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Africa's Gas Road to Nowhere

South Africa's policy debate on using gas to accelerate the energy transition

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Author

Sikho Luthango

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Executive Summary

There is significant support within the South African government to develop a homegrown gas supply as part of energy development and transition efforts. However gas is not a greener alternative as suggested by the policy debate in South Africa. Methane leaks along the full supply chain of the gas industry are underplayed and incorporating that gas has a far larger carbon footprint. South Africa has a large coal fleet and coal-to-gas switching, without significant scaling up of renewables, will yield a miniscule saving in carbon emissions. Rather than helping the transition to more secure and sustainable energy supply, gas may well hinder the transition

Geopolitics is also moving against South Africa's focus on gas, as the EU's carbon border adjustments and climate neutrality targets, which will punish carbon emissions across the whole supply chain of all industries. South Africa's exports from agriculture to car manufacturing to minerals and metals production still relies solely on dirty electricity generated by coal. At the same time carrots for renewables are being dangled by Germany saying it is ready to help fund R390bn ($22 billion) to help South Africa's grid revamp and expansion to connect renewables to the electricity system. Previously the amount of money available for South Africa's just energy transition was estimated at $85 billion for the 2023-2027 period and would be for decarbonisation of the electricity sector, alongside investments to help workers and communities that will lose fossil fuel jobs and industries.

South Africa needs a different direction. There are more opportunities in green supply chains, and this could be anchored using platinum and existing gas infrastructure to develop a green hydrogen economy. South Africa's policy should also be looking at the mineral endowments of its region, to manufacture batteries for renewables storage using lithium from Zimbabwe.

By developing renewable energy and green hydrogen sector about 94,000 jobs can be created, a net increase from those that will be lost due to the decommissioning of coal-fired power stations alone. The potential for more jobs is way higher than is envisaged.

The draft IRP2023 needs to align with the Renewable Energy Master Plan and the Just Energy Transition Investment Plan. The Renewable Energy Master Plan aims to leverage battery technology, to unlock the industrial and inclusive development. The IRP should scale up renewables to reflect the genuine cost of renewables and available carbon space. The IRP should also align more with Hydrogen South Africa (HySA) and the Hydrogen Road Map to align with platinum's potential with the energy transition and to maximize green value chains.

Contents

Introduction

This paper examines the complex policy debate on gas in South Africa and evaluates the potential use of gas as a transition fuel by exploring the opportunities and risks within the context of the country's security, sustainability, and affordability trilemma. There is significant support within government to develop a homegrown gas supply. This indicates that the government's policy direction is heading towards gas as an alternative to coal to meet its decarbonisation agenda as espoused in Nationally Determined Contributions (NDCs) given to the United Nations Framework Convention on Climate Change, which serves as the secretariat for the Paris Agreement. Government is supported by industry, especially those companies that rely heavily on gas.

These policy proposals, such as the draft Integrated Resource Plan (IRP), released in late 2023, and the Gas Master Plan (GMP) have received criticism from civil society stakeholders, think tanks, academics, and some businesses. Critics see no role for gas or believe it should only be used for peaking support. Other alternatives are those supported by the Presidential Climate Commission (PCC) which envision a role for gas for dispatchable purposes to support renewables. However, the PCC also proposes other alternatives that include renewables and battery storage to enhance South Africa's competitive advantage. South Africa already possesses a competitive advantage in green hydrogen; however, large-scale renewable input is required to realise a green hydrogen economy. The opportunities presented by alternatives such as renewables and other green technologies, including green hydrogen and batteries are considerable. These alternatives are considered cost-effective and offer environmental and socio-economic benefits. They play a crucial role in facilitating the energy transition, as mandated by South Africa's National Development Plan 2030.

While there are many uses for gas as a transition fuel, these policies support gas-to-power projects which would make gas a major component of South Africa's energy system. This would prompt a shift from South Africa's current use of gas as a net importer from Mozambique, mainly for industrial use. The drying up of this Mozambican supply has contributed to the growing narrative of an impending gas crisis in South Africa. As a result, there is an urgent need to explore other options including finding and using its own reserves. With recent discoveries such as the Brulpadda and Luiperd gas condensate deep fields off the southern coast in 2019, developing South Africa's homegrown gas production is within grasp.[1]

As a signatory of the 2015 Paris Agreement, South Africa has also committed to phasing out coal and embracing carbon-free clean energy by using renewables such as solar and wind generation. Gas-to-power projects can undermine this commitment considering the impact of

[1] Reuters, "TotalEnergies to Exit Gas Field Offshore South Africa in Blow to Country," Reuters, July 2, 2024, https://www.reuters.com/business/energy/totalenergies-exit-gas-field-offshore-south-africa-blow-country-2024-07-02/.

methane leakages on global warming. South Africa's energy mix should consider how short-term options will affect the long-term viability of net zero goals. While current models to 2050 are guidelines based on assumptions, foresight and futurist models increasingly support the technical feasibility and cost effectiveness of 100 per cent renewable-electricity systems.[2] In South Africa, models suggest that a renewable energy pathway is the "least-cost, least-water-intensive, least-GHG-emitting and most job-rich option for the South African energy system".[3] Growing research shows that gas is not as green as it has been portrayed.

Expanding the role of gas in South Africa's electricity sector, beyond its current industrial role, would lay the groundwork for a costly blind alley compared to renewable energy options and other peaking support options like battery storage. Homegrown gas production would require significant infrastructural investments, which could lead to stranded assets and a carbon lock-in. Early signs of asset stranding can already be seen with the announcement of TotalEnergies' intent to withdraw from the Brulpadda and Luiperd gas condensate deep fields after five years of drilling in rough seas. Gas also carries significant economic risks including price volatility and fluctuations.

While the current geopolitical context presents many opportunities for South Africa for both gas and green hydrogen, especially in export, South Africa should first seek its own domestic energy security and autonomy and prioritise regional integration. This is important, especially considering some countries in the Global North are shifting towards trade protectionism, regionalisation and deglobalisation. From a socio-economic perspective, with emphasis on job creation and impacts on South Africa's massive coal and platinum industry, developing green value chains makes for a stronger case compared to gas.

Reaping the socio-economic benefits presented by the current global rise of critical minerals, necessary for the energy, digital and mobility transition, is important. The critical minerals demand is estimated by the World Bank to reach 500 per cent by 2050. This will require the strategic development of local and regional value chains through regulatory and policy measures to support advancements in processing and refining capacity. In addition, it will require aligning policies with industrialisation efforts. The development of strategic green value chains offers an opportunity to support job creation and further industrialisation of the South African economy.

South Africa already has a supportive policy framework such as the Just Energy Transition Investment Plan (JET-IP) and the South African Renewable Energy Master Plan (SAREM) to develop a green value chain and the green hydrogen sector. The green hydrogen sector can support the Platinum Group Minerals (PGM) sector and lead to a more coherent industrial sector. Developing the renewable energy and green hydrogen sector can create about 94,000

[2] Ibid.

[3] Oyewo et al., 2018 in International Institute for Sustainable Development, 2022

jobs – a net increase from those that will be lost due to the decommissioning of coal-fired power stations.[4]

This paper begins by assessing the geopolitical context and how it has boosted the case for gas globally, including in Africa. The paper then aims to situate Africa within the global geopolitical context by assessing its role in gas supply chains, while also setting out the main arguments for and against gas as a transition energy source. The main body of the paper unpacks the apparent drive for gas and assesses the potential role of gas in South Africa's future energy mix. This paper concludes by underscoring the importance of decisions about the future energy mix for South Africa's industrial and socio-economic fate, especially the impact of short-term decisions for its 2050 climate targets. Finally, applying the framework of the security, sustainability, and affordability energy trilemma, this paper provides recommendations for decision-making.

Situating Africa in the geopolitical context of gas supply chains

Currently, there are market opportunities arising from the geopolitical context created by the Russian gas shortfall, leading to increased demand in the European Union. This situation is expected to lead to growth in the gas markets. Beyond these new opportunities, the political sentiment to adopt gas as a transition fuel echoes across the African continent and in Southern Africa, evidenced by the Southern Africa Development Community Gas Master Plan.[5] The development of supply chains around gas is largely political. The support for the continued use of fossil fuels for African policymakers can be traced to the understanding that Europe and North America have contributed significantly more to climate change compared to other regions. Moreover, there is an argument that these countries are economically developed and better equipped to adapt and mitigate the environmental impact they have caused. Thus, African countries need to be allowed to develop using whatever means possible, through a combination of transition fossil fuels and renewables.[6]

African countries rely on fossil fuels as a critical source of revenue and economic stability. For a country like Nigeria, which derives a substantial portion of its GDP from oil exports, the sector is crucial for government revenue, which in turn funds services and infrastructure projects. Managing the energy transition in a way that minimises adverse economic impacts and ensures affected communities have alternative opportunities for incomes and livelihoods

[4] Cloete, D., Grobbelaar, N., Bertelsmann, T., 2020. SADC Futures of e-Mobility: EVs as Enablers of a New Energy Paradigm

[5] SADC Gas Master Plan – Phase One, Development Bank of Southern Africa and SADC.

[6] International Institute for Sustainable Development (IISD), 2022

is crucial.[7] Fossil fuels also provide an immediate, reliable, and stable source of energy, especially in the African context, in countries like Mozambique and Uganda where energy access remains constrained.[8]

Transitioning towards renewables also involves significant investment in terms of costs and technology, requiring substantial financial mobilisation. Grid integration is also a significant challenge as seen in countries like Kenya. The upfront investments required pose a major barrier to the transition to renewables without external support and investment.[9] This means that determining the role of gas as a transition fuel is varied across different contexts, incorporating both newcomers and legacy producers. While legacy African producers like Egypt have paved the way as net gas exporters, the same pathway cannot be transposed to all contexts, especially countries that are not already producing gas.[10] In the same breath, for countries that already depend heavily on fossil fuel production, transitioning to renewables cannot be done at the same pace.

Trickling down from the general continental-wide political sentiment, South Africa has strong political support for not only the expanded and continued use of fossil fuels, including gas, but also for uranium to develop nuclear power, alongside renewables.[11] At the last African Energy Week in Cape Town, Gwede Mantashe, Minister of Mineral Resources and Energy, recognised fossil fuels as playing a continued role in supporting South Africa's energy security and said, "Africa must intensify its efforts aimed at developing its oil and gas sector in order to benefit from the expected increase of natural gas market in global supply".[12]

Is there a window of opportunity for Africa in the geopolitics of the energy transition?

Gas has become important for Europe's transition, especially in the context of the Russia-Ukraine war. This presents a short- to medium-term opportunity for gas producers. Although the period of this window of opportunity is contested, it is clear that in the long term, it becomes riskier. Many European multinational fossil fuel companies have rushed to explore and extract gas to export it to international markets in what has been described by anti-gas campaigns as a 'dash for gas in Africa'. For example, the Italian government has struck agreements for the export of gas with Angola, Algeria, and the Republic of Congo. This could be a driving force for the uptake of gas projects in Africa and reinforce Africa's export-led economies which could not only be detrimental to its energy security but also to its autonomy.

[7] K. Makgonyana, 2024. Should South Africa Abondon oil, gas and coal for a renewable future. Mail and Gurdian, September 12, 2024. https://mg.co.za/thought-leader/opinion/2024-09-12-should-africa-abandon-oil-gas-and-coal-for-a-renewable-future/

[8] Ibid.

[9] Ibid.

[10] Egypt's natural gas exports climb to $8.4b in 2022, Energy Terminal, Anadolu Agency

[11] Pillay, 2024

[12] Ayuk, 2024

The Russia-Ukraine war, and subsequent European Union (EU) sanctions on Russian goods including gas, have brought increased political attention to supply chain risks due to unreliability. The reduction of gas supply to the EU from Russia is estimated to be between 74 per cent to 88 per cent less, since 1991. In addition, the COVID-19 pandemic created extraordinary responses towards crises, significantly shaping supply chains.

The war has also created a renewed appetite for fossil fuels, especially natural gas, and has changed the game plan for Europe's transition away from fossil fuels. The EU Green Deal (EGD), introduced in 2019, was a new economic and environmental strategy for Europe with the main aim of achieving climate neutrality in 2050 and bolstering energy security.[13] It was updated and expanded in response to the pandemic and later evolved into a response to the war. The EGD included a range of policy initiatives. One of these, the so-called 'taxonomy,' sought to classify projects as green or not green to attract and guide investment decisions. This taxonomy designated some gas and nuclear projects as green energies on a transition basis.

This occurred amid the significant disruption to the EU's energy markets and plans caused by the severing of trade ties with Russia, following Russia's invasion of Ukraine and the EU's response, along with the resulting fallout. In the wake of this, while Europe's ambition to invest in renewables remained strong, a powerful short-term demand for new gas supplies became just as important. Europe's substantial financial influence, technological advancements and regulatory standards have affected its trade with African countries, especially in its demand for clean energies. In the long term, the EU is heading towards an energy transition and this will further impact supply chains including in South Africa. While the EU's future is uncertain, there is scope for a system dominated by renewables, energy storage, critical raw materials and potentially other energy vectors such as green hydrogen. For example, the EU signed a Memorandum of Understanding with Namibia for a potential green hydrogen offtake at the Green Hydrogen Summit in May 2024.

[13] Cloete et al., 2023

The case for and against gas as a transition fuel in Africa

Gas and the environment

Because renewable energy sources are variable, natural gas is seen as a way to ensure grid reliability and improve electricity access, forming part of a more balanced approach to the energy transition. Withdrawing from fossil fuel projects like gas has the potential to worsen fragile energy systems, affecting energy access and security.[14] The continued use of gas, together with the accelerated deployment of renewables, could be a compromise between the ostensibly competing imperatives of decarbonisation and energy security.

Gas generation indirectly contributes to reducing coal use by supporting the integration of renewable energy.[15] Since the amount of gas in an energy mix is limited, its role in extending grid flexibility and a reliable operation of fast-changing power systems is crucial. Gas balances variable renewables to meet peak demand periods – a function referred to as peaking capacity or dispatchable use.

Africa is rich in minerals and fossil fuels, including gas. Knowledge about the quality of these resources remains limited, especially at a country level. African countries account for about 8 per cent of global gas output. The World Bank estimates there were over 40 per cent more gas discoveries in 2020 compared to 2010, including what has been dubbed as the 'game changer' – a 15 trillion cubic feet gas discovery in Senegal.

In the Paris Agreement's sustainable development scenario, gas contributes eight per cent of the emission savings required. In terms of CO_2 emissions, the combustion of natural gas results in about a 40 per cent saving when compared to coal for each unit of energy output. Compared to oil, emissions from gas combustion are 20 per cent. Based on the Paris Agreement there is still space for gas. The developments in Africa are in line with a call for the creation of 'carbon space' for developing economies. This is particularly important for those countries with significant oil and gas wealth, as they take on the challenging task of reducing government subsidies, which in Nigeria has resulted in substantial price hikes and subsequent protests.

A "Common Position on a Just Energy Transition" was developed by the African Union (AU) in preparation for COP27. The position advocates for the development of gas, low-carbon

[14] Matola et al., 2023
[15] IEA, 2019 ; Mohammed et al., 2021.

hydrogen and nuclear energy in the short-to-medium term, concurrently with the scaling up and deployment of renewable energy. It recognises that it is important to equitably share mitigation efforts between different countries and actors. The use of gas has also been framed within the context of the just energy transition. Countries like Nigeria recognise the use of gas as a bridge to achieve net zero emissions.[16] In 2022, at the Sustainable Energy for All Forum held in Rwanda, ten African countries issued a communique supporting the use of gas as a transition fuel for Africa's development. These sentiments acknowledge the differentiated goals for African countries and gas as a solution to the security, sustainability, and affordability energy trilemma.[17]

However, there are questions surrounding the role of gas in decarbonisation scenarios in meeting the Paris Agreement's climate goals. Distinctions must be made between the short-term and long-term potential impacts. In the short-term, the credentials for gas as a transition fuel are strong due to the fuel's lower carbon emissions compared to coal or other liquid fuels.[18]

In the short-to-medium term, coal-to-gas switching's potential mostly lies in the electricity sector. It is estimated that up to 1,200MtCO_2 reduction in emissions could be achieved from coal-to-gas switching, effectively reducing the global coal demand by 15 per cent.[19] These investments need to be relative to the existing coal fleet at the national level. If the coal fleet is large, potential savings will be miniscule. In 2018, coal-to-gas switching resulted in a 33 per cent reduction in emissions per unit of heat used in industry and buildings compared to coal.[20]

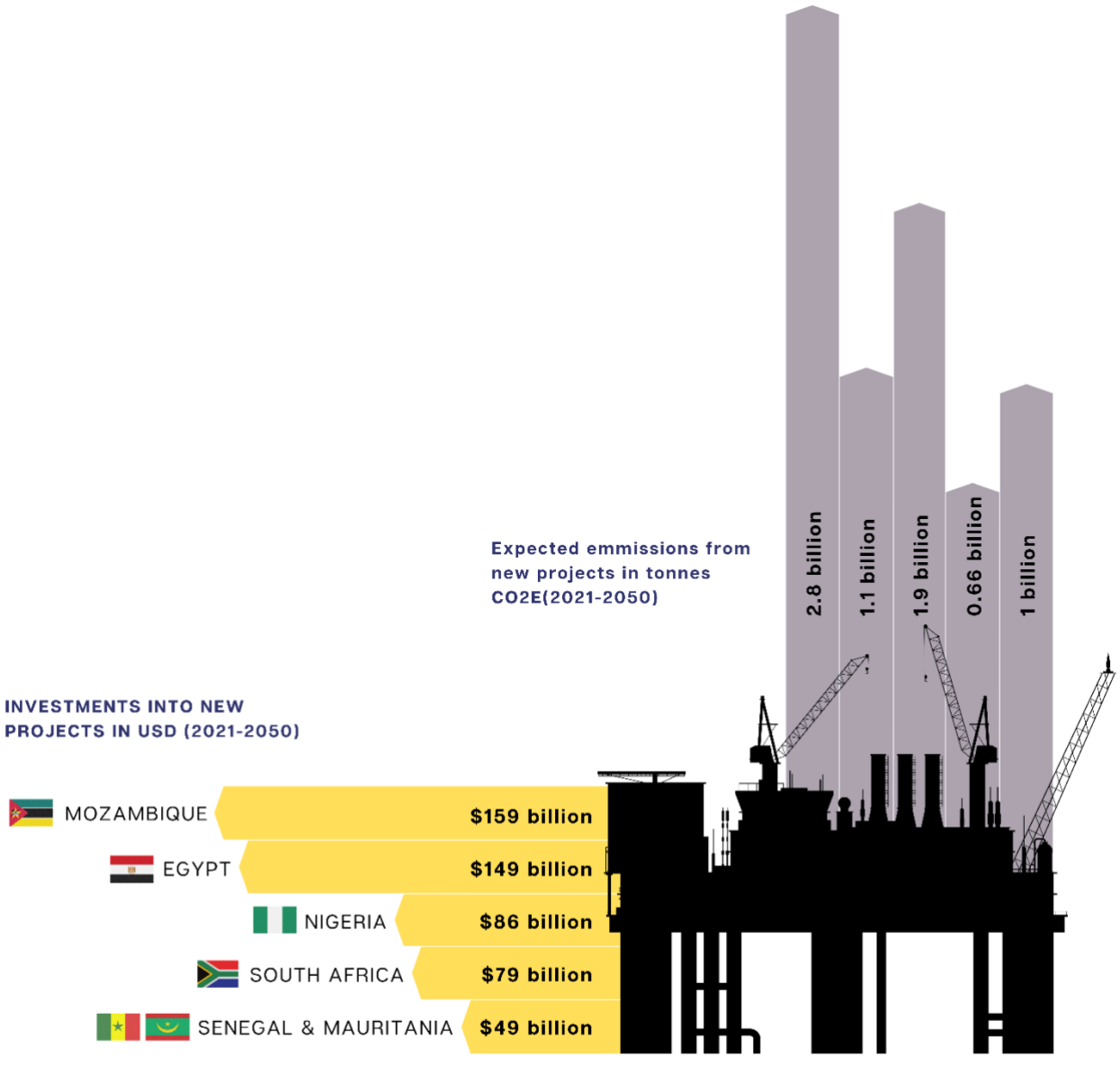
The International Energy Agency (IEA) recommends that to be able to meet targets below 2°C, ideally 1.5°C, investors should not fund new oil, gas and coal supply projects. The wealthiest fossil fuel producing countries like the US must decrease oil and gas output by 75 per cent by 2030. Newcomer gas-producing countries like Mozambique are likely to cut production by 14 per cent in 2030 with a complete phase-out by 2050. However, the IEA also shows that the development of any new gas projects is incompatible with the 1.5° C target outlined in the Paris Agreement. [21]

The push for gas as a transition fuel has also been challenged b African civil society and other actors through campaigns such as the 'Don't Gas Africa Campaign', arguing that a gas pathway is inconsistent with the Paris Agreement. These campaigns against gas emphasise growing research against the viability of fossil gas as a transition fuel, highlighting the warming

Figure 1: African countries fossil fuel production and expected emissions

[16] Deloite, 2022.
[17] Matola et al., 2023
[18] Losz & Elkind, 2019
[19] Dash for Gas Campaign, n.d
[20] Ibid.
[21] International Energy Agency, 2023

impact of methane leakages, additional shipping and transportation emissions, and the risk of a fossil fuel infrastructural lock-in. Africa contributed only one per cent of global emissions in 2020, while the US has been responsible for 20 per cent of all emissions since the 1850s. Despite this, Africa is facing severe climate change effects. These include higher temperatures, rising sea levels, changing rainfall patterns, frequent droughts and flash floods, leading to the disruption of agriculture. The impacts of climate change will result in further social, economic, and political challenges that will increase government expenditure and reduce tax revenues, increasing the debt burdens of African countries.



Figures taken from Oil Change International's analysis of Rystad UCube.73

Figure 2: Natural gas investments and their expected emissions in Africa to 2050

Coal is a high emission fossil fuel and gas is thought to be cleaner. Coal sets a low bar for natural gas, particularly in the context of the falling costs of renewables such as wind and solar

PV in many power markets. The IEA recognises that the case against coal, as the most carbon-intensive fuel, is not persuasive if there are lower-emission and lower-cost alternatives to both fuels. One of the most crucial factors to consider in terms of gas is its release of methane. Methane is a highly potent greenhouse gas estimated to have 80 times the climate warming impact of CO_2 in a lifespan of 20 years. The credentials for using gas as a bridge fuel could be undermined through flaring, venting, and methane leaks across the upstream and downstream supply chain. These are known as indirect emissions occurring from unintended and intended leaks.

African gas reserves are concentrated within a few countries. In 2020, five nations – Nigeria, Algeria, Egypt, Mozambique, and Libya – held about 90 per cent of known African reserves. Regionally, North Africa holds the most known reserves at about 45 per cent but Nigeria has the highest reserves. A huge investment is needed to take advantage of these reserves. 'Legacy' gas producers such as Algeria and Egypt compared to the 'newcomers' like South Africa, currently a net importer of gas, are better positioned to develop new reserves in a brief period while the more underdeveloped gas producers will need significant building of infrastructure to ramp up production.[22] Egypt's declining fossil fuel output, coupled with surging demand, serves as a warning sign. Despite production from its vast Zohr field, the country is experiencing energy shortages and blackouts. [23]

While there have been new discoveries across the continent, such as those in South Africa and Namibia, most African countries will not be able to meet the demands of the Russian shortfall.

[22] Don't Gas Africa Campaign, 2022

[23] Financial Times: Egypt's journey from gas bonanza to power blackouts

Gas and the economy

According to the median of Intergovernmental Panel on Climate Change (IPCC) selected scenarios, bringing in new oil and gas fields would either generate regulatory (changing regulatory framework in the form of laws and policies), economic impacts (due to laws and changing geopolitical and supply chain context) and environmental (cleaning up of gas related projects such as lack of proper mine closure which has been a common occurrence in South Africa) stranding of assets or push global warming rates above the 1.5°C target.[24] A stranded asset refers to an asset that has experienced unanticipated or premature write-downs, devaluations, or conversion to liabilities. To meet the 1.5°C climate target, the operations of currently producing oil and gas fields need to be reduced.

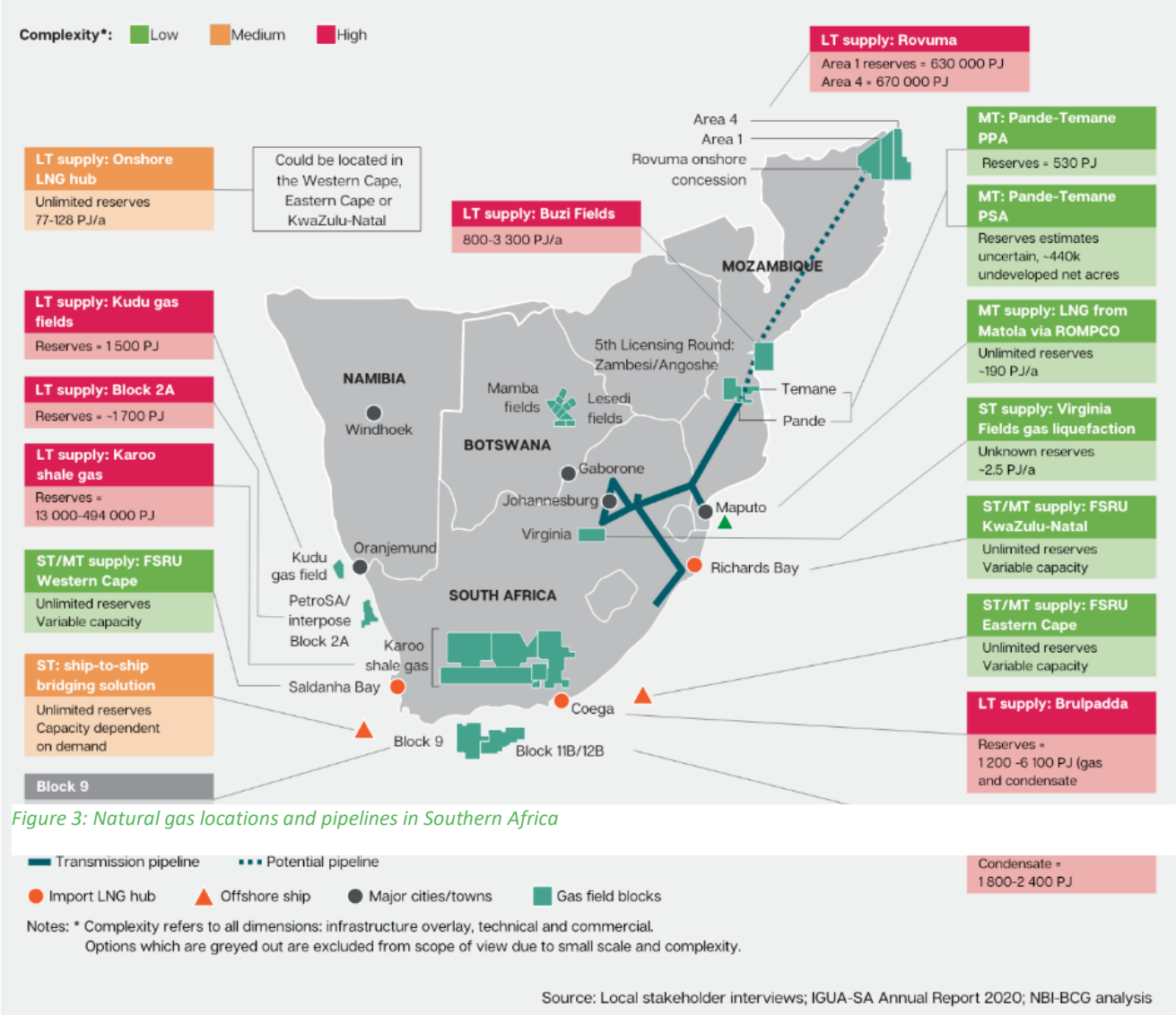


Figure 3: Natural gas locations and pipelines in Southern Africa

These scenarios indicate that massively increasing wind and solar capacities is required to effectively displace oil and gas production. Investment of about $830 billion is required by

[24] International Panel on Climate Change, n.d

2030 to ensure that the IPCC pathway of 1.5°C is met. Current investment plans show that there is a $450 billion annual investment gap. The investments in capital and operational expenditure for exploration and extraction of oil and gas in new fields, which are incompatible with the IPCC 1.5° C scenario, are expected to reach about $570 billion annually by 2030. These investments, reaching about $4.2 trillion between 2030 and 2030 make up what would close the entire wind and solar gap by 2030. The current planned generation from gas power plants, including those in operation, construction, or exploration is expected to deliver capacity that would be inconsistent with the Paris Agreement, risking a high number of stranded assets.[25]

Due to the uncertain limits on carbon emissions in Paris Agreement scenarios, the risk of stranded assets increases, as this uncertainty can affect gas demand and impact the financing of gas projects. As power plants commonly operate for a lifespan of about 30 years, in the context of an IPCC 1.5°C scenario, any new gas projects would result in stranded assets or underutilised capacity.[26] New producers may already be putting public finances at risk if some projects have not started or proceeds from production have not yet been received. This is called the 'presource curse', arising when countries engage in substantial public investments in expectation of future revenue streams. For example, after modelling two major assets under development in Senegal, Open Oil projects estimates that these assets have already been stranded.

Price shocks also do not make a compelling case for gas. The African gas market is mostly export-led and operated by transnational companies. The development of natural gas reserves should depend on whether there are already existing offtake agreements with a focus on energy security and autonomy. This is where support can be given through avenues such as the G20. Developing Africa's gas reserves to exclusively export to foreign markets would present a major risk, especially in the context of the continent's own existing challenges in energy access and poverty. [27] For example, in Asia, while gas has long been viewed as a transition fuel, price shocks may make the gas bridge shorter and narrower than originally thought.[28] With new liquefied natural gas (LNG) terminals coming online from 2022, including from new entrants like Vietnam, there will be stiff competition for limited spot cargoes in the coming years, driven by rising demand of 22bcm and strong competition from Europe and Northeast Asia. New gas import deals are intensifying competition among gas importers, with the US dominating the supply side. For example, Germany has signed a long-term import contract with Qatar, reflecting the shifting dynamics in the global gas market. The EU has also signed a memorandum of understanding with Egypt and Israel to meet its rising demand.[29]

[25] International Panel on Climate Change, n.d
[26] IISD, 2022
[27] Matola et al., 2023
[28] IISD, 2022: 38
[29] IISD, 2022

Competition for gas supplies will also be intensified by a general trend towards more state ownership of energy infrastructure. Germany seized control over Russian natural gas supplier subsidiary including its storage facilities. In addition, some policy measures have been taken in Germany to mandate a trading hub to procure LNG worth about EUR 1.5 billion for its market. These measures will affect the competitiveness of the African gas market.

Gas and governance risks

Oil and gas production will likely make institutions more vulnerable compared to other resources, making accountability and transparency important factors to consider.[30] The projects also have a close association conflict. When gas reserves were discovered in Mozambique in 2010, an International Monetary Fund (IMF) report predicted that the total revenue from LNG exports would reach $500 billion by 2045 and an average real GDP growth rate of about 24 per cent between 2021 and 2025.[31] This is significant for an indebted country. Cabo Delgado, the province where LNG facilities were under construction, has since been declared a conflict zone, forcing TotalEnergies to declare force majeure in 2021, leading to a humanitarian crisis and violent extremism[32]. Since then, Mozambican poverty rates have remained the same at 63 per cent in 2023. Without strong governance and institutional capacity, oil and gas projects carry significant risk, making accountability, transparency and participatory governance measures important, going beyond just voluntary measures.

How gas fits into South Africa's energy picture

South Africa's economy can be described as a mineral and energy complex, heavily dependent on coal-generated electricity. The coal mining sector is one of South Africa's major employers creating an estimated half a million jobs in the broader economy with about 90,000 direct jobs.[33] The impact of jobs in the coal sector is even broader when you consider, on average, that each mineworker supports five to ten dependents. This accounts for approximately two to four million livelihoods.[34] The country has, however, been unable transform its mineral wealth into a thriving economy over the past 15 years remaining one of the most unequal countries in the world. Transitioning from coal will have significant economic impacts that need to be managed.

[30] Luthango, S. 2017.
[31] Halsey, R. 2024.
[32] Lucey, A. & Patel, J. 2021; Lucey, A. & Chingotuane, EVF.
[33] National Business Initiative, 2022
[34] Ibid.

It is important for South Africa's transition be designed in a way that is just, to ensure that it reduces inequality, maintains social cohesion, lessens poverty, and ensures democratic participation. Reskilling programmes are important in this context.[35] Climate finance in the form of Just Energy Transition Partnerships (JETPs) – concessional loans and grants – have been allocated to ensure a just transition and cater to coal workers and affected communities. However, the country is far from meeting its $89 billion target and developing an effective plan that leaves no one behind.

Eskom, the state-owned utility company that provides 90 per cent of the country's energy, has in recent years suffered supply interruptions in the form of load shedding and load reduction. Between 2022 and 2023, South Africa experienced the worst years in terms of frequency and stages of load shedding in history. Load shedding cost the economy R225 billion from 2020 to 2023.[36] Coal currently accounts for about 86 per cent of the energy mix and is reliant on an ageing coal fleet. The existing coal-fired power facilities are expected to be decommissioned as they reach end-of-life from 2030 onwards. South Africa is among the top 15 carbon dioxide emitters in the world and these facilities have also been identified as the main source of South Africa's greenhouse gas emissions. To mitigate these emissions there are laws and regulations to protect the environment, including the National Environment Management Act[37] and the Climate Change Act, 2024. There is an opportunity to develop new utility-scale electricity generators and supporting infrastructure that are low in carbon emissions, costs, and risk[38].

Progress in decarbonising the country's energy sector is mostly criticised for being lacklustre.[39] Political commitment has been identified as one of the major setbacks in decarbonising South Africa's energy system resulting in regulatory uncertainty and delayed investments in renewable energy. Instead, natural gas is seen as able to provide energy security and economic growth. This sentiment is supported by President Cyril Ramaphosa who sees natural gas and renewables as part of the process of transitioning away from coal, pushing back against the anti-gas narrative by environmentalists. With countries like the US continuing to approve gas projects worth about $8 billion, as in the case of Alaska, African leaders like Ramaphosa view this as a double standard geopolitically. The use of natural gas is supported by key policymakers and industry, and as such, has seeped through the energy policy framework.

In the early 2000s, Sasol, South Africa's synthetic fuels and chemicals giant, entered a contract with the Mozambican and South African governments to explore Pande-Temane Complex Conventional Gas Field near Vilanculos.[40] The gas is transferred via pipeline through

[35] Ibid.
[36] BusinessTechAfrica, 2024
[37] Air Quality Act 39 of 2004
[38] Mkhize & Sanders, 2023
[39] Briel, 2024
[40] Mahlaka, 2024

the Republic of Mozambique Pipeline Investments Company (Rompco) and then over the South African border to the Sasol Secunda plant which then supplies gas to KwaZulu-Natal and Mpumalanga via Transnet's Lily pipeline. However, the Mozambique gas fields, one of the country's main suppliers of gas for the past 20 years, are depleting and due to cause substantial gas shortages by 2026, the same year the supply contract ends. The halt of gas supplies to South Africa will have grave consequences on South Africa's economy. This operation is estimated to support as many as 70,000 jobs and contributes up to R500 billion a year to the domestic economy through Sasol. There has also been pressure from industry actors like the Industrial Gas Users' Association of Southern Africa (Igua-SA), which represents industrial gas users including Consol, Illovo, Nampak, Mondi, ArcelorMittal, South32, South African Breweries and Coca-Cola. These companies are heavily dependent on uninterrupted gas supply for their operations. As a net-importer, South Africa's gas supply is mostly used for Sasol's chemical and gas-to-liquids (GTL) facilities, with the remainder being supplied to gas traders, local gas distributors and a considerable number of industrial customers. The gas market is thus predominantly comprised of GTL plants and industrial users.[41] Avoiding the gas cliff has contributed to South Africa's political and industry support for gas as a transition fuel.

In addition, the offshore Brulpadda and Luiperd discovery by TotalEnergies made in 2019 in deep water conditions is seen as a potential game changer for South Africa's gas production. The gas produced from these deep-sea fields has the potential to meet at least half of the country's current energy needs. Moreover, the regional development of other gas resources (other than the drying up of Pande reserves in Mozambique and Namibia) has made the inclusion of gas in the energy mix more pronounced.

South Africa's gas policy framework

Currently, South Africa uses a small amount of gas in its energy mix accounting for only three per cent of its energy consumption in 2021.[42] The recently proposed GMP (Gas Master Plan) and IRP 2023, along with other regulatory developments would make South Africa a production newcomer in the gas industry. Other than being a net-importer of gas, the underutilisation of gas in South Africa can be attributed to the abundant coal resources that have allowed for cheap exploitation to produce electricity. However, the exploration of oil and gas fields has recently become a prominent focus in South Africa's mining industry. As such, the government has developed a regulatory framework to respond to mounting pressure.

These regulatory developments include the Draft Gas Amendment Bill of 2023, which aims to amend the Gas Act of 2001 to facilitate the massive expansion of the gas sector, and the Upstream Petroleum Resources Development (UPRD) Bill, passed by Parliament in 2023. The Bill aims to separate the upstream oil and gas industry from the mining and minerals industry.

[41] Rodgers & Carstens, n.d.
[42] Green Economy Journal, 2022

More recently, this includes the draft Gas Master Plan (GMP) published for comment in 2024. After the May 2024 general election, the Department of Mineral Resources and Energy had its name changed to the Department of Minerals and Petroleum, suggesting that beyond regulatory entrenchment, there is also an institutional entrenchment of a gas-to-power pathway.

The GMP, published in April 2024 by the mineral resources department, reflects evolving positions.[43] The GMP is the government's plan to ensure energy security and reduce its reliance on unabated coal to mitigate South Africa's carbon emissions. The plan lays out government's intentions to make gas a critical component of South Africa's energy mix and introduces several pathways to grow supply based on different demand scenarios – low, medium, and high. The GMP makes provisions to overcome South Africa's electricity shortfall by ensuring that 7,220 MW of new gas-to-power capacity is installed. It also declares that these dispatchable plants should operate at a 'high utilisation factor' of 86.71 per cent.[44]

The GMP enables a favourable market for investors and aims to ensure a transition while mitigating potential job losses. It emphasises the need for an extensive infrastructure network to support the gas industry. The plan also proposes converting Open Cycle Gas Turbines (OCGTs) into Combined Cycle Gas Turbines (CCGTs), new builds, and addresses the of retiring Eskom coal power stations into gas power stations. It unpacks the upstream, midstream, and downstream value chain and aims to collaborate with partners in the Southern African Development Community (SADC) region to ensure regional energy security and stability.[45]

The first of the Risk Mitigation Independent Power Producer Procurement Programmes (RMI4P), initiated in 2019, intended to use gas-to-power at large scale instead of peaking capacity.[46] It was introduced as an urgent short-term measure to bring new capacity to reduce blackouts. However, these 20-year purchase agreements were constructed as a take-or-pay where Eskom would be required to pay at least 50 per cent of the net available capacity each year. The structure of the agreements forces gas to be the source of bulk supply despite modelling scenarios showing that gas is not required at such high capacity.[47] In addition, South Africa's first Gas Independent Power Producers Procurement Programme (GASIPPPP) has been initiated to meet this gas-to-power capacity.[48]

To meet South Africa's gas demand, the GMP states that gas will be sourced locally, from areas including Mossel Bay in the Western Cape, to address the shortfall caused by the

[43] Pillay 2024
[44] Parker, 2024
[45] DMRE, 2024
[46] Meridian Economics, 2022
[47] Ibid.
[48] This Closes in August 2024

depleting Mozambican reserves. In addition, the GMP will develop gas terminals at Richards Bay in northern KwaZulu-Natal, Saldanha Bay near Cape Town and the Port of Ngqura in the Eastern Cape to facilitate the large scale importing of liquefied natural gas (LNG). The GMP foresees LNG imports dominating gas markets, making up about 30 per cent of the total energy supply with a projected growth to 87 per cent by 2050. The plan identifies Richards Bay as the main hub for LNG imports from Mozambique, contributing 165 Petajoules per annum (PJ/a) in 2030, projected to double to 387 PJ/a in 2038.

According to the Department Minerals and Petroleum[49], large-scale indigenous natural gas production is necessary for exports. However, the minister has noted that to facilitate exports, there is an urgent need to develop refinery capacity in the form of infrastructure investment through the Strategic Fuel Fund and PetroSA working together with other partners. This would be achieved through a massive drive in additional exploration projects whilst enabling other forms of gas to ensure security of supply. The minister envisages that developing the gas domestic market will facilitate industrialisation and the development of the gas industry including LNG, gas processing, and gas pipelines.[50] The GMP envisions a globally competitive South Africa using innovate technology for the design, production, and development of a varied energy mix.[51]

The minister announced that South Africa has entered into a gas sales agreement with the Mozambican national company, Empresa Nacional de Hidrocarbonetos (ENH) to address the gas supply shortfall. The agreement has the potential to deliver up to 200 PJ/a of natural gas. According to the minister, in addition to the significant new finds of natural gas including the discovery by Kinetiko Energy in Amersfoort, Mpumalanga, this will support South Africa's energy security and promote industrialisation that will bring about growth and development.[52]

Several gas pathways for the short- and long-term have been explored. A report by Meridian Economics proposes that the availability of grid capacity at Eskom's old power station, coupled with its proximity to the ROMPCO pipeline (as Sasol still plans to use this pipeline to source LNG via Maputo), has the potential to create a gas-fired peaking plant in the short term. This would take advantage of the existing infrastructure and provide the lowest cost LNG, as developing extensive gas-to-power infrastructure from scratch would involve significant investments

However, the development of the GMP was raised about a decade ago when TotalEnergies was looking to develop the Brulpadda and Luiperd gas fields. This contributed to regulatory uncertainty.[53] Since these reserves were not developed, the window to develop them to meet

[49] Since the 2024 post-elections Government of National Unity Cabinet.
[50] Pillay, 2024
[51] Mkhize & Sanders, 2023
[52] BusinessTech, 2024
[53] Reuters, 2023

South Africa's climate neutrality targets and to significantly reduce the risk of asset stranding may have already passed. Where and when gas will come from are important questions and this is still unclear in South Africa. Avoiding a gas cliff in 2026 also hinges on these questions, leading several other actors to suggest a case for imported gas as recent discoveries are more mature.[54]

The GMP and the Gas Amendment Bill present major policy shifts in South Africa's gas industry coupled with what has been described as a 'gas heavy IRP 2023.[55] The IRP 2023 also reflects the growing sentiments for the case of gas use and calls for gas technology generating 6,000 MW from combined-cycle gas turbines, including 3,000 MW from LNG-to-power, 726 MW from gas-to-power, and 1,500 MW from non-specified gas.

The role of gas in South Africa's just energy transition – what does the IRP 2023 tell us?

The draft IRP 2023 was released in March 2024 for comment. The main objective of the IRP 2023 is to provide a roadmap for meeting South Africa's energy demand. It proposes that integrating all financial considerations with the country's climate change commitments will ensure sustainable and economically viable energy supply solutions. The IRP 2023 considers the country's planned electricity pathway across two successive timelines: Horizon 1 and Horizon 2. Horizon 1 sets out a short-term action framework with interventions planned until 2030, while Horizon 2 focuses on long-term strategies from 2050 onwards. The interventions address the current energy generation supply by reducing 'unserved energy'. This refers to energy that cannot reliably be met due to supply-side shortages. Of these initiatives deployed for unserved energy, gas-to-power solutions are proposed to add to dispatchable generation.

Gas is identified to address the unserved energy risk, as reliance on non-dispatchable supply initiatives such as wind and solar is considered insufficient. This will also be done alongside the extension of certain coal-fired power plants that were due to be decommissioned and the completion of the extension of the Koeberg Nuclear Power Station's lifespan by another two decades. According to the draft IRP 2023, renewables and clean energy technologies cannot sustain supply security in isolation. A combination of dispatchable technologies such as nuclear, clean coal and gas can meet this requirement and support carbon reduction commitments. Dispatchable or peaking power generation is characterised by low annual gas volumes, with intermittent offtake and large instantaneous flow rate requirements for a limited number of hours at a time.[56] This would be achieved by scaling up the allocation of gas-fired power generation to 7,220 MW, meaning that South Africa would have to import gas in the

[54] Parker, 2024
[55] BusinessTech, 2024
[56] Meridian Economics, 2022

short- to medium-term and rely on domestic and regional sources in the long term.[57] Compared to the 2019 IRP 2023, the current draft also focuses on Carbon Capture Utilisation and Storage (CCUS) as a technology option to mitigate environmental damage and reduce CO_2 emissions.

Significantly, the IRP 2023 excludes green hydrogen as a potential baseload option for the transition towards cleaner energy. By excluding green hydrogen, the IRP also fails to consider the potential of phase-in targets for green hydrogen to achieve decarbonisation targets.

The IRP 2023 is therefore misaligned with other government policies including the Green Hydrogen Commercialisation Strategy. Compared to the IRP 2023 2019, it provides for less renewables of the total energy mix in Horizon 1. The total installed capacity for solar PV has been reduced from 8,288 MW to 3,615 MW, with wind down from 17,742 MW to 4,468 MW.[58] In Horizon 2, the IRP 2023 concludes that renewables and clean energy technologies cannot sustain the security of supply in isolation. Horizon 2 compares combinations of gas, wind, solar PV, nuclear, battery storage and cleaner coal technologies. It concludes that a combination of dispatchable technologies is required, including gas. A new build programme is required to meet demand for the 2032–2050 period and will depend on the successful implementation of the Transmission Development Plan (TDP). The expansion of the TDP will require about R390 billion, presenting a risk for Horizon 2. Several options are being pursued including private sector involvement and the establishment of an independent procurement office designated for transmission infrastructure[59].

Opposition to the use of gas in South Africa

Despite growing support for gas, South Africa is a signatory of the Paris Agreement. In 2021, it also increased its Nationally Determined Contribution (NDC) and set a new target to limit GHG emissions to between 398 and 510 Mt CO_2 equivalent (CO2-eq) in 2025, and between 350 and 420 Mt CO_2-eq in 2030.[60] Several civil society actors and think tanks view the decision to develop large-scale gas through offshore and onshore gas fields for exploration and extraction as a disaster for the environment. For example, onshore gas fragments wildlife habitats. For this reason, fracking of shale gas in the semi-arid Karoo Basin has been strongly opposed. This has resulted in a moratorium on the processing of new applications for exploration and production rights in the area.[61]

Offshore gas exploration has also come under the spotlight for its impact on marine wildlife, especially through seismic surveys. Opposition is particularly strong in light of global shifts in

[57] Feris, Pienaar & Brandt, 2023
[58] Feria et al., 2023
[59] Feria et al. 2023
[60] Briel, 2024
[61] Green Economy Journal, 2022

energy technology, including renewables, battery storage, green hydrogen, and even nuclear power. Nuclear energy, which became highly controversial during the Zuma presidency, may face renewed criticism because of the new electricity and energy minister's plan to procure more nuclear power. This is despite nuclear being seen as expensive and high-risk due its long construction times.[62] The opposition against fossil fuels in South Africa is growing and has made it more challenging for any related projects to go ahead, demonstrated by Shell's failed attempt to continue exploring oil and gas off South Africa's Wild Coast.[63] These legal and environmental challenges indicate an eroding social licence for fossil fuel projects to operate.

The long-standing battle between Shell and the community over a seismic survey for oil and gas on the Wild Coast is now headed for the Constitutional Court over Shell's failure to meaningfully consult with the affected community. The Constitutional Court is tasked with determining whether it is possible to be given a second chance to conduct a consultation. This judgment will significantly impact our understanding of why meaningful consultation is essential and whether the law provides an opportunity to rectify these mistakes

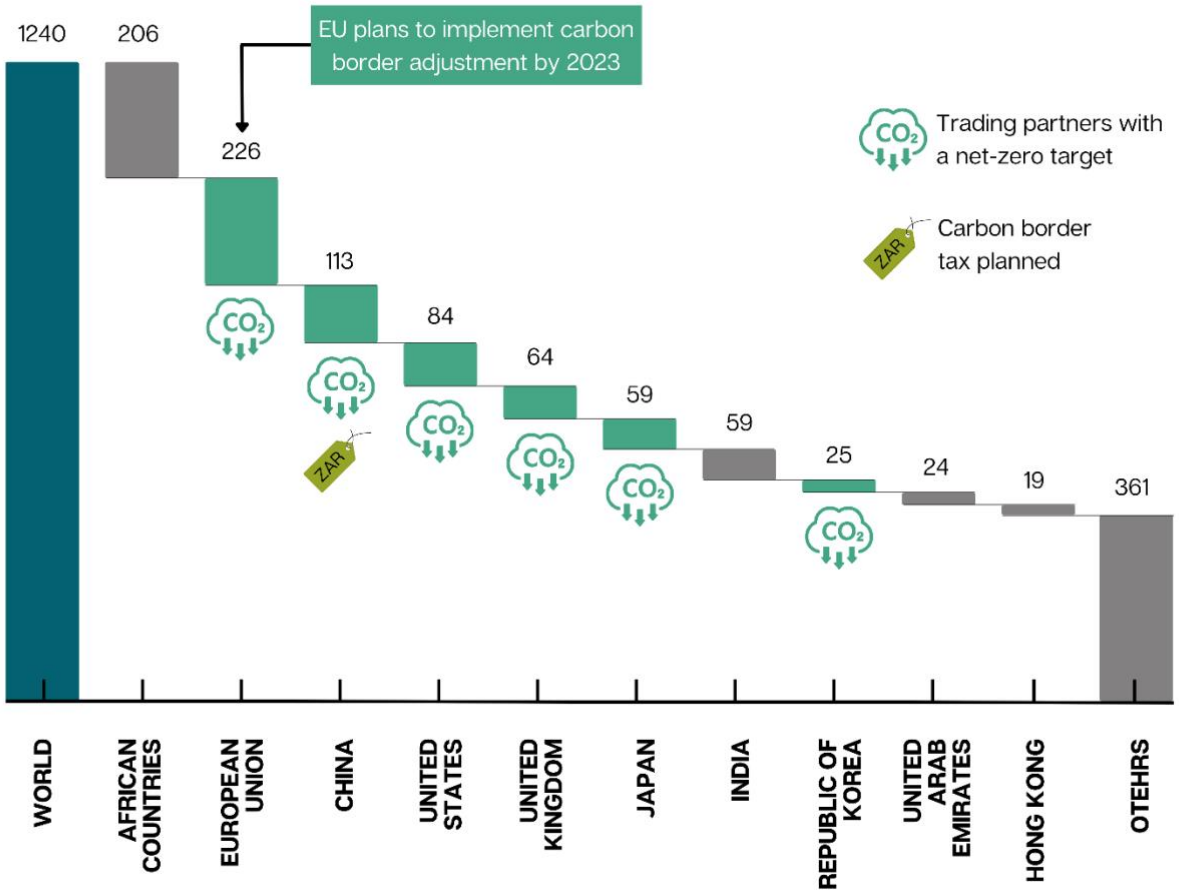
Stakeholders' views on the role of gas vary widely: some communities and think tanks see no role for gas, while policymakers advocate for its large-scale use. Additionally, some actors hold more nuanced views, seeing gas as essential for providing peaking support. The most fiercely debated question is what peaking support should look like. The Presidential Climate Commission (PCC) head of mitigation, Steve Nicholls, points to studies showing that the cheapest electricity system for South Africa going forward would comprise a combination of variable renewable energy, peaking support, and storage, which could be either pumped hydro or batteries. However, for peaking support, gas has prevailed. The other major question, according to Nicholls, is where the gas will come from. The National Development Plan 2030 is a crucial point of departure in answering this question. It supports a low-carbon economy transition that does not compromise the country or its citizens' social and economic status.[64]

The PCC, a multi-stakeholder body established by President Cyril Ramaphosa to oversee and facilitate a just and equitable transition towards a low-emissions and climate-resilient economy, also commented on the current draft IRP 2023. The PCC suggests that, in line with all other major studies, the least-cost, climate-compliant future electricity system would involve rapidly building variable renewable energy, complemented by storage and peaking support in the long term (for example, an OCGT gas peaking plant).[65] In addition, the PCC emphasises that new coal and nuclear are not the least-cost options. However, renewable energy cannot be implemented on its own due to variability and requires peaking support in

[62] Parker, 2024
[63] Luthango, 2023
[64] National Planning Commission 2012
[65] Horizon 2 in the draft IRP2023.

the form of battery storage. The PCC recognises that while it is difficult to plan ahead – the short- to medium-term will lay the ground for 2050. [66]

While the PCC supports gas combined with renewable energy and storage in the short- to medium-term, the IRP 2023 has deployed more gas than various models suggest for the short- to medium-term without addressing load shedding. The PCC recommends 3-5GW of peaking support, for example, gas running at low utilisations by 2030, instead of the 7-8.5GW currently proposed by the IRP 2023. Additionally, the PCC recommends 50 to 60GW of variable



Source: World Integrated Trade Solution. 2018. 'Press research'.

renewable energy by 2030 while the IRP 2023 proposes around 20GW. The PCC warns that carbon emissions calculations in the current draft of the IRP 2023 might be understated. The PCC also suggests that using a high capacity of gas for peaking power will have significant cost implications and needs reviewing.[67] The PCC establishes a foundation for a role for gas, though it envisions this role as limited. However, considering the climate impacts of gas previously underestimated in research, exploring alternatives that do not include gas should be a possibility considering that South Africa currently has zero gas production.

[66] Horizon 1 as stated in the draft IRP2023.
[67] Presidential Climate Commission, 2024

Eskom's capability to build the required 14,000km new transmission lines to connect to renewables is also questioned as they have only managed to build 400km in the past eight years.[68] Additionally, in the context of a declining carbon budget space, large-scale gas investments proposed in the draft IRP 2023 have been criticised. Fossil fuel lock-in is identified as a key risk. With the introduction of initiatives like the European Union's Carbon Border Adjustment Mechanism (CBAM), that seeks to curb the import of emissions-intensive goods, the competitiveness of South Africa's exports within the EU market will be threatened.[69] Carbon pricing is another question to factor in. The South African Treasury has set carbon pricing at a minimum of US$20/tCO2 by 2026, to US$30/tCO2 by 2030, reaching US$120/tCO2 beyond 2050.[70]

Technologies included in the IRP 2023, such as Carbon Capture, Utilisation and Storage (CCUS), still face uncertainty in their uptake due to high capital costs, design complexity and the slow pace of cost reductions. As such, CCUS technology is still not ready for commercial use. The PCC questions the viability of Horizon 2 and its reliance on unpredictable technology. There are also concerns about South Africa's suitability for CCUS technologies due to its geographical location. There is also a risk of leakage, and reports of frequent technical failures encountered at storage sites, which the IRP 2023 has been criticised for not considering in its comparative analysis.[71] In addition, the IRP 2023 lacks some alignment with the goals of the JETPs that aim to accelerate the retirement of South Africa's coal-fired power stations. This is a deviation from the modelling done by the PCC showing that extending coal fired power stations is not a least-cost scenario. This has the potential to undermine financing opportunities.[72]

Introducing 3,000MW of gas capacity is projected to cost about R47 billion despite gas being less competitive than greener alternatives like renewables. As an alternative to the depleting

Figure 4: CBAM tax calculation (in ZAR) of carbon emissions costs across the world

Pande-Temane fields and as part of a least-cost scenario with gas included, ROMPCO is exploring the possibility of connecting an LNG terminal to Mozambique's Matola terminal. This terminal will feature a floating storage and regasification unit (FSRU), capable of receiving LNG shipments from various sources. The regasified LNG will then be delivered to gas-to-power plants. These power plants are yet to be built at the Belulane Industrial Complex to supply gas via the ROMPCO pipeline.[73] The project will be developed by a South African energy company and TotalEnergies. The terminal is expected to be come online in 2026, and the pipeline may prove useful and leverage existing infrastructure to avoid the stranding of assets.

[68] BusinessTech Africa, 2024
[69] Smith, 2024
[70] IMF Africa Department, 2023
[71] Zulu, 2024
[72] Smith, 2024
[73] 360Mozambique, 2024

Even if the Rovuma pipeline is constructed, there is a risk of insurgency in northern Mozambique that could contribute to supply issues going against the government's stated goal in the IRP 2023. In 2021, TotalEnergies declared a force majeure due to the insurgency in Cabo Delgado leading it to close gas operations and withdraw staff at the Afungi site. Relying on a single pipeline that is vulnerable to interruptions due to the conflict threatens the security of supply.[74] This comes at a time when energy security has become a broader issue of national security as in the case of the EU needing to reduce Russian gas supplies due to the war in Ukraine.

There are also global shifts in the regulation of supply chains within the EU and the US. These regulatory developments can impact how products made with 'conflict gas' are classified, affecting South African products. To secure this supply, numerous recommendations have been made including the active management and optimisation of bilateral relations at a national level with Mozambique.[75] Nonetheless, South Africa is facing an overall trade risk especially since seven of South Africa's key export markets have all set net-zero targets, including the EU, China, the US, the UK, Japan and South Korea.[76] The unstable situation in Cabo Del Gado also puts South Africa's supply at risk, making it vulnerable to trade wars. While a new reserve is being negotiated between South Africa and Mozambique, the risk of engaging in a conflict zone should be carefully considered. This could also affect the labelling of South African products as being made with 'conflict gas'— similar to the backlash faced by blood diamonds.

The IISD (International Institute for Sustainable Development) notes that the length of time unsubsidised gas must compete with alternatives is decreasing the risk of these assets becoming stranded before reaching a break-even point. In South Africa, continued investment in gas-to-power could result in a higher risk of asset stranding compared to countries like India, which have already declared some assets as stranded. The IISD projects that investment in proposed gas generation and associated infrastructure in South Africa is projected to cost a minimum of R184 billion. Scaling up gas-to-power, where gas becomes central to economic activity in the region, could also result in stranded economies as seen in Mossel Bay. The Mossel Bay economy is already heavily reliant on gas-to-liquid (GTL) facilities. However, offshore gas reserves have been depleted and without a viable and affordable feedstock replacement, the future of the municipality is precarious.[77]

Saliem Fakir of the African Climate Foundation contends that in the African context, the issue is not just about stranded assets but about stranded economies due to a reliance on gas

[74] IISD, 2022
[75] NBI, 2022
[76] Ibid, 2022
[77] IISD, 2022

without economic diversification. Fakir states that "investments in extractive oil and gas infrastructure tie the economic prospects of a country to the future fortunes of the oil and gas sector. This may be a yoke that may impede economic progress". At the same time, he acknowledges that the transition needs to be a resilient process that considers the impact on workers.[78]

The role of gas as peaking capacity

Any long-term gas infrastructural investment, or short-term investments that require long lead times and delay payoffs, may result in sunk costs, leading to an infrastructural lock-in and asset stranding. It is clear that while gas may have a crucial role to play in South Africa's transition in the short-to-medium-term, large-scale uptake of gas to power is highly contested due to uncertainty about the trajectory of future green technologies. The most strongly supported role of gas is peaking capacity.

The National Business Initiative (NBI) suggests that a modelling without gas will inhibit decarbonisation efforts. However, this narrative does not consider the contribution of methane leakages in the supply chain. It is based on misleading use of combustion-only GHG emissions. An IISD report found that, "when making climate change investment decisions, gas-to-power should not be compared to coal: it should be compared with alternatives such as renewables plus storage, stand-alone storage, and green hydrogen turbines that can provide a similar function to gas during coal phase out".[79]

From the PCC recommendations, it is clear that the most viable role of gas is as peaking capacity – a small, intermittent but crucial role currently provided by diesel in South Africa. Gas as peaking power forms part of assorted options including diesel, piped natural gas, LNG, Liquefied Petroleum Gas (LPG), hydrogen, and ammonia. These options do not have the same environmental or economic risks. For example, marine-transported LNG has a higher carbon intensity than land-based gas supplied through pipelines.[80] Meridian Economics suggests that LNG has the potential to replace peaking plant sites. However, in evaluating the role of gas for peaking capacity it is important to weigh it against maturing technologies such as storage batteries and other hidden costs. The costs include the exposure of power prices to the exchange rate and the global gas market. This also accounts for geopolitical factors that may impact both the gas market and power prices.

AmaBhungane reported that in March 2022, LNG prices skyrocketed to $1000 per gigajoule (GJ) and eventually settled at $300/GJ. Price shocks like this should be considered in making

[78] Fakir, 2024
[79] IISD, 2022
[80] Meridian Economics, 2022

an economic case for gas, which the current draft IRP 2023 does not do. The current IRP 2023 uses a fixed gas fuel price and the Rand/US Dollar exchange rate.[81]

Unlike gas markets, battery storage, wind and solar technologies are not exposed to these risks and provide the option of more stable prices. The current IRP 2023 does not consider price fluctuations, especially considering that gas would be imported from Mozambique. For example, although battery storage prices are currently higher than gas prices, they are expected to drop after 2030 making them cheaper than gas, according to predictions by the NBI. However, the limitations of battery have been highlighted in some studies. This includes the duration for which batteries can sustain peak capacity beyond 10 hours. In addition, while new, long-duration, battery storage technology is being developed, there is uncertainty about when this technology will become commercially viable at grid scale.[82]

However, the price of battery technology has already reached a point where projections indicate that there is an economic advantage over gas for peaking functions. Between 2018 and 2020, the levelised cost of energy (LCOE) benchmark utility-scale battery storage (four-hour duration) halved to $150 per MWh.[83] This is the lowest international LCOE for gas peakers. In addition, battery peaking is estimated to be about 30 per cent cheaper than gas peaking and, for this reason, US states like California are already adding battery storage.

In South Africa, the Council for Scientific and Industrial Research (CSIR) found that the modelling requirement for gas turbines can be replaced by batteries if costs continue to decline. The University of Cape Town also recommends that, to meet the Paris Agreement goals, building battery storage to complement renewables would be a better pathway if battery storage prices continue to fall. The IISD research report shows that there are rare occasions when peaking support will be required in a future system in the form of flexible, dispatchable generation or longer-term storage capacity. For most of the year when there are not significant weather changes, this would not be a requirement. In South Africa, adopting batteries would make a stronger socio-economic case, considering the country's mineral resources like PGMs (platinum group metals).

Green hydrogen has also been proposed as an alternative for peaking power. While the IRP 2023 recognises that renewable technology presents opportunities for creating new industries across the value chain, and that the global renewable energy sector is projected to grow exponentially through new sources of demand such as green hydrogen and electric vehicles, it does not fully capitalise on these possibilities as an alternative to gas. [84] The opportunities found in the localisation and manufacturing of renewable technologies can provide a just

[81] OUTA, 2024
[82] Meridian Economics, 2022
[83] IISD, 2022
[84] Just Share, 2024

transition by providing alternative jobs in mining – one of the at-risk sectors. PGMs are key elements in two growing technologies in the zero-emissions hydrogen economy – electrolysers and fuel cells. Increased demand for these technologies can boost the minerals sector. Supporting beneficiation in the PGM sector alone could create around 90,000 jobs to replace those lost in coal. Maximising value chain benefits, such as those from PGMs, should be considered in the development of hydrogen and fuel cell technology. These technologies are crucial for South Africa's power sector and for transitioning away from combustion engines. They are also important for the automotive sector and for developing charging stations for electric vehicles. Adjacent to this green hydrogen value chain, a battery value chain can also be developed in the region to support regional integration.

Developing local manufacturing will be challenging but necessary. For example, protecting nascent industries such as the solar panel industry in the context of Chinese imports is already being done as the Department of Trade, Industry and Competition is imposing import duties on solar panels. These measures are being taken ahead of the formal release of the South African Renewable Energy Masterplan (SAREM).[85] Due to fierce competition from already developed manufacturers such as China, developing strategic value chains to ensure competitive advantage is even more important.

Developing the electric vehicle sector will also require renewable energy to reach GHG emission targets instead of using electricity generated from fossil fuels. At the regional level there is an opportunity to develop a green hydrogen economy that takes advantage of the Southern African Power Pool (SAPP). The African Continental Free Trade Agreement (AfCTFA) can also be leveraged for regional integration including for the green hydrogen economy-required skills.
South Africa has experience in the sector and has positioned itself as one of the world leaders in carbon-neutral fuels with Sasol as a leading producer in the Fischer-Tropsch hydrogen production.[86] Other green hydrogen projects include the Hydrogen Valley Project, a partnership with the Department of Science and Innovation and Anglo-American Platinum, Bambii Energy and ENGIE. The project will integrate the hydrogen ecosystem in the platinum belt, presenting significant employment and investment opportunities.

According to the Minerals Council South Africa, the global market for platinum is seven million ounces a year, six million ounces of which is the result of mining and 90 per cent of which is found in South Africa. Fuel cells thus offer a key developmental area for platinum.[87] The current regulatory framework is short-sighted in sidelining green hydrogen. It does not consider the repurposing of gas infrastructure investments should gas-to-power projects continue,

[85] Creamer, T., 2024
[86] NBI, 2022
[87] Cabanac, 2022

which could help avoid carbon lock-in and stranded assets. To achieve net-zero targets, gas will need to be phased out by 2050.

The European Union has also announced that, through the Global Gateway, it will support South Africa's green hydrogen ambitions. A sum of about R628 million has been allocated to support the green hydrogen agenda.[88] The grant is expected to finance the hydrogen value chain, including production, transportation, storage and downstream industries. Additionally, money has been allocated for the storage of green hydrogen. This is in addition to the currently provided JETPs but is still far from what South Africa needs for a just energy transition. The grant funding lays the groundwork for a matchmaking platform that will be launched in 2025 and connect European offtakers of green hydrogen with non-European producers, such as South Africa and Namibia. This is an important opportunity in global demand for green hydrogen. Europe currently has a demand of about ten million tons of mostly grey hydrogen, however, this would need to be slowly replaced with green hydrogen to meet its sustainability targets. The Minister of Trade and Industry and the Minister of Energy and Electricity have welcomed the opportunity, signalling a political interest in considering green alternatives. However, producing green hydrogen will require significant scaling up of renewable energy and a review of the current allocation in the draft IRP.

The green hydrogen opportunity opens up offtakers, which is an important incentive for investors. However, South Africa must address its own energy security questions and energy autonomy. The Just Energy Transition Plan lays the groundwork for the creation of green value chains and for a hydrogen value chain. R320 billion is needed by 2027 for research and development of infrastructure to support the production, use and export of green hydrogen. The current funding is just a drop in the ocean. More financing for green hydrogen is important to buffer the uncertainties around the technology, especially storage. In addition, it will also depend on the rate in which South Africa can ramp up its research into the technology before competitors like China[89]. The EU's grant commitment is a positive direction, but this should remain a top priority at the upcoming COP29.

The government now estimates that the green hydrogen economy could boost South Africa's GDP by 3.6 per cent by 2050 and generate around 370,000 jobs.[90] Electricity and Energy Minister Kgosientsho Ramokgopa states, "The green hydrogen economy provides the best opportunity to re-industrialise the South African economy, drive localisation, preserve and create new jobs, and introduce new skills for development".[91] This is a significant indicator of

[88] Engineering News, 2024.
[89] Interview with Dr Deon Cloete, South African Institute of International Affairs (SAIIA) on the 20th of August 2024.
[90] Thorne, S., 2024
[91] Ibid.

changing political sentiments which could also influence the redrafting of the much-criticised draft IRP.

Green hydrogen, like gas, is not without environmental, social and governance (ESG) risks. One of the most significant risks associated with green hydrogen production is occupational health and safety, as it is a highly flammable fuel.[92] A high standard of occupational health and safety is required for workers. The production of ammonia and methanol also generates waste, which can be harmful to the environment and water sources. This has possible health and safety impacts on the livelihood of communities depending on these water sources. This risk includes the storage of hydrogen, which poses a risk to surrounding communities in the event of an explosion or leak. Vast amounts of land are needed for green hydrogen production which impacts land use in surrounding communities and disturbs agricultural land use, biodiversity and habitats, affecting food security. Finally, the production of green hydrogen is a water intensive process. In the context of South Africa's constrained water resources, this will be a challenge. To ensure the sustainability of the green hydrogen value chain, it is important to conduct environmental and social impact assessments with emphasis on free prior and informed consent from affected communities to avoid a deadlock in production.[93]

Despite challenges, renewable energy is the least-cost option to address the supply shortage, meet new demand and replace the decommissioned coal fleet. In South Africa by 2016, wind and solar were estimated as 56 per cent and 78 per cent cheaper than new combined-cycle gas turbines (CCGTs) and open cycle gas turbines (OCGTs), respectively. Additionally in 2021, the fifth bid window of the Renewable Energy Independent Power Producer Procurement Programme showed an average cost of R0.5 per kWh and R0.43 per kWh for wind and solar. These estimates were lower than the previous year's estimates.[94] The lowest bid price for solar and battery storage projects still amounted to less than the RMI4P, despite being designed to favour gas.[95] Renewables costs, which are important to support the production of green hydrogen, have consistently declined. This addresses the challenge of renewables, which were regarded as capital intensive, whilst being operationally cheap.

IISD recommends that an optimised build rate of renewables and storage will enable a future energy mix capable of meeting peak demand during extended periods of low renewable output. These occur infrequently, but when they do, there is already 3,414MW of nominal OCGT capacity. The IISD suggests that the historical OCGT liquid fuel use range can provide all peaking requirements for the next 15 years for all scenarios. This is supported by several international studies that show the technical feasibility and cost effectiveness of 100 per cent renewable electricity systems. These scenarios are based on renewables, storage, and flexible

[92] Hurwitz, H. et al. 2023.

[93] Ibid.

[94] IISD, 2022

[95] Amabhungane, 2021.

or dispatchable generators that run on greener alternatives such as green hydrogen or are powered entirely by renewables and storage, with capacities overbuilt to handle system variability.[96] Expanding significantly in gas is seen as a sub-economic option compared to other holistic power system alternatives including renewable energy and peaking plants.

Conclusion

Gas isn't so green after all, considering methane leakages across the supply chain. Research shows that in the short- to medium-term, coal-to-gas switching's potential lies in the electricity sector. Where the coal fleet is large, potential savings will remain miniscule. South Africa has a large coal fleet and coal-to-gas switching, without significant scaling up of renewables, will yield a negligible saving in carbon emissions. Gas may hinder, rather than help the transition to more secure and sustainable energy supply. In addition, considering the environmental, social and governance risks of gas, including the push back from host communities for fossil fuel related projects, the social license to continue using fossil fuels is steadily eroding.

The geopolitical context presents many opportunities for African countries; however, these should be weighed against risks such as carbon border adjustments and the climate neutrality goals of key markets like the EU. Investing in gas can lead to demand and supply issues exposing gas to price fluctuations and higher tariffs on South African products. As a new gas comer, South Africa would be required to make significant infrastructural investments for gas-to-power projects. Due to shrinking carbon space globally, this can lead to regulatory stranding which can lead to economic stranding in South Africa. Investing in gas is risky when considering the economic landscape. Any long-term infrastructural gas investments could have a substantial risk for fossil fuel infrastructural lock-in. In terms of affordability, funding for gas projects, including those in operation, in construction, or exploration, are expected to deliver capacity that would be inconsistent with the Paris Agreement, risking a high number of stranded assets. Ultimately, investing in gas may not be a fiscally prudent or wise option to take.

Nonetheless, optimising the socio-economic impacts of gas in South Africa is the most important consideration. This includes the consideration of job creation, trade, and adjacent impact on value chains. The creation of green supply chains is important and must align with South Africa's industrial policy. South Africa is rich in platinum and the development of a green hydrogen supply chain that uses platinum in its key components can support a long-term vision to 2050 that mitigates the negative socio-economic impacts of the transition. Battery

[96] IISD, 2022

regional supply chains, with other mineral deposits such as lithium in neighbouring countries like Zimbabwe, can help to realise this vision. Laying the groundwork to support a green hydrogen economy will require a significant scaling up and commitment to renewable energy, particularly wind and solar power. A reviewed draft IRP offers an opportunity to significantly steer South Africa's trajectory in the right direction by supporting government's existing policies such as the JET-IP.

Weighing the competing interests of gas as a transition fuel will require policymakers to assess the interests of South Africans and not just the industry. The general sentiment of those opposing the use of gas is that it is a "campaign for gas being waged not based on what the country actually needs but what a handful of politicians and oil and gas executives want".[97]

Recommendations

Applying the guiding framework of the energy trilemma of security, sustainability and affordability, this paper offers the following recommendations:

- Short-term decisions stated on Horizon 1 of the draft IRP 2023 should consider long-term impacts that will affect Horizon 2. This will result in a more coordinated and coherent industrial strategy. By 2050, green hydrogen demand may out-compete natural gas demand. Should South Africa follow a gas-to-power project, it can capitalise on the green hydrogen economy by ensuring flexible infrastructure post-2030. New gas infrastructure should be flexible enough to allow for green hydrogen use and include green hydrogen phase-in targets.

- The EU, one of South Africa's biggest trading partners, is moving away from investments in fossil fuels at pace and has adopted various policy initiatives to ensure climate neutrality by 2050. The shift away from fossil fuels has already taken place in upstream investments by European development agencies, concessional lenders, and private financiers of hydrocarbon projects in Africa. This is despite the labelling of gas as green in the EU Green Deal. The declining pot of fossil fuel investment funding should be monitored, as gas projects are likely to become harder to fund. On the other hand, South Africa can secure more climate finance at the COP29 from G7 countries if it continues with plans to decommission coal power plants and adopt greener technologies. In addition, it should push for climate financing in the form of grants instead of loans.

- In terms of South Africa's future energy mix, the IRP 2023 needs to align with other government policies like the Renewable energy Master Plan and the Just Energy Transition

[97] Comrie, 2022

Investment Plan. The Renewable Energy Master Plan aims to leverage rising battery technologies to unlock the industrial and inclusive development of associated value chains in the country. The GMP and the IRP 2023 should consider scaling up renewables to reflect the genuine cost of renewables and available carbon space. The IRP 2023 should consider Hydrogen South Africa (HySA) and the Hydrogen Road Map to align its mineral resources, especially PGM potential, with the energy transition to maximise the green value chains. The current draft IRP 2023 should evaluate a modelling that includes green hydrogen, and determine available options for peaking capacity.

- Regional integration is important in the context of deglobalisation and towards more protectionist industrial policy – approaches observed in the EU and the US. For South Africa, the battery supply chain also offers an opportunity for regional integration and an opportunity to leverage the PGM sector, together with regional cooperation partners like Zimbabwe who have lithium. Policy and specific stakeholder platforms should be leveraged with Mozambique to ensure security of supply. However, instability and the insurgency in Mozambique can affect national security of supply, which can affect supply to South Africa. In a global context where energy security poses a national security threat and where gas can be used as a geopolitical weapon, dependence on another country for gas should be carefully considered as this could put South Africa in a precarious position.

- Although gas is less polluting than coal, it is not as clean as available alternatives like renewable energy. When methane-related supply chain leaks are considered—something that must be done—the cost-benefit analysis increasingly disfavors gas as a viable 'transition solution.' Companies such as BP and ExxonMobil have made commitments to reduce methane related emissions, but how these emission reduction targets are calculated remains unclear. Hence, the South African government should develop a regulatory approach that defines concepts that add substantive criteria to ensure Paris Agreement compatibility.

- Finally, government should mandate comprehensive, third-party verified disclosure practices. Moreover, South Africa should join the Extractive Industry Transparency Initiative (EITI) as part of a smart mix of voluntary and binding mechanisms for corporate disclosure. South Africa should also join over 100 countries who have signed the Global Methane Pledge.

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