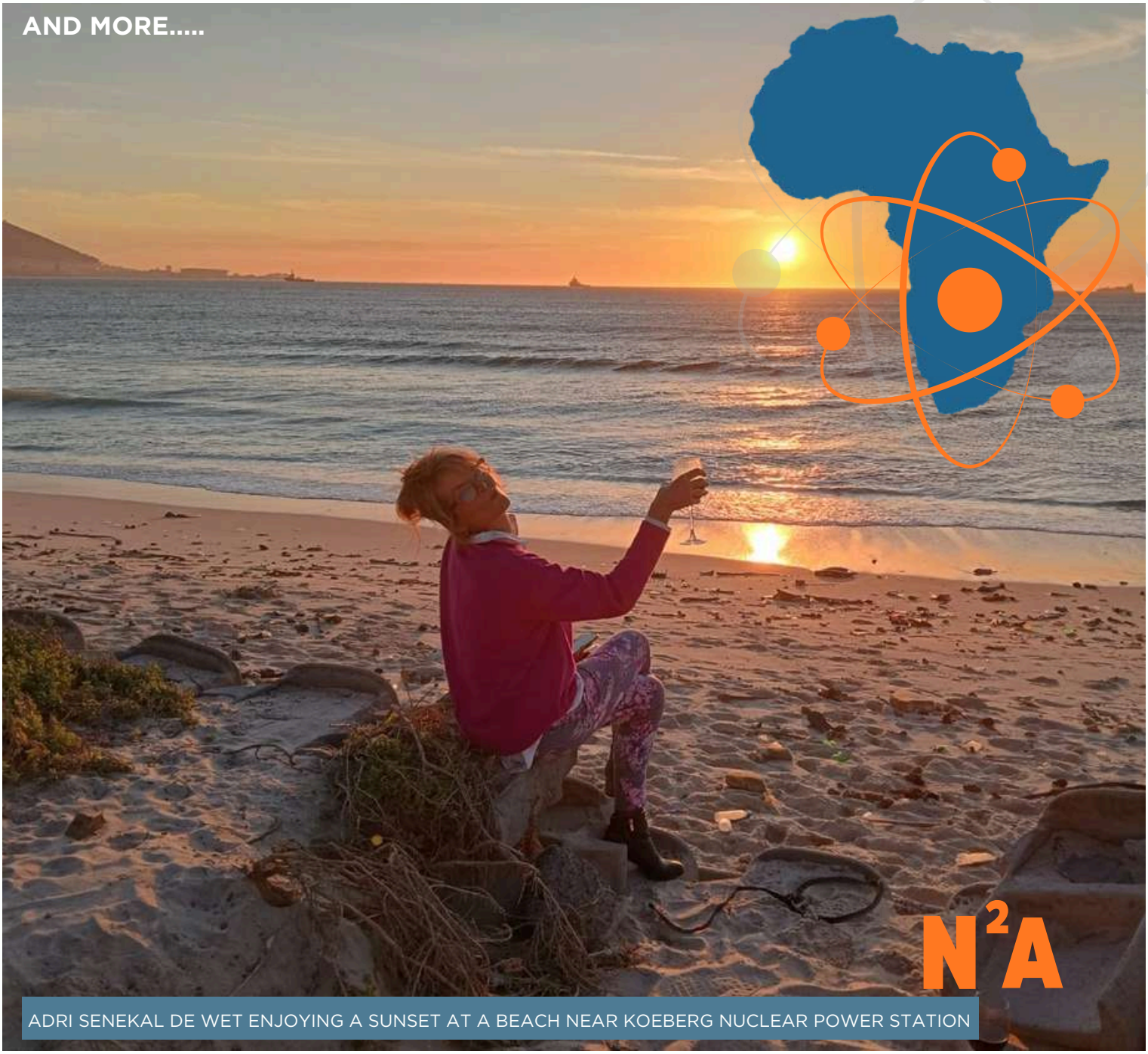
NUCLEAR NETWORK AFRICA

THE WORLD OF NUCLEAR

RED ALERT. FALSE WARNINGS ABOUT NUCLEAR POWER
ANDREW KENNY

NATURAL NUCLEAR HOT SPOTS IN SOUTH AFRICA
PROF JACQUES BEZUIDENHOUT

AND MORE.....



ADRI SENEKAL DE WET ENJOYING A SUNSET AT A BEACH NEAR KOEBERG NUCLEAR POWER STATION

FEBRUARY 2025 | ISSUE 007/25

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N²A HIGHLIGHTS

PICTURE CREDIT: BEAUTIFUL SOUTH AFRICAN SUNSET

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FROM THE EDITOR

Nuclear energy has long been shrouded in fear and misinformation, often shaped by outdated perceptions and sensationalized narratives.

While it is natural to be cautious about any powerful technology, it is essential to separate fact from fiction, especially when the future of clean, reliable energy is at stake.

Myth: Nuclear power is inherently dangerous and results in frequent disasters.

Fact: Nuclear energy is one of the safest energy sources in the world. Modern reactor designs prioritize multiple layers of safety, and historical data shows that nuclear has far fewer fatalities per unit of energy produced than coal, oil, or even hydropower.

Myth: Nuclear power plants are major polluters and contribute heavily to environmental degradation.

Fact: Nuclear energy is one of the cleanest sources of electricity. Unlike fossil fuels, nuclear plants produce no greenhouse gas emissions during operation, and advancements in waste management ensure that spent fuel is securely contained and can even be recycled.

At Nuclear Network Africa (N^2A), our mission is to cut through the noise and present nuclear developments with clarity and accuracy. As the world seeks sustainable solutions to energy security, it is time to look beyond the myths and engage with the facts.

Warm regards,

Heather Veldhuis

HEATHER VELDHUIS
EDITOR

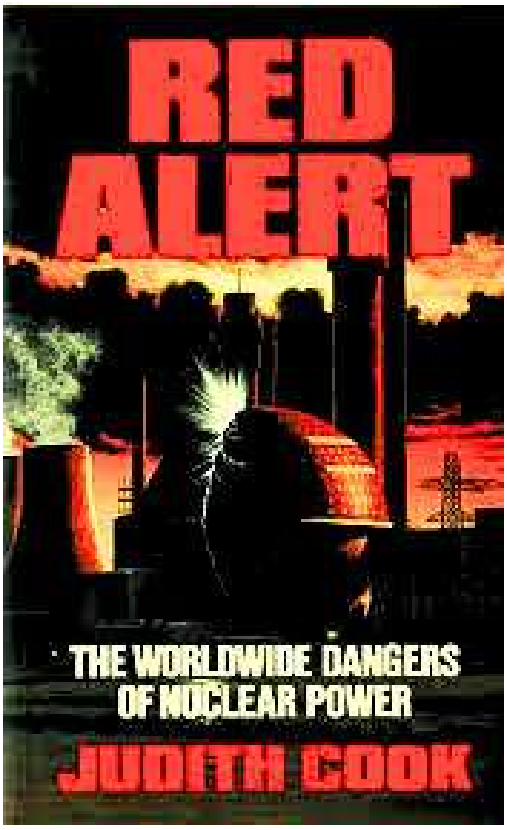
Pelindaba Nuclear Research Facility, situated near Pretoria, South Africa, is the country's primary nuclear site for research, uranium, and technology development.

RED ALERT. FALSE WARNINGS ABOUT NUCLEAR POWER.

ANDREW KENNY

"Red Alert: The Worldwide Dangers of Nuclear Power." This was a book I had forgotten about. I stumbled across it as I was re-arranging our bookshelves after our recent move to the small town of Kleinmond on the Cape coast. The book has a glaring red cover, showing a nuclear power station with a big, gleaming crack, about to burst asunder. The author is Judith Cook, an English woman, who used to write for The Guardian.

Red Alert was published in 1986. It predicts nuclear catastrophe and sneers at the British Energy Minister who said that nuclear was "the safest energy known to man." Time has passed, and 39 years later, he has been proved right. Nuclear has a much better safety record than any other energy technology, including solar and wind. Cook gets her nuclear science horribly wrong. But she is right about one thing: the appallingly bad public relations of the nuclear industry.



She writes on the dangers of radiation but doesn't mention that the radiation from the nuclear industry is tiny compared with that from natural sources all around us, in the ground, water and air, doing us no harm at all.

Cook talks the usual rubbish about nuclear waste. She says it presents a unique danger because it lasts such a long time. Actually, most waste from human activities lasts forever – not for millions of years, but forever. All matter consists of atoms, and most atoms last forever. Only radioactive atoms do not last forever; they break down releasing radioactivity. The shorter their lives, the more dangerous they are. A radioactive substance with a half-life of five minutes is exceedingly dangerous, but one with a half-life of five million years is quite safe (for radioactivity).

Nuclear waste is easy to store safely, so that it presents no threat to people or the environment. We are already doing so at the South African nuclear waste repository, Vaalputs, in the Northern Cape. I know of no plan to store the deadly toxins of solar waste, such as cadmium, which last forever.

Cook thinks plutonium is uniquely dangerous. It isn't. It is quite toxic but handled with care, it presents no danger. She says it is "totally synthetic" (manmade). It isn't. The original plutonium on Earth has all decayed away, but plutonium is made naturally all the time, all around us, and even in our own bodies, when neutrons are captured by uranium. Plutonium in our bodies is doing no harm at all.

Cook is right about the dangerous activities at the beginning of the nuclear era in Britain, caused by sheer ignorance of nuclear engineering. At Windscale, later called Sellafield, the UK's nuclear processing plant, they cooled the graphite reactor (known at the time as a "pile") with air! It caused the UK's worst nuclear accident, way back in 1957. The casualties, though, seem to be few, if any. Since then nuclear understanding has grown, and such practices have been banned. Nuclear is now enormously safer.

CONTINUED ON PG5

CONT.... FROM PG 4

The 1979 nuclear accident at Three Mile Island (TMI) in the USA harmed nobody. Cook screams about it under the heading, “Three Mile Island: The night they nearly lost Pennsylvania”. TMI used Pressurised Water Reactors (PWRs) like Koeberg’s. The accident was caused by a faulty valve, a faulty instrument, and bad human operation. The release of radiation was far too small to harm anyone. Casualties from TMI were nil. Since then, PWRs around the world have improved their equipment, operator training and inspections, and have had a superb safety record.

Chernobyl, the world’s worst nuclear power accident, the only one to harm civilians, happened in 1986. (The radiation from Fukushima in Japan in 2011 harmed nobody.) None of Cook’s warnings predicted why such an accident might happen. It was caused by runaway reactivity. In a well-designed reactor, such as all PWR reactors, if there is a surge in power, the reactor automatically slows itself down or shuts down. In Chernobyl, a surge in power, at a low level, did the opposite. It made the reactor speed up terrifyingly, resulting in a rapid gas pressure build up, which then caused a gas blow up. In a PWR, a Chernobyl accident is impossible, but a slight power runaway is just possible. In the Small Modular Reactor, the HTMR-100, any runaway is totally impossible.

Suppose, for some reason, that a slight increase in power from the normal level were to occur in the HTMR-100. This would heat up the fuel, which would then capture neutrons and slow the reactor down. A big increase in power would shut it down completely. Tests have shown that this is exactly what happens. All modern reactors are very safe, but the HTMR-100 really does take safety to a new level.

Cook is best when she talks about the secrecy and stupid public relations of the nuclear industry in the early days. This is much improved but is still not enough. The nuclear industry must be completely open about all nuclear incidents, and must inform the public about its huge economic and environmental advantages, and wonderful safety record. Tell everybody about the wonderful HTMR-100 Small Modular Reactor.

Andrew Kenny is a nuclear engineer who has published many public interest articles around the world. He has worked with large power stations and other industrial operations.

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WHAT IS PASSIVE SAFETY?

A simple example of passive safety in vehicles is the airbag system. When a crash occurs, sensors detect the sudden deceleration and trigger the airbag to deploy automatically,without requiring any action from the driver or passengers. This process happens purely through mechanical and chemical reactions, ensuring protection even if the car loses power or the driver is unconscious.

Similarly,"Passive safety" in a nuclear reactor refers to safety systems that automatically activate and function to cool the reactor core and prevent accidents without requiring any active human intervention, relying instead on natural physical processes like gravity, convection, and pressure differences to maintain safety, even in the event of a power loss or other emergency situation; essentially, the design itself helps to contain the radioactive material without needing external power sources to operate.

Key points about passive safety in nuclear reactors:

Natural forces:
Passive safety systems utilize natural phenomena like gravity to allow coolant to flow downwards, cooling the core, or natural convection to transfer heat away from the reactor.

No external power needed:
Unlike active safety systems which require electricity to operate, passive systems function even when power is lost, making them highly reliable in emergency situations.

Examples of passive safety features:
Gravity-driven coolant systems: Coolant flows downwards by gravity to cool the core.
Passive containment cooling systems: Heat is dissipated through natural convection within the containment structure.
Isolation cooling systems: Water is automatically released to cool the core in case of an accident.

Benefits of passive safety:
Enhanced safety in case of power loss or human error
Increased reliability and redundancy of safety systems
Simplified plant operation and maintenance

EMBRACING NUCLEAR POWER

TIFFANY MOODLEY

As a young mechanical engineer, I speak on behalf of many South African youth when I say that we fee are inheriting a world in crisis. The challenges before us (climate change politics, energy shortages, and outdated infrastructure) seem deeply rooted, leaving many uncertain about where to turn. Yet, we are als at a crossroads: we can either accept the status quo or embrace change and build a better future.

Energy requirements will soar

A key part of this change lies in nuclear power generation. Its potential is undeniable, and its benefits cannot be understated. Looking at South Africa's energy landscape, our power grid is under immense strain. Aging coal-fired power stations require extensive repairs, and the pressure is evident to all. Without bold action, our energy challenges will only worsen. World pressure to reduce carbon emissions and minimise environmental damage, have played their part in the nuclear debate. We can use nuclear to produce electricity, but maybe also to produce petrol from coal in a SASOL process, and there are many other possibilities. The need for reliable, large-scale power is greater than ever, especially as advancements in artificial intelligence, automation, and data centres continue to demand a stable energy supply. Without a dependable power infrastructure, economic growth and technological progress will be severely hindered.

Nuclear Power is here

As a society, we must explore all available options and embrace emerging technologies which can shape a more sustainable future. Nuclear power stands out as a solution that is not only reliable but also environmentally friendly. Nuclear produces no greenhouse gas emissions during operation, and provides a consistent energy supply, unaffected by weather conditions. South Africa already has a significant foundation in nuclear energy, with the Koeberg Nuclear Power Station proving its viability. Expanding our nuclear capabilities with modern reactors, such as Small Modular Reactors (SMRs), can provide the stability our grid desperately needs while reducing our reliance on coal.

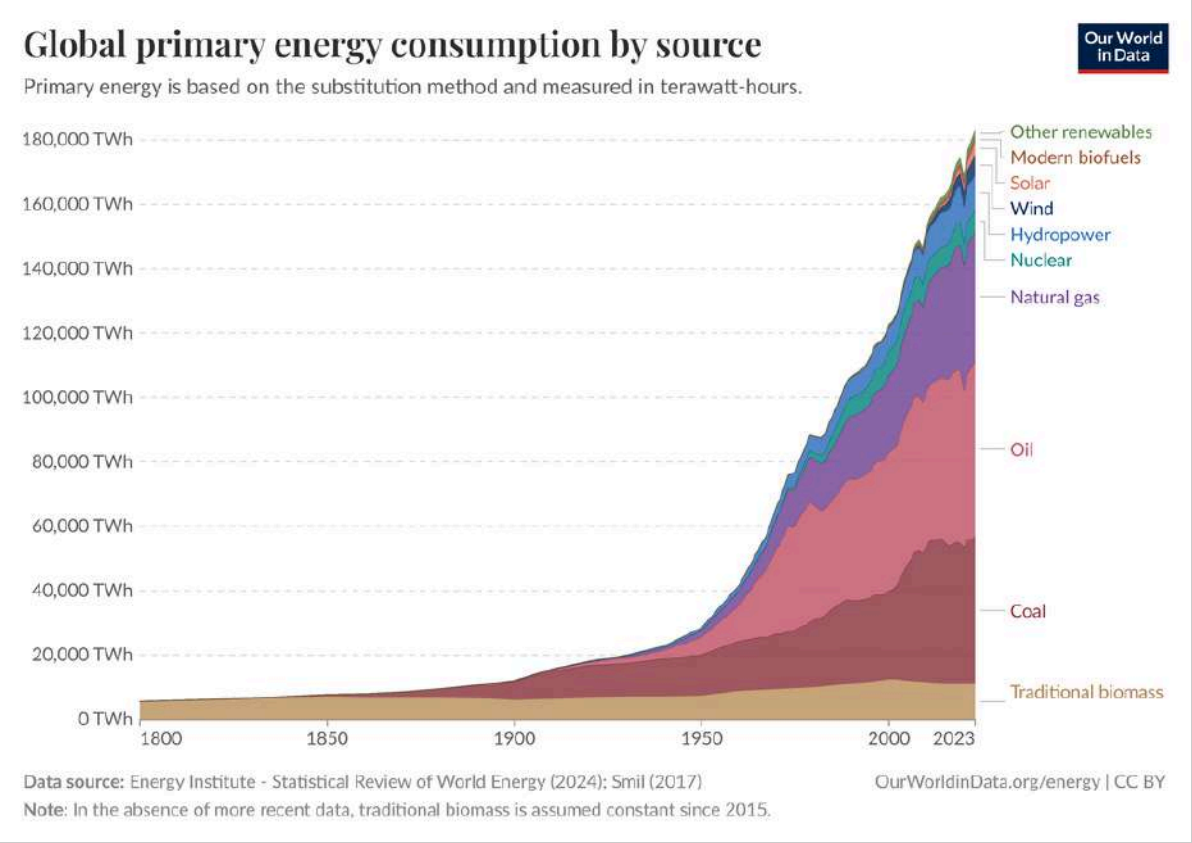
Innovation and the Future

To secure a bright future, we must embrace innovation, problem-solving, and new technologies. The words of Socrates resonate deeply: "The secret of change is to focus all of your energy not on fighting the old, but on building the new." Instead of resisting progress, we should channel our efforts into developing energy solutions that will sustain future generations. Investing in advanced energy solutions like nuclear power, addressing infrastructure challenges with modern engineering approaches, and implementing cleaner, more efficient power generation methods will help shape a bright future for South Africa and the world.

Decisions

The energy decisions we make today will pave the path for generations to come. By embracing nuclear power, we can create a cleaner, more reliable energy system that supports economic growth, technological advancement, and environmental sustainability. The time for action is now! Let's build the future we want to see. **CONTINUED ON PG9**

CONT.... FROM PG 08



Tiffany is a candidate mechanical engineer with a degree from the University of Pretoria.

Passionate about innovation and sustainability, she is dedicated to finding engineering solutions that drive progress.

She has presented her research on thermal energy storage at the 17th Green Building Convention, highlighting her commitment to advancing cleaner, more efficient technologies.

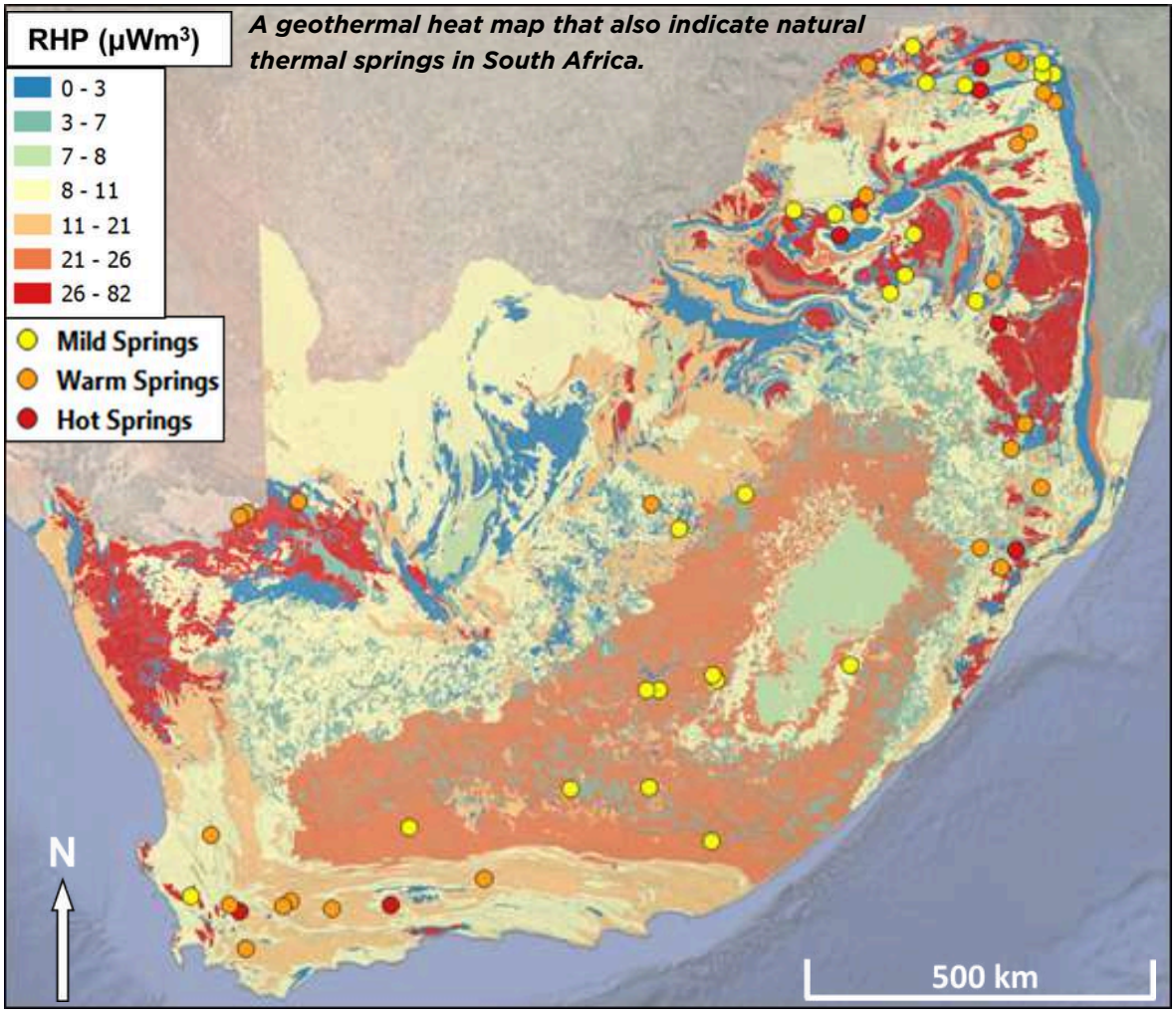
Tiffany believes in embracing new energy solutions, like nuclear power, to create a more sustainable future.

NATURAL NUCLEAR HOT SPOTS IN SOUTH AFRICA

PROF JACQUES BEZUIDENHOUT

Every second of the day, humans are exposed to radiation from natural nuclear processes, and we are constantly bombarded by rays and particles. Cosmic rays, in the atmosphere, and natural radioactivity in rocks, soil, water, and food all contribute to this exposure. Natural nuclear reactions in rocks and soils account for over half of the radiation that humans get. All these nuclear processes are similar to those that produce electricity in nuclear power plants. The natural nuclear processes in rock and soil also provide heat energy. These reactions are therefore the primary source of geothermal heat in the earth's crust and mantle.

South Africa offers a magnificent geology, with huge rock belts and cratons, impact craters, and some of the world's greatest mineral resources. Many of these rocks have high levels of natural radioactive materials that causes nuclear reactions. The amount of natural radioactive materials in the rocks determines how much heat is generated naturally. Potassium, uranium, and thorium are natural radioactive elements that generate heat, and their radioactive lives are significantly longer than the earth's age. As a result of this natural nuclear energy, permanent radiation hotspots form on the earth's surface, resulting in heated areas such as geysers and hot springs. This energy can be used to help meet human energy needs. South Africa is heavily reliant on coal-burning power plants, which have serious environmental consequences. Geothermal energy offers an environmentally friendly "nuclear" alternative to coal-based electricity generation. **CONTINUED ON PG 11**



A geothermal heat map that also indicate natural thermal springs in South Africa.

CONT.... FROM PG 10

The figure shows a radioactive heat map of South Africa and indicates elevated levels in wide areas of the far northeast and northwest parts of the country. The Limpopo Belt, the Bushveld Complex, and the Barberton Greenstone Belt are high-heat producing sites in the country's far northeast. Smaller pockets of strong radioactive heat areas can be also seen in the Witwatersrand and the Vredefort Dome. There are numerous natural thermal springs in South Africa that are associated with these hot spots. Thermal springs are distinguished by water temperature as moderate (25°C to 37°C), hot (37°C to 50°C), or hyperthermic (hotter than 50°C). Several of the thermal springs are located on the edges of geological hot zones. The Limpopo Belt had the highest concentration of thermal springs. The Bushveld Complex also has warm, hot, and two hyperthermic thermal springs, which generate a lot of heat. The Western Cape contains a large number of hot and hyperthermic thermal springs while the Karoo is estimated to produce medium levels of radioactive heat. These geothermal hot spots and hot springs are important indicators of where alternative energy can be found in South Africa.

The information in this article was extracted from a scientific publication in the Journal of Environmental Radioactivity (ELSEVIER) titled "Estimating geothermal and background radiation hotspots from primordial radionuclide concentrations in geology of South Africa" authored by J. Bezuidenhout, 2023.

Dr Jaques Bezuidenhout is a nuclear physicist. He has published extensively in nuclear-related matters. He is a Radiation Consultant, and also lectures at the South African Military Academy in Saldanha, where he holds the Naval rank of Commander. He is also an Associate Professor at the University of Stellenbosch.

OLIFANTS RIVER, KRUGER NP, LIMPOPO, SOUTH AFRICA

TRUMP'S ENERGY POLICIES AND THE RISE OF SMRS IN AFRICA

HEATHER VELDHUIS

Donald Trump's recent policy shifts toward prioritising fossil fuel industries and cutting back on climate-related regulations have global implications, including for the nuclear energy sector in Africa. While these changes may reduce US government-backed clean energy investments, they present a unique opportunity for Small Modular Reactors (SMRs) to gain traction in Africa. As Africa looks for reliable, low-carbon energy solutions, Stratek Global is well-positioned to emerge as a competitive player in the development of locally designed and manufactured SMRs.

The US Shifts Energy Policy

Trump's administration has focused on boosting oil, gas, and coal production while reducing federal support for international clean energy programs. This could mean less US government funding for renewable energy projects in Africa. At the same time we should find this resulting in a greater reliance on private-sector investment in nuclear technology. One would imagine that this reality would result in a push for African nations to seek nuclear partnerships with local innovators. Such moves would open a gap for private-sector-driven solutions, which Stratek Global is well-equipped to fill.

South African SMR Solution

South Africa is actively exploring SMRs as a reliable part of a mix including coal and intermittent renewables. With a history rooted in the Pebble Bed Modular Reactor (PBMR) project, Stratek Global brings deep expertise in helium-cooled, high-temperature reactor technology, which could be the key to unlocking Africa's nuclear future.

Unlike traditional large-scale reactors, SMRs offer Modular deployment, allowing for phased rollouts to match demand. At the same time, SMRs placed around the country allow for Grid flexibility, making them ideal for South Africa's distributed energy needs. SMR deployment requires a reduced capital investment compared to major generating stations, making them financially more viable.

One can also add extra SMR units to an existing site, as finances allow.

Stratek Global's advanced 4th Generation nuclear technology, rooted in the legacy of the PBMR program, is a homegrown alternative to foreign SMR suppliers This makes Stratek Global a strategic choice for energy security, job creation, and local industry growth.

Competing in a Shifting Global Landscape

With the US stepping back from global clean energy leadership, South Africa's nuclear future is increasingly shaped by Russia and China, both of which aggressively market their nuclear technologies in Africa. However, a locally developed SMR solution offers multiple advantages, over and above the use of local expertise and control, thereby reducing dependency on foreign technologies.

Clearly one can produce tailored solutions for South Africa's specific energy and economic landscape. This also holds true for other African countries as well. A local product also allows for stronger regulatory alignment with South Africa's National Nuclear Regulator (NNR), and domestic legislation.

If SA is to secure energy independence and build a sustainable future, it is obvious that investing in homegrown nuclear innovation is a key.

Trump's policies may reduce traditional US government-backed investments in Africa, but this could well create an opportunity for private sector-driven nuclear development. With its decades of nuclear expertise, modular reactor design capability and deep understanding of African energy needs, local teams are uniquely positioned to fill the gap. By advancing SMR technology from within, South Africa can offer a competitive, locally driven alternative to foreign nuclear dominance, while securing a leading role in Africa's nuclear energy revolution.

Comic by Lizzon-Vanique De Villiers a rising star in the world of art and design, blending her creative talents with her passion for innovation. (Her latest contribution to the Voluntary Contributor Program)

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Any person who has influence and a role to play in representing any Nuclear-Related Developments to advance nuclear power in Africa. or in any international entity, which can contribute to the development of Africa's nuclear energy capability is encouraged to be part of this great journey.

Any company, ranging in capability from a nut and bolt to the most sophisticated piece of equipment, should join the journey now.

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Rachel has been involved with Stratek Global and our nuclear projects for over 10 years. She handles sales and marketing functions related to conferences, meetings, brochures and publications like N²A