

Fracking — what, who and where?

The costs and benefits of fracking to South Africa's development should be debated using scientific evidence, writes **David Fig**.

Within the last decade, technology has emerged for the extraction of shale gas, or methane, from deep under the earth. Although research and exploration remains to be done, estimates have been made that South Africa could be a rich source of shale gas. However, its extraction requires drilling deep into the earth for between four and six kilometres, and through underground freshwater supplies. When the drilling reaches the level where the gas is

found, it changes direction from vertical to horizontal. Enormous quantities of water, combined with sand and a cocktail of toxic chemicals, are pumped at high pressure into the rocks. The injection of sand particles causes the rocks to fracture and release the gas which is captured and piped back to the surface by the same equipment. This process is known as hydraulic fracturing, or fracking.

Several companies have lined up to explore shale gas locally,

and have been granted permission by the Petroleum Agency of South Africa, which is the regulator, to undertake preliminary technical studies in the country. Four bids cover a total area of 228,000 km², almost a quarter of South African territory. Three bids are for parts of the Karoo, while the fourth covers an enormous area including most of the Free State, northern parts of the Eastern Cape, and a strip of KwaZulu-Natal adjacent to the Drakensberg mountains.

Applicants for exclusive exploration rights for shale gas in South Africa, 2011

Company	Nationality	Area of exploration	Surface area granted (km ²)
Royal Dutch Shell	UK/Netherlands	Karoo (W & E Cape)	90 000
Bundu	Australia	Karoo (E Cape)	3 100
Falcon	US	Karoo (E Cape)	30 350
Sasol - Statoil - Chesapeake*	SA - Norway - US	Free State, E Cape & KZN	105 000

Sources: Petroleum Agency of South Africa, Falcon, Challenger, and Sasol

According to the Mineral and Petroleum Resources Development Act 28 of 2002, the regulator first allocates a technical cooperation permit. This gives the applicant a year to conduct feasibility studies on extracting the shale gas, and an exclusive right to apply for an exploration right. If successful, the applicant can undertake exploration for three years, renewable for another six. During that time, if the deposits of gas are found to be economically viable, the company can apply for an exclusive production right lasting 30 years, but which is also renewable.

The regulator does not hold open hearings in granting these rights. The only way in which the public can intervene is when the company applies for an exploration right. To do so, the company must hire consultants to produce an Environmental Management Report (EMR). It needs to release the EMR to those registered as interested and affected parties, hold public meetings, and allow time for comments on the report. Since the exploration rights are often, in South African practice, converted almost automatically to production rights, this is one of the very few occasions in which the public has any voice in the process.

Fracking is a controversial new technology, for which almost no research has been done in South Africa. In order for companies to find out how large the resource is, and whether it is worth exploiting, fracking has to be undertaken during the exploration phase. Therefore by giving permission to explore means that government would be allowing fracking to take place immediately. It is unlikely that the effects of fracking would ever be reversed once it has started.

For example, large questions on water contamination, waste management, climate change, employment and social impacts were not even discussed. Government did not create a space for a transparent public policy

discussion and appropriateness to South Africa's development needs. Instead everything was left to obscure administrative processes which excluded the public.

The oil companies argue that the technology is safe, proven and reliable and that the shale gas is plentiful. Unconfirmed estimates put the gas at 485-trillion cubic feet. The companies also claim that the energy from shale oil is more climate-friendly than coal, and that its production would make a contribution to reducing carbon emissions. Shell, in particular, has offered assurances that the huge amount of water needed for fracking would not be drawn from the Karoo. It has also undertaken to consult communities and to reveal in confidence the list of toxic chemicals it will be using to a small committee of selected interested parties. The companies say shale gas will be a 'game changer' in South Africa becoming more energy self-sufficient.

The government sees the mining of shale gas as substitution for imported fuels thus providing increased energy security. Although the recent policy process, the Integrated Resource Plan 2010 (IRP2010) does not take shale gas into account, it nevertheless allows for combined-cycle natural gas turbines to play a part in the country's future energy mix, at 2.6% by 2030.

As opposition pressure built up, Mineral Resources minister Susan Shabangu suspended the granting of exploration licences, and renewal will depend on whether the task team established by the minister has had time to investigate fracking properly in order to report back. According to a *Business Report* article Water and Environment Affairs minister Edna Molewa has stated in parliament that the water legislation needs to be made more robust in order to 'ensure adequate control' to prevent contamination from fracking.

The National Planning Commission (NPC)'s *National Development Plan: Vision for 2030* report says 'shale gas has the potential to contribute a very large proportion of South Africa's energy needs... South Africa will seek to develop these resources provided the overall environmental costs and benefits will outweigh the costs and benefits associated with South Africa's dependence on coal [and] nuclear.' This enthusiasm is not the product of any intense debate on fracking within the NPC, and pre-empts any scientific examination of the issue. In examining the costs and benefits of fracking, a number of dangers and challenges have come to light.

WATER

In most fracking areas of the United States, such as the Marcellus Shale area of Pennsylvania, water is plentiful. Not so in the shale fields of the Karoo, one of South Africa's most arid areas. Life in the Karoo depends on underground aquifers or chambers containing fresh water which are refilled by infrequent rains. The Karoo is known by its extensive sheep, ostrich and, increasingly, game farming, with steel wind pumps drawing up the groundwater for use by animals and humans. Surface dams provide the rest of the area's water requirements, but can be unreliable. For example, in recent years the dams in the Beaufort West area dried up, causing a water crisis in the town to the extent that travellers passing through were asked to donate bottled water.

About 98% of South Africa's surface fresh water has already been allocated to existing users. Where then will the fracking industry get the 20 to 25-million litres it needs to frack a single well? At least 1,667 trucks will be needed to transport water per well. Possibly the building of expensive pipelines and salt removal plants will be done. Shell has, however, promised not to use Karoo water, but some hydrologists have recommended

that it be sourced from the already overstretched Gariep (formerly Orange) catchment.

Around 30% of the water used in the process will be unrecoverable and will remain underground. This subtracts it from the water that might be recycled.

The use of toxic chemicals in the drilling process has also raised questions about contaminating underground fresh-water sources in the case of accidents. Although uncommon there are records of at least eight instances of large-scale pollution resulting from drilling and fracking.

Waste management

Although forming only 1% of the mix, the toxic chemicals used vary between wells depending on their geology. Most of the fracking liquid returns to the surface after use, and is disposed of without causing harm to the environment. On site there need to be lined ponds or tanks to receive the toxic sludge initially. Questions arise about how this is handled and what arrangements are made for the final disposal of the wastes. According to Daniel Vermeulen, in the US, home to about a million wells, 25% of wells ignore the rules of safe management, and enforcing is not easy for regulatory agencies.

In South Africa hazardous waste management falls under provincial jurisdiction. The Eastern Cape is likely to be the site of most of the fracking, and remains the 'poorest, least resourced and most administratively weak' province, writes Greg Ruiters. Capacity to deal with the extensive management of hazardous waste from fracking does not yet exist, and will have to be funded and planned. The province's municipalities do not have enough money or workers even for ordinary household and industrial waste. Aside from liquid and solid waste, there will be enormous dust pollution arising from the large-scale transportation of water, sand and chemicals on mostly gravel roads.

Climate

Shale gas is a fossil fuel and its burning contributes to global warming. Although carbon dioxide emissions are less than coal or conventional gas, methane is also a greenhouse gas far more deadly for our climate than carbon dioxide. Recent research from Cornell University by RW Howarth shows that shale gas has a larger greenhouse gas footprint than coal, 20% more, rising to 40% over 20 years. Other studies in the US have shown that fracking releases up to 8% of methane into the atmosphere.

The oil industry nevertheless claims that fracking is less harmful to the environment than coal mining. It advocates that although fossil, shale gas is a sensible 'transition' fuel. What it does not calculate is the requirement for the government to invest in infrastructure for the industry (improved roads, waste disposal, and regulatory functions) which will take investment away from supporting the emerging renewable energy industry.

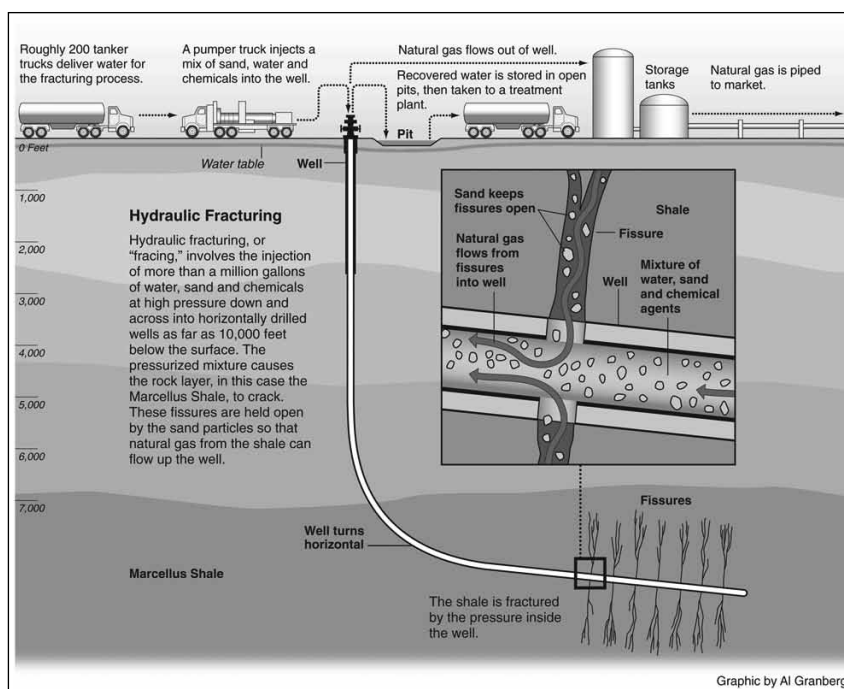
South Africa recently hosted the 17th annual UN climate conference in Durban, making commitments to a plan to lower greenhouse

emissions and to develop a greener economy. Support for a shale gas industry would compromise such commitments.

LIVELIHOODS

If the industry is introduced, will this not lead to an expansion of employment and of the local economy? During the exploration phase, which would last up to nine years, very few jobs (about 100) will be created on site. Running the wells and drilling requires a small number of very skilled workers. The oil companies admit that they will outsource to experienced subcontractors possibly foreign companies, which will use their own labour, and not draw from unskilled Karoo residents. Figures from the US indicate that over 400 wells can be managed by 66 employees.

Jobs will expand in such areas as truck driving, security, road construction, and service provision. However each well can only be fracked around 18 times, and the drilling will move from place to place as wells are closed. This means that there is a cycle of local 'boom and bust' as the fracking moves to new areas.



Credit Al Granberg on Flickr

With the increased risks of water contamination and severe air pollution, the fate of local agriculture is at stake. In the Eastern Cape, agriculture provides over 70,000 jobs in the commercial sector, and livelihoods for many thousands of emerging farmers. Julianne du Toit, a Karoo-based journalist, feels that farming and fracking do not get along. In her view, farming will stop because of air and water contamination. The Karoo would lose its reputation for clean air, soil and farm produce. Those trying to sell up will experience difficulty in finding willing buyers, and property prices would drop. Many farm workers would be displaced, adding to the widespread unemployment.

Furthermore, niche industries like astronomy, palaeontology and ecotourism will also be adversely affected and South Africa's bid to host the Square Kilometre Array of new-generation telescopes might be compromised.

OPPOSITION BUILDS

Propelled by the applications for exploration rights, a new opposition movement quickly arose during 2011. It includes a number of campaigns such as the Treasure the Karoo Action Group (TKAG), which has placed resources in public outreach, research, and legal interventions. TKAG has gained an extensive following through the use of traditional and social media, and its membership consists of residents of the Karoo and large cities. It has made links with other sympathetic campaigns and non-governmental organisations, but remains the main civil society organisation speaking out against fracking.

Public meetings have attracted a great deal of interest, and have seen interventions opposing fracking from personalities such as the entrepreneur Johann Rupert and swimmer Lewis Pugh. Marches in Cape Town have been well

attended, and the movement has generated many posters, t-shirts, leaflets and considerable media attention.

TKAG has a back-up team of legal and communications professionals. The legal team was able to put together a comprehensive response document to the EMR issued by Shell and to challenge Shell's newspaper adverts, which were described by the Advertising Standards Authority as making 'unsubstantiated and misleading' claims.

The legal team also took legal action under the Promotion of Access to Information Act to challenge Mineral Resources minister Shabangu, who had failed to reveal information on the government task team to fracking research. The minister had appointed officials from the Petroleum Agency and departments of Trade and Industry, Mineral Resources, Science and Technology and Energy to serve on the team. However, she did not include representatives of Water, Environment and Agriculture. There was no transparency in the team's consultations, what research it was reviewing or even its terms of reference.

Opposition has also developed within commercial agriculture. Dougie Stern's farm is in the Murraysburg district, where Shell plans to frack. Along with fellow-farmer Lukie Strydom, Dougie was sponsored by BKB (a former farmers' co-operative which markets wool and livestock) to investigate fracking in the United States. The two of them returned as convinced opponents, and have been mobilising other farmers. Stern is an office bearer of Agri-Eastern Cape and has been organising anti-fracking resolutions at local and Agri-SA conferences. Stern rejects the claim that shale gas could be a bridging fuel and feels that instead government should speed up its support for renewables.

FINAL QUESTIONS

How do we as South Africans decide on these questions? We have not created democratic spaces for decision-making on the adoption of new, controversial technologies. We do not have robust regulatory or administrative institutions that could guarantee both the public interest and our rights to clean energy, a safe and healthy environment, and decent livelihoods. The fracking controversy has shown up this deficit in our democracy. Will we be able to resolve these issues through administrative procedures and litigation? Instead we need a broad, lively, transparent national debate that is independent of vested corporate interests.

Meanwhile, the question of trust looms large. Will citizens rely on government to defend the public interest? This seems unlikely, when government is making decisions to favour the technology in the absence of real scientific enquiry. Can we trust the multinational oil companies like Shell, whose record in Nigeria has been complicity with the violation of human rights and who have already been caught out transgressing our advertising standards? If we are serious about the creation of 'green' jobs in a low-carbon economy, why is there such a strong continued interest in inviting large new investment in fossil fuels?

Will the minister take a leaf out of the books of France, Quebec, British Columbia, New York State, New Jersey and New South Wales, which have refused to allow fracking for the present? While the scientific jury remains out, will we take serious risks with the Karoo? ¹⁸

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