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THE BUBBLE THAT GOT AWAY?

PROSPECTS FOR SHALE GAS DEVELOPMENT IN SOUTH AFRICA

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Abstract:

The potential for shale gas development (SGD) in South Africa's environmentally sensitive Karoo region has attracted the interest of energy companies, government and the public. The South African government is eager to revive economic growth, improve energy security following an energy supply crisis and relieve high unemployment. The public is torn between environmental concerns and prospects of economic benefits, while investors seek clarity in legislation. The impact of the US shale revolution explains the allure of SGD and constitutes the only model worldwide of a developed shale industry. South Africa is a useful case study for examining how various societal interests shape support for and opposition to SGD. While government seeks to proceed with exploration, a dominant coal industry and other alternatives including renewables and nuclear compete for attention, and there are increasing concerns about the size and economic viability of South Africa's shale gas deposits. Influential actors in the energy-intensive industries comprising South Africa's powerful 'minerals-energy complex' will play a role in how any shale industry might develop. By considering the interests of key actors including a vacillating government, cautious energy companies and a determined environmental lobby, this article examines South Africa's tenuous road towards SGD.

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The Bubble That Got Away?

Prospects for Shale Gas Development in South Africa

1. Impact and allure of the US shale revolution

In order to consider the potential for shale gas development (SGD) in South Africa, or anywhere else for that matter, it is necessary to begin with the emergence of SGD in the US. It constitutes the reference point against which other potential cases are inevitably compared. It is difficult to overstate the scale and impact of the rapid increase in production of US shale gas (and oil) that commenced in the early 2000s and which became known as America's shale revolution. According to Wang and colleagues (2014, p. 2), '[t]he biggest energy story that has happened in the 21st century so far is the extraction of natural gas from shale rock formations in the United States'. In the decade from 2007 to 2016 alone, US shale gas production increased thirteen-fold, from 1,293 to 17,032 billion cubic feet (bcf) (EIA 2018).

Indicative of the attendant excitement, *Foreign Affairs* highlighted America's 'energy edge' and the 'geopolitical consequences of the shale revolution' (Blackwill and O'Sullivan 2014). Jones and Steven (2015) assumed a greatly enhanced international agency for a rejuvenated US superpower previously considered waning in the face of Chinese ascent and the emergence of the Global South. The International Energy Agency (IEA 2013) described these developments as a 'supply shock … as transformative to the [global energy] market over the next five years as was the rise of Chinese demands in the last 15 years'. The IEA's Executive Director, Fatih Birol, argues that "[t]he US shale revolution shows no sign of running out of steam and its effects are now amplified by a second revolution of rising [liquefied natural gas] LNG supplies' (IEA 2017).

The US shale revolution has also promised economic benefits including substantial job creation even if early claims about the ability of the shale industry to create and sustain jobs, as well as boosting incomes and tax revenues, were sponsored by the energy industry itself with a view to influence public policy. They were not published in economics journals and thus not subjected to the standard peer review process for validating such, very likely overstated, claims (Kinnaman 2011). More recent research remains contentious as well (e.g., Inman 2014; Paredes et al. 2015). Wang and colleagues (2014, p. 14) demonstrate 'profound economic impacts' of the US shale industry, including supporting some 600,000 jobs, which they estimated rising to more than 1.6 million by 2035. They further estimate that whereas the shale industry contributed US$76.9 billion to the US economy in 2010, this would increase to an estimated US$231.1 billion in 2025, a 300% increase. Following the 2014 oil price crash which resulted in job layoffs across America's shale plays and in the energy industry more generally – vividly illustrated in Wright's (2018) portrait of the boom and bust nature of the Texan oil and gas industry – a recent study by Maniloff and Mastromonaco (2017) suggests 555,000 jobs attributable to the shale industry which, while a lower estimate than previous ones, is nevertheless substantial.

Feyrer and colleagues (2017) suggest that for each two jobs created in the shale industry, there is more than one job created elsewhere (i.e., an 'employment multiplier'). This is significant following a decade (2000-2010) during which US manufacturing employment shrunk by a third (Arezki 2016, p. 25). The multiplier effect is especially attractive to developing countries like South Africa that are burdened with high levels of unemployment and struggling to boost manufacturing. There are environmental benefits too. US carbon emissions were reduced by about 430 million tonnes CO_2 between 2006 and 2011, more than in any other country, as industry shifts

away from coal and oil towards cleaner natural gas (Wang et al. 2014, p. 1). By 2017 CO_2 emissions from the US energy sector reached a 27-year low according to the US Energy Information Agency (EIA).

Lower natural gas prices also make energy intensive industries in the US more competitive due to the substantial price advantage they now enjoy as compared to international competitors in Asia and Europe. The US price reached a fourteen-year low in 2016, at below US$2 per British thermal unit (btu), compared to nearly US$7 in Japan and US$5 in Germany. Energy intensive industries have therefore invested in US plants to take advantage of lower energy prices there (Makan and Hume 2013). These advantages are however contested. Levi (2015) argues that the expectation of a 'reshoring' of US industry is exaggerated as energy costs, even in the case of energy-intensive industries, constitute a relatively small percentage of their overall costs and are therefore 'rarely pivotal' in investment decisions. Given the many potential benefits and risks of hydraulic fracturing ('fracking'), a major costs and benefits review concludes that policymakers will inevitably face 'pernicious tradeoffs and tough choices' (Sovacool 2014, p. 249).

Tough choices will be no less likely elsewhere, including in South Africa. While benefits of SGD in the US are certainly contested, their cumulative impact also provide other countries an alluring model of what economic forces could be set in motion should their own deposits be successfully exploited. Irrespective of the risks and concerns, governments in developing countries would be loath to not at least consider SGD.

2. Contrasting the US model with South African reality

The US case is not introduced to generate a systematically comparative case study, as no other comparable case of SGD exists.[1] Rather it provides the relevant context in

which arguments for and against SGD elsewhere must be considered. Any country with the potential for exploiting shale gas (and oil) reserves would take into account the US experience in the anticipation that they too could reap substantial benefits from replicating, or at least learning lessons from, the American shale revolution.[2] The US government also promotes its shale gas industry worldwide, including in South Africa, via the US Department of State's Unconventional Gas Technical Engagement Program (UGTEP). At the same time, having only one model to consider limits the ability to generalise and predict what SGD across a variety of cases may be. Hypotheses about the socio-economic impact of a rapidly expanding shale industry developed by Neville and Weinthal (2015) and explored more fully by Neville and colleagues (2017) do however provide grounds for beginning to generalise beyond the US case.

Ultimately there are many ways in which the potential for exploiting shale in other countries with substantial reserves differ from that of the US. The geology of shale formations and supplies of the substantial water supplies required to exploit them by means of fracking are not similar or equally distributed worldwide (Zou et al. 2017). A study by the World Resources Institute on the impact of freshwater availability for SGD identifies the lack of water resources as a major 'stumbling block' for the industry globally. Among countries with major shale gas deposits, South Africa (along with China and Mexico) 'stand[s] out' as 'ranking very highly … on exposure to baseline water stress' (Reig et al. 2014, p. 36).

Jones Luong and Weinthal's (2010) argue that it is the largely private and decentralised ownership structures that prevail in the US shale industry that makes it more resistant to the common ills of the 'resource curse' (Ross 1999). Technological expertise including the presence of a wide range of highly skilled energy companies, financial institutions experienced in financing this emergent and dynamic sector of the

energy industry, and even the necessary societal tolerance for and acceptance of large scale extractive industries, is not equally present across countries with substantial shale deposits (Maugeri 2013).

A review of the prospects for shale development in other countries with substantial shale gas and oil deposits suggests a range of legal, tax and operational hurdles to be overcome:

> [S]hale or unconventional resources development poses several unique challenges to regulators, policy-makers and the citizens they serve and represent. The specialized knowledge, equipment and capital intensive processes involved in extracting liquids and gas from shale elevate the importance of project economics. In order for nations to replicate elements of the shale revolution in the USA, changes to accommodate the unique project economics of shale are necessary (Nülle 2015, p. 235).

There are more specific differences between the US model and South African realities as well. This even though, or perhaps because, South Africa's extractive industries have long played a dominant part in the country's economy. There are several reasons for this, which together suggest that any future SGD in South Africa is likely to play out rather differently than in the US. Some of these differences, to be expounded on in subsequent sections, include the following.

By contrast to the US, it is the South African government that owns mineral rights (as is the case in most countries) and not the landowners atop these deposits. And with mining taxes accruing at the national level and not to local governments there is less incentive for local communities to back SGD, irrespective of the already

contentious socio-political and environmental issues that the prospective industry has given rise to. This makes SGD less attractive to those who live and potentially stand to profit in the Karoo as any economic benefits would have to filter through high-level political processes at the national level. The lack of pipeline infrastructure for transporting natural gas, noted previously by Fig and Scholvin (2015), complicates the investment climate in that private provision of such infrastructure will raise the costs for potential energy industry investors, whereas government provision raises the prospect of mismanagement, delays and corruption as elsewhere in the government-dominated energy sector and among parastatals more widely.

Lastly, vocal government support for SGD has primarily been associated with a narrow group of actors, centred on former President Zuma and his closely affiliated departments of Energy and Mineral Resources. The departments of Environmental Affairs and Water Affairs have generally opposed SGD, due in particular to the risks posed by SGD to underground water. The prudent approach of these latter two departments has largely aligned with and strengthened the environmental lobby's opposition to SGD. Both departments are regularly cited approvingly by the Anti-Fracking Alliance comprised of Afriforum and the Treasure the Karoo Action Group (TKAG). For instance, noting how Environmental Affairs describes the government's stance on fracking in 2013 'ill-advised' and praising Water Affairs in 2014 for its 'proactive and accessible approach' to dialogue with groups opposing fracking in the Karoo.

3. Why frack South Africa?

Having considered the wider context in which the US shale revolution has emerged as a force in international energy markets, the potential for SGD in South Africa must also

be assessed in light of domestic developments and in particular the country's political economy of energy. Today South Africa is a flagging BRICS nation whose economic growth rates are stagnant, its competitiveness hampered by infrastructural bottlenecks and serious problems with corruption in government and faltering educational provision, all of which is resulting in an increasing corrosion of the social fabric. South Africa has become a *de facto* dominant party state and the increasing blurring of the constitutional lines between party and state might ultimately endanger the rule of law (Southall 2014). Consequently, its economic and political role as a leading nation in Africa has been in question for some time (Andreasson 2011).

South Africa has also been experiencing a crisis of energy supply (Baker et al. 2014; Scholvin 2014; Bohlmann et al. 2016). So-called 'load shedding' (managed rolling blackouts across the country according to schedule) to avoid a country-wide energy shutdown became from 2008 until recently a regular feature of daily life as the state energy company Eskom, which supplies some 95% of all electricity, failed to supply the energy demanded by private and industry consumers alike. The government identified the crisis as a key barrier to economic growth. In response it created an 'Energy War Room' in 2015 to implement a '5-Point Energy Plan' including an emphasis on increased energy efficiency but also alternatives to coal such as gas-to-power technologies, off-grid renewables, hydrogen and shale gas (Pollet et al. 2016, p. 16697). The option to build new nuclear plants (most likely by Russia's Rosatom) capable of supplying as much as 9,600MW in new generating capacity, which was a preferred option for the previous administration of President Jacob Zuma and Energy Minister David Mahlobo, became highly contentions due to public concerns about excessive costs and the potential for corruption in tendering processes, especially with the emergence of a vociferous public debate about 'state capture' (Bhorat et al. 2017).

Any continued commitment to nuclear, albeit less likely in the current administration led by President Cyril Ramaphosa and Energy Minister Jeff Radebe, is now expected to be scaled down in the updated Integrated Resource Plan (IRP) for energy that was approved by the Cabinet in December 2017 and expected to be released in the latter half of 2018 (Ensor 2018).

And whereas South African consumers enjoyed the world's cheapest electricity prices prior to 2008, the price has been rising steadily since 2010 when the government announced annual tax increases of 25% to be levied annually until 2013, and then by 8% annually until 2018. By 2014, electricity prices had increased by 260% to R0.65 per kWh. They are now predicted to rise as high as R1.10 per kWh by 2020, a staggering 440% increase on 2008 (Baker et al. 2014, p. 792). A recent study commissioned by Eskom shows that steady price increases have been met with 'increasing public resistance', Eskom's credit rating has been downgraded due to concerns about deteriorating finances and substandard regulation. These problems, combined with the cost of economic subsidies, have, according to this report, resulted in 'harm and distortions' that are 'wide-ranging' (Deloitte 2017, p. 53).

Rising energy costs have taken a toll on the country's economically important, politically influential and energy-intensive mining industries, as well as putting pressure on the Rand and South Africa's credit ratings (England 2014b). Combined with costly labour unrest on the mines (England 2014a), the energy crisis and Eskom's role in exacerbating it has caused serious doubts about the future viability of South African mining according to the South African Chamber of Mines' Chief Economist Henk Langenhoven (Odendaal 2017). Effects of the energy crisis have not been limited to interruptions in the daily routines of South African citizens and to the operations of energy intensive industries, serious as these are. The crisis has also hampered the

country's ability to portray itself to international investors as an attractive, cost effective place to invest. Consider, for instance, reporting from the 2015 Invest in African Mining Indaba in Cape Town, the world's premier gathering for the global mining companies seeking opportunities in Africa. '[F]oreign investors can't avoid the electricity crisis. The shortage is obvious even in their swish Cape Town hotels, where their rooms are often plunged into darkness from rolling blackouts' (York 2015). Improving energy access, including reliability of supply, and reducing spiralling production costs would therefore become vital to reviving South Africa's flagging economic fortunes.

South African industry is, moreover, heavily polluting with an environmental impact that is severe even when compared to major economies of the Global South, such as China and India. This due to the energy intensive nature of South African industries, especially the extractive ones, and their overwhelming reliance on 'climate-devastating' coal which generates nearly 90% of the country's energy in ageing coal plants (Scholvin 2014; Pollet et al. 2016), and henceforth also in two recently constructed coal plants, Medupi and Kusile, that will add 9,600MW of new capacity when fully operational in 2022. In this context, South African energy experts have suggested that the economic rationale for investing in South African shale gas remains favourable as the gas would be used to generate electricity rather than fuel (Steyn 2015).

The energy crisis and attendant concerns about energy supply might reasonably alleviate some investor concerns investors about an industry that is prone to booms and busts, as experienced in the US following the 2014 oil price crash (Wright 2018). There is opportunity in that shale gas could address a pressing problem in the South African market that has been exacerbated by the big increases in energy prices, the public's and investors' doubts about government and in particular Eskom's capability to handle energy provision notwithstanding (Bhorat et al. 2017; Baker and Phillips 2018). An

increase in electricity generation from natural gas would be a step in the right direction given South Africa's energy-intensive and almost entirely coal-dependent industrial profile, this irrespective of controversies surrounding the notion of shale gas as a 'bridge fuel' (e.g., Levi 2013) and about 'carbon lock-in' (Unruh and Carrillo-Hermosilla 2006). In sum, there are potential efficiencies to be gained by moving from coal to natural gas that would be attractive for reasons beyond economic ones alone. The question is whether South Africa is able to realise them.

4. Uncertain scenarios

But persistent doubts have been raised about the potential for improving energy supply and security by shifting the South African economy away from coal towards natural gas. Natural gas been an insignificant contributor to the country's energy mix in the past (Fig and Scholvin 2015). Nor is it clear that it will become a significant contributor in the future as South Africa's IRP, which determines the national energy strategy ahead to 2030, emphasises coal, nuclear and renewables such as solar and wind in addition to natural gas. While South Africa could do more to harness the southern African region's ability to supply it with a range of energy sources, from hydropower to natural gas (cf. Scholvin 2014), there is at present no clear strategy to do so by, for instance, laying the infrastructural plans to import natural gas from Mozambique (beyond the modest amounts imported today) and Tanzania once their vast new offshore gas reserves are developed (cf. Demierre et al. 2015). I would seem that Eskom and the government 'have already taken a path not related to gas-fired power generation' (Fig and Scholvin 2015, p. 139).

Nevertheless, Hedden and colleagues (2013) outline three basic SGD scenarios for South Africa. Their 'Base Case' scenario is that there is no SGD (the 'fracking-free

status quo'). It is the most promising scenario in terms of safeguarding water and other natural resources in the fragile Karoo environment, but holds the least potential for providing additional solutions for the country's many economic problems including energy security. The 'Shale Boom' scenario suggests a boost for economic growth, job creation and poverty reduction along the lines of the benefits that have been suggested in the US case, including additional state revenues to spend on a range of developmental programmes. The downside are potential environmental costs including contamination of water supply, a great concern in the Karoo given its aridity and high baseline water stress levels (Reig et al. 2014), other damage to the eco-system and, ultimately, failure to reduce the country's high carbon emissions over the long term.

Finally, a 'Blue Bridge' scenario offers a more productive path, ahead. In this scenario, a tax regime would be developed to specifically target the funding of renewables from the revenues generated by shale extraction, to thereby reap economic benefits of SGD while also reducing its role as compared to renewables over the longer term to thereby produce environmental benefits as well (Hedden et al. 2013). However, uncertainties abound in this most optimistic case, too, as the ability of natural gas to act as a 'bridge fuel' to a low-carbon economy remains contested given the substantial amount of methane gas emissions in fracking operations (Howarth et al. 2011; Levi 2013).

More recent scenarios provided by the CSIR *Strategic Environmental Assessment of Shale Gas Mining* (Scholes et al. 2016) have added further concerns about the viability of SGD in South Africa, which have in turn been picked up on by environmental groups opposed SGD and national media, ensuring its having a significant impact on the public debate about SGD. Commissioned by the Department of Environmental Affairs, this authoritative assessment has been produced in 'close

collaboration' with a wide range of stakeholders, including government and non-governmental organisations and extensive consultation with major national scientific bodies involving over 200 leading South African and international scientists in a peer-reviewed process over 18 months between 2014 and 2016. It constitutes 'the largest scientific assessment undertaken in South Africa in terms of material scope and participation, both scientific and stakeholder based' (Scholes et al. 2016, p. 3).

A high-profile conference organised by the Academy of Science of South Africa (ASSAf) in 2017 presented the critical findings of the CSIR report as well as ASSAf's own report, *South Africa's Readiness to Support the Shale Gas Industry* (ASSAf 2016). One of the lead co-authors of the CSIR report summarises its findings by noting that 'more realistic guesses' (which is all that is possible in the absence of exploration and testing) suggest a recoverable shale gas resource of about 20 trillion cubic feet (tcf), which is 'tiny by global standards' (Scholes 2017). At the same time, he notes that:

> A viable gas find in South Africa, even if quite small, would potentially transform the national energy economy. But making a large investment in infrastructure, regulatory tools, monitoring bodies, and wellfield development for a resource which may not exist is financially, politically and environmentally risky (Scholes 2017).

The ASSAf report adds further uncertainty by questioning South Africa's readiness to support SGD, concluding that:

> [B]efore South Africa can consider itself to be technically ready to implement a shale gas industry much needs to be done to ensure that there is in place a

> clear legislative environment and a rigorous regulatory and monitoring structure which will ensure that operators, in using their exploration and production licences, apply best-practice technologies that are fully compliant with the rules and regulations governing the industry (ASSAf 2016, p. 20).

The most recent evidence likewise points towards much less exciting prospects for SGD. A study by de Kock and colleagues (2017, p. 1) argues that substantially reduced estimates of shale gas in the Karoo, from 485 tcf to a mere 13 tcf, are 'the most realistic', while also recognising that even 'such low estimates still represent a large resource with developmental potential for the South African petroleum industry'. These new estimates would nevertheless amount to an astonishing 97% reduction on previous ones and would reduce South Africa from having the world's 8th largest resources to merely 34th among 46 countries included in US EIA estimates.

In light of these assessments, renewables are increasingly seen as a cleaner, more efficient alternative. Renewables in South Africa, facilitated by the 'unprecedented take off' of the Renewable Energy Independent Power Producer's Programme (REIPPP) launched in 2011, have the significant benefit of not requiring government investment, the capital and technology being provided in with by the private sector, in (mandated) collaboration with local communities (Baker 2015), and thus beyond meddling by government and Eskom. Opposition to SGD by environmental activists, farmers and other societal groupings in the Karoo may also prove resilient (cf. Finkeldey 2018), especially if the government's optimistic prognostications about economic benefits and job creation come to be seen as unrealistic. These may all be issues that the proponents of SGD will downplay when making their case to government and investors alike, but they are important ones that

discerning companies and investors will have to consider when making decisions on whether South African SGD is a viable bet.

At this time there are more questions about the prospects for SGD than there are answers. But whether or not SGD will commence, we can learn more about the complex politics surrounding the quest for a new shale revolution by examining key interests lining up in support of and opposition to South Africa's prospective shale industry.

5. The political economy of fracking

While the approach of both government and investors has been characterised by shifts and variations over time, that of the environmental lobby has by contrast been steady and consistent. However, the approaches of these actors cannot be properly understood unless they are situated in the wider context of South Africa's extractive industries and energy.

a. The Minerals-Energy Complex, coal and path dependency

To better understand the forces shaping energy policy, and thus the prospects for SGD, we need a historical perspective on the political economy of energy. The end of apartheid era sanctions in the early 1990s, and the subsequent internationalisation of South Africa's major companies, 'led to a rapid growth of energy-intensive industries and hence hardened the country's entrenchment in the path of energy-intense industrialisation' (Scholvin 2014, p. 194). These long-established and close ties between mining, energy, finance and manufacturing sectors remain in place. Post-WWII industrialisation, producing what Fine and Rustomjee (1996) termed the 'minerals-energy complex' (MEC), is crucial to any understanding of the link between

politics, industry and energy in South Africa. The MEC has acted as a conduit, '[providing] domestic and foreign capital with cheap and plentiful coal-generated electricity [that] is no longer economically or environmentally sustainable' (Baker et al. 2014, p. 791). According to Freund (2010, cited in Baker et al. 2014, p. 797), the MEC provides a vivid picture of key networks of power in the South African political economy, notably the links between finance, parastatals, government, the private sector and the International Development Corporation (IDC).

The Energy Intensive Users Group of Southern Africa (EIUG) is a central manifestation of the MEC and represents businesses that together account for about 44% of South Africa's total energy usage (Scholvin 2014, p. 188). The EIUG is made up of South Africa's industrial giants – including among others Anglo Platinum, AngloGold Ashanti, Arcelor Mittal, BHP Billiton, Glencore, Lonmin Platinum, SABMiller, SASOL and Transnet – and is closely connected to the ANC government, just as it was to the National Party government in the apartheid era. Leading ANC government officials have played various roles on the boards of the EIUG's constituent companies or are otherwise closely involved with them, including President Ramaphosa who has held numerous executive chairmanships across the South African business landscape and is one of the country's richest men. The EIUG thus remains a 'highly influential lobbying organisation' (Scholvin 2014, p. 188), primarily the result of its 'enormous collective bargaining power' (Nakhooda 2011, p. 21).

South Africa's coal industry remains a key part of, and source of supply for, the powerful MEC, and its difficulties in providing sufficient energy supplies would find the industry in direct competition with the shale industry should any substantial SGD materialise. While the coal industry's positioning on SGD could certainly shift, it is clear that any replacement of coal by natural gas in electricity generation runs counter

to its immediate business interests. And the industry has enjoyed strong backing by government, which released a direct statement on the future role of South African coal on the eve of the 2015 Invest in Africa Mining Indaba:

> [The development of a national Coal Policy will] reposition South Africa's coal sector back on the global map, and ensure that coal infrastructure requirements are sufficiently considered in the national infrastructure programme in order to achieve world-class efficiencies and promote competitive local supply (Department of Mineral Resources 2015).

The statement also quotes then Minerals and Energy Minister Ngoako Ramatlhodi, stating that '[c]oal will remain a significant strategic input to energy security and power generation'.

Chandrashekeran and colleagues (2017, p. 8) note furthermore that growth in renewables (or other sources of energy) will not in the foreseeable future displace the use of coal to generate electricity given the completion of the Medupi and Kusile coal-fired power plants. The decision to build two of the world's largest coal plants was made shortly after the commitments made by South Africa at the 2009 Copenhagen Summit. It is evidence of a willingness to back coal even in light of a sustained environmental justice campaign and increased global push for a transition away from fossil fuels. Whatever the merits of SGD, its proponents will have to make their case in the face of a strongly positioned and resilient coal industry.

That said, the emerging global push for a transition towards a low-carbon economy might shift the balance of power away from coal. At the 2009 Copenhagen Summit the South African government pledged a 32% reduction in its carbon emissions

by 2020 in return for receiving financial and technical support to accomplish such substantial reductions (Fig and Scholvin 2015, p. 137). In that context SGD becomes an increasingly attractive proposition alongside renewables. Following the 2015 Paris Agreement on climate change, those incentives will only increase. Orthofer and colleagues (2018) find a role for shale gas (in combination with 'stringent climate policy') in reducing South African emissions in line with its commitment regarding the Paris Agreement, but only if South African shale gas is abundant in terms of deposits and low cost in terms of post-production price, which of course remains highly uncertain. And because the MEC, and the coal-generated economy it has produced and sustained, 'has been able to resist pressures for more profound change [in energy policy] and to apply the brakes on more radical notions about how to advance a low-carbon economy' (Baker et al. 2014, p. 809), it will likely continue to play an influential role in shaping the possibilities for SGD.

b. A vacillating government

Following long delays, South Africa's Department of Mineral Resources published its long-awaited regulations for shale gas exploration in the Government Gazette in June 2015. The government had declared a moratorium on exploration in 2011 only to rescind it in the following year because of concerns about missing out on economic opportunities (Fig and Scholvin 2015, p. 135). The current regulations are meant to be guidelines and do not deal with criminal offences. They also do not deal explicitly with socio-economic matters such as job creation and food security, nor – crucially – do they provide for public participation. Rather they primarily concern technical, environmental, safety and health aspects of the industry. There is an assumption that these regulations will be further amended once SGD commences, and as such their

impact on the entire life-cycle of SGD 'remains to be seen' (Du Plessis 2015, pp. 1465-69).

These regulations are now the basis on which exploration licenses can be granted so that actual exploration of the country's Karoo Basin can then commence. However, indicative of previous setbacks in relation to the regulation of SGD, an October 2017 ruling by the Eastern Cape High Court declared these regulations invalid following a politically contentious case brought by farmers in the Karoo: 'David Msiza, acting director-general of the Department of Mineral Resources, argued that the applicants [Karoo farmers] were biased as they wanted to protect their existing privileged positions in the Karoo' (Mathews 2017). The bigger point here, however, is the fact that the government mishandled the process to begin with, in that, according to the relevant legislation it is the Department of Environmental Affairs, and not Energy, whose remit it is to produce the required shale gas regulation. Given the existing concerns about government management of energy affairs, this high-stakes blunder is hardly a cause for allaying public and industry misgivings.

Adding further complexity to the government's position is the fact that a declining rate of economic growth and decreasing contribution of mining to gross domestic product (GDP) over the recent decade has resulted in decreased demand for electricity (Baker and Phillips 2018, p. 7). A recent upturn aside, levels of demand are still below those at the peak in 2007. While this decline in demand provided at least temporary respite from load shedding, it also means that there is now less pressure on government to increase energy supply capacity at any cost (economic, political, environmental). But as of June 2018, load shedding has recommenced, albeit this time ostensibly related to ongoing industrial action over workers' pay.

In addition, the eagerness with which President Zuma and his Department of Energy sought to pursue the nuclear option (due not inconceivably in part to the opportunities for economic kick-backs that this option would entail) meant dwindling government support for both renewables and shale gas. Notably, the country's successful renewables programme was actively impeded, in particular by Eskom's decision not to approve 37 power purchasing agreements from independent power producers even though doing so was an obligation under national policy (Baker and Phillips 2018, p. 8). But the new administration's commitment, led by President Ramaphosa and Energy Minister Radebe, to reactive government support for the renewables programme indicates a break with the Zuma administration's plans for South Africa's energy future and possibility an opening for renewed support for the shale gas option as well.

Lastly, the Zuma administration's insistence on a 'free carry' – i.e., a share of profits from any SGD accruing to the state in addition to normal taxation, and without the need to contribute to capital and exploration costs – has created serious concerns among private energy companies considering investment in SGD in South Africa. The then Mineral Resources Minister Susan Shabangu proposed a free carry of 20% in 2013 for all new oil and gas projects and reserved the right by government to purchase a further 30% at market rates, which could bring government interest in any SGD to 50%. The general response from the oil and gas industry and interests has been that the government approach is 'piecemeal' and unreliable, thus eroding the prospects for investment (Kotze 2013).

The government's hesitant, arguably erratic, approach to SGD provides an understanding not only of the forces at play within relevant government departments, but also why the energy industry's appetite for investment has seemingly dissipated and

why the environmental lobby's consistent opposition seems surprisingly effective in casting doubt on the potential for SGD – each of which to be considered in turn.

c. An increasingly cautious energy industry

The consequences of a persistent lack of clarity on whether or not South Africa will ever begin the seemingly slow and complex process of SGD is evident in industry responses to government delays. Three energy companies had initially filed applications for exploration before the 2011 moratorium was declared: Shell South Africa, along with smaller exploration companies Bundu Oil & Gas based in Johannesburg and Falcon Oil & Gas based in Dublin. It is now doubtful whether any of these companies will be able to, or even want to, begin exploratory drilling in the Karoo. And if exploration proceeds, the quest for SGD will now take place against the backdrop of a less favourable international and domestic climate than existed just a few years ago.

Following the oil price crash of 2014, energy companies have been increasingly cautious about investing in more expensive sources of unconventional energy including shale gas and oil, as well as smaller resources and projects in less established markets of the Global South (Neville et al. 2017). This is clearly a very different environment from the one in which the proponents of SGD in South Africa initially set out their plans. The uncertainty of the current environment has made Shell, the one energy major to register an interest in South African SGD, reconsider its options in the Karoo.

While major energy companies have recently resumed major investments in US shale, especially in the booming Permian Basin of western Texas (shale oil), following the success of smaller independent companies (Crooks 2017), Shell announced in April 2018 that it is pulling back from its plans for the Karoo. The company will instead focus

on existing downstream operations and LNG and will merely consider the 'long term potential' for SGD in South Africa, which now seems less likely. Shell also notes that exploration and operation costs would be too high in the Karoo in the current price environment and considering the recent substantial reductions in estimates of South Africa's shale gas deposits (*The Herald* 2018). The current lack of interest in South Africa stands in stark contrast to the energy companies' interest in US shale, as well as shale prospects in countries with significant potential such as Argentina and China.

d. A persistent environmental opposition

In the end, Fig and Scholvin (2015) see shale gas as a rather tenuous proposition for South Africa as they consider it likely to disappoint across all key dimensions of government assumptions about its outcomes including economic benefits, job creation and environmental impact. Their conclusions are reinforced more recent analyses, such as the influential CSIR *Strategic Environmental Assessment for Shale Gas Development* (Scholes et al. 2016) and de Kock and colleagues' (2017) drastically lowered estimates of potentially recoverable shale deposits in the Karoo. These are sentiments and evidence that the environmental lobby has been able to capitalise on in making its persistent and relatively successful case against SGD. Fig and Scholvin (2015) are however sceptical about the ability of anti-fracking organisations and related environmental groupings in civil society to prevent SGD from moving ahead as public participation in environmental affairs has deteriorated in South Africa and consultative bodies such as The National Environmental Advisory Forum have been abolished. Debates on these matters are now dominated by business and government, with civil society left out (Xavier et al. 2017).

These sentiments are echoed elsewhere. Describing the proceedings of a technical advisory group tasked with providing inputs into the modelling process for the IRP for electricity (2010-2030), Baker and colleagues (2014, p. 802) note obvious shortcomings in the supposedly participatory nature of the consultative process:

> [The advisory group] was heavily criticised for consisting largely of representatives from coal miners, the EIUG, Eskom and government… a Who's Who of the coal-mining and energy-intensive users in South Africa [failing] to include representatives from the renewables industry, civil society or experts from the fields of social impacts and environmental quality (Baker et al. 2014, p. 802).

Such assessments may, on the other hand, prove overly pessimistic. There are indications of a change in the government's approach to arriving at a finalised IRP as well, which is likely to have implications for the prospects for SGD. Recent reporting suggests that Energy Minister Radebe is now aiming to bring a revised version of the IRP before Cabinet in mid-August 2018. In 'stark contrast' to the approach of his predecessor, Mahlobo, Radebe has announced that there will be further consultations on the IRP with a wider range of stakeholders including the National Economic and Development Council (NEDLAC) (Njobeni 2018).

Moreover, various groupings in civil society, ranging from farmers to environmentalists and local civil society organisations opposed to SGD in the Karoo, have continued to apply pressure on government to reconsider plans for SGD and have in fact scored some important victories, even though an 'anti-extractivist campaign' can be difficult to sustain and there remains 'robust' support for SGD in government

(Finkeldey 2018). Furthermore, it seems that the attendant push for renewables is striking a chord with broader segments of South African society, in particular when linking their strategies to concerns about government ineptitude and corruption in the wider context of 'state capture'. This is crucial for any lasting success by the societal forces opposing SGD given that the environmental lobby risks being perceived as representing narrow societal interests, in particular those of white farmers and other relatively privileged groups over those who are marginalised including the far larger numbers of unemployed black South Africans.

The environmental movement can moreover gain strength, and ensure government's attention, by drawing on South Africa's rich, if complicated, history of social protest and disruption. This is the legacy of the anti-apartheid movement and its post-apartheid manifestations ranging from so-called 'service delivery' protests to activism aiming to 'decolonise' education (Leonard 2018). Ultimately the environmental lobby represents a constant, strengthening and relatively successful opposition in the face of an ambivalent government position and a private sector approach characterised by caution in the face of uncertainty.

6. A missed opportunity, or dodging of a bullet?

In light of recent developments, it is now increasingly doubtful whether the current environment is one in which those promoting SGD can expect to continue receiving a generous hearing and that government will not continue to vacillate and thereby fail to provide legislative clarity and political support for SGD. There are increasing concerns about the future appetite of energy companies and related investors to explore for shale gas and whether any stable and coherent government position on SGD will emerge. This might seem remarkable in that the extractive industries have long dominated South

Africa's economic and, by extension, political landscape. Like Texas, South Africa is a place that sees itself as being built on and defined by natural resource exploitation. As Houston was built tall and brash by the fortunes of the Texas oilmen, so did Johannesburg emerge vertically out of the empty veld on the backs of the African miners that dug the profitable mines of the Randlords.

While a confluence of power at the intersection of government, energy industry and finance has long determined South Africa's fossil fuel-dependent energy path (Fine and Rustomjee 1996; Scholvin 2014), its ability and willingness to continue doing so is less certain given the increasing profile of renewables and related concerns about government-led energy initiatives – crystallised in the much publicised controversies surrounding Eskom and 'state capture' – which, in turn, suggests a transformation of the energy nexus over the longer term (cf. Baker and Phillips 2018). In this context, betting on shale gas is becoming a less viable proposition for both government and industry. The more interesting question may now be how to best understand the nature and pace, as well as socio-economic and political consequences, of South Africa's embryonic energy transition away from fossil fuels.

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[1] There are significant commercial developments and prospects for SGD in Canada, China and Argentina, but none are so far in any way comparable to SGD in the US. This even though shale oil already constitutes 8% of total Canadian crude oil production (Williams 2018) and Chinese shale gas production is on track to double between 2017 and 2020 (White 2018).

[2] According to the US Energy Information Agency's (EIA 2013, p. 10) 2013 estimates, the countries with the largest recoverable shale gas reserves, measured in trillions of cubic feet (tcf) are: 1. China (1,115 tcf) 2. Argentina (802) 3. Algeria (707) 4. United States (665) 5. Canada (573) 6. Mexico (545) 7. Australia (437) 8. South Africa (390) 9. Russia (285) 10. Brazil (245). However, in locations outside the US where exploration has been much less extensive there is greater uncertainty about the actual amounts of recoverable shale gas. The agency which regulates South Africa's exploration and production activities, Petroleum Agency SA (Pasa), notes that the shale gas in the Karoo Basin is merely a 'prospective resource at present' and that 'possible scenarios' indicate that there is between 30 and 500 tcf of recoverable shale (http://www.petroleumagencysa.com/index.php/home-14/shale-gas). In other words, a rather cautious assessment.