

IN THE HIGH COURT OF SOUTH AFRICA
(WESTERN CAPE DIVISION, CAPE TOWN)

Case No/2024

In the matter between:

AUKOTOWA FISHERIES PRIMARY CO-OPERATIVE LIMITED First Applicant

THE GREEN CONNECTION NPC Second Applicant

NATURAL JUSTICE Third Applicant

and

**DIRECTOR-GENERAL: DEPARTMENT OF MINERAL AND
PETROLEUM RESOURCES** First Respondent

**MINISTER OF FORESTRY, FISHERIES AND
THE ENVIRONMENT** Second Respondent

TGS GEOPHYSICAL COMPANY (UK) LTD Third Respondent

**MINISTER OF MINERAL AND PETROLEUM
RESOURCES** Fourth Respondent

EXPERT AFFIDAVIT : MARK NEW

I, the undersigned,

MARK NEW

do hereby make oath and state:

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1. I am a professor in the Department of Environmental and Geographical Science at the University of Cape Town and the previous director of the African Climate and Development Initiative (2011 – 2023).
2. The facts contained in this affidavit fall within my own personal knowledge, except where I indicate otherwise and are, to the best of my knowledge, true and correct. To the extent that I rely on information supplied by others, I believe that such information is true and correct.
3. I have over twenty-five years of experience in climate change research, teaching and project management. My qualifications and experience are set in my curriculum vitae, a copy of which is attached marked 'MN1'. By virtue of my qualifications, training and experience, I submit that I am qualified to give expert evidence on the issues traversed in this affidavit.
4. In order to arrive at a balanced assessment of whether or not the exploration for, and production of, oil and gas in South Africa is socially, environmentally and economically sustainable, it is necessary to consider, assess and evaluate the social, economic and environmental impacts of those activities, including disadvantages and benefits. In this affidavit, I set out the basic science underpinning concerns about climate change and the global and national efforts to arrest this phenomenon, and some of the considerations relevant to deciding whether or not to authorise gas exploration and production in South Africa. I point out that authorising those activities would be at odds with South Africa's climate change policies and its international commitment to dramatically reducing greenhouse gas emissions. It would also exacerbate the extent of climate change and thereby contribute to very significant adverse impacts on

people (especially women, vulnerable people and future generations) and the environment.

Paris agreement limits

5. As a party to the United Nations Framework Convention on Climate Change (“UNFCCC”) and the Paris Agreement, South Africa has agreed to collaborate with the other Parties to limit the increase in the global average temperature to well below 2°C above pre-industrial levels, and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. This requires South Africa to do its “fair share” of reductions in the emissions of greenhouse gasses (“GHGs”). South Africa has acknowledged this in its first (2016) and updated (2021) Nationally Determined Contribution (“NDC”) submissions to the UNFCCC, where (in the latter) it states it has committed “to ultimately moving towards a goal of net zero carbon emissions by 2050, which will require various interventions to reduce greenhouse gas emissions”.
6. Climate change is already having very significant negative impacts on people and ecosystems throughout the world, including in South Africa. The significance of the Paris Agreement target of 1.5°C above pre-industrial levels is that it reflects a global consensus that the level of risk to humanity becomes unacceptably high once that threshold is crossed. Those include the risk of extremely high impact “tipping point” changes in the climate which I discuss below.

Remaining Carbon Budget

7. The cumulative "stock" of GHGs (particularly CO₂) in the atmosphere is the primary driver of long-term global warming. This means that even if all human-caused GHG emissions ceased immediately, Earth's climate would still heat up by several tenths of a degree Celsius because the GHGs which are already in the atmosphere will continue warming in the Earth's climate for more than a century.
8. The "Remaining Carbon Budget" is the amount of CO₂ that can be emitted in the future, while still keeping human-induced warming below 1.5°C or 2.0°C. The remaining carbon budget is not a single number, but a range of budgets each of which corresponds to a specific likelihood of keeping global warming below 1.5 °C or 2.0°C. For example, the IPCC's Sixth Assessment Report published in March 2023 estimated that in order for there to be a 50% likelihood of limiting warming to 1.5°C, the remaining carbon budget from the start of 2020 was 500 Gt (Gigatonnes) CO₂.
9. However the Remaining Carbon Budget is shrinking fast. The Indicators of Global Climate Change ("IGCC") initiative produces estimates for key climate indicators that are consistent with the IPCC's Sixth Assessment Report.¹ The IGCC's updated assessment has determined that the remaining carbon budget has reduced from 500 Gt CO₂ at the start of 2022 to 200 Gt CO₂ as of November 2024. This is largely due to the annual emissions of around 55 Gt CO₂ per year over the last four years. My own estimates, which are more conservative (and therefore generous), place the current remaining carbon budget at 380 Gt CO₂.

¹ See [Current Remaining Carbon Budget and Trajectory \(climatechangetracker.org\)](https://climatechangetracker.org)

Using either determination, this means that the window of opportunity within which humanity can take measures to avoid overshooting the 1.5°C and 2.0°C thresholds for dangerous, and perhaps catastrophic, climate change, is closing fast.

Proven oil and gas reserves far exceed what can be combusted

10. I have prepared the report attached to this affidavit, marked 'MN2', and confirm that to the best of my knowledge and belief the contents of that report are true and correct.
11. As I explain in that report, as a matter of scientific fact, the total proven oil and gas reserves globally exceed by some margin what it would be possible to combust while still implementing the global GHG emissions reductions necessary to limit the increase in global average temperatures to no more than 1.5°C above pre-industrial levels. Proven coal reserves, if burned, would result in additional emissions more than double those from oil and gas. Investing in more oil and gas exploration and new resource discoveries will inevitably lead to greater production and greater GHG emissions at a time when it is critical to reduce emissions.
12. The abovementioned report shows that the remaining amount of global GHG emissions (specifically CO₂) that can be emitted (as of November 2024) and still have a reasonable (50:50) chance of keeping global mean temperature below 1.5°C is 380 Gt CO₂. Similarly, remaining emissions of CO₂ that would have a reasonable chance of keeping "well below" 2.0°C are 920 Gt. Both of these remaining CO₂ budgets far exceed the emissions that would arise from combustion of already discovered coal, oil and gas, which conservatively, are

estimated to be 1540, 543 and 350 Gt CO₂, respectively, or 2,433 Gt CO₂ combined. Therefore, today, the extent to which discovered reserves exceed what can be burned while keeping global temperature increases below 1.5°C is already significant, and increases each year by approximately 50 Gt CO₂ as GHG emissions continue.

13. The analysis in my report is echoed in other work. For example, based on a review of selected climate and energy scenarios by intergovernmental organizations, including the IPCC, the International Renewable Energy Agency (IRENA) and the International Energy Agency (IEA), the International Institute for Sustainable Development (IISD) noted a consensus that no new oil and gas fields should be developed if the world is to achieve the 1.5°C target². Similarly, in 2021, the International Energy Agency declared that “there is no need for investment in new fossil fuel supply” in its scenario for achieving net zero emissions by 2050 – a finding it reiterated again in 2023³.
14. The IPCC's Sixth Assessment reports also show that reducing emissions is no longer sufficient, and that it will also be necessary to remove some of the carbon that is already in the atmosphere or will be in the atmosphere in the years to come.

“From a physical science perspective, limiting human-caused global warming to a specific level requires limiting cumulative CO₂ emissions, reaching at least net zero CO₂ emissions, along with strong reductions in other greenhouse gas emissions. Reaching net zero GHG emissions primarily requires deep

² International Institute for Sustainable Development, Navigating Energy Transitions: Mapping the Road to 1.5°C (Oct. 2022), p18, <https://www.iisd.org/system/files/2022-10/navigating-energy-transitions-mapping-road-to-1.5.pdf>.

³ International Energy Association (IEA), *Net Zero by 2050: A Roadmap for the Global Energy Sector*, 2021, p. 21; see also International Energy Agency, *Net Zero Roadmap: A Global Pathway to Keep the 1.5 °C Goal in Reach*, 2023, p. 16.

reductions in CO₂, methane, and other GHG emissions, and implies net negative CO₂ emissions. Carbon dioxide removal (CDR) will be necessary to achieve net negative CO₂ emissions [...].⁴

The fact that CDR, which is as yet unproved at scale, will be required over the next 25 years to reduce CO₂ levels in the atmosphere to meet the Paris temperature targets, reiterates the need to reduce future GHG emissions as steeply as possible.

Impacts of climate change and tipping points

15. It is important to appreciate that climate change is not linear, and its impacts not necessarily reversible. Non-linear impacts of climate change have been termed "tipping points". A climate tipping point occurs when change in one or more large parts of the climate system change rapidly (or "tip") once a particular global warming threshold is exceeded. Once such a tipping point has been passed, the change will continue regardless of how humans respond, causing so-called "irreversible" climate change.
16. An example of a climate tipping point is melting of the Greenland Ice Sheet. At somewhere between 1.5 and 2.0 °C global warming, summer melting will exceed winter accumulation of the ice sheet, and its mass balance starts to decrease. As its mass decreases, the elevation of the ice sheet (currently up to 3,300m above sea level) decreases, and surface temperatures become warmer due to this lower elevation (the lapse rate effect). Even if global warming is reversed, the lower elevation and warmer temperatures ensure that melting continues in a positive feedback loop. Complete melting of the

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Greenland Ice Sheet will cause ~6m of sea level rise, inundating nearly all coastal settlements, including those in South Africa, such as Cape Town and Durban.

17. Some tipping points can act to increase GHG emissions, further accelerating climate change. For example, the Amazon forest is projected to collapse and transform into a savanna landscape somewhere around 2.0 °C. The carbon stored in the forest vegetation and soils will be released into the atmosphere as GHGs, adding to those from fossil fuels, and the capacity of this new savanna ecosystem to act as a sink for CO₂ will be much lower than the forest it replaced. This creates “positive CO₂ feedback” which causes the change to accelerate and become self-perpetuating.
18. An article titled “*Exceeding 1.5°C global warming could trigger multiple climate tipping points*” published by leading climate change scientists in Science on 9 September 2022⁵ states the following:

“Potential causal interactions among tipping elements are such that overall tipping of one element increases the likelihood of tipping others, possibly risking a “tipping cascade” of impacts that may further amplify global warming. In the worst-case scenario, interactions might produce a global CTP.”

“The Earth may have left a safe climate state beyond 1°C global warming. A significant likelihood of passing multiple climate tipping points exists above ~1.5°C, particularly in major ice sheets. Tipping point likelihood increases further in the Paris range of 1.5 to <2°C warming. Current policies leading to ~2 to 3°C warming are unsafe because they

⁵ Armstrong McKay et al. ‘Exceeding 1.5°C global warming could trigger multiple climate tipping points’ Science 377, 1171 (2022) p.1

would likely trigger multiple climate tipping points. Our updated assessment of climate tipping points provides strong scientific support for the Paris Agreement and associated efforts to limit global warming to 1.5°C.”⁶

19. The Summary for Policy Makers, which the IPCC published with its Sixth Assessment Report on global warming, was approved by government signatories to the UNFCCC, including South Africa. It recorded that human activities are causing an increase in the Earth's temperature, and this poses a risk to health, livelihood, food security and water supply, among others. The following extracts are relevant.

“In the near term, every region in the world is projected to face further increases in climate hazards (medium to high confidence, depending on region and hazard), increasing multiple risks to ecosystems and humans (very high confidence). Hazards and associated risks expected in the near term include an increase in heat-related human mortality and morbidity (high confidence), food-borne, water-borne, and vector-borne diseases (high confidence), and mental health challenges (very high confidence), flooding in coastal and other low-lying cities and regions (high confidence), biodiversity loss in land, freshwater and ocean ecosystems (medium to very high confidence, depending on ecosystem), and a decrease in food production in some regions (high confidence). Cryosphere-related changes in floods, landslides, and water availability have the potential to lead to severe consequences for people, infrastructure and the economy in most mountain regions (high confidence). The projected increase in frequency and intensity of heavy precipitation (high confidence) will increase rain-generated local flooding

⁶ Armstrong McKay et al. 'Exceeding 1.5°C global warming could trigger multiple climate tipping points' Science 377, 1171 (2022) p. 8.

(medium confidence). {Figure 3.2, Figure 3.3, 4.3, Figure 4.3} (Figure SPM.3, Figure SPM.4)⁷

“Risks and projected adverse impacts and related losses and damages from climate change will escalate with every increment of global warming (very high confidence). They are higher for global warming of 1.5°C than at present, and even higher at 2°C (high confidence). [...]”⁸

20. Climate change is having, and will continue to have, disproportionately severe impacts on South Africa, and on poor and marginalised communities, women, children and future generations. The South Africa government acknowledges this. For example, the Just Transition Framework states:

“South Africa is in a part of the world that is severely impacted by climate variability. The country frequently experiences droughts, floods, and other extreme weather events, with evidence that the frequency and intensity of such events are increasing because of climate change (IPCC 2022). These events have already caused enormous damage to infrastructure, ecosystems, lives, and livelihoods, and displaced thousands of people, and continue to be a stark reminder that it is poorer communities—women and young people, the unemployed, those living in informal settlements—that are most vulnerable to climate change.”

South Africa’s emissions and remaining carbon budget

21. South Africa’s GHG emissions are relatively high and the Union of Concerned Scientists estimated that in 2018 South Africa was the world’s 13th biggest emitter of CO₂, and the largest in Africa. South Africa’s per capita emissions of GHGs are also high by African standards. According to Climate Watch, South

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⁸ B2.2.

Africa's per capita emissions are 9.01 tonnes of CO₂-eq⁹ and while Nigeria's is 1.83 tonnes CO₂-eq.

22. South Africa's remaining carbon budget, if it were to meet its self-defined "fair share" contribution to net zero global GHG emissions by 2050 is in the range of 6-9 Gt CO₂-eq¹⁰. At current annual emissions of ~455 Mt CO₂-eq, this budget will be exhausted within between 13 and 20 years (2037 - 2044). Thus, the country is already challenged to not exceed its nationally defined remaining carbon budget.
23. If a gas field were to be developed as a deep-water field, and over a ~15 year period it produced between 5 Tcf¹¹ and 10 Tcf of gas (approximately the minimum viable reserve size for offshore exploration at these depths), the combustion of that gas would release between 258 (5 Tcf) to 564 (10 Tcf) Mt CO₂-eq.
 - 23.1. Those emissions will consume part of South Africa's remaining global carbon budget. By way of illustration, if the total amount produced were to be combusted in South Africa, this would consume a significant amount (3-9%) of the country's remaining carbon budget, meaning that other GHG emitting activities would have to be restricted more severely.
 - 23.2. If such a field were developed, it is reasonable to assume that it would not start producing gas until about 2035. Extremely steep reductions in emissions will be necessary well before this date to meet the goal of net-

⁹ CO₂-eq refers to the combined GHG warming effect of all gases emitted from production to burning, re-expressed as the equivalent concentration of CO₂

¹⁰ Marquard, Andrew, et al. (2023). Exploring net zero pathways for South Africa - An initial study. University of Cape Town. Report. <https://doi.org/10.25375/uct.22189150.v2>.

¹¹ Tcf = trillion cubic feet of gas

22 MN

zero emissions by 2050, meaning that it is extremely unlikely that the field could operate and be consistent with South Africa's 2050 net-zero commitment.

24. It is virtually certain that the world will overshoot 1.5 °C within the next few years and enter a zone of very significant risk. Current implemented and planned emissions reduction policies from countries will result in an overshoot of 2.0 °C, most likely to between 2.1 and 2.5 °C¹², increasing the severity of impacts and the likelihood of tipping points being reached. Widespread failure to implement currently planned emissions reductions, such as those articulated in South Africa's updated Nationally Determined Contribution, could well result in overshoots higher than 2.5 °C.

Natural gas, methane, CO₂ and GHG warming

25. Methane is the main component of natural gas found underground (i.e. the gas which Total is exploring for). The amount of methane in raw natural gas varies, but is typically between 70% and 97%, and on average around 95%. The second most abundant gas in raw natural gas is ethane, which is also a GHG. Natural gas affects climate through two pathways: (i) during its production and transport so called fugitive emissions arise from releases methane, ethane and other gases directly into the atmosphere (e.g., from leakages in pipelines); and (ii) during combustion, CO₂ is produced, in a similar manner to burning of oil and coal.

¹² <https://climateactiontracker.org/global/cat-thermometer> [accessed 09 October 2024].

26. Methane (from fugitive emissions and other sources such as agriculture) is a powerful GHG. Although it breaks down in the atmosphere faster than CO₂, its Global Warming Potential (“GWP”) is ~80 times greater than that of CO₂ when measured over a 20 year period, and ~28 times greater when measured over a 100 year period¹³.
27. The magnitude of natural gas production on GHG warming depends strongly on the level of fugitive emissions (gas that escape into the atmosphere during production and transport and is therefore not burnt for energy production). At zero fugitive emissions, production natural gas for electricity results in emissions of ~258 g CO₂-eq/kWh_{el}¹⁴, while 10% fugitive emissions increase the GHG forcing to ~1439 g CO₂-eq/kWh_{el}. Actual fugitive emissions across different natural gas production systems typically fall towards the upper level of this range. In many cases, the net GHG effect of natural gas use is greater than that of oil or coal, because of these fugitive emissions.
28. Therefore, the argument that natural gas is a lower impact “transition fuel” that should be exploited in place of oil and gas is untrue in most gas production cases to date.

¹³ Global warming potential (GWP) is a measure of a molecule of a given GHG's warming power, relative to a molecule of CO₂, over a given time period, typically 20, 50 or 100 years. GWP is a function of both a molecule's instantaneous warming power and its lifetime in the atmosphere.

¹⁴ As noted earlier, CO₂-eq refers to the combined GHG warming effect of all gases emitted from production to burning, re-expressed as the equivalent concentration of CO₂, while kWh_{el} refers to electricity energy produced.

Proven oil and gas reserves far exceed what can be combusted

29. Together with Dr Lawrence Meckel, I have also prepared the report attached to this affidavit, marked 'MN3', and confirm that to the best of my knowledge and belief the contents of that report are true and correct.
30. This report provides a methodology to transparently estimate national or sub-national hydrocarbon volumes that might possibly be produced by a series of commercially-viable projects in the future and the associated greenhouse gas (GHG) emissions from those projects. We also recommend a rigorous project-based classification and reporting framework that ensures these factors are considered, assessed and quantified across the life cycle of specific projects.
31. The key messages from this report are as follows:
- 31.1. Estimation of yet to be discovered, commercially viable, oil and gas reserves for South Africa are possible, using well established methodologies. These estimates carry large uncertainties, but can usefully be applied to determine likely upper and lower limits for these resources.
 - 31.2. Well established emission factors, which determine the CO₂-equivalent greenhouse gas emissions from use of oil and gas for different purposes, can be used to calculate the emissions that would be emitted from exploitation and use of yet to be discovered oil and gas reserves
 - 31.3. Such information on GHG emissions from exploitation of future, yet to discovered, oil and gas reserves in South Africa can (and should) be used in support of development of the country's Nationally Determined

Contribution for reducing greenhouse gas emissions, as required by the Paris Agreement of the UNFCCC.

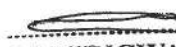
- 31.4. The South African government should develop a system, using the methods described in this report, to estimate the CO₂-eq emissions from its national yet to be discovered reserves.
- 31.5. The South African government could include a requirement for oil/gas exploration and producing companies to provide reserve estimates and associated emissions as part of any exploration licensing process.



MARK NEW

I hereby certify that the deponent has declared that he knows and understands the contents of this Affidavit and that to the best of his knowledge and belief it is the truth, which Affidavit has been signed to and affirmed to before me at RONDEBOSCH on this the 13 day of NOVEMBER 2024.



 **SGT**
Z.I. TUNGWANA
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COMMISSIONER OF OATHS