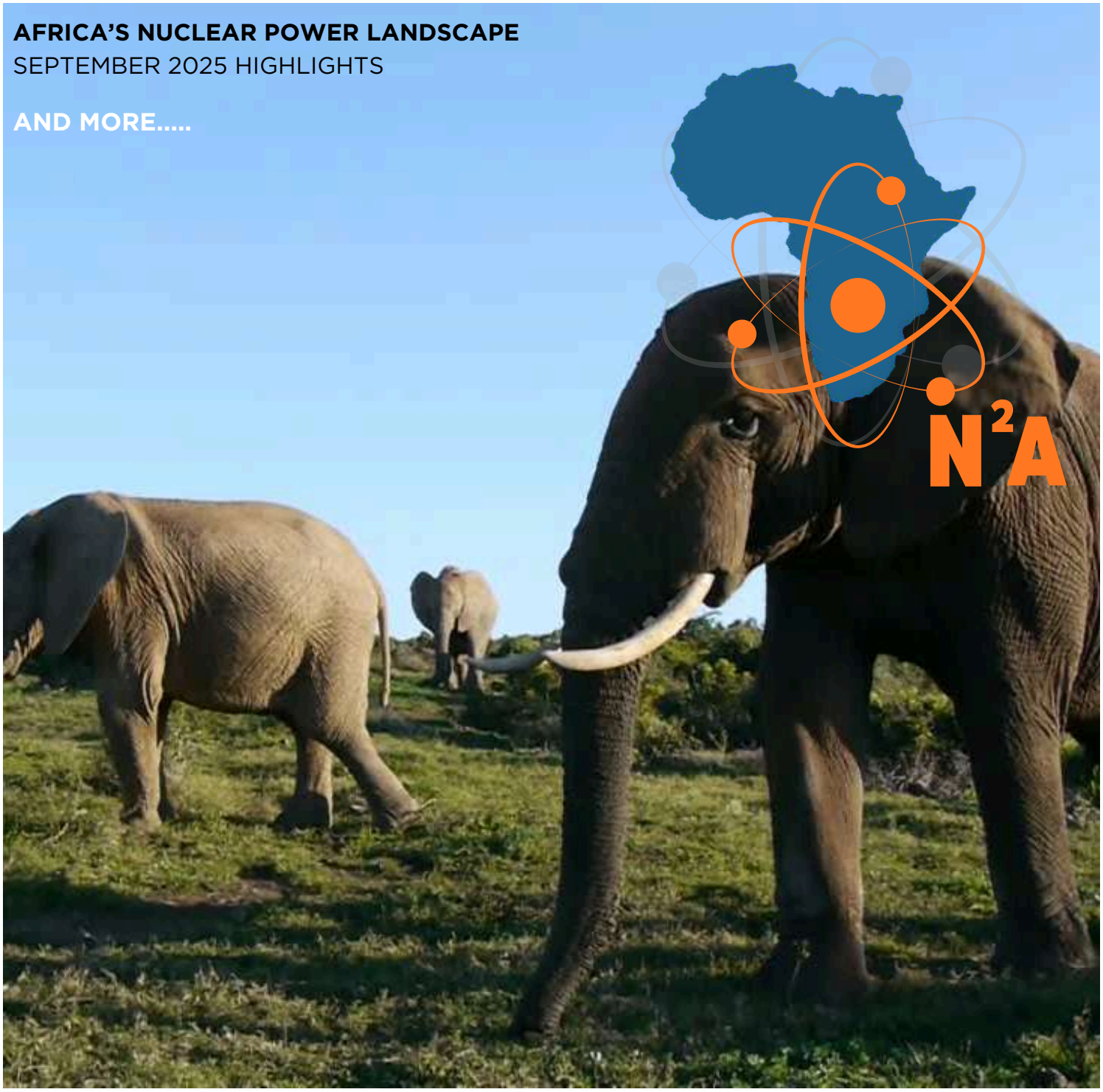
NUCLEAR NETWORK AFRICA

THE WORLD OF NUCLEAR

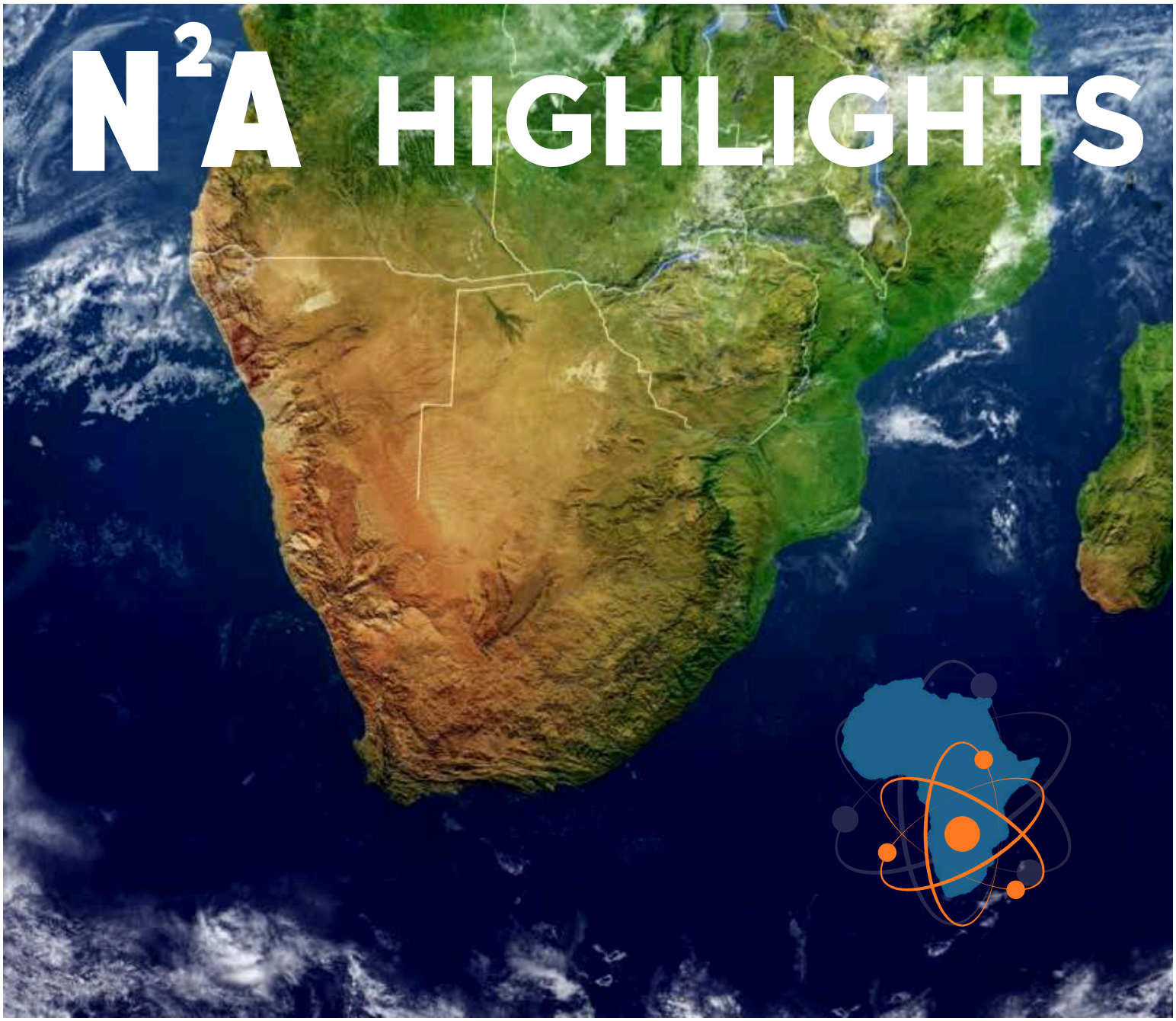
DECOMMISSIONING AND TOXIC WASTE PLANNING NEEDED – FOR RENEWABLES
CHRIS MEYER

AFRICA'S NUCLEAR POWER LANDSCAPE
SEPTEMBER 2025 HIGHLIGHTS

AND MORE.....



N²A HIGHLIGHTS



FROM THE EDITOR

Spring has arrived in South Africa, a season of renewal, new growth, and fresh possibilities. The same spirit of renewal is echoed in the global energy landscape, where nations are rethinking how they generate, manage, and sustain power for the future.

Just as spring invites us to consider what must be pruned to make space for flourishing growth, so too does the energy sector face the challenge of responsibly planning for what comes after today's technologies have run their course.

An interesting fact often overlooked is that nuclear power plants, despite their complex reputation, produce far less waste by volume than renewables such as solar or wind when measured across their full lifecycle. For instance, a single wind turbine blade, non-recyclable and often buried in landfills, can weigh up to 36 tonnes. Multiply this by thousands, and the long-term footprint is enormous. In contrast, the total volume of spent nuclear fuel generated worldwide over the past 60 years would fit into just a single football field stacked a few metres high. This perspective frames our lead article: "Decommissioning and Toxic Waste Planning Needed for Renewables." It raises the critical question: Are we adequately preparing for the waste challenges posed by so-called "green" energy?

In this issue, we also include a thought-provoking exploration titled "How Mass Exists... Discovered." While deceptively simple in title, it dives into the groundbreaking work of particle physics and the Higgs Boson, sometimes called the "God particle"—that helps explain why matter actually exists. Therefore the universe itself, has weight.

Heather Veldhuis

HEATHER VELDHUIS
EDITOR

As we embrace spring's optimism, N²A continues to shine light on the often-overlooked dimensions of nuclear and energy science. May this issue encourage fresh conversations, deeper understanding, and an openness to seeing beyond conventional narratives.

Majestic, powerful, social predator; Africa's iconic symbol of strength. The African Lion.

Graceful and agile antelope, impalas leap effortlessly, thrive in herds, adapt to diverse habitats, symbolising resilience and balance in African ecosystems.

DECOMMISSIONING AND TOXIC WASTE PLANNING NEEDED – FOR RENEWABLES

CHRIS MEYER

One of the major arguments used against nuclear power is the issue of nuclear waste. More specifically, what is going to happen to the nuclear waste produced? And, of course, what is going to happen to a nuclear power plant at the end of its working life: decommissioning the plant and budgeting for the costs involved. High-level nuclear waste can actually be more valuable than gold if reused.

With any nuclear reactor, long before building starts, detailed planning has already been completed on both decommissioning and how to handle all nuclear wastes. This applies equally to large, pressurised-water reactors (PWRs) and SMR reactors, such as the HTMR-100.

But what about renewable energy? Comparatively few people realise that renewable energy also needs planning for decommissioning and hazardous wastes, and the costs involved. For this is not cheap: one estimate places the complete decommissioning of a single wind turbine in Australia at between 400,000 and 600,000 Australian dollars. Furthermore, some types of solar panels may need to be treated as hazardous waste, which requires expensive processing.

End-of-use solar panels

In the USA, the Environmental Protection Agency has only recently (2023) begun grappling with how to deal with end-of-use solar panels, although they have been aware of the growing problem for quite some time. There are basically two types of solar panels, silicon solar and thin-film solar.

While some parts of solar panels, like their aluminium frames, copper wire, plastic junction boxes, and glass coverings, can be recycled and reused, the actual silicon panels pose more of a problem. Depending on the amounts of toxic heavy metals (like lead, cadmium, and tellurium) they contain, the panels may need to be classified as hazardous waste. CONTINUED ON PG 05

Chris Meyer attended the University of Stellenbosch, where he obtained a BSc (Hons) in Chemistry. For three years, he then taught science in a high school, and found that he really enjoyed explaining Science. He then went on to the Council for Scientific and Industrial Research (CSIR) as an information officer. Later, he moved to the South African Bureau of Standards (SABS) as a technical publicity specialist and then a technical reviewer. He became interested in the history of nuclear and renewable energy while writing a book, "Is Chernobyl dead? Essays on energy: renewable and nuclear", published in 2011.

Extracting these metals for recycling and reuse is far from simple.

Put another way, end-of-use solar panels cannot, like other waste, simply be dumped in a landfill. Special sorting and recycling processes are required, and some material will need to be treated as hazardous waste.
This means that disposing of end-of-use solar panels will require extra costs. While the process and the treatment may be simpler than treating nuclear waste, the volumes involved will be far larger. By 2030, the USA is expected to be generating close to half a million tonnes of end-of-use solar panels. This will be something like 0,5% of the total solid waste produced in the USA.

What about Wind Turbines
Drive anywhere in a South African city and you can hardly fail to notice one thing: the large numbers of photovoltaic systems being placed on roofs just about everywhere. Wind turbine farms are less common. To see one, you will probably need to go to the narrow band near the coast where enough wind blows to make erecting one worthwhile.

Wind turbine farms are far more common in Europe, the USA, and Australia than in South Africa. They have also been going for longer, long enough for some wind turbines to start reaching their end-of-life and so require disposal.

In Texas and Australia, people are starting to realise that disposing of wind turbines is going to pose issues that were not considered when the wind turbines were built. Some journalists are starting to question just how 'renewable' the wind turbines really are when they encounter more and more ugly heaps of wind turbine blades awaiting burial as landfill.

Only a limited number of these blades can be repurposed in creative ways, like: as bus stops, in playgrounds, as shelters and the like. The problem is going to get worse, as the newer wind turbines are huge, and have blades the length of a football field. While most older wind turbine blades are only about half this size that is still a lot of very tough fibreglass – resin composite to dispose of.And wind turbine blades are designed specifically not to break down easily.

Only recently have designers realised the problem and are trying to develop blades that can be disposed of, or possibly even recycled.

Problem Looming
Renewable energy is still a comparatively new thing in South Africa. Most of the photoelectric systems and wind turbines are still within their working lives of around twenty years. What will happen to all the photoelectric panels after their working lives have been reached is a problem few have considered.

It is an unpleasant reality that we will need to consider very soon. In mining, the actions and costs needed to rehabilitate a mine are planned and budgeted for well before actual mining starts. Like mining, we need to have plans and processes - and costs - ready long before it becomes a problem.

LATEST NEWS

AFRICA'S NUCLEAR POWER LANDSCAPE.

SEPTEMBER 2025 HIGHLIGHTS

Russia's President Vladimir Putin and Ethiopia's Prime Minister Abiy Ahmed watch Director General of Russia's State Atomic Energy Corporation Rosatom Alexei Likhachev and Ethiopia's Foreign Minister Gedion Timothewos exchanging documents during a meeting in Moscow, Russia, September 25, 2025. REUTERS

South Africa mulls large nuclear plants and SMRs

Issue 532 - 11 Sep 2025 - By Marc Howard | **3 minute read**

Procurement of new, large-scale nuclear capacity has been given fresh impetus in South Africa, with a likely site identified and permitting advancing. But some have questioned its affordability, arguing in favour of small modular reactor technology instead, with potential suppliers including China.

Ethiopia and Russia Forge Nuclear Partnership

On September 25, 2025, Russia and Ethiopia signed a significant agreement to plan and construct a nuclear power plant in Ethiopia. The deal includes developing a comprehensive construction plan, establishing an intergovernmental agreement, and training Ethiopian personnel in nuclear energy operations. This collaboration marks a pivotal step in Ethiopia's energy strategy and reflects a broader trend of African nations exploring nuclear energy options.

Necsa Advocates for SMRs in Africa

The South African Nuclear Energy Corporation (Necsa) highlighted the potential of small modular reactors (SMRs) to address Africa's energy challenges. Necsa emphasized that SMRs could help close South Africa's energy shortage and boost power security across the continent, offering a scalable and flexible solution to meet growing energy demands.

South Africa's Ambitious Nuclear Expansion Plans

South Africa announced plans to add 10 GW of new nuclear energy capacity, aiming to restart its pebble bed modular reactor program and re-establish the full nuclear fuel cycle within the country. These initiatives are part of a broader strategy to enhance energy security and reduce carbon emissions.

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Projected Growth in Nuclear Capacity in the MENA Region

A report from the International Energy Agency (IEA) projects that nuclear capacity in the Middle East and North Africa (MENA) region will triple by 2035, reaching 19 GW. This significant increase underscores the region's commitment to diversifying energy sources and enhancing energy security through the adoption of nuclear power.

Rosatom's Expanding Role in Africa

Rosatom, Russia's state nuclear corporation, is strengthening its partnerships with African nations in the peaceful use of nuclear energy. The company is involved in various projects across the continent, including the construction of the El Dabaa Nuclear Power Plant in Egypt, and is actively engaging with countries like Ethiopia and Niger to explore nuclear energy solutions.

(Image: World Nuclear Association)

Koeberg Nuclear Power Station

The UAE has been at the forefront of nuclear development in the region with four nuclear units at Barakah. Courtesy Enec.

ARE SMR'S SOUTH AFRICA'S TICKET TO ENERGY SECURITY AND GLOBAL ENERGY COMPETITION?

EDITOR'S VIEW

On 18 September 2025, the Nuclear Energy Corporation of South Africa (Necsa) issued a statement that could well be remembered as a turning point in the nation's energy narrative. Their message was clear: small modular reactors (SMRs) could power Africa's future.
This announcement did more than highlight a technology, it acknowledged that South Africa is finally beginning to see the immense potential of SMRs as part of the solution to the country's ongoing energy crisis. Even more importantly, it opened the door to South Africa positioning itself as a competitive player in the global nuclear economy.

Why SMRs, and Why Now?
For decades, South Africa has grappled with chronic electricity shortages, rolling blackouts, and an overreliance on coal. Renewable energy projects have been rolled out with enthusiasm, but they remain intermittent by nature. The reality is that South Africa needs reliable baseload power, energy that does not falter when the wind dies down or the sun sets. Nuclear has always been the most dependable option, but the high upfront costs and long construction times of large plants have made expansion politically and economically difficult.

SMRs change that equation. Designed to be smaller, faster to deploy, and scalable according to demand, these reactors are not only affordable but also flexible. They can be placed closer to industrial hubs, mining operations, and even in regions far from the national grid. This decentralisation of nuclear power could redefine how South Africa generates and distributes energy, bringing resilience and stability to a struggling system.

The HTMR-100
Leading the charge in this field is Stratek Global, with its high-temperature modular reactor, the HTMR-100. This reactor represents the next generation of nuclear technology: gas-cooled, inherently safe, and designed with both African and global markets in mind.

Unlike traditional designs, the HTMR-100 offers high efficiency and operational flexibility. Its compact size makes it easier to finance and build, while its modular nature means units can be added incrementally as demand grows. It is the kind of reactor perfectly suited for a continent where energy demand is climbing but financial and infrastructural constraints remain significant.

What makes this development particularly exciting is that it is home-grown. South African scientists, many of whom once worked on the Pebble Bed Modular Reactor (PBMR) project, have poured their expertise into the HTMR-100. At a time when the global nuclear industry is searching for scalable solutions, South Africa already has one in hand. CONTINUED ON PG 09

STRATEK GLOBAL
ADVANCED ENERGY SOLUTIONS

CONT.... FROM PG 08

From Energy Security to Export Potential
If South Africa embraces SMRs, the benefits will extend well beyond stabilising the grid. This is an opportunity for the country to become a global exporter of nuclear technology. Nations across Africa, as well as those further afield, are desperate for reliable, low-carbon energy solutions. Few are better placed than South Africa to provide them.

Consider the economic impact: building SMRs domestically would stimulate local industries in manufacturing, construction, engineering, and maintenance. Exporting reactors and services would generate new revenue streams and create high-skill jobs. Most importantly, it would re-establish South Africa as a leader in nuclear innovation, capable of competing with established powers such as Russia, China, and the United States.

At a time when the world is racing to decarbonise, the demand for nuclear technology, particularly SMRs, is only going to grow. If South Africa acts decisively, it could ride this wave rather than watch from the sidelines.

The Role of Private Business
However, government recognition and scientific ingenuity alone are not enough. To truly realise this vision, private business must step in. The ecosystem needed to commercialise SMRs is vast, covering everything from financing and insurance to advanced manufacturing and logistics.

For South African businesses, this is not merely a chance to diversify; it is a chance to be part of a once-in-a-generation transformation. The opportunity lies in supplying components, investing in development, partnering on international projects, and supporting the infrastructure that will allow reactors such as the HTMR-100 to move from blueprint to reality.

Necsa's endorsement is a signal that momentum is building. The train has started to move. Now is the time for entrepreneurs, industrialists, and financiers to climb on board. Those who hesitate may find themselves left behind as others capture the value.

Who's brave enough to take action?
For years, South Africa's nuclear potential has been a story of missed opportunities. Today, with Necsa aligning behind SMRs and Stratek Global ready to deliver a reactor designed for African realities, the narrative is shifting. The pieces are falling into place for South Africa to solve its own energy challenges while also becoming a competitive force in the international energy economy.

The promise is compelling: secure, clean, and affordable power for South Africans, coupled with the prestige and prosperity of exporting cutting-edge nuclear technology to the world. But it will not happen automatically. It requires vision, collaboration, and above all, decisive investment from the private sector.

South Africa stands at the edge of a new frontier in energy. With SMRs, we can light up our future and, in doing so, help power the world.

HOW MASS EXISTS... DISCOVERED

On 4 July 2012 nuclear scientists Dr Joe Incandela and Dr Fabiola Gianotti at CERN (European Organization for Nuclear Research) announced the discovery of the elusive Higgs Boson nuclear particle. This was a very significant discovery. The particle was also dubbed the God Particle by the media due to its fundamental role in the understanding of the Universe.

The Higgs Boson is an elementary particle predicted by theory in 1964 by Dr Peter Higgs and Dr François Englert, and confirmed in 2012 by the Large Hadron Collider at CERN. It is the manifestation of the Higgs Field, which is responsible for giving mass to other fundamental particles, such as electrons and quarks, through their interactions with the field. Particles that interact more strongly with the Higgs Field exhibit more mass.
The Higgs Boson explains the property we know as mass. If you kick a brick it has mass, your toe will certainly feel it. But if you chop the brick up into smaller and smaller pieces you end up with atoms. If you chop the atoms up you end up with fundamental nuclear particles, if you chop them up you end up with something like a group of 'energy smears.' **CONTINUED ON PG 11**

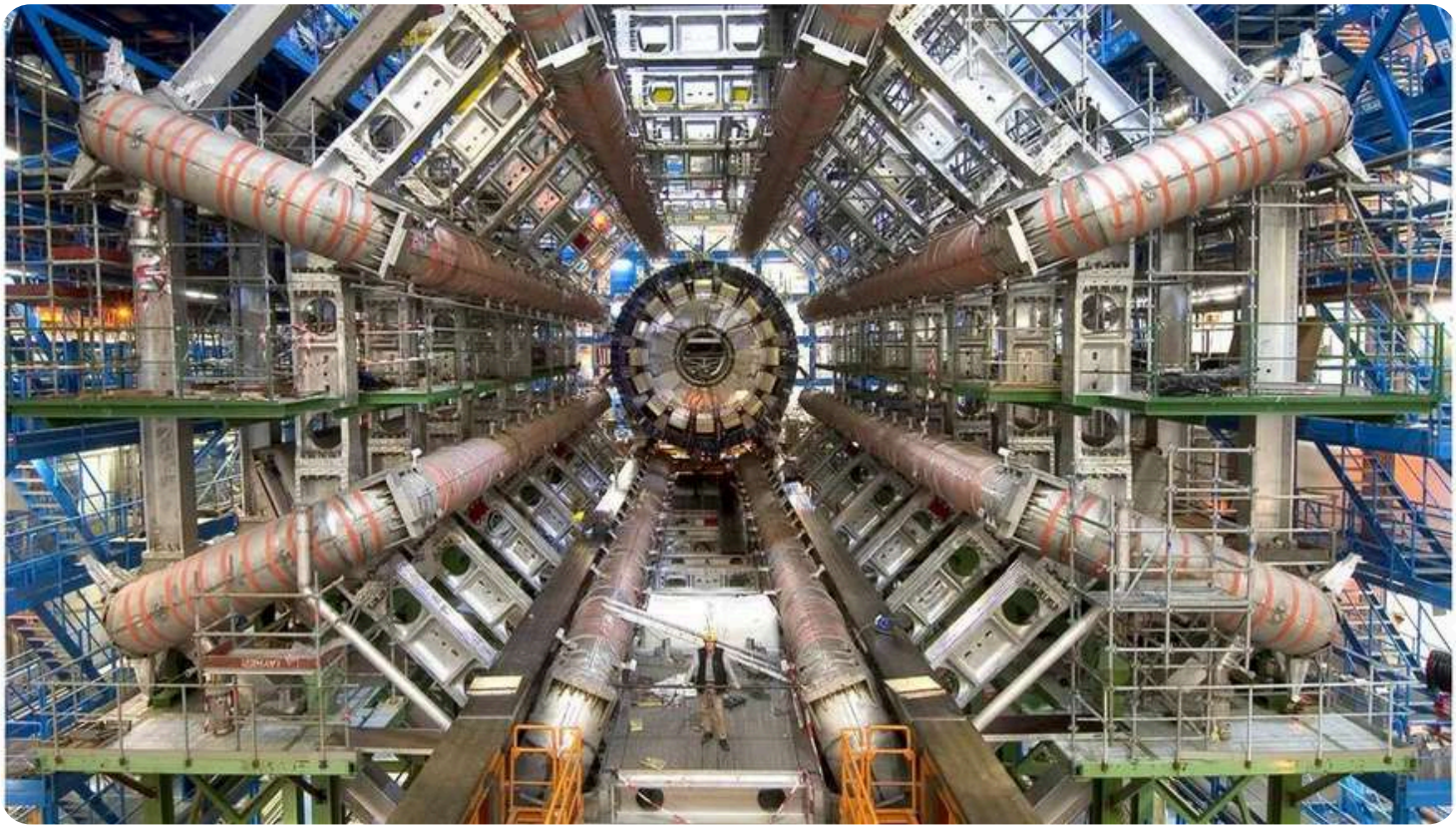
Belgian theorist, Dr François Englert (left), and British theorist, Dr Peter Higgs in CERN's Main Auditorium, on 4 July 2012. They were awarded the Nobel Prize in Physics the following year. (Image: CERN)

CONT.... FROM PG 10

So scientists asked the question; what actually is mass?

Some 50 years ago British nuclear physicist Dr Peter Higgs proposed that there is a Higgs Field in outer space. When particles travel they have to 'push' through the field. The resistance to this field we observe as mass. As a comparison, imagine walking on the ground through air, then imagine walking in a swimming pool of water, and then imagine walking in a pool of honey. Walking in air is easy, walking in water is more difficult, but walking in honey produces great resistance. This resistance to movement feels like you have a different weight, or mass. It is this effect that nuclear particles experience when moving through the Higgs Field in outer space. The discovery of the Higgs Boson nuclear particle shows that the field exists. This was a major advance for nuclear physics.

The Large Hadron Collider (LHC) at CERN, the most expensive physics experiment ever built, at nearly R50 billion was built largely to find the Higgs Boson. The discovery came much sooner than the scientific community expected.



The Atlas detector is one of four instruments at the LHC trying to find particles completely new to science. *Note the size of the man for size comparison. Image Credit CBBC

CONTINUED ON PG 12

NUCLEAR NETWORK AFRICA

THE WORLD OF NUCLEAR

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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