

South Africa

Innovation

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South Africa shifts from coal to locally-extracted hydrocarbons on its way to renewable, sustainable energy

Here's why.

Twenty years ago, South Africa basked in a false sense of energy security. When Nelson Mandela was released from prison in 1990 only 35% of the population had access to electricity. By the time he left office in 1999 access had increased to over 70%. Eskom, South Africa's public electricity utility, had been voted the emerging world's best-run utility company. And, the South African government was marketing the country as a "low energy-cost, mineral-beneficiation destination" resulting in the coastal province of Kwazulu Natal hosting in Bayside and Hillside the world's largest factories, where a single-site consumed as much energy as all of neighbouring Botswana, Namibia and Zimbabwe combined.

Astute leaders in the coal industry began developing a sense of disquiet. South Africa was, and still is, overly dependent on coal – 70% of the calorific value of the country's energy needs is derived from coal. That's three times the world average. The coal feedstocks east of Johannesburg have been mined since the 19th century in order to feed the insatiable energy demand of the gold mines.

By January 2008, the country's most affluent citizens were shocked that they could no longer drive their SUVs to work. Why? The electric gates at their homes were blocked by the electricity cuts. The country's once cheap and reliable electricity supply, which had been a given, was now dwindling, and the shock was both economic and psychological. Power cuts are always economically damaging – every un-served KWh of electricity which costs less than 7 cents US to generate causes \$3.50 US of loss to the downstream economy. The mines stopped mining, the restaurants failed to open, and the children no longer had light to do their homework at home.

Heavy industry and the mining sectors, which together consume the majority of South Africa's electricity supply, responded robustly over the last decade with effective energy-savings, enabling the country to live within newly-straightened energy constraints. Production has held constant. But that only bought the country a bit of time.

AEI research findings conclude that unless South Africa, one of the world's most energy-intensive economies, fundamentally reduces its reliance on coal over the next two decades, the nation as we know it will not survive.

To remedy this now, the country's top coal pioneers need to believe us. Committed to ethical, and profitable, innovation, AEI has shown success in converting former coal devotees.

To understand the future, we like to remind investors and policymakers how the structural problem with coal is rooted in history. The Apartheid government comfortably plugged in the 1980s' \$800 US per ounce gold price to bet the country's future on its energy security. As South Africa had more coal on hand than any other energy feedstock, coal, conveniently, remained at the heart of this strategy. South Africa doubled its electricity capacity from 17 GW to 35GW between 1985 and 1988. It invested heavily in energy-giant Sasol's coal-to-liquid hydrocarbons plants to give it a capacity of 150,000 barrels of oil per day—half of the country's consumption at the time. It also invested in Moss gas, a liquidified natural gas plant with a 50,000 bpd capacity.

But the haste with which the Apartheid government embarked on these projects resulted in its ignoring the warnings of engineers who pointed out one key factor: the limited longevity of the coal feedstock supply. Industry leaders will attest that coal-fired power stations should be provisioned for a minimum of 40 years of feedstock available within a 25-kilometre radius of the plant. Many power stations at the time had less than 30 years of supply on hand. By 2008, Eskom had already estimated that South Africa was 25% short of its production needs.

Today, matters have escalated to a much more serious level.

Forty-eight is an unfortunate number in the electricity sector. Seven of South Africa's coal-fired power stations have less than 48 hours of available feedstocks and need a coal truck delivery every 48 seconds in order to maintain production. Nearly half of the coal that is needed must be hauled substantial distances on South Africa's rural roads. Richards Bay Coal Terminal, whose exports halve the country's current account deficit, is not getting enough coal. It needs 90 million tonnes per year, but in 2018 it received about 76 million tonnes. Moss gas' 50k bpd will be obliged to close in 2022 due to the lack of locally-produced natural gas, which will result in a 10% increase of expensive oil imports. Sasol, too, is running out of coal reserves that are within an economically-viable distance of its coal-to-gas plants, and has been obliged to gradually convert

to natural gas. Even feedstocks from neighbouring Mozambique's Pande and Tenami fields are proving to be challenging despite the direct pipeline that links them.

With national consumption of 643k bpd of liquid hydrocarbons and derivative products, coal shortages are increasing demand for diesel. With declining Sasol and Moss gas production, foreign imports have already crossed the 500k bpd threshold, costing the country \$12 billion US per year—or 4% of GDP, which is unsustainable.

The combination of the electricity sector running out of coal, Sasol needing natural gas, and Moss gas needing more feedstock clearly indicates our urgent national imperative: South Africa must find its own hydrocarbons. And preferably use clean technology to extract.

Hydrocarbons have been found in Southern Africa previously – the Ibhubesi Field near Cape Town potentially contains 20 TCF; the Kudu field in nearby south Namibia has 1.3 TCF; and Moss gas and the Sable fields have been discovered offshore. Nearby Mozambique hosts the second-largest natural gas deposit ever discovered – the 200 TCF Ruvuma field.

We at Alumni Energy Investments—essentially a group of young South African mathematicians—went to work, and came up with a new method of locating undiscovered hydrocarbons at moderate cost and with limited environmental impact. Based on backtesting around the world, we can affirm that our method is three times more likely to result in a discovery than traditional techniques. As a group of numbers-driven scientists with investment expertise, driven by both a belief in technology and a requirement for social impact in our pursuit of high ROI, we have invented an algorithm that can account for the country's full energy needs.

The algorithm ingeniously picks up how vegetation, soils, and geophysical attributes change when oil lies underneath the surface. Most importantly, we have found these leading indicators in a number of areas across South Africa and have been awarded technical cooperation permits by the South African government to test and prove our algorithm. Select coal executives and others have come onboard, and are backing this technologic quest to locate hydrocarbons onshore.

Our investors have liked the sensible way in which mathematicians approaches the management of risk. By applying South Africa's highly-generous angel investing tax breaks to fund exploration with local capital, AEI is able to leverage risk

with tax advantages as a financing strategy. This goes beyond clever; it is reassuring.

Hydrocarbon self-sufficiency will change South Africa for the better. If we succeed in our goal, we can expect that 400,000 direct and indirect jobs will be created in a country that is dealing with 37% unemployment. President Ramaphosa's New Year speech to the nation underscored the priority of creating "Jobs, jobs, jobs." Beyond that, the fiscal terms are such that should the gross prospective resource we anticipate finding indeed be discovered and extracted, South Africa's fiscal deficit can be wiped out. Lastly, converting to natural gas from coal will reduce emissions of the electricity generation sector by a whopping 70%. And then, progressively, AEI has a next-phase of transformation from hydrocarbon sources to renewable ones, primarily solar. While we solve South Africa's energy crisis, major environmental improvements will be consistent with the global effort on climate goals.



Most importantly, our success will give South Africa the confidence to create a vast export industry that has the potential for the country to play a leading role in carbon reduction across the developing world where \$12 trillion of energy investment is needed by 2050. AEI is all about the good news that South Africa is capable of producing.

To read more about Alumni Energy Investments, visit us at:


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