2019) which is an electricity infrastructure development plan based on least-cost electricity supply and demand balance, taking into account security of supply and the environment in order to minimise negative emissions and water usage. The energy sector contributes close to 80% towards the country's total greenhouse gas emissions of which 50% is attributed to electricity generation, predominantly in the form of coal fired electricity, which constitute 84% of electricity production, and liquid fuel production⁴³. There are initiatives to reduce emissions through adoption of policies through investments in renewable energy, energy efficiency and public transport⁴⁴.

The IRP2019 places strong emphasis on wind amongst the renewables in the generation mix. The IRP2019 targets adding 14,400MW of wind, an additional 6,400MW of solar PV, an additional 3,000MW of gas and diesel, an additional 2,500MW of hydro, and an additional 1,500MW of coal by 2030. In addition, the IRP2019 aims to add an additional 4,000MW of embedded generation and 2,000MW of storage by 2030. In this context, gas and gas-to-power in general plays a very small role. In the context of worsening blackouts with loadshedding reaching stage 6 for the first time since December 2019, and several times in 2022⁴⁵, the debates about the South African energy crisis focus on Eskom operations and augmenting domestic electricity generation. However, some have argued that the IRP2019 is already outdated and out of touch with country's current realities because it does not include a near-term phase out of coal nor does it acknowledge the need to complement renewables with additional storage, gas or nuclear⁴⁶. The debates seldom explore the extent to which people can reduce their electricity demand by using alternative fuel sources or shifting demand for energy towards alternative sources⁴⁷. There is somewhat of a supply-side bias in the policy discourse as opposed to a mixed balance of supply- and demand-side management interventions. This where gas has a role to play both in mitigating the shortfall in supply of electricity and other fossil fuels (at least for cooking, heating and transport) and help the country in the JET⁴⁸.

The South African Gas Master Plan 2022 Base Case Report proposes gas as part of the broader demand side management interventions. The South African gas market is relatively small at just 2.6% of the country's total energy mix⁴⁹. At a global level, natural gas constitutes approximately a quarter of total primary energy consumed⁵⁰. The national gas master plan aims to exploit its potential to stimulate economic growth and development, stability, and job creation. Given that nearly 90% of South Africa's existing natural gas is supplied by Sasol Gas, there are significant risk imbalances in the gas sector⁵¹. This makes it imperative to develop the gas sector and ensure economic and employment stability within the natural gas sector by introducing more suppliers. The central constraints to developing the gas sector are bringing gas demand and supply on stream at the same time; and spreading the sector geographically to stimulate broader localised demand throughout South Africa. The base case identifies power generation or "gas-to-power" as a priority sector for gas utilisation in the IRP2019⁵². Despite the strong bias towards wind and solar, the initial aim of the IRP2019 was to increase the natural gas contribution to the national energy mix from 2.6% to 15.7% by 2030. The existing OCGT plants that are being decommissioned present an ideal opportunity for conversion to natural gas, with the potential to realise substantial cost savings of more than 30% from fuel source perspective⁵³. Therefore, the base case presents the gas-to-power sector and future conversion of coal-fired power stations into OCGT plants as a stable source of demand that natural gas in South Africa, along with other non-power sectors such as industry, transport and the export demand. This can be used as the backbone to develop the local demand and infrastructure.

The JET in South Africa, like all countries, will follow the influence of various interest groups. For example, the dominance of wind in the energy mix reflects the result of political economy factors in the policy-making process. The weak continuing dominance of coal in the IRP2019 energy mix also reflects the result of political economy factors and the dominance of entrenched coal interests and the fact that South Africa has huge coal reserves⁵⁴. This is not necessarily a negative, because the political economy of development will inevitably reflect the balance of bargaining power of all the respective stakeholder pursuing their individual or collective interests. The challenge of development is balancing or coordinating competing private interests to achieve the overarching collective interests of energy security and reducing climate change impact through national and global objectives of the JET.

Table 1: Summary of JET in South Africa and SADC ⁵⁵

Years	JET Framework	IRP2019	Draft Renewables Master Plan	SADC Regional Master Plan
2021-2025	<ul style="list-style-type: none"> No closures of Eskom plants to meet emissions targets, but some aging out. Increased renewables generation. Surge in coal prices due to pandemic recovery and reduced supply followed by decline. Sasol plans new feedstock; energy-intensive refineries begin to use renewable energy or to downsize. 	<ul style="list-style-type: none"> Decommissioned coal plants, total capacity decommissioned: 2,802MW. Total new Wind capacity commissioned: 7,218MW. Total new PV capacity commissioned: 3,700MW. Total new Coal capacity commissioned: 2,894MW. Total new Gas and Diesel capacity commissioned: 1,000MW. 	<ul style="list-style-type: none"> IRP2019 targets adding 14,400MW of wind and 6,400MW of solar PV, including some additional 4,000MW of embedded generation and 2,000MW of storage by 2030. Localising 70% of the components and 90% of Balance of Plant and Operations and Maintenance in the wind and solar PV value chains, combined with battery energy storage, could deliver 36,500 new direct jobs by 2030, with a total GDP contribution of R420 billion. 	<ul style="list-style-type: none"> The role that natural gas can play extends beyond the energy sector for power generation and industrial heating, with effective utilisation of cost-competitive gas reserves possible as a chemical feedstock or transport fuel. As a chemical feedstock, natural gas can be used in the production of ammonia and urea, methanol, and diesel contributing towards sectors, including but not limited to, agriculture, mining, industrial development, consumer products and transportation. In the base case scenario, the aggregated gas-to-power potential in the region is expected to reach the Indonesian benchmark by 2035 and will require a supply of 893 PJ per annum by 2050. South Africa is set to lead the deployment of gas-to-power due to the relative size of its economy and generation capacity while gas producing countries within SADC (Angola, Mozambique and Tanzania) are well poised to follow suit as a result of the local availability of natural gas. Gas-to-power is key to anchoring gas demand in the region and demand for gas will increase, particularly in the short to medium term, where gas-to-power is expected to grow to both diversify the power supply mix as well as reduce carbon emissions. The forecasted demand for gas-to-power considered three trend scenarios: <ul style="list-style-type: none"> Low Case: gas-to-power is developed according to planned commitments with no changes; Base Case: After 2030, the share of gas-to-power in the planned electricity supply increases to 7% by 2050; and High Case: After 2030, the share of gas-to-power in the planned electricity supply increases to 15% by 2050.
2026-2030	<ul style="list-style-type: none"> Depending on strategic choices around electricity and carbon taxes, start to see downsizing in coal production and employment. Coal districts in Mpumalanga begin to see impact of energy transition on economies. 	<ul style="list-style-type: none"> Decommissioned coal plants, total capacity decommissioned: 5,285MW. Total Wind capacity commissioned: 8,000MW. Total PV capacity commissioned: 3,000MW. Total Coal capacity commissioned: 750MW. Total Gas and Diesel capacity commissioned: 2,000MW. 		
2031-2040	<ul style="list-style-type: none"> Accelerating decline in coal demand, production, and related employment. 			
2041-2050	<ul style="list-style-type: none"> Coal largely phased out, with workers and communities engaged in new livelihoods. 			

THE POLITICAL ECONOMY OF GAS-TO-POWER PROJECTS IN SOUTH AFRICA

The role of gas in South Africa should not be viewed as one limited to South Africa nor one that solves only a power issue. Gas for South Africa is about regional development through an integrated gas plan for SADC, as well as using gas for numerous applications in the energy, industrial, commercial and agricultural sector⁵⁶.

Oil and gas exploration and development has become an integral part of several government development plans and initiatives, such as Operation Phakisa, the Integrated Resource Plan and the National Development Plan, to name a few. These initiatives envisage a diversification of South Africa's energy sources, infrastructure development, foreign investment and a reduction in South Africa's dependence on energy imports⁵⁷.

Operation Phakisa, launched by the government in 2014, encouraged an increase of offshore exploration activities and has set a target to achieve at least 30 exploration wells by 2024. The National Development Plan states that once gas reserves are proven, the development of these resources as well as gas-to-power projects, should be fast tracked⁵⁸.

The SADC 2022 Regional Gas Masterplan⁵⁹ envisages gas playing a prominent role in driving industrialisation in the region through large scale applications such as gas to power, fertiliser plants, petrochemical and gas to liquids applications.

One of the overarching goals for regional integration through the use of gas is to correct supply and demand imbalances that are present in the region⁶⁰. Integration will allow for infrastructure development that will result in secure, reliable, and affordable energy for member states. Oil and gas producers typically want to see infrastructure to supply gas into domestic markets before making a decision on whether what is produced will be sold into those markets based on demand and pricing. Oil and gas producers need ready markets since reaching financial close on oil and gas production is predicated on the final product being presold to portfolio players or those seeking long term supply agreements. Projects bringing in temporary infrastructure like FSRUs are important in seeding the market for upstream development that benefit the domestic market that will further see additional infrastructure and skills development⁶¹.

African markets are often ranked lowest in competing with global markets primarily because Africa operates in a fragmented fashion that is inefficient and constrains economic growth⁶². Africa needs to capitalise on its recent oil and gas discoveries by leveraging on its comparative advantage in an integrated manner.

The scale and cost of investment required needs large markets which are anchored on a few customers, this is currently not the case in SADC despite the chronic power shortages. South Africa with its large energy market becomes pivotal in unlocking such investment because it is able to offer credible offtake. Regional integration therefore allows for potentially lower costs of energy as opposed to single sovereign markets. Integration offers a benefit for both the member importing and exporting nation as has been witnessed by the relationship between South Africa and Mozambique and the development of the Pande and Temane fields for mutual benefit. Integration will also offer a route to market for the delivery of LNG and associated products. It's important to assess integration for the benefits it will provide with what the sovereign requires⁶³.

Energy in the South African Political Economy

More than 90% of South Africa's electricity is generated from coal and it is anticipated to remain the main fuel source for power generation for the foreseeable future⁶⁴. The power sector presents an immediate source of secure and growing natural gas demand, with attractive margins at low-risk as existing OCGT plants are ready to convert to CCGT plants, in addition to new gas-based thermal plants at various stages of development.

The Risk Mitigation Independent Power Producer Procurement Programme (RMIPPPP) was launched in 2020 to alleviate the existing short-term electricity supply constraint due to unplanned maintenance and breakdowns. The RMIPPPP was technology agnostic and includes LNG as part of the Preferred Bidders' technology range and allows for 20-year Power Purchase Agreement (PPA) terms. The demand created by the RMIPPPP presents opportunity for short-term gas supply⁶⁵.

The 2,000MW Ministerial Determination for RMIPPPP, has two objectives, namely to procure new generation capacity:

- from a range of source technologies to address the electricity capacity supply gap as identified in the IRP2019; and
- to reduce the extensive utilisation of expensive diesel-based peaking open cycle gas turbine (OCGT) generators in the medium-to-long-term⁶⁶.

The DMRE envisaged the RMIPPPP programme to be based on the following qualifying criteria:

- Job creation, local content, preferential procurement, enterprise development, socio-economic development;
- The minimum dispatch commitment under the RMIPPPP is for a 50% load factor in a year;
- Provide different charge rates for a load factor of 100% and at 75%;
- Provision of ancillary services; and
- There is no take or pay, buyer will issue a dispatch notice⁶⁷.

The key benefits of this programme are not having to sign, take, or pay PPAs. However, one should be cognisant that without the certainty of take or pay contracts and without a 20-year PPA, the tariff could have easily increased threefold⁶⁸.

The RMIPPPP was designed to consider South Africa's precarious energy procurement, the need for energy security and to provide ancillary services that are required by the system operator to run a system that is going to place a heavy reliance on variable renewables. Furthermore, the RMIPPPP provided an opportunity by the DMRE to kickstart the gas to power programme through the ancillary services to be provided by the Karpowership. Finally, the RMIPPPP gave the energy transition the required impetus not only from an additional capacity perspective but a refocus on the system requirements, building new industries, post Covid-19 economic recovery and to link all of this with South Africa's own development goals⁶⁹.

The benefit of prioritising gas for power generation provides for large and concentrated volume of offtake, making the development of gas transmission infrastructure easier and more financially viable. Power generation represents one of the most economically attractive, low-risk and urgent demand sectors for natural gas supplies. The financial viability of the sector must be secured in order to incentivize supply and new investment⁷⁰.

As gas supply sources within the Region will be unable to fully meet growth in demand, especially in the short to medium term⁷¹, Liquefied Natural Gas (LNG) is a necessary option in catalysing development. Short term development becomes dependent upon importation of global LNG, requiring new port, storage, and regasification facilities in key locations. Strategic small-scale options are considered as part of 'the hub and spoke' model – whereby aggregating regional demand, and breaking bulk in strategic locations, may be implemented with small-scale LNG delivery mechanisms within the region⁷². This is specifically true around the SADC Oceanic Member States and SADC Mainland Member States through ship, road, and rail. This would provide the necessary aggregated volumes required for overall improvements in LNG importation economics⁷³.

This is at the centre of the regional impetus, and the drive for regional integration – through regional demand aggregation and leveraging of existing regional infrastructure and markets, suitable scale can be realised thereby improving gas price economics within the region. However, though aggregation is an important consideration, and certainly one that enhances the overall value proposition of a regional gas market, it is anchor demand that secures investment and development. The existing infrastructure and markets, across the value chain, can serve as the backbone for developing and growing a regional gas market.

Where domestic gas sources are available and competitively priced, utilising gas as a chemical feedstock can create value through:

- developing the agricultural and mining sector(s) through the production of fertilisers and explosives;
- supplementing fuel refinery blend stock through Gas to Liquids (GTL) diesel or methanol; and
- catalysing downstream petrochemicals industries.

Through existing, strengthened, and new regional transport and economic corridors, gas-based products can contribute to economic and social development and aid in the creation of value for both the suppliers and consumers within the region. This will require strengthening of existing institutions and capabilities within the region, ensuring relevant technical skills are present to deliver on the promise of gas-based industrialisation.

Eskom Challenges

Eskom experiences the following challenges related to its fleet:

- An ageing fleet;
- Lack of skilled staff to manage its infrastructure;
- High cost of funding due to high debt levels and a low investment grade rating;
- An increase in the deployment of grid tied variable renewable energy;
- An increase in rooftop solar installations;
- A significant decrease in grid tied demand during the day, mirroring the use of solar PV;
- A lack of flexibility in the coal fleet;
- A need for dispatchability and ramping for the evening peak; and
- Rising diesel costs due to global supply chain challenges⁷⁴.

Eskom's power plant fleet is performing at its worst level ever⁷⁵, and there appears to be nothing the utility can do about it until government speeds up power procurement. One of the best indicators of Eskom's overall plant performance, and the severity of load-shedding required to prevent a national blackout, is its Energy Availability Factor (EAF). This number illustrates the proportion of Eskom's fleet producing electricity relative to its maximum potential generating capacity⁷⁶.

Figure 1: Eskom Weekly EAF (2016-2022)⁷⁷

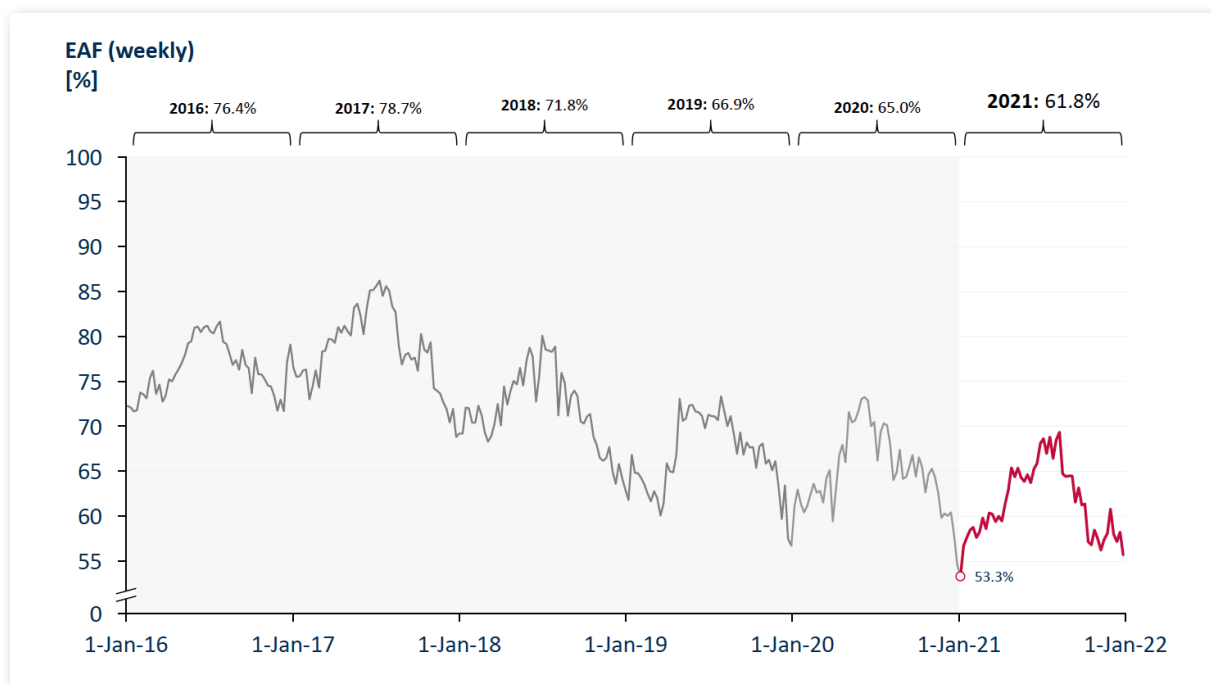
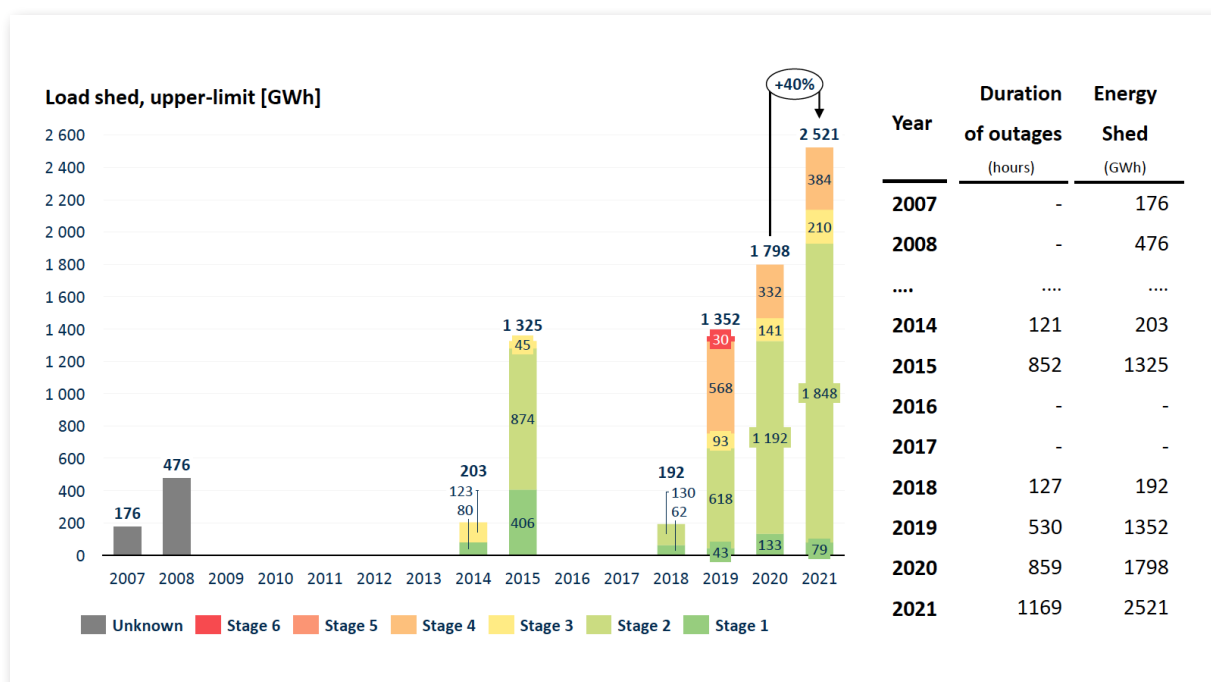


Figure 2 provides the total hours of loadshedding since 2007. In 2021, loadshedding occurred for 1 169 hours (~13% of the time) with an upper limit of 2 521 GWh relative to actual energy shed of 1 775 GWh.

- Intensive loadshedding was experienced in 2021 (40% increase compared to 2020 loadshedding upper limit)
- Loadshedding dominated by Stage 2 type loadshedding
- Loadshedding occurred for 13% of the hours in 2021

Figure 2: Loadshedding 2007 - 2021⁷⁸



The issues listed above necessitated the need for the RMIPPPP which was designed to provide additional capacity whilst maintaining the integrity of Eskom's fleet. This has not materialised and the EAF has consequently further deteriorated under the burden of a high Energy Utilisation Factor (EUF), a lack of reliability maintenance and a requirement for the coal fleet to load follow intermittent technologies.

Just Energy Transition

South Africa's energy mix is not premised on a single plan or policy. It emanated from the IRP, the Integrated Energy Plan, the Green Economy Accord, various government programmes and funds such as the Green Fund and the NDCs made by South Africa in Paris.

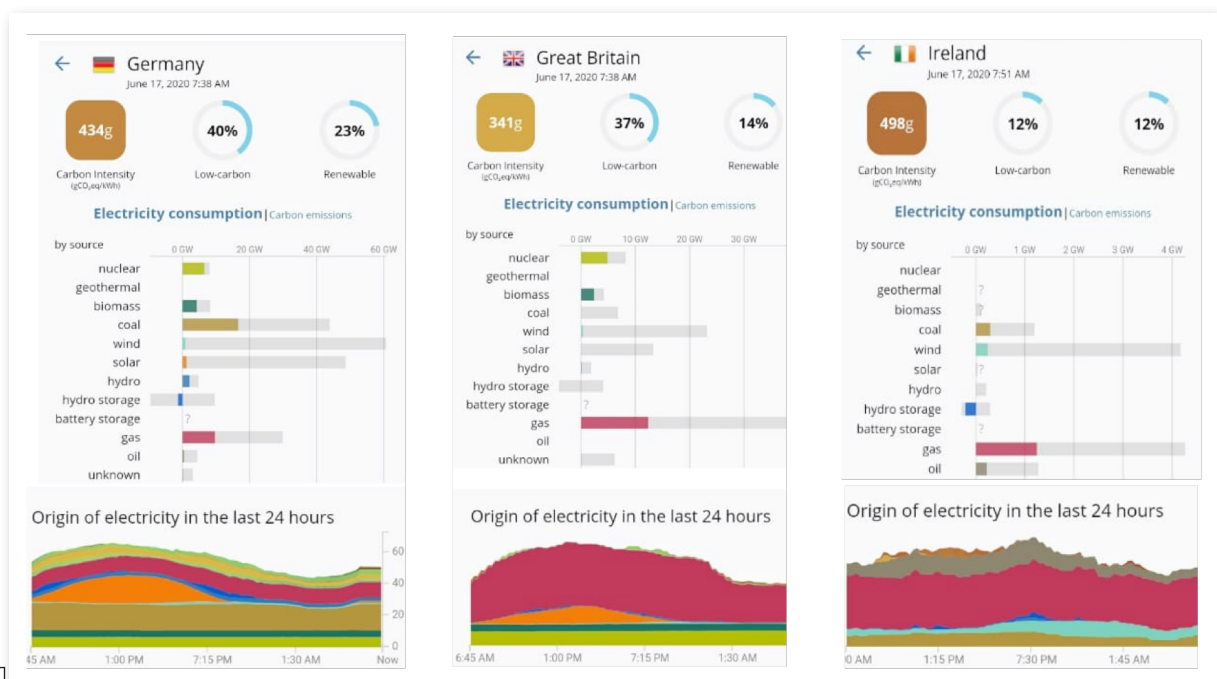
South Africa's transition follows on the heels of the renewable energy auction programme (the Renewable Energy Independent Power Producer Procurement Programme- REIPPPP) that was hailed as the best in the world⁷⁹. Since its inception the renewable energy auction programme has rightfully called for the energy mix to be less carbon intensive and move to more renewable sources – the source document, the IRP, called for a smoothed transition to renewable resources while recognising the importance of gas in this energy transition.

To integrate renewable capacity, Eskom needs roughly ZAR 180 billion to upgrade its transmission (ZAR 120 billion) and distribution (ZAR 60 billion) infrastructure, which it does not have. The three provinces with the best renewable energy potential – and where the majority of the IPP projects are to be built – are the Northern, Western, and Eastern Cape. Unfortunately, those are also the territories with the weakest grid infrastructure.

The balance was designed to transition South Africa's energy mix while recognising the limitations of the coal fleet and balancing that with renewables, gas and lesser extent batteries. World over, transitions are taking place with the increased use of gas for balancing the electricity generation system.

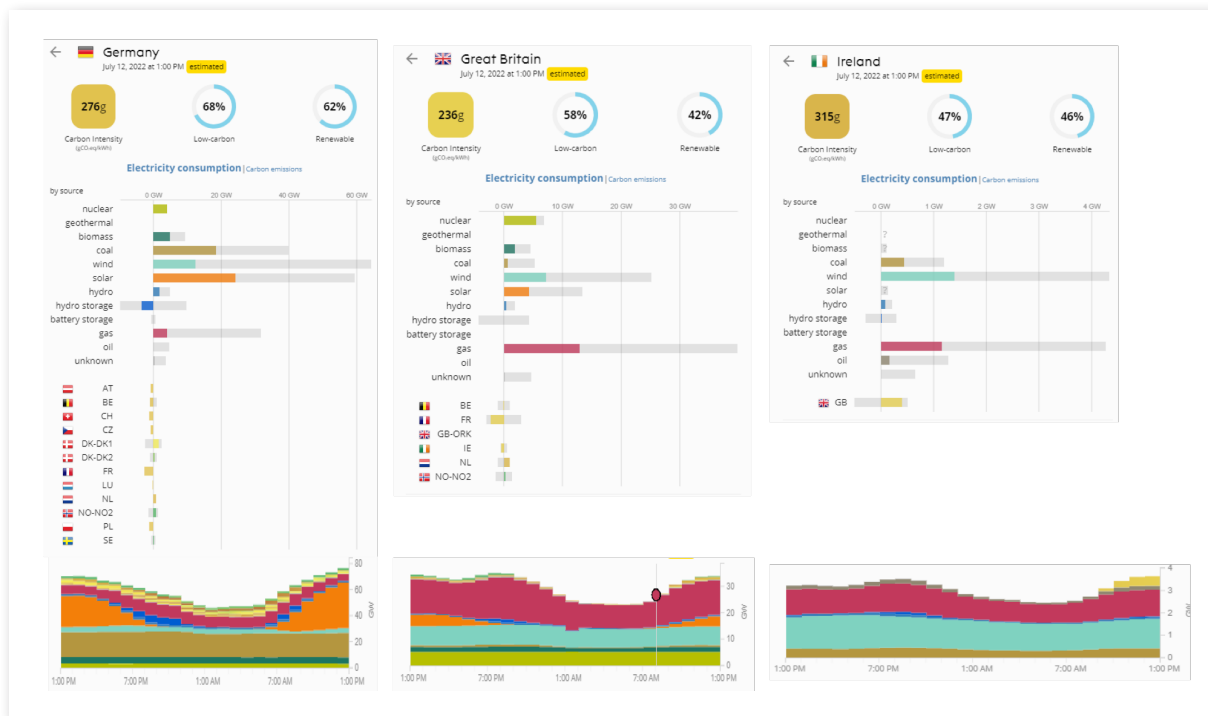
Figure 3 depicts the use of gas by Germany, Great Britain and Ireland in June 2020. Gas is preferred for nations undergoing an energy transition and who also have a growing variable renewable energy penetration. Figure 4 shows how 2 years later there is an ever-growing need for gas and it makes up a significant part of the energy mix.

Figure 3: Electricity Map June 17 2020 ⁸⁰



Compiled by:

Figure 4: Electricity Map July 12 2022⁸¹



The greyed-out bars on both figures 3 and 4 indicate the installed capacity of the technology and the colour indicates what was dispatched. In both instances we see the low dispatch of renewables necessitating the need for the dispatching of nuclear (Germany and Britain), coal and gas. The need for dispatchable technologies is an immutable fact given the variance of renewable energy that could threaten energy security. Governments worldwide are considering various technologies to ensure energy security, however in gas constrained Europe, Germany has decided to keep their nuclear plants opened and are even considering Powerships⁸².

It is also with these facts in mind that the EU decided in 2022 to classify nuclear and gas as green due to their importance to their energy mix, sustaining the economy and ensuring energy security. The unavailability of Russian gas has further bolstered these classifications as they now need to move to coal and fuel oil to meet their winter needs.

Role of Gas-to-Power in the South African Energy Mix

As South Africa increases its renewable energy penetration through further renewable bid windows, it is becoming apparent that dispatchable and flexible generation is required – which is found in gas and lesser extent battery technology. The role of gas is indisputable in the just energy transition as it provides additional dispatchable capacity at scale that enables the large exploitation of renewable resources.

The often-mentioned costs of gas and lack of infrastructure are the two main inhibitors to the mass adoption of gas infrastructure⁸³. It has become acceptable to quote the declining costs of renewables and their offering as the least cost of energy however this basis of comparison with dispatchable technology is factually incorrect according to a Meridian Economics Report titled “Resolving the Power Crisis Part A: Insights from 2021 - SA’s Worst Load Shedding Year So Far⁸⁴. The report argues that renewables offer the least cost to energy, would reduce loadshedding and provide secure baseload energy. The assertion is that an additional 5GW of wind and solar would have allowed Eskom to eliminate 96.5% of loadshedding in 2021⁸⁵. This is a spurious claim because the report does not make any

consideration or reference to assumptions about the storage capacity and climate conditions required to produce the optimal amount of electricity from the additional 5GW in renewables.

Least cost as a measure of comparison leaves out the cost of service from the tariff, thus inappropriate comparisons lead to inappropriate expectations. The cost of service includes frequency and voltage control, transmission, synchronous power, dispatched ramping, system balancing and last mile connections. In developing and maintaining energy systems, optimisation outcomes of energy modelling must not be confused with the technical requirements of operating an energy system⁸⁶. Moreover, these types of studies make factually inaccurate comparison between the cost of gas-to-power (which includes the total cost of evacuation and distribution) against the incomplete estimations about the cost of renewables.

In South Africa, continuous renewable bid windows have resulted in decreased tariffs over the last decade⁸⁷. The REIPPPP bidders bid on a per unit energy costs and not the cost of the actual service. The service costs are borne by Eskom with no compensation from the renewable IPPs. The closest the system costs have been reflected was with the RMIPPPP tariffs, which included energy, dispatchability, voltage stability and storage costs⁸⁸. It is for this reason that when technologies are modelled for the IRP2019, they include a multitude of parameters such as system and transmission constraints, load following, dispatch costs and energy costs amongst others.

Internationally, gas has been shown to be the most economical fuel for dispatchable generation. In Europe and North America, which have major natural gas networks, the gas needed to meet the dispatchable generation can be provided using gas from existing networks. For South Africa, with a minimal existing gas network and almost no local production, the source of gas to meet this need has not been addressed in the IRP planning process. However, South Africa through the powerships will get ancillary services which will ready the market for a gas programme and simultaneously support regional gas development and the use of indigenous gas which is cheaper. This is where South Africa will achieve its gas competitiveness.

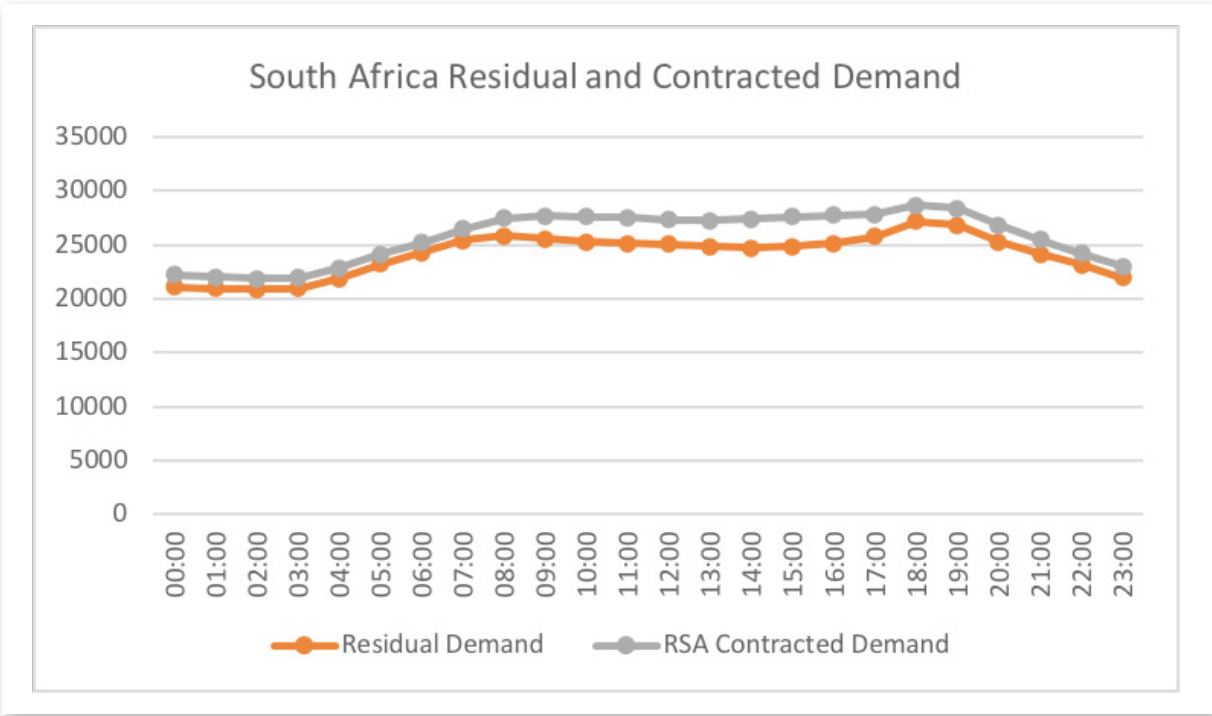
With the likely demand profile for electricity in South Africa uncertain, the amount of generation required will remain unknown. However, for portions of generation that will be provided by variable sources, provision must be made for supplying all the generation from dispatchable resources in the times where the variable sources do not provide the required energy⁸⁹. Energy technologies are classified as dispatchable or non-dispatchable. Both these technology groupings play an important role in meeting baseload and peaking demand and thereby ensuring security of supply. Non dispatchable technologies provide capacity and intermittent energy.

Dispatchable technologies such as gas, coal, nuclear, oil and even hydro play a pivotal role in ensuring security of supply globally. Dispatchable technologies provide the following benefits:

- Peak Capacity;
- Dispatched Ramping;
- Energy;
- Synchronous Power;
- System Strength;
- Frequency moderation; and
- Voltage stability⁹⁰.

When considering energy supply options, the continuous delivery of customer requirements needs to be achieved. Typically, the morning and evening peak as well as daytime load needs to be catered for with a sufficient reserve margin and peaking capacity. A typical daily load profile graph is presented in Figure 5 below, the lines indicate the continuous delivery of the customers' requirements. The orange line, residual demand, is the hourly average demand that needs to be supplied by all resources that can be dispatched by Eskom National Control. It includes Eskom generation, international imports, dispatchable IPPs and Interruption of Supply. The grey line indicates South Africa's contracted daily demand which includes residual demand as well as supply from all sources such as IPPs.

Figure 5: Typical Daily Load Profile (01/04/2022)

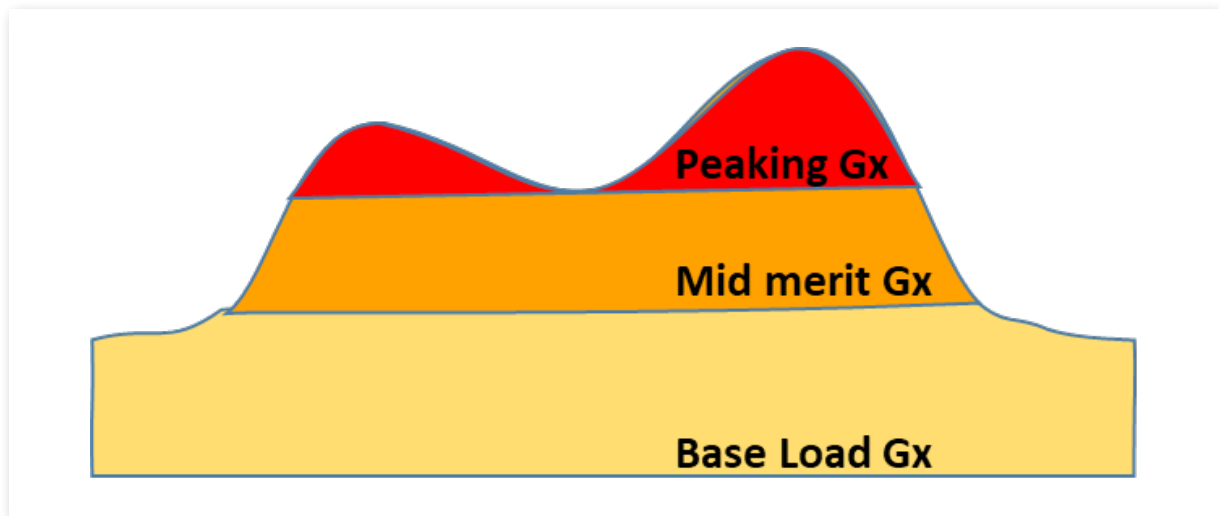


When comparing energy supply options, the 6 Cs need to be considered (LCOE cake):

- Cost;
- Convenience;
- Continuity;
- Consistency;
- Choice; and
- Consciousness⁹¹.

Dispatchable technologies typically meet these requirements and thus meet the needs of the customer. Generators must meet two criteria to ensure security of supply – dispatch and energy. The question then arises of what the optimal energy mix is to ensure security of supply. Figure 6 illustrates how a diversified grouping of technologies will ensure an optimal mix; however, people only want to focus on the levelised cost of energy (LCOE) element as the only determinant of technology selection. LCOE includes the initial capital, discount rate, as well as the costs of continuous operation, fuel, and maintenance over the life of the project. However, it does not address energy security. An optimal energy mix considers the needs of the system throughout the day, it is technology agnostic and considers grid limitations.

Figure 6: Optimal Energy Mix ⁹²



A system that needs to meet customer requirements cannot be based on dominant discrete services. This does not mean that non-dispatchable technologies are good or bad, they are just different. The graph below gives an illustration of the services provided by non-dispatchable technologies and their challenges in meeting system requirements.

Figure 7: Dominant Discrete Services

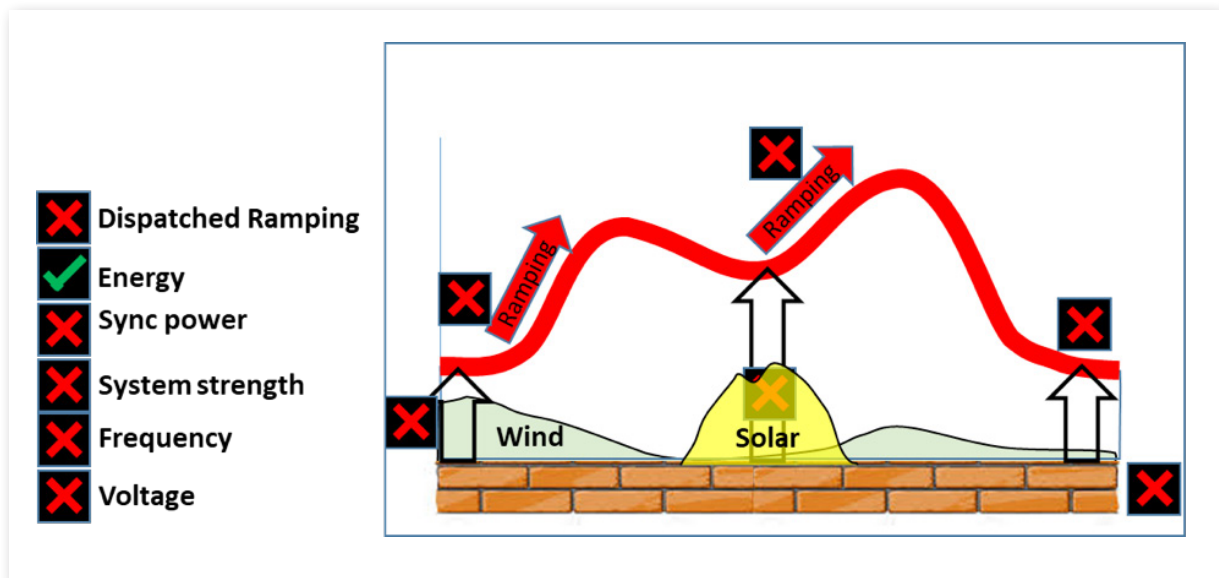
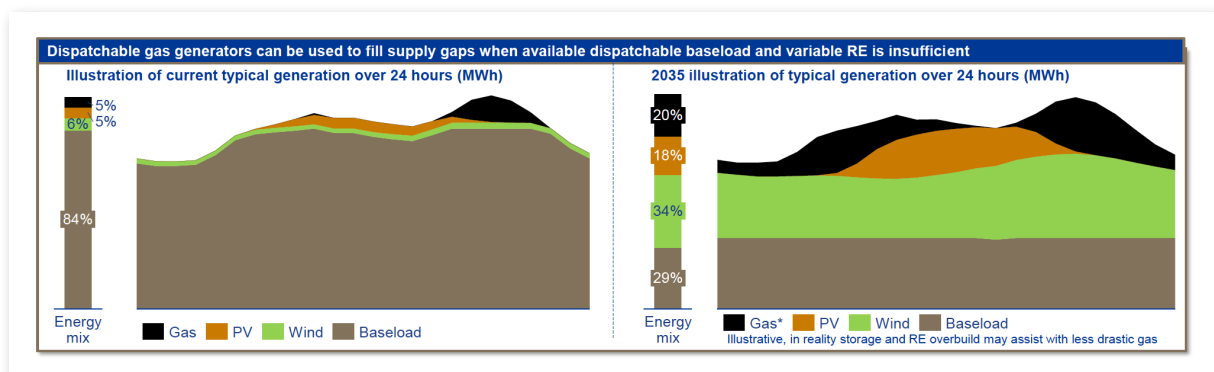


Figure 7 illustrates how wind and solar provide energy during their typical hours, albeit intermittently however they are not able to provide all the other requirements for a functional energy system. Figure 8 however looks at the benefits of a stacked product offering which considers both dispatchable and non-dispatchable technologies. In that instance, all the elements to ensure energy security are met.

Figure 5: Typical Daily Load Profile (01/04/2022)



This stacked product offering is premised on the following insights:

- Increasing levels of variable renewable energy (RE) in an energy system will result in the increased need for balancing resources to supply energy when non-dispatchable renewable energy is not available;
- Montecarlo simulations run by Eskom system modelling indicate a need for dispatchable power to achieve an operable system;
- Based on available technology, gas plants are viable solutions for grid balancing because of their relatively low capital costs and fast ramp rates;
- Commodity pricing, political risk and forex exposure present significant risks to gas investment - price and exchange rate volatility associated with gas (EU gas up >400% y-o-y); and
- While the technology developments and decreasing costs of alternative or supplementary resources (BESS) is promising - indigenous and regional gas development will mitigate the risks related to commodity pricing and forex⁹³.

Techno-economic and social considerations, as well as long term sustainability should guide technology selection decisions. The following considerations should be made when assessing technologies:

- Short Term: Lowest cost option with viable technology delivery mechanisms that enable energy security, accessibility, affordability, and sustainability, and
- Long Term: Mitigate risks associated with stranded assets.

Furthermore, investment in energy infrastructure creates value chains that have broader economic benefits, requiring an integrated and value chain approach to market development. These additional benefits and system needs should not be negated because of lowest cost options. These create additional problems for the system and are not reflective of the true cost of operations.

Existing Gas-to-Power Plants in South Africa

SASOL

Gas has been used by Sasol extensively in their gas to liquids (GTL) facility, where natural gas is converted to the world's cleanest diesel. The Pande and Temane gas fields were established decades ago. However, at the time these assets were stranded due to lack of markets and gas infrastructure in Mozambique, in addition to an ongoing war, until Sasol proposed the US\$1.2 billion natural gas project.

The project involves cleaning and processing natural gas from the Pande and Temane fields in a 120 MGJ/a central processing facility (CPF) in Temane and transmitting it via an 865km pipeline (capacity: 120 to 240 MGJ/a) to join Sasol's gas distribution network which starts at Secunda in South Africa.

The natural gas project contributed to the creation of a viable relationship between Mozambique and South Africa by initiating regulatory co-operation. Both governments negotiated a general Bi-lateral Agreement on Natural Gas Trade. The overall objective of the Agreement was to promote and facilitate gas trade between South Africa and Mozambique, and to set up a governing agreement for specific gas trade projects.

Key elements of the agreement included:

- Harmonisation of regulatory requirements;
- Taxes and customs duties; and
- Safety and environmental protection.

This single agreement catalysed a financially viable, friendly investment climate and the establishment of an upstream and midstream gas sector in Mozambique. Despite significant gas discoveries in the Rovuma basin offshore northern Mozambique, Sasol is still the only operator currently monetising gas in Mozambique⁹⁴. This over reliance on the depleting Pande Temane fields places Sasol and gas users in a precarious position as more gas will have to be found to support the countries gas needs.

MOSSGAS

The EM and satellite gas field which delivered the Moss gas Field Project is located 120km south-west of the Mossel Bay Complex in South Africa. The fields were discovered in 1984 and following years of development, first gas was produced in April 2000.

Like Sasol, PetroSA using the Fischer Tropsch method through a refinery converts natural, methane-rich gas into ultra-clean, low-sulphur, low-aromatic synthetic fuels and high value products. These fields have been the lifeblood of the Southern Cape for the last 20 years but have reached depletion. All the infrastructure will remain unused despite there being a need for more GTL production facilities and cleaner products.

BRULPADDA AND LUIPERD

The discovery of gas condensate fields during 2019 and 2020 are significant and they have the potential to expedite the government's much touted energy transformation. Whilst studies are still being conducted, early estimates are that the two gas fields may hold in excess of 1 billion barrels of gas condensate each. If these estimates are accurate, these discoveries would be huge for South Africa as a non-producing country, which is heavily reliant on oil and gas imports.

Oil and gas production would dramatically reduce South Africa's current reliance on imports, create employment opportunities in various sectors and provide an alternative to the current coal dominated energy sector. Currently, the majority of South Africa's gas demand is supplied by the Pande-Temane development in Mozambique. However, energy demand in the country has been growing at a much faster rate than can be supplied. This has necessitated a development of the country's energy pool and capacity, and if the early estimates of the recent Brulpadda and Luiperd discoveries are accurate, the gas produced from Brulpadda and Luiperd would be sufficient to meet more than half of the country's current energy demands⁹⁵.

Figure 9: Regional Gas Outlook



Figure 9 depicts the gas outlook for South Africa in the Northern and Southern Clusters. Gas key centres are spread around the coast in cities such as Saldanha, Gqeberha and Richards Bay. These cities are also primed to have FSRUs which coincidentally is where the powerships are planned for. However, apart from the ROMPCO, Lily and Sasol pipelines, these areas do not have natural gas infrastructure landed or floating⁹⁶. In response to this infrastructure shortage, Transnet has issued request for proposals (RFP) for the development of gas infrastructure in these ports⁹⁷. The powership proposal however has included ancillary infrastructure at the ports which is complimentary to the issued RFPs.

South Africa’s potential future gas demand will be driven by four key sectors with proven use cases for gas as a transition fuel or lower emission feedstock:

- **Power:** Use gas in gas-to-power (GTP) plants to enable a high penetration of renewable energy in the power system by providing the flexible capacity to manage the long-duration intermittency, which battery storage cannot currently address.
- **Synfuels:** Introduce additional gas to enable the phase-out of significantly more carbon-intensive coal feedstock in the production of liquid fuels.
- **Industry:** Phase out higher emitting coal, and to a lesser extent diesel, with additional gas as an energy source for industrial heat generation and other processes.
- **Transport:** Use gas as an alternative to diesel, albeit at a small scale, for heavy-duty (predominantly >15 tonne) commercial road transport in the short- to mid-term while alternative greener technologies mature and become economically viable⁹⁸.

Impact of Gas-to-Power to the JET in SA and SADC

The SADC region is undergoing an unprecedented energy transition. SADC Governments require energy security with a reserve margin to facilitate not just their own countries’ needs but regional energy trading as well. The SADC energy mix has primarily been renewable apart from Eskom and BPC, the region makes use of mostly hydro⁹⁹. SADC governments are now being forced to procure additional energy that will need to meet a zero-carbon future whilst simultaneously ensuring energy security and following economic cost principles.

From a supply perspective, the SADC landscape is starting to change. The first change was from the utilisation of Mozambique and Tanzania's gas in the 90s however due to recent exploration along the SADC coastline there are now additional finds in Tanzania, Mozambique, South Africa, Namibia, associated gas in Angola and opportunities for inland development as well¹⁰⁰. This unique opportunity allows SADC member states to pursue increased development and use of renewable technologies while using gas as a transition fuel and keep the grid stable.

Given the scale and nature of these reserves in the region it is anticipated that the main channel to monetise and unlock these reserves will be through export LNG¹⁰¹. This of course does not bode well with SADCs regional integration, AfCFTA, chronic power outages in the region and a lack of regional growth. Realising that the SADC region would probably be the biggest losers if this were to happen, SADC requested the development of the SADC Regional Gas Masterplan in order to monetise this gas for regional development, not just for gas to power but for all its intended purposes.

SADC is called upon to attain the UN SDG7 goal "to ensure access to affordable, reliable, sustainable, and modern energy for all thus increasing the share of renewable energy in the regions energy mix"¹⁰². While the region has some of the best solar and wind resource yields in the world¹⁰³, natural gas can complement these technologies by providing a dispatchable source of energy as a quick ramp up which will expedite the proliferation of renewable technologies in the region. To fully leverage its gas potential, the region needs an overhaul approach to energy and power planning. SADC member states often use their own indigenous resources to facilitate their energy planning, however sometimes this occurs at the expense the most economically viable options. This leads to sub optimal economic outcomes, increased tariffs for residents and unfavourable environmental outcomes as high carbon emitting technologies are utilised instead of gas or renewables.

According to the draft SADC Regional Gas Master Plan the following three-step process is required to drive greater regional cooperation and energy integration:

1. Gas producing countries should provide a clear estimate of the volumes, timing and price range of gas resources that will be available for domestic and regional consumption,
2. All countries in the region need to commit to including a consideration of regional resources in their energy planning and wherever possible to prioritise the least cost energy mix on this basis,
3. SADC countries would need to make firm commitments regarding the (GTP) volumes that they would be willing to offtake. While this may be done via a competitive bidding process, it should be done in a way that can underpin long term investment in power distribution and generation infrastructure in the region¹⁰⁴.

Should these requirements be met, the gas and power industry in SADC can unlock USD 17 billion in investment in power and gas distribution infrastructure¹⁰⁵. This investment can have the following benefits:

- Unlocking additional investment in renewable energy,
- Strengthening grid infrastructure in the region,
- Contributing to overall industrial competitiveness in the region by reducing the overall cost of power,
- Creating energy generation and distribution infrastructure in areas of the region that lack both, thus creating an opportunity to combat energy poverty with significant social and economic benefits, and
- Improving energy security through greater regional integration.

While large industrial processes, such as the production of methanol in fertilisers requires advantaged gas prices, the availability of cheaper gas can assist industries in the region in meeting the process heating requirements.

Based on the SADC regional Gas Master Plan, gas is envisioned “[A]s an important transitional fuel, building a gas economy through the various modes of utilisation can provide a viable path towards socio-economic development, job creation and poverty alleviation, while achieving the objectives of better regional (infrastructure and market) integration and cooperation in an environmentally sustainable manner. Due to the multitude of applications and uses; the proper harnessing of natural gas resources within the region could make a significant contribution towards the common goals of SADC Member States”¹⁰⁶.

RISKS AND OPPORTUNITIES FOR GAS-TO-POWER IN THE JUST TRANSITION



The JET from fossil fuels is inevitable influence of the global trends towards deepening sustainability. These trends started with the greater demands on firms and industrial operations beyond the historically narrow focus on profitability¹⁰⁷. The demands on firms have broadened the core principles of corporate governance and provided opportunities for both developed and developing economies to enhance sustainable development. Sustainable development is the integration of social, economic and environmental factors into planning, implementation and decision making so as to ensure that development serves present and future generations¹⁰⁸. This research takes polycentric approach to sustainable development and emphasises social, economic, environmental and political economy factors that are crucial for sustainable development around gas-to-power industry.

While most of the gas is currently supplied and distributed by Sasol, further development of a gas economy and infrastructure in South Africa will require significant planning and investment in the context of South Africa’s NDC commitments. The required infrastructure includes LNG import terminals, storage and regasification facilities, primary high-pressure gas transmission pipelines and secondary distribution pipeline networks¹⁰⁹. In order to ensure stronger regional integration and sustainable development the planning and implementation of gas-to-power infrastructure in the SADC region should follow a carefully considered collaborative and partnership approach. This has already been evidenced by the partnership between South Africa and Mozambique on the ROMPCO pipeline¹¹⁰. A similar approach will also serve to advance a just transition by supporting the creation of new economic activity around the gas-to-power value chain. The table below summarises a cost-benefit analysis of developing a sustainable gas-to-power industry in SADC.

Table 2: Cost-Benefit Analysis of Gas-to-Power in SADC

Approach/ Cost-Benefits	Gas-to-Power	JET	Renewables Reliant
Costs	Environmental – While gas is a cleaner energy source than oil and coal, it remains a source of GHG emission especially when the entire value chain is considered.	Extensive socio- economic impact that requires meaningful consultation of all key stakeholders.	Flexibility component in the form of new dispatchable power or storage required to ensure continued stability of the grid.
	High cost of developing and upgrading gas infrastructure.	Investment in reskilling and upskilling of staff employed in existing coal fired stations.	Investment required to resuscitate local manufacturing capacity for components and research and development in enhancing technologies.
	Gas price indexed to global oil prices, and as such exposed commodity price shocks.	Gradual and phased process that may require detailed industrialisation and beneficiation components to be built.	Constrained transmission capacity, particularly in the Northern Cape will require investment in capacity expansion an identification of new sites.
Benefits	Supports transition towards lower carbon future.	Existing connection and transmission infrastructure which reduces deployment cost construction time relative to new renewable plants.	Short time frame of 18 to 24 months in getting renewable power onstream.
	Strong demand for gas in South Africa and the SADC region.	Potential for creation of new local industries in the repurposing of old power stations. Allows for shift to community ownership models	Established technologies with well mapped resources.
	Collaboration supports regional integration, diversification of gas sources and ultimately regional energy security by developing already discovered resources.	Unlocks access to Just Energy Transition Partnership (JETP) funding and other financing opportunities.	Cost of technologies have declined over time with established financing framework.
	Established regulatory framework requiring minor amendments.	Preserves energy security but may be limited in term of scale and speed of implementation.	Can incorporate battery storage technologies to enhance security of supply.
	Gas as an alternative to diesel fuel with the conversion of existing/decommissioned plants.	Maintains livelihoods of affected individuals.	Established framework in the form of the REIPPPP.

The key stakeholders within the political economy of energy sector include the government through the Department of Mineral Resources and Energy (DMRE) the energy regulator NERSA, business, financiers and labour. The interests of these groupings are varied and often conflicting, and as such complex trade-offs and bargaining amongst these stakeholders is required. While there is well understood urgency and economic rationale for decarbonisation the energy sector, there is no single political solution to transform the sector and achieve sustainable development¹¹¹. The DMRE and its leadership has been blamed for lacking decisiveness and action in implementing the myriad of initiatives and policy decisions including the REIPPP, RMIPPPP and GMP¹¹². The difficulty in navigating and balancing of the different interests of the key stakeholders makes this a highly complex endeavour. While commitments have been made in terms of the NDCs and policy pronouncements made by government this has not been enough to accelerate the JET.

There have been technological advancements that have brought costs down for implementing some of the proposed solutions, governance and regulation have lagged behind¹¹³. The enormous structural challenges in south African have seen some stakeholders advocating for the shelving of some initiatives aimed at rapid decarbonisation and climate change mitigation at the expense of socioeconomic development¹¹⁴. The perceptions of weak institutional and human capabilities coupled with long unresolved issues around reliable power supply have called into question a sustainable development initiative that do not present a clear path towards resolution of the current challenges. Labour unions continue to fight against steps they perceive as being aimed towards the privatisation of Eskom, such as the unbundling of Eskom. Despite the challenges in getting buy-in on the unbundling, the process is required to enable the transition from fossil fuels as it will enable access to financing for transmission and allow the establishment of an ISMO. Businesses in the energy sector can be opposed to, or become allies for, a just transition. Companies in the fossil fuel business may fight to keep the status quo at the risk of foregoing future opportunities and creating stranded assets¹¹⁵.

Eskom remains in many ways the only entity capable of delivering a just transition. This notwithstanding, Eskom remains a prime target of corruption networks in similar fashion to state capture, particularly in the procurement space, with the entity continuing to report on irregular expenditure. In this regard acts of sabotage have been reported by Eskom management which may point to the extent of the networks¹¹⁶. To achieve sustainable development, the complexities require a strengthened public system, integrated with updated resource planning and state regulators that determine which energy resources are invested in and where, and are accountable to broader political economy¹¹⁷.

Competing NGO Interests and Funding Agendas

The energy space of replete with different narratives around the best way to solve South Africa's energy crisis and how to implement a just energy transition. However, it is important to understand the full context of the different narratives that emerge mostly from academics and consultants often funded by pressure groups and NGOs. Numerous reports and articles have been produced and debated that advocate the narrative that renewables are the only way forward and that they offer the quickest way out of the current energy crisis¹¹⁸. This view appears limited in its balancing the needs of the South African power system. In considering the advice based on such research, policy makers need to remain objective and consult widely as a way of balancing competing interests and countering narrow and divergent NGO interests. Yielding to such narrow private interests of NGOs and their funders risks a slippery slope towards the capture of the state – something no one

is keen to relive. While South Africa's commitments under the Paris Agreement and the NDCs are noted, the asset timelines, costs and lead times that include inclusion of gas as a transition fuel need to be considered in a manner that is just from an economic, social and environmental perspective. Even in some of the most advanced economies gas remains an integral part of base-load energy. Given the current technology, the most advanced economies in the world still rely heavily on gas – especially in Europe, North America and South-East Asia¹¹⁹. The idea that South Africa can chart a different part that is solely reliant on renewable energy does not make sense based on the empirical facts. Yes, South African may increase its reliance on renewable energy sources such as wind and solar PV, due to our geography and climate, but there are still major constraints to relying on renewables solely for base-load energy.

The key economic consideration for gas-to-power is ensure the sustainability of gas as an energy source given the requirements of the South African economy. South Africa's IRP2019, which is regarded as outdated, provides limited details in terms of the sources of gas supply and required supporting infrastructure¹²⁰. Government has identified the development of Coega LNG Hub and/or Richards Bay LNG Hub in partnership with Transnet, which will facilitate the importation of LNG to South Africa¹²¹. To increase the access to gas and support the gas-to-power industry, the government of South Africa through the Central Energy Fund and its subsidiaries looks to strengthen the downstream gas market by increasing the utilisation of some of its underutilised assets including:

- Repurposing of aging coal fired power plants with 5,000MW planned for decommissioning by 2024 (and another 5,000MW by 2030);
- Planned 3,000MW Gas Power Plant which will require connection loop to the pipeline network;
- Current OCGTs which can be switched from diesel to Gas;
- Develop industrial/commercial markets with limited access supply from Sasol;
- Collaboration with Transnet, which operates the Lilly Gas Pipeline which connects Secunda and Durban and presents opportunity to connect the pipeline to Coega LNG terminal;
- Development of a Gas Trading capability, focusing in the Short-Medium Term on Mozambican gas supply and in the Long Term on Southern African gas supply.

The national power utility Eskom remains under significant financial pressures and operational challenges. This has resulted in the delay of major projects while the breakdowns within its aging coal fleet have resulted in long running rolling blackouts. The economic impact caused by the impact of loadshedding, and a lack of clear policy co-ordination will further slow the achievement of a just energy transition, especially as Eskom battles to implement the repurposing of its old power stations such as the Komati Power Station.

Roff et al argue that if South Africa installed 5GW of renewable capacity, it would have reduced loadshedding significantly in 2021¹²². This is incorrect for the following reasons:

- Renewables are variable and the average capacity factor given (31.57%) is unrealistic and is premised on renewable plants not being intermittent¹²³;
- Providing an average capacity factor for solar and wind is misguided as solar tends to perform at even half the average provided and only the efficient wind turbines in the "wind belt" reach capacity factors of above 35%¹²⁴;
- New plants are not going to be located in the Northern or Western Cape so will invariably differ from existing plants – they will have lower yields and even lower capacity factors¹²⁵; and
- The modelling was premised on matching loadshedding hours with the renewable availability – this is incorrect as most loadshedding occurs at peak and only CSP and wind are sometimes available at peak.

Furthermore, the Meridian report was funded by George Soros' Open Society Foundation and the European Climate Foundation. Additional funding was also received from the UK's Children Investment Fund whose objectives are to:

- build the evidence, assets and credible spokespeople needed to influence the elite debate around gas investments;
- vilify gas and develop a study on a cost comparison between existing diesel and new gas for power plants;
- a study which shows that gas is uneconomic and unrequired;
- a study on the jobs and just transition benefits of renewable energy; and
- a digital campaign aimed at tarnishing gas in South Africa¹²⁶.

Finally, Meridian acknowledges that “even with large amounts of renewable capacity, there would still be a few remaining hours of load shedding” report only considers costs and does not call for new capacity to close this gap, hence their analysis calls for the increased use of diesel. Loadshedding in 2022 alone has been detrimental for the country and has been exacerbated by this very thinking that calls for continued use of diesel in a world with diesel constraints, lack of refining capacity and production cuts by OPEC+. All of these studies and adverse positions by influential people in the energy sector may have the nefarious undertones of taking over energy planning in South Africa for private and lobbied benefit. This is proving detrimental for investment in South Africa particularly energy investments¹²⁷.

Renewables Lobby and Prejudicing National Development

The influence of renewables lobby groups is a significant force pushing power system planning towards full adoption of renewables as only additional new infrastructure projects going forward. However, the lobby groups often fail to provide a comprehensive solution that address both the JET and the vast energy poverty in South Africa and more so across the rest of Africa¹²⁸. To achieve sustainable national development South African should consider its energy reserves and aim to transition in a manner that is affordable for their economies. It is noted however that lobby groups have been successful to a great extent in persuading financiers to start reducing funding available to new fossil fuelled power generation, South Africa and other similarly affected developing nations can short circuit this by accessing funding from their own development finance institutions such as the New Development Bank in groupings such as BRICS. Declining demand of fossil fuels by developed nations over the long term will further close the market and opportunity for Africa to invest in, extract and sell fossil fuels¹²⁹. The impact of shutting off these industries is potentially underestimated should this be implemented with the envisaged speed. The realistic scenario is perhaps one whereby the transition is slower than predicted if it is to the economically viable, environmentally coherent, technically feasible and socially just. Sustainable national development will thus require significant increase in energy sector investment supported by robust local policies.

While some of the arguments put forward by renewables lobby groups particularly around the declining cost of renewables are undeniable, the full picture needs to be considered in the context of the country's climate change commitments. The arguments that renewables offer the least cost to energy is inaccurate since the models do not estimate the true cost of transitioning from fossil fuels to renewables. The study also makes factually inaccurate comparison between the cost of gas-to-power (which includes the total cost of evacuation and distribution) against the incomplete estimations about the cost of renewables. Very often the arguments only consider the unit costs associated with the investment costs for certain level of generation capacity which excludes the cost of evacuating and distributing that power. The renewables lobby also does not make an accurate estimate of the costs associated with the lead-times required to get renewables on the grid. This cost is also in addition to the ongoing cost of loadshedding during the construction phase of renewable projects.

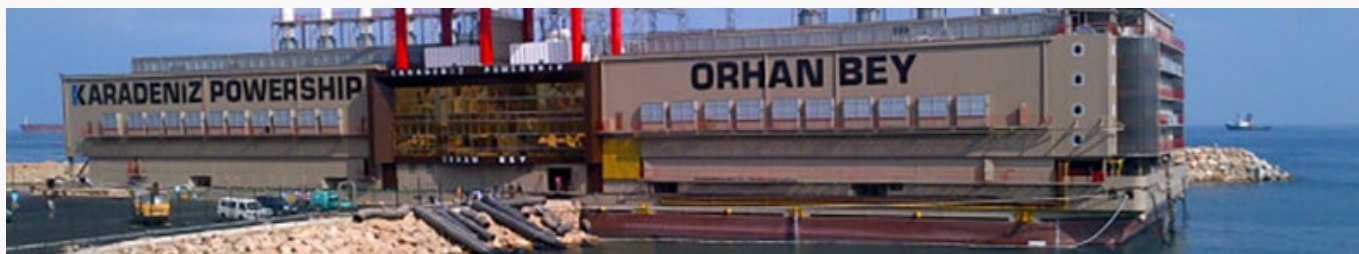
Nevertheless, a key shortcoming of the current NDCs is that it appears too ambitious in the context of South Africa's challenges and does not include comprehensive strategies for the labour market, nor engagement with business, trade unions and other stakeholders¹³⁰. As such, incorporating gas to power projects in line with an integrated resource plan can create economic livelihoods for local communities but requires development of comprehensive social plans that are inclusive of all key stakeholders and can address issues that include spatial planning and access to services.

Influence of Geopolitics and Finance for Development

Geopolitical issues significantly influence the financing available to South Africa to implement the JET. With South Africa being the largest emitter of GHG on the African continent, it has naturally attracted interest from the developed countries for assistance. The South African government forged the Just Energy Transition Partnership (JETP) jointly with the governments of the United Kingdom, the United States, France, Germany and the European Union. The partner governments have jointly pledged USD 8.5 billion at COP26 in November 2021 towards the financing of first phase of the transition process over the next three to five years aimed¹³¹ at preventing up to 1,5 gigatonnes of emissions over the next 20 years. Naturally the funding comes with stringent conditions with limited application likely towards renewable energy investments exclusively. This presents a challenge in that it does not consider South African's own envisaged energy mix as per the IRP2019 and pathway towards decarbonisation. In this regards a JETP investment plan that looks to unlock the proposed funding and is expected to be signed off during the COP27 climate takes in Egypt in November 2022¹³². The Russia-Ukraine conflict has seen significant global disruption that has resulted in many European countries to implement short term measures to improve energy security which has in turn resulted in global price shocks and an energy security crisis¹³³. South African coal exporters and regional gas producers have been beneficiaries of a surge in the demand for coal and LNG. However, in the medium to long term this is likely to drive an increase in global investment in cleaner energy sources, natural gas is one of those sources¹³⁴.

Ensuring that decarbonisation remains viable and attractive for investors will likely remain a fundamental challenge as the era of the 20-year PPAs and government guarantees is poised to come to an end. This shift is expected to emerge with the liberalisation of the energy sector and increase in commercial offtakes and will see private investors having to take more business risk, which will in turn result in higher financing costs for JET projects. Another concern in the South African context is the availability of cheap land and labour. Renewable energy projects have already faced contestations from unions and current Eskom employees who would need to be redeployed into this sector will hardly be willing to give up relatively high wages to join a sector hostile to organized labour. A disaggregated energy market will also require significant investment in the upgrade and expansion of transmission infrastructure by Eskom at an estimated cost of USD10 billion (ZAR180 billion)¹³⁵. Furthermore, the disaggregation will likely result in a fragmentation or tiering of the market with high tier customers shifting to private producers of electricity and Eskom remaining with lower quality customers potentially affecting the Eskom's ability to access and cost of financing.

The Implementation the JET hinges on the ability of South Africa to unlock the USD 8.5 billion¹³⁶. This will require a co-ordination of policy and the activities of the different stakeholders in the development of feasible investment plans and implementation of projects. This notwithstanding the issues of corruption and maladministration continue to pose a threat to the successful rollout of initiatives aimed at achieving the JET and as such will require careful attention to root out.



In South Africa the question of a JET is made more complex by the history of the country and characteristics of an economy built on extractive industries and decades of segregated spatial planning. Coal, which happens to be an abundant energy source in South Africa remains the main fuel used in power generation with about 77% of all electricity produced generated from coal, making South Africa the largest emitter of greenhouse gases (GHG) in Africa¹³⁷. The activities around its extraction and beneficiation support the livelihoods of many across the country¹³⁸. The energy sector alone, contributes about 80% towards total GHG emissions of which 50% are from electricity generation and liquid fuel production alone¹³⁹. Gas has a role to play in achieving this transition as it is considered a cleaner energy source.

Coal mining activities which are concentrated in the Mpumalanga Province of South Africa with local economies in towns such as Middelburg, Hendrin, Pullenhop and Komati largely reliant on activities around coal mining. In addition to the issue of emissions produced in the burning of coal for electricity generation and production of synthetic fuels, some of the negative externalities of coal are around the transportation of coal on national roads which has been a major source of road traffic accidents, air and land pollution, together with the associated health implications for local communities, with many community members suffering from respiratory illnesses¹⁴⁰. Gas which is transported via pipeline is generally a safer option while the location of gas plants mostly along the coast reduced transportation risks. The risks associated with coal procurement and overall energy security risks have heightened with the state capture phenomenon. In this regard the abandonment of some of the historical cost-plus contracts following the closure of some tied mines wherein coal was transported via conveyer belt systems. This shift was driven by political intervention and Eskom's financial crisis. The utility has struggled to invest in new mines which has resulted in volumes from these mines shrinking. Eskom now purchases coal from small producers (including some unqualified) at a significantly higher price with additional costs borne for transport and poor-quality coal which has resulted in increased boiler tube leaks¹⁴¹. Fundamentally however, this has made coal less competitive in relation to other forms of power generation such as natural gas¹⁴².

Why Gas-to-Power Supports Sustainable Development

Despite underinvestment in oil exploration activities in recent years, gas discoveries on the African continent have increased with proven natural gas reserves seeing a significant increase of 37% to 625.6 trillion cubic feet (tcf) in 2022¹⁴³. An estimated 175 tcf of proven gas reserves across Africa have not been able to proceed to production¹⁴⁴. Gas consumption and gas pipeline exports have increased by 7.1% and 45% respectively which demonstrates to potential for gas to sustain economic developments on the journey towards decarbonisation. In the South African context these discoveries including its own Luiperd-Brulpadda gas condensate discovery, expected to produce its first gas by 2027 present further opportunities for regional integration as well as diversification benefits in terms of the energy mix. The key positive for gas to power remains in its ability to provide flexibility to the power system and complement renewable energy sources as the JET is implemented. Gas to power also presents significant job creation opportunities both upstream and downstream. Gas to power is an important cog that addresses the economic social and environmental considerations within the South African and region context wherein the impending decommissioning of aging coal plants needs to be balanced with the need to solve South Africa's energy crisis with the least possible disruption the livelihoods of the otherwise affected parties.

CONCLUSION



It remains clear the NDCs adopted by South Africa have resulted in rapid proposition of domestic policies and climate change laws. These ambitious transition goals lack the mechanisms to provide the right incentives to the different stakeholders and may potentially have unintended consequences. Given the current high battery costs, which can act as an alternative to gas in providing flexibility to renewables South Africa should also continue to explore a suite of options to supply flexibility to the grid. As such, while gas-to-power may no longer be a competitive supply option when battery storage can be provided at scale and cost reductions take place, it remains the most viable transition energy source that provides power system flexibility. Modelling studies indicate that the contribution to electricity from gas is low, 10–15% of electricity demand in 2050. There are no studies we have come across that have excluded gas entirely from the long-term future of the power sector¹⁴⁵. Overall, while the future of gas to power remains somewhat uncertain due to lack of policy coordination, and it is estimated there is an additional USD 31.2 billion of value at risk in South Africa based upon the decisions to accelerate the retirement of aging coal assets¹⁴⁶. The level of support available from financiers and development partners, both internationally and locally will be critical to the role of gas-to-power for sustainable development in South Africa and SADC region.

Gas-to-Power Projects and Sustainable Development

Ultimately, the JET can only be achieved if countries are committed to achieving net zero within a specific timeframe. This means the results can only be geared to the extent of each country and every individual's ability. Governments and policy-makers need to balance a myriad of competing interests and coordinate them around the national objective of sustainable development. In the case of South Africa, government has provided some policy direction through legislations such as the IRP2019, REIPP and the JET Framework. Through these policies and frameworks, the South African government identifies a role for gas-to-power in transition to net zero. The South African Gas Master Plan Base Case Report needs to be developed further and integrated in the various levels of national regulations. The gas-to-power projects are understood as having a potential to play a role in the transition to net zero as well as the broader national development of infrastructure.

The South African gas sector development requires steady demand in order to provide a financial basis for development of crucial infrastructure needed to bridge the structural gaps in the market. Gas-power-power projects are identified as one the means to provide this reliable demand for gas in order to incentivise infrastructure investment and further development of the sector. This would lead to the development of further opportunities across the LNG and LPG value-chain and provide South Africans with a cleaner alternative energy source. Although gas-to-power may have a limited role to play in the just transition to net zero, the diversification of energy demand away from fossil fuels such as fire wood and paraffin will have a lasting impact. Providing the alternative of natural gas or any other renewable energy option will therefore have an invaluable role and lasting impact towards energy security and environmental conservation.

Whilst environmental activism prioritises the state of the environment, this view is hardly a balanced one against the backdrop of South Africa's JET objectives geared toward a gradual shift from more carbon intensive energy sources to renewable energy systems with gas playing the role of a transitional fuel. No consideration is given to internalise current social and economic realities in the country. Governments should be able to protect its society along with its environment.

The Karpowership projects, despite their perceived shortcomings, are the quickest way to provide South Africa with the much-needed dispatchable power (all technologies have shortcomings). This dispatchable power provides the flexibility to renewables that is necessary to ensure South Africa's short to medium term energy security. Some of the shortcomings highlighted by critics besides the perceived gaps on the environmental processes include that the 20-year PPA's are too long for an emergency power solution wherein the powerships will leave at some date in the future. This is a rather simplistic view that does not account for the positive externalities which include supporting the growth of the local and regional gas industry in the medium to long term, augmentation to the transmission infrastructure and supporting feasible JET implementation. For South Africa this not the immediate trade-off that is on the table given our need to expeditiously resolve the intensifying energy crisis, which needs a solution now and not a decade in the future. While gas does provide a peaking solution on a limited scale, its role in supporting energy security by complementing the power system as a whole in South Africa cannot be overstated.



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PESA

FOR MORE INFORMATION



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COMPANY PROFILE

PESA promotes regional integration in SADC and provides research on the political economy of development in Africa. **PESA** conducts political economy research and analysis, monitors and promotes regional integration in SADC, and facilitates policy dialogues on issues related to the political economy of development in Africa.

POLITICAL ECONOMY:

We provide accurate and balanced analysis of the political economy in each SADC country and a selection of other African countries.

For more information visit:
<https://politicaleconomy.org.za/countries/>



REGIONAL INTEGRATION:

We monitor the status of regional integration and the promotion of sustainable regional development in SADC.

For more information visit:
<https://politicaleconomy.org.za/region/>



POLICY DIALOGUES:

We facilitate public dialogues on economic policy and political developments in SADC and Africa broadly.

For more information visit:
<https://politicaleconomy.org.za/policy/>



CORPORATE GOVERNANCE

The PESA Board of Directors provides oversight over all operations and strategic matters. The PESA Board provides strategic oversight and guidance in matters related to political, economic and development issues on the continent. The PESA Executive Council consists of Executive Directors who are in-charge of operation and executing the mandates in their respective regions.



Mr Siyaduma Biniza
 Chairperson
 & Chief Executive



Mr Sinethemba Ntezo,
 CA(SA)
 Financial Director



Mr Terence Mbangwa
 Company Secretary



Ms Michelle Livie
 NED: Development



Ms Mpumi Tshabalala
 NED: Legal



Ms Hildabertha Kundu
 NED: Global Partnerships



Ms Zukiswa Mqolomba
 NED: Local Partnerships

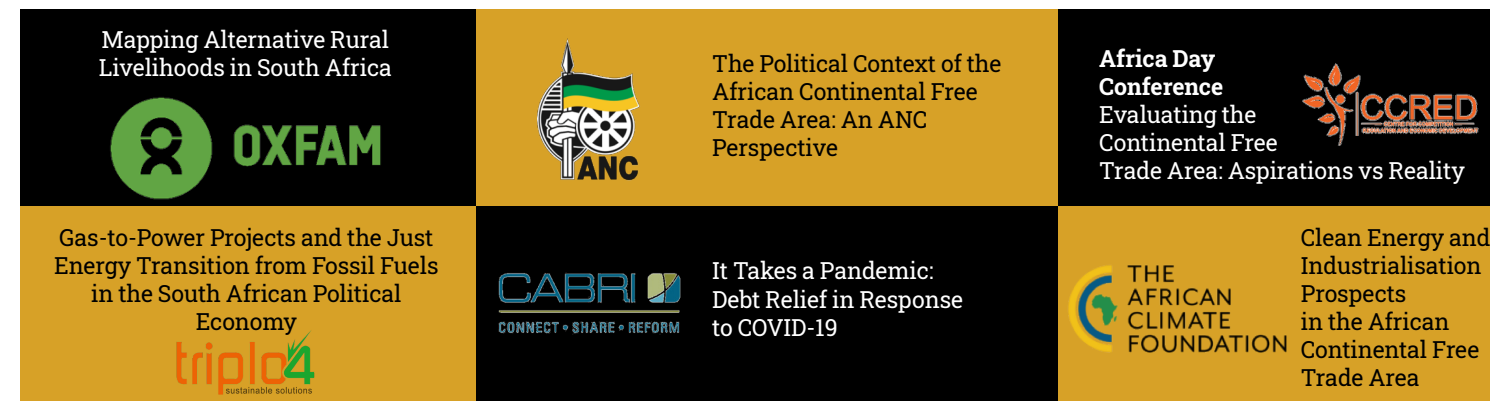


Mr Serge Hadisi
 SVP: Francophone Africa



Dr Ken Kalala Ndalamba
 SVP: Lusophone Africa

PESA CLIENTS AND PROJECTS



Mr Siyaduma Biniza

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Siyaduma "Siya" Biniza is the Executive Director at PESA, an independent think-tank promoting regional integration in SADC and providing research on the political economy of development in Africa. Siya is an Economist by training and specialises in applied development economics. His work focuses on international finance, public policy, the political economy of development and regional integration in Africa. Siya has served in a variety of senior leadership positions in the South African government and the NGO sector.

ACADEMIC QUALIFICATIONS

University of the Witwatersrand – Johannesburg, South Africa

M.Com. in Development Theory and Policy

2015

B.Com. (Hon.) in Development Theory and Policy

2013

University of Cape Town – Cape Town, South Africa

B.Soc.Sc. (PPE) in Politics, Philosophy and Economics

2012

DIRECTORSHIPS AND TRUSTEESHIP

Political Economy Southern Africa NPC – Founder & Director

Apr 2015 – Present

Executive Director

7 years 7 months

As Executive Director, Siya focuses on extending the impact of PESA's work. He challenges the organisation to broaden its reputation of accessible political economy analysis and contribution towards policy solutions that promote SADC regional integration and sustainable development in Africa. Siya provides executive and strategic leadership for PESA's daily operations; conceptualising, costing and managing implementation of all PESA projects. PESA's central activities are political economy research and analysis, regional integration monitoring and promotion, and dialogue facilitation on relevant political economy issues.

Ubuntunomics (Pty) Ltd – Co-Founder & Director

Jan 2021 – Present

Executive Director

1 year 10 months

Ubuntunomics is a sustainability consultancy focused on understanding the political economy of development and policy-making in Africa. Our mission is to place sustainability at the core of economic development. We facilitate shared valued amongst stakeholders to enable sustainable development and progressive policy-making in Africa.

Independent Development Trust – Trustee & Deputy Chairperson of the Board

Nov 2016 – Apr 2021

Board of Trustees

4 years 6 months

The Independent Development Trust (IDT) is a Schedule 2 state-owned entity which manages the implementation and delivery of social infrastructure programmes on behalf of the South African Government. The Board of Trustees supports Executive Management with the implementation of social infrastructure programmes through strategic leadership as the IDT undergoes internal transformation involving financial and business recovery. Leading the organisational transformation process as Deputy Chairperson of Board of Trustees. Trust Registration: IT 669/91(T).

Caswill CC – Founding Chairperson

Sep 2015 – May 2018

Board of Trustees

2 years 8 months

Providing leadership to the Caswill Body Corporate as it transitions from a newly formed sectional title scheme under the Sectional Titles Act into a sustainable entity. Supporting and sustaining the operations at Caswill, providing governance leadership under the Management Rules and the Conduct Rules of the scheme, and strategic fundraising support.

Rethink Africa NPC – Financial Director

Jun 2013 – Dec 2016

Co-Founder & Chief Financial Officer

3 years 6 months

Rethink Africa is a pan-African social enterprise focused on development. The Financial Director manages and facilitates the balancing of all Rethink Africa accounts and financial obligations. Managing the annual budget, financial reporting and business development. Conceptualising, fundraising and implementation of projects under the Knowledge Exchange initiative of Rethink Africa.

WORK EXPERIENCE

National Treasury of South Africa – Deputy Director: SACU Sep 2015 – Jan 2017
International and Regional Economic Policy Division 1 years 4 months

National Treasury is responsible for managing the Republic of South Africa's national government finances. The Deputy Director formulates National Treasury's position on regional integration and the role of the Southern African Customs Union (SACU) therein. Analysing the extent of existing institutional arrangements, available financing, and informing National Treasury's stance for assistance towards attain regional integration. Assisting with negotiations within SACU and bilaterally with SACU countries. Administering the bilateral and multilateral obligations of the SACU Agreement in conjunction with the South African Reserve Bank and other government departments.

National Treasury of South Africa – Economist: Secondary Sector Nov 2014 – Oct 2015
Economic Policy Division 11 months

The Economist produces research and analysis of sector trends and identifies the required policy stance for the manufacturing industry and the secondary sector. Representing National Treasury on the Industrial Participation Control Committee in conjunction with the Department of Trade and Industry, Department of Defence and other government agencies. Supporting National Treasury in liaising and building effective working relationships with the multilateral and other stakeholders. Facilitating and coordinating the Staff Policy Seminar Series.

University of the Witwatersrand – Special Projects Administrator Jan – Sep 2014
Strategic Planning Division 9 months

The Strategic Planning Division formulates and manages the development and implementation of the University of the Witwatersrand strategic vision and mission by administering the Strategic Planning and Resource Allocation Committee (SPARC) Fund. The Special Projects Administrator conducts strategic research, reports on implementation and progress, and coordinates events and workshops for monitoring and evaluating all SPARC-funded projects. Managing projects, compiling PowerPoint presentations, and internal public relations for the Division. Developing and compiling annual strategic projects' reports, operational plans and annual performance reviews for all SPARC-funded projects.

University of Cape Town – Computer Lab Assistant Sep 2008 – Apr 2012
Information and Communication Technology Services (ICTS) 3 years 7 months

ICTS is responsible for the strategy, planning, management and provision of all core ICT services and infrastructure at UCT campuses. The Computer Lab Assistant provides full end-user support and training to staff members, postgraduates and third parties; and limited support is provided to undergraduate students at the various UCT Student Learning Centres.

University of Cape Town – Front Desk Assistant Sep 2008 – Sep 2009
Smuts Hall Residence 1 year

The Front Desk Assistant welcomes all guests and is responsible with managing access to the residence. Answering all incoming calls and coordinating with the Residence Management team on maintenance and disaster risk management.

CONSULTANCIES AND PUBLICATIONS

Biniza, S. & Nkhonjera, M. 2022. '**Energy Transitions, Regional Electricity Markets and Industrialisation Prospects in Africa**', in [Energy Access and Transitions](#), African Climate Foundation: Cape Town. Available At: <https://africanclimatefoundation.org/>.

Biniza, S. 2021. '**It Takes a Pandemic: Debt Relief in Response to COVID-19**', in [COVID-19 Africa Public Finance Response Monitor](#), P. Krause & D. Serebro (eds.), CABRI Secretariat: Centurion. Available At: <https://www.cabri-sbo.org/>.

Biniza, S. 2020. '**Macroeconomic Trends and Policy Context: Creating a Conducive Policy Environment for BEE**', in [Beyond Tenderpreneurship: Rethinking Black Business and Economic Empowerment](#), A. Cawe & K. Mabasa (eds.), MISTRA: Johannesburg. Available At: <https://mistra.org.za/>.

Landell-Mills Ltd – Technical Advisor: Finance and Financial Training Jun 2018 – May 2021
SADC Regional Vulnerability Assessment and Analysis Programme 3 years

Landell-Mills (LM) is an international development consulting company providing research and management services headquartered in Ireland. Contracted by LM for the regional programme jointly funded by the Swiss Agency for Development and Cooperation and the UK Department for International Development, aimed at supporting institutionalisation and sustainability of vulnerability analysis and assessment systems and processes in SADC.

Xesibe Holdings (Pty) Ltd – Consultant Jun 2018 – Aug 2018
Budget Analysis for Advocacy: Alfred Nzo District Municipality 3 months

Xesibe Holdings (XH) is a socially-grounded advisory, content development and facilitation firm providing unique perspective and solutions-based development consulting services. Contracted by XH for the budget analysis research funded by Oxfam South Africa, which intended to provide an analysis of the municipal budget for advocacy purposes. Conducted budget analysis of Alfred Nzo District Municipality in the Eastern Cape, South Africa.

Xesibe Holdings (Pty) Ltd – Consultant Oct 2017 – Dec 2017
Revenue Situational Analysis of Chris Hani District 3 months

Contracted by XH for the revenue analysis research funded by the Deutsche Gesellschaft für Internationale Zusammenarbeit which intended to provide a comprehensive study of the entire revenue environment and recommend ways to improve revenue management and resource mobilisation for the Chris Hani District Municipality and Enoch Mjijima Local Municipality in the Eastern Cape, South Africa. Conducted detailed analysis of different revenue streams, socioeconomic demography of the district, the intergovernmental relations and budgeting considerations in the area.

Biniza, S. & Tsebe, M. 2015. '**Analysing Total Factor Productivity Growth for South Africa's Manufacturing Sector Using a DEA-Based Malmquist Productivity Index**', *South African Journal of Economics*, Vol. 83, Issue 1. Available At: <http://2015.essa.org.za/>.

PRESTIGIOUS AWARDS AND PROFESSIONAL TRAINING

- Alliance Française, Pretoria: Diplôme d'Etudes en Langue Française A1.2 2021
- Alliance Française, Pretoria: Diplôme d'Etudes en Langue Française A1 2018
- IMF Regional Technical Assistance Center for Southern Africa, Ebène: Economic Issues in Regional Integration 2015
- IMF Regional Technical Assistance Center for Southern Africa, Ebène: Macroeconomic Diagnostics 2015
- Economic Research Southern Africa Postgraduate Scholarship 2014
- Public Affairs Research Institute-Nedbank Master's Fellowship 2014
- University of the Witwatersrand Postgraduate Merit Award 2013
- Department of Trade and Industry Public Bursary 2013
- Allan Gray Orbis Foundation Fellowship Award 2007

Dr Charl Swart

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Charl Swart is an Editor at PESA, an independent think-tank promoting regional integration in SADC and providing research on the political economy of development in Africa. Charl is a Political Scientist by training and specialises in constitutionalism and governance. His work focuses on ensuring that PESA publishes accessible research and analysis. Charl edited a number of peer-reviewed publications including most of the PESA publications.

ACADEMIC QUALIFICATIONS

Stellenbosch University – *Stellenbosch, South Africa*

PhD in Political Science

2013

M. A. in International Relations

2009

B. A. (Hon.) in Political Science

2007

WORK EXPERIENCE

American University of Iraq Baghdad – Associate Professor

Jun 2021 – Present

College of International Studies - Associate Dean

1 year 5 months

The American University of Iraq Baghdad (AUIB) is a private, not-for-profit university teaching in three colleges: Arts & Sciences, International Studies, and Business. The Associate Professor teaches courses in Political Science, International Relations and Research Methodology. Contributing to institutional development and advancement of AUIB. Actively engages in curriculum development and student advancement.

Political Economy Southern Africa NPC – Editor

Sep 2018 – Present

Research and Publications Division

4 years 1 months

Political Economy Southern Africa (PESA) is an independent think-tank promoting regional integration in SADC and providing research on the political economy of development in Africa. The Editor focuses on ensuring that PESA publishes accessible research and analysis. Evaluating argumentation, coherence, research methods and methodology of all PESA publications. Ensuring that all our research meets our rigorous internal professionalism and credibility requirements.

American University of Kurdistan – Assistant Professor

Jan 2020 – Jun 2021

College of international Studies

1 year 6 months

The American University of Kurdistan is a public, not-for-profit special status, university in Duhok, Kurdistan Region of Iraq. The Associate Professor taught courses in Statistics, Research Methodology, International Relations and World Politics. Actively engaged in research, curriculum and course development, and participating in university services.

Compuscan – Copywriter

Apr 2018 – Aug 2018

Marketing Division

3 months

Stellenbosch University – Post-Doctoral Research Fellow

Jan 2016 – Apr 2018

Centre for Research on Evaluation, Science and Technology

2 years 4 months

University of the Western Cape – Post-Doctoral Research Fellow

Jan 2014 – Dec 2015

School of Public Health

2 years

Stellenbosch University – Lecturer

Jan 2013 – Jan 2014

Department of Political Science

1 year

CONSULTANCIES AND PUBLICATIONS

Swart, C., Confraria, H. & Blanckenberg, J. 2020. 'Which Factors Influence International Research Collaboration in Africa?', in *Africa and the Sustainable Development Goals*, M. Ramutsindela & D. Mickler (eds.), Springer Nature Switzerland AG: Basel. Available At: <https://link.springer.com/>.

Swart, C., Confraria, H. & Blanckenberg, J. 2018. **'The Characteristics of Highly Cited Researchers in Africa'**, *Research Evaluation*, Vol. 27, Issue 3. Available At: <https://doi.org/>.

Swart, C., Beaudry, C., Mouton, J., Prozesky, H. & Treptow, R. 2018. **'Research Design and Methodology'**, in The Next Generation of Scientists in Africa, C. Beaudry, J. Mouton, & H. Prozesky (eds). Available At: <http://www.africanminds.co.za/>.

Swart, C., Mouton, J., Botha, J., Boshoff, N., Prozesky, H., Treptow, R., Redelinghuys, R., Ford, K., van Niekerk, M. & Visagie, A. 2018. **Building a Cadre of Emerging Scholars for Higher Education in South Africa**, Department of Science and Technology: Pretoria. Available At: <https://www.dst.gov.za/>.

Swart, C. & Blanckenberg, J. 2018. **'Citation Time Windows Based on Citation Frequency Profiles of Basic Recognised Work'**, *STI 2018 Conference Proceedings*. Available At: <https://openaccess.leidenuniv.nl/>.

Swart, C. & Blanckenberg, J. 2018. **'Citation Time Windows Based on Citation Frequency Profiles of Basic Recognised Work'**, *STI 2018 Conference Proceedings*. Available At: <https://openaccess.leidenuniv.nl/>.

Swart, C. & Fourie, P. 2017. **'South Africa's HIV and Aids Response: Two Scenarios Towards 2019'**, in *Modern State, Development, Capacity and Institutions*, D. Lambrechts & P. Fourie (eds.), SUN Media: Stellenbosch. Available At: <https://scholar.sun.ac.za/>.

Swart, C., Simfukwe, P. & Van Wyk, B. 2017. **'Perceptions, Attitudes and Challenges About Obesity and Adopting a Healthy Lifestyle Among Health Workers in Pietermaritzburg, Kwazulu-Natal Province'**, *African Journal of Primary Health Care & Family Medicine*, Vol. 9, No. 1. Available At: <https://phcfm.org/>.

Swart, C., Du Toit, P. & Teuteberg, S. 2016. **South Africa and the Case for Renegotiating the Peace**, SUN Media: Stellenbosch. Available At: <https://africansunmedia.store.it.si/>.

Swart, C., Okma, K. & Arora, R. 2016. **'Improving Health and Access to Health Care in South Africa and India'**, *Policy in Focus*, Vol. 13, Issue 1. Available At: <https://ipcig.org/>.

Swart, C. and Fourie, P. 2015. **'South Africa's AIDS Governance: Two Scenarios Towards 2019'**, *Development*, Vol. 57, Issue 3-4. Available At: <https://link.springer.com/>.

Swart, C. and Fourie, P. 2015. **'The Epistemology of AIDS in South Africa: Lessons from Three Scenario Projects'**, *African Journal of AIDS Research*, Vol. 14, Issue 2. Available At: <https://www.tandfonline.com/>.

PRESTIGIOUS AWARDS AND PROFESSIONAL TRAINING

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|---|-----------|
| ▪ NRF SARChI Post-Doctoral Fellow in Health Policy and Systems Research | 2014-2015 |
| ▪ University of Stellenbosch Doctoral Scholarship | 2010 |
| ▪ University of Stellenbosch Academic Post-Graduate Merit Bursaries | 2008-2012 |

Miss Lungile Mashele

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Lungile Mashele is an Associate at PESA, an independent think-tank promoting regional integration in SADC and providing research on the political economy of development in Africa. Lungile is an Energy Economist and performs technical due diligence services to close deals within the energy sector in Africa. She is an award-winning energy professional and banker with over 12 years' energy experience on the continent.

Core Competencies: Energy Policy, Energy Technology, Energy Economics, Problem Solving, Stakeholder Engagement, Leadership, Research, Communication, Analysis, Sector Strategies.

ACADEMIC QUALIFICATIONS

University of Johannesburg – *Johannesburg, South Africa*

M.Phil. in Energy Studies 2019

B.Sc. (Hon.) in Energy Studies 2013

B.Com. in Economics and Econometrics 2007

DIRECTORSHIP

Goldwind Africa (Pty) Ltd – Non-Executive Director Oct 2016 – Feb 2022

Board of Directors 5 years 5 months

Goldwind Africa (Pty) Ltd is a subsidiary of Xinjiang Goldwind Science & Technology Co., Ltd., commonly known as Goldwind, which is a Chinese multinational wind turbine manufacturer headquartered in Beijing, China. Performed two functions as Non-Executive Director and as Chairperson of the Goldwind Community Trust. Chaired the Social and Ethics Committee focused on Employment Equity and Broad Based Black Economic Empowerment. Evaluated the company's corporate citizenship and ensured that corporate activities do not impact the environment, health and safety of the public adversely. Monitored project development as well as the implementation of projects making sure that they are congruent with the company's social and ethics policies. The Chairperson of the Community Trust approved community projects to facilitate corporate social investment.

WORK EXPERIENCE

Public Investment Corporation – Energy and Infrastructure Specialist Oct 2021 – Present

Research and Project Development Division 1 year 1 month

The Public Investment Corporation is a South African state-owned entity with ZAR 2.4 trillion (approx. USD 127.6 billion) of assets under management, as of 31 March 2022, and it is Africa's largest asset manager. The Energy and Infrastructure Specialist provides project advisory services for energy and related infrastructure projects. These are energy projects in the renewable and non-renewable sectors across the continent. Producing industry leading proprietary research that generates investment views and ideas in the Energy and Infrastructure sector in Africa. Providing research and analysis on the impact of current as well as evolving macro themes and trends in the Energy and Infrastructure sector. Managing the investment identification process across the Energy and Infrastructure sectors and assisting deal teams understand the key technical risks and opportunities during the due diligence process, when potential investments are being evaluated. Identifying and generate sector, intra-sector and cross sector investable opportunities in the Energy and Infrastructure sector and collaborating with relevant specialists in tourism, mining, agriculture etc.

Political Economy Southern Africa NPC – Associate May 2018 – Present

Energy Analyst 4 years 6 months

Political Economy Southern Africa (PESA) is an independent think-tank promoting regional integration in SADC and providing research on the political economy of development in Africa. The Associate focuses on providing accessible research and analysis for their specialisation. Contributing policy solutions that promote SADC regional integration and sustainable development in Africa. Representing PESA in Policy Dialogues across SADC. Contributing towards the discourse on regional integration through publications and direct discussions in policy dialogues about development in SADC and Africa broadly.

Development Bank of Southern Africa – Energy Specialist

Apr 2014 – Sep 2021

Financing Operations Division

7 years 6 months

The Development Bank of Southern Africa (DBSA) is a development finance institution wholly owned by the Government of South Africa. Supported the DBSA's development of power projects in Africa. Provided technical analysis of all projects primarily oil and gas, renewables, transmission, distribution and off grid. Provided energy sector expertise, engineering services, sector analysis, deal structuring, validating of technical assumptions and designs, due diligence services, technical risks, client advisory services. Provided energy sector expertise to support the Bank's lending programme. Provided analysis on the sectoral policy, legislation, strategy, tariff regimes, sector environment and key infrastructure initiatives to inform potential investments in South Africa and Sub-Saharan Africa. Validated assumptions and projections of potential investment products and their design, including technology options, operations and maintenance plans. Analysed the macro sectoral economic market and economic rationale of potential investments including demand and supply drivers as well as cost benefit analysis. Reviewed and opined on all technical aspects related to contracting such as the PPA, GSA, ancillary contracts, EPC, O&M, concession and CTA. Provided tariff, cost, energy yield, operational and maintenance data required for input into the financial model. Provided informed professional advice and appropriate technical solutions to inform investment decision making. Analysed sectoral risk factors and conducted risk analysis of potential investments in South Africa and Africa and presented suitable solutions for possible investment. Developed the Banks energy sector strategy to support investment decision making.

Eskom – Energy Economist

Aug 2012 – Mar 2014

Group Capital

1 years 7 months

Produced energy and economic intelligence, numerous journals and reports in support of BI, LCOE for Eskom, project cost estimations, Business Productivity Programme for reducing capital and operational costs. Provided energy and economic intelligence for the project development department within Eskom. Provide the levelised cost of energy for numerous energy related technologies and assisted in project cost estimations. Seconded to the Business Productivity Programme work stream aimed at reducing operational and capital costs across the group.

Letsema Consulting & Advisory – Economic Consultant

May 2011 – Jun 2012

Energy Unit

1 year

EON Consulting – Economic Consultant

Sep 2009 – Apr 2011

Economics Unit

1 year 7 months

First National Bank – Systems Analyst

Jul 2008 – Aug 2009

Group Commercial

1 year

ABSA – Business Analyst

Jan 2008 – Jun 2008

Corporate Banking

6 months

PUBLICATIONS

Mashele, L. 2019. **'The Mega-Project Paradox: Is the "New-Build Programme" the Last Mega-Project South Africa will See This Century?'**, Presented at Decarbonization, Efficiency and Affordability: New Energy Markets in Latin America, Buenos Aires, Argentina, 10-12 March 2019. Available At: <https://www.iaee.org/>.

Mashele, L. 2018. **'CCRED-PESA Africa Day 2018 Seminar'**, on the Political Economy Southern Africa Website, Available At: <https://politicaleconomy.org.za/>.

Mashele, L. 2017. **'Renewable Energy Opportunities for DBSA in SADC'**, Development Bank of Southern Africa: Midrand. Available At: <https://www.dbsa.org/>.

Mashele, L. 2014. **'Benefits and Costs of the Energy Targets for the Post-2015 Development Agenda'**, in Post-2015 Consensus, Copenhagen Consensus Center: Tewksbury. Available At: <https://www.copenhagenconsensus.com/>.

PRESTIGIOUS AWARDS AND PROFESSIONAL TRAINING

- Massachusetts Institute of Technology, Cambridge: Certificate in Energy Economics and Policy 2022
- 2021 Energy Financing ECA-Backed Deal of the Year: Angola Solar 2021
- 2021 Energy Financing ECA-Backed Deal of the Year: Mozambique LNG 2021
- Gordon Institute of Business Science, Pretoria: Executive Development Programme for Women 2020
- African Women in Energy Advisory Board 2019 - Current
- Destiny Magazine Top 40 under 40 Women 2018
- 2017 African Power Elite 2017
- Africa Utility Week Advisory Board 2016 - 2020
- University of Johannesburg, Johannesburg: Certificate in Insolvency Law 2009

Mr Jotham Makarudze

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Jotham Makarudze is an Associate at PESA, an independent think-tank promoting regional integration in SADC and providing research on the political economy of development in Africa. Jotham is a Chartered Financial Analyst who has authored various articles focused on economic development on the African continent and has a particular interest in the energy sector. He is a qualified and experienced in credit and project finance with over 16 years' experience in South African and other African markets, with 8 years at a senior level.

Core Competencies: Credit Risk and Financial Analysis, Project Finance and Deal Structuring, Risk Management, Policy Development, Leadership, Financial Modelling, Investment Analysis, Corporate Finance, Macroeconomic Research and Analysis.

ACADEMIC QUALIFICATIONS

Gordon Institute of Business Science – <i>Johannesburg, South Africa</i> <u>M.B.A.</u>	2016
CFA Institute – <i>Charlottesville, United States</i> <u>C.F.A.</u> Charter	2013
University of Cape Town – <i>Cape Town, South Africa</i> <u>B.Com. (Hon.)</u> in Financial Analysis and Portfolio Management	2012
University of the Witwatersrand – <i>Johannesburg, South Africa</i> <u>B.Com.</u> in Business Finance and Management Accounting	2005

DIRECTORSHIP

Cartesian Solutions (Pty) Ltd – Executive Director <i>Director</i>	Jan 2011 – Present 11 years 9 months
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Cartesian Solutions seeks to provide a range of services that include, but are not limited to: Consulting Services, Risk assessments, Control Reviews, Advisory, Research, Strategy, Business analytics, Management Consulting, Training, Program and Project Management. Role includes leading the organizational objectives and guiding strategy direction.

WORK EXPERIENCE (ABRIDGED)

Political Economy Southern Africa NPC – Associate <i>Financial Analyst</i>	Aug 2022 – Present 2 months
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Political Economy Southern Africa (PESA) is an independent think-tank promoting regional integration in SADC and providing research on the political economy of development in Africa. The Associate focuses on providing accessible research and analysis for their specialisation. Contributing policy solutions that promote SADC regional integration and sustainable development in Africa. Representing PESA in Policy Dialogues across SADC. Contributing towards the discourse on regional integration through publications and direct discussions in policy dialogues about development in SADC and Africa broadly.

Intellidex Investment Research – Senior Investment Analyst <i>Investment Research Division</i>	Jan 2010 – Feb 2014 4 years 1 month
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Intellidex is an investment research company with offices in Johannesburg, South Africa and London, UK that provides customized research on investment targets for investors particularly on the African continent. The company also provides sell side equity research and trading strategies for its clients. The Senior Investment Analyst role focused on conducting detailed due diligence and compiling investment research reports with well-reasoned strategic recommendations for clients. Compiling of market reports as well as reviewing of reports compiled by junior analysts.

Global Credit Rating Co. – Credit Analyst
Corporates Division

Aug 2007 – Dec 2009
2 years 5 months

Global Credit Rating is a credit rating agency, recently acquired by Moody's that is focused on credit analysis and issuance of credit ratings for corporates and financial institutions across Africa. The Analyst assessed and quantified the various risks inherent within emerging market entities, with particular emphasis on credit, liquidity, market and operational risks. Specialised areas included financial statement & budget analysis, debt capital markets, structured finance, securitisations, risk management & modelling, debtors book analysis and fixed income instruments. Covered mainly corporate entities, with some exposure to assessing banks and insurance companies in numerous African countries including Kenya, Uganda, Tanzania South Africa, Zimbabwe, Ivory Coast, Nigeria and Ghana.

CONSULTANCIES AND PUBLICATIONS

Biniza, S., Mashele, L. & Makarudze, J. 2022. '**Gas-to-Power Projects and the Just Energy Transition from Fossil Fuels in the South African Political Economy**', in *Just Energy Transition in SADC*, Political Economy Southern Africa: Pretoria, forthcoming.

Makarudze, J. 2022. '**SIE24 Jotham Makarudze: Project Finance and Partnerships for Facilitating the Just Energy Transition**', on *Earth Cast Podcast*, Available At: <https://anchor.fm/>.

Ruwo, N. & Makarudze, J. 2017. '**Infrastructure: The Seed for Economic Development**', on The Standard Website, Available At: <https://thestandard.newsday.co.zw/>.

International Finance Corporation – Contract Researcher
Technical and Vocational Colleges in South Africa

Sept 2016 – Nov 2016
3 months

The International Finance Corporation (IFC) is an international financial institution that offers investment, advisory, and asset-management services to encourage private-sector development in less developed countries. Contracted by IFC to conduct market research on technical and vocational colleges in South Africa.

Makarudze, J. et al 2009. '**African Water Utilities Regional Comparative Utility Creditworthiness Assessment Report**', Water and Sanitation Program: Nairobi. Available At: <https://thedocs.worldbank.org/>.

PRESTIGIOUS AWARDS AND PROFESSIONAL TRAINING

- Best MBA Student Award: Corporate Finance 2016
- Telkom Business Award 2011
- University of the Witwatersrand Merit Award 2006