

# The role of gas as a transition fuel in South Africa's path to net-zero

## INTRODUCTION AND BACKGROUND

South Africa is a signatory to the UNFCCC and to the Paris Agreement. As an energy and emissions intensive middle-income developing country, it recognises the need for it to contribute its fair share to the global effort to move towards net-zero carbon emissions by 2050, taking into account the principle of common but differentiated responsibilities and the need for recognition of its capabilities and national circumstances.

South Africa is highly vulnerable to the impacts of climate change and will need significant international support to build resilience, transition its economy and to decarbonise. Furthermore, given the country's high rate of inequality and unemployment and the extent of dependence on a fossil fuel-based energy system and economy, this transition must take place in a way that is just, that leaves no-one behind and that sets the country onto a new and more equitable and sustainable development path; one which aims to systematically reindustrialise the country, and build new and green industries, value chains and jobs on the basis of a supportive and aligned industrial policy.

In response to the above imperatives, the National Business Initiative, together with Business Unity South Africa and the Boston Consulting Group, has worked with corporate leaders to assess whether the pathways exist for the country's economic sectors to decarbonise by 2050, and whether this can be done in such a way as to build resilience to the impacts of climate change and to put the country onto a new and low emissions development path. The results of this work to date have shown that this can be done, and that to realise these pathways, efforts must begin now.

**Johannesburg, February 15, 2022** —The report "The Role of Gas in South Africa's Path to Net-Zero" was released today. This research was conducted by the [National Business Initiative](#) (NBI), [Business Unity South Africa](#) (BUSA) and the [Boston Consulting Group](#) (BCG) as part of a comprehensive and consultative process to show that it is possible to decarbonise key sectors of the South African economy.

A central finding of the report is that as South Africa decarbonises its economy, gas can, if affordably supplied, play a role as a transition fuel to replace more emissions-intensive fossil fuels such as coal and diesel. Importantly, it can complement battery storage to provide flexible capacity thereby enabling a rapid scale-up of renewables, until alternative long-duration energy storage solutions and greener fuels become affordable. An LNG pathway is

assessed as the optimal gas supply option to meet South Africa's gas demand and address the supply constraints from the diminishing Pande-Temane reserves, South Africa's only major gas supply source today. The LNG pathway requires limited infrastructure with Floating Storage and Regasification Units (FSRUs) and potentially one inland pipeline and therefore provides the flexibility to ramp down supply post-2040 and minimise the risk of stranded assets and gas infrastructure lock-in.

The report finds that new investments in gas infrastructure should consider the future repurposing of these assets for the usage of green gases (e.g. green hydrogen blends and green hydrogen). For South Africa to achieve a net-zero 2050 target, gas will need to be phased out by 2050 and substituted with greener alternatives.

Going forward, South Africa will need to establish the enabling policy and commercial framework to 1) Procure gas on an aggregated basis and achieve economies of scale; 2) Enable supply infrastructure within the time and to the scale of the gas demand required and 3) Manage the risk of unconstrained demand and stranded supply infrastructure.

The gas report is available and can be downloaded from the NBI's [website](#). Reports for the power sector, mining sector AFOLU and petrochemical and chemical sectors are also available on this website. Reports for other sectors will be released as they are completed.

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## 15 key findings on the role of gas analysis

1. As South Africa decarbonises its economy, gas can, if affordably supplied, play a key role as a transition fuel to replace more emissions-intensive fossil fuels like coal and diesel, and provide flexible capacity to enable a rapid scale-up of renewables, until alternative energy storage solutions and greener fuels become affordable. New investments in gas infrastructure should consider the future repurposing of the assets for the usage of green gases (e.g., green hydrogen blends or green hydrogen). For South Africa to achieve a net-zero 2050 target, gas will need to be substituted with greener alternatives and phased out by 2050.
2. Today, South Africa consumes ~180 Petajoules per annum (PJ/a) of gas, predominantly in the synfuels sector (110 PJ/a) and the industrial sector (70 PJ/a), which supports up to 56 thousand (k) jobs across the value chain, generates up to ZAR215 billion (bn) in taxable revenue, and contributes ~1–2% of GDP.
3. All of today's gas demand is located in Gauteng (50 PJ), Mpumalanga (110 PJ) and KwaZulu-Natal (KZN) (20 PJ), supplied by gas from Pande-Temane in Mozambique (~160 PJ) via the ROMPCO pipeline and from Sasol operations – around 20 PJ of Methane Rich Gas – to KZN via the Lilly pipeline. Industrial consumers currently pay ~ZAR30–90/GJ for the gas from Pande-Temane.
4. The reserves of the Pande-Temane gas fields are declining, and supply is expected to be constrained from about 2025 onwards, presenting a supply risk if additional gas cannot be sourced at an affordable price. This poses a risk to the decarbonisation ambitions of key sectors in the South African economy, which will rely on gas as a transition fuel or low carbon feedstock. A future with no additional gas could lead to more cumulative emissions in the long-run across the synfuels, power and industrial sectors, due to the extended use of coal and diesel in the absence of greener alternatives.

5. 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:
  - 1) **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.
  - 2) **Synfuels:** Introduce additional gas to enable the phase-out of significantly more carbon-intense coal feedstock in the production of liquid fuels.
  - 3) **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.
  - 4) **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 viable.
6. South Africa's actual future gas demand will be influenced by whether consumers can afford the delivered price of gas as an alternative energy source and feedstock. As an alternative to diesel, the power sector can afford gas, for predominantly peaking capacity, at delivered prices of up to ZAR300/GJ, whilst the transport sector's affordability threshold for gas is ZAR100–300/GJ. These affordability thresholds are the highest because of the high price of diesel. Synfuels has the lowest affordability threshold, and the industrial sector's affordability threshold is less than ~ZAR135/GJ, given the relatively cheap cost of the coal alternative.
7. Four scenarios are considered, structured on two key variables: whether additional gas supply is available; and the level of decarbonisation ambition. Cumulative emissions, across sectors, for scenarios with no additional gas are 400–600 Mt higher than scenarios with additional gas supply, due to the prolonged use of more carbon-intense fossil fuels like diesel and coal, before greener alternatives become economically viable. In scenarios that do allow for additional gas supply, 2030 demand ranges from ~230–550 PJ/a in a low vs. high gas demand scenario, with peaks of ~330 PJ/a and 800 PJ/a post-2030, respectively. In both scenarios, gas would either need to be phased out by 2050 via green alternatives like green H<sub>2</sub>, or the residual emissions captured with Carbon Capture Utilisation and Storage (CCUS) or Direct Air Carbon Capture and Storage (DACCS). Across these scenarios, cumulative emissions from gas amount to 250–690 Mt, equivalent to 3–9% of an 8 Gt carbon budget for South Africa.
8. In both high and low gas demand scenarios, inland gas demand in Gauteng and Mpumalanga exceeds the capacity of South Africa's only major gas pipeline, ROMPCO, which has a capacity of ~210 PJ/a, and supplies the inland market. Inland gas demand reaches 280 PJ/a by 2030 in the high scenario, and 220 PJ/a by 2035 in the low scenario. Therefore, in both scenarios new midstream gas supply infrastructure may be required by 2030–2035. This decision on midstream infrastructure can be deferred at least until 2023.
9. The scale, pace of deployment, and location of GTP peaking plants in the power sector are critical swing factors to the quantum and location of demand. Given the high affordability threshold of GTP, it can serve as a demand anchor to enable the optimal supply option for South Africa. It is therefore critical that energy planning policy gives clarity to the deployment, operating regime, and location of GTP plants beyond 2030.

10. Potential supply options vary over the short- (2021–2024), mid- (2024–2030), and long-term (2030+). In the short- to mid-term, key options are extending piped gas supply from Pande-Temane via technical work on the reserves, and Liquefied Natural Gas (LNG) via Floating Storage Regasification Units (FSRUs). The amount of additional gas available from Pande-Temane is not fixed, given contractual and technical uncertainties. However, this gas is the most cost-competitive of all options. In the long-term, potential supply options, in addition to LNG, are piped gas from Rovuma and potentially other Mozambique gas fields, and gas from exploration activities in South Africa’s Brulpadda and Luiperd gas fields.
11. All supply and demand-side infrastructure needs to be assessed with a lens to minimise the risk of carbon lock-in and stranded assets. All investments considered should be financially resilient to future drops in demand and costs related to potential repurposing of gas infrastructure, for example, to enable a substitution of gas with green H<sub>2</sub>, its derivatives or sustainable sources of carbon.
12. Considering South Africa’s supply options, five strategic gas infrastructure pathways exist: 1) No additional gas supply; 2) Piped gas and exploration – Rovuma and Brulpadda; 3) Piped gas only – Rovuma only; 4) Exploration only – Brulpadda only; and 5) LNG. The LNG pathway emerges as optimal for South Africa because of the socio-economic benefits it yields, and the inherent flexibility to ramp down supply post-2040 and minimise the risk of stranded assets and gas infrastructure lock-in.
  - Pathway 1: A no additional gas supply pathway has the lowest infrastructure lock-in risk, but also the lowest socio-economic benefit, and leads to ~400–600 Mt higher cumulative emissions in the long-run. Given the higher carbon-intensity of alternatives, this pathway could yield higher carbon tax burdens for consumers.
  - Pathways 2–4: These are only relevant in a high demand scenario and present a high risk of stranded assets and carbon lock-in, with large capital investments of ~ZAR70–200 bn required. Rovuma piped gas, in particular, is highly complex with significant political and security risks to be addressed. Extracting gas from Brulpadda and Luiperd may also be technically complex, which could further increase the cost of these pathways.
  - Pathway 5: The LNG pathway is optimal for South Africa given the flexibility it provides, due to shorter lead times as demand ramps down post-2040 to achieve net-zero, and due to the positive socio-economic benefits it brings. The negative impact on the trade balance will need to be offset by new green export industries, such as a South African e-fuels industry.
13. Within the LNG pathway, a multi-hub approach with FSRUs in Matola, Richards Bay, Coega and Saldanha is assessed. In addition to Matola as a supply option, developing all three South African FSRUs in parallel emerges as the optimal supply scenario for South Africa, given the higher socio-economic impact and increased bargaining power for consumers, which will potentially yield a more competitive delivered LNG price. A scenario where Richards Bay is not developed restricts and locks the inland market into supply from Matola and should, therefore, be avoided.
14. Developing the three FSRU hubs in parallel will require limited CAPEX, focused on the FSRU and port modifications, with a maximum FSRU CAPEX of ZAR50 bn across scenarios. Critically, should an alternative greener technology for peaking support arise beyond 2035, the net present value of the investment at risk in a low demand power scenario is ~ZAR7 bn. This value at risk is relatively low,

compared to the ZAR14–28 bn in OPEX saving arising predominantly from cheaper gas prices relative to diesel prices, and should not inhibit technology switching, particularly in the context of a higher carbon price.

15. South Africa must establish the enabling policy and commercial framework to: 1) Procure gas on an aggregated basis and achieve economies of scale; 2) Enable supply infrastructure within the time and to the scale of the gas demand required; and 3) Manage the risk of unconstrained demand and stranded supply infrastructure, for example, by putting in place phase-out targets. A detailed view on the gas supply-demand economics and affordability across all sectors should inform the Gas Master Plan which should in turn provide clarity on the long-term demand and preferred supply pathway for South Africa. Policy and specific stakeholder engagement platforms should also be leveraged to promote investment, drive public-private partnerships and bilateral relations with Mozambique, and to invest in research and development for solutions to address methane leakage and repurposing of gas infrastructure.

## ABOUT THE AUTHORS

### About the National Business Initiative

At the [National Business Initiative \(NBI\)](#), we believe in collective action and collaboration to effect change; building a South African society and economy that is inclusive, resilient, sustainable and based on trust. We are an independent, business movement of around 80 of South Africa's largest companies and institutions committed to the vision of a thriving country and society. The NBI works with our members to enhance their capacity for change, leverage the power of our collective, build trust in the role of business in society, enable action by business to transform society and create investment opportunities.

### About Business Unity South Africa

[BUSA](#), formed in October 2003, is the first representative and unified organisation for business in South Africa. Through its extensive membership base, BUSA represents the private sector being the largest federation of business organisations in terms of GDP and employment contribution. BUSA's work is largely focused around influencing policy and legislative development for an enabling environment for inclusive growth and employment.

### About Boston Consulting Group

[BCG](#) partners with leaders in business and society to tackle their most important challenges and capture their greatest opportunities. BCG, the pioneer in business strategy when it was founded in 1963, today works closely with clients to embrace a transformational approach aimed at benefiting all stakeholders – empowering organisations to grow, build sustainable competitive advantage, and drive positive societal impact. Our diverse, global teams are passionate about unlocking potential and making change happen and delivering integrated solutions.

## MORE INFORMATION

For more information on NBI's Climate Pathways and a Just Transition for South Africa visit <https://www.nbi.org.za/climate-pathways-and-a-just-transition-for-south-africa>. *Just Transition and Climate Pathways Study for South Africa – Chapter 3: The Role of Gas in South Africa's Path to Net-Zero*, and other reports in this study, can be accessed on the site.

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