NUCLEAR NETWORK AFRICA

THE WORLD OF NUCLEAR

WHY DEVELOPING ECONOMIES ARE PURSUING SMALL MODULAR REACTORS
RONALD STEIN, DR ROBERT JEFFREY & OLIVIA VAUGHAN

WHY SMALL MODULAR REACTORS (SMRS) WILL BE SUCCESSFUL
SHAWN CONNORS

AND MORE.....

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N²A HIGHLIGHTS

FROM THE EDITOR

As the year draws to a close and South Africans begin to slow the pace for a well-earned festive season break, this seventeenth edition of N²A offers both reflection and anticipation.

December is traditionally a time to pause, reconnect, and look ahead, and this Christmas edition does exactly that by bringing together some of the most important nuclear conversations shaping Africa's future.

We are proud to officially introduce the launch of the N²A website at www.n2a.co.za. This platform marks an important milestone for Nuclear Network Africa, creating a permanent home for credible insight, informed debate, and accessible nuclear knowledge as we move into a pivotal new year.

Looking ahead to 2025, this edition highlights the top news stories that will influence energy security, economic growth, and policy across the continent. With South Africa hosting the G20 in 2025, Africa's position in the global nuclear conversation has never been more relevant. In my own contribution, I explore why G20 2025 places Africa firmly on the path to becoming the next billion-dollar nuclear market.

Our contributors delve deeper into the role of small modular reactors as economic catalysts for developing economies and the reasons SMRs are positioned for success.

As we close off the year, we thank our readers and contributors for their continued engagement. May this festive season bring rest, perspective and renewed energy as we prepare for an exciting year ahead.

Heather Veldhuis

HEATHER VELDHUIS
EDITOR

Christmas in Africa hums with cicadas and sun,
Braais glow while summer rain cools the dust.
Under bright stars, clean nuclear power quietly
promises light, growth, and hope,
fueling tomorrow as families gather on the day.

WHY DEVELOPING ECONOMIES ARE PURSUING SMALL MODULAR REACTORS

CO-AUTHORED BY RONALD STEIN, FROM THE USA,
AND FROM SOUTH AFRICA, DR ROBERT JEFFREY AND OLIVIA VAUGHAN

While developed nations debate renewable energy portfolios, 565 million Sub-Saharan Africans remain without electricity. For billions living on under $10 daily, the electricity conversation demands pragmatism over ideology.

South Africa plans to reactivate its Pebble Bed Modular Reactor program by early next year, as small modular reactors (SMRs) gain traction globally. The US recently signed a partnership with Saudi Arabia including civilian nuclear energy, reflecting renewed international interest in nuclear technology.

The Dispatchable Power Imperative

Economic growth requires dispatchable electricity—power available on demand, 24/7, year-round. Developing nations must evaluate energy sources against this criterion, examining three primary alternatives: intermittent renewables (wind and solar), fossil fuels (coal and gas), and nuclear power.

The fundamental limitation of renewables becomes clear when considering modern infrastructure. Hospitals, airports, and homes depend on products—plastics, pharmaceuticals, medical devices, construction materials—that cannot be manufactured by wind turbines or solar arrays. Hydrocarbons serve not merely as fuel but as essential feedstock for petrochemicals, fertilizers, and thousands of manufactured goods.

This distinction proves critical for developing economies. While wealthy nations experiment with intermittent sources, supported by infrastructure built through historical fossil fuel use, developing countries need continuous power to industrialize, create employment, and reduce poverty. Current "green" policies risk perpetuating global inequality—keeping rich nations prosperous while constraining developing world growth. **CONTINUED ON PG 05**

Ronald Stein, P.E., is an engineer, columnist on energy literacy at America Out Loud NEWS, and advisor on energy literacy for the Heartland Institute and CFACT, and co-author of the Pulitzer Prize-nominated book "Clean Energy Exploitations." He is also the recipient of an unsolicited Tribute to Ronald Stein from Stephen Hines.

Dr Robert Jeffrey is an economist, business manager and energy expert. He has a Master's degree in economics from Cambridge, a Master's degree in business management and holds a PhD in Engineering Management. He was on the economic round table advising the South African Reserve Bank.

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Nuclear Power's Proven Benefits

Nuclear energy's resurgence stems from demonstrated advantages: exceptional safety records, environmental benefits including minimal land use and zero emissions, reliability with over 90% capacity factors, energy density, scalability, and economic efficiency with long operational lifespans and low running costs. South Africa's Koeberg Power Station exemplifies these benefits as one of the country's most economical facilities, while its Safari reactor produces medical and industrial radioisotopes exported globally.

Transformative Economic Impact

A comprehensive economic analysis of South Africa's SMR deployment reveals extraordinary potential:

GDP Growth: Within two decades, an SMR program would contribute approximately R74 billion ($4.3 billion USD) annually—1.1% of baseline GDP—representing economy-altering development.

Employment Creation: The program would generate over 33,000 direct jobs and 154,000 indirect jobs within ten years of operation, expanding to nearly 350,000 jobs supporting over 1.4 million people within twenty years. These represent sustained high-skill positions in manufacturing, engineering, and operations, not temporary construction work.

Skills Development: Unlike fossil fuel extraction or renewable installations, nuclear technology cultivates highly skilled workforces, creating permanent technical capabilities while retaining talent and attracting international expertise.

Trade Advantages: Long-term projections show ongoing current account surpluses of approximately R8 billion ($9.4 billion USD) annually as exported SMR units generate hard currency.

Revenue Generation: Annual tax revenues would exceed R19 billion ($1.1 billion USD), with job-related remuneration approaching R33 billion ($1.9 billion USD)—funding further development in education and healthcare.

The SMR Advantage

Traditional large-scale nuclear plants require massive capital, decade-long construction, and major grid infrastructure—often insurmountable barriers for developing economies. SMRs offer alternatives:

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Scalability: Incremental deployment matches investment capacity and demand growth, with typical rollouts reaching four domestic units annually, expanding to eight exported units within two decades.

Flexibility: Smaller units locate near demand centers, reducing transmission losses and infrastructure costs while providing industrial process heat for chemical facilities and remote electricity generation.

Safety: Passive safety features and simpler designs reduce operational risks, with modern SMRs incorporating inherent safety characteristics suitable for nations building nuclear expertise.

Industrial Development: Unlike imported renewable components, SMR programs build domestic manufacturing capacity, creating entire nuclear industry value chains encompassing development, engineering, design, and manufacturing.

Building Sustainable Industries

Historical precedents validate this approach. South Africa's Richards Bay development, Sasol's coal-to-liquids technology, and automotive industry growth each transformed regional economies.

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SMR deployment offers comparable employment impacts—340,000 jobs supporting 1.4 million people—with superior balance of payments outcomes.
SMRs extend beyond power generation to platforms for industrial development. For uranium-rich countries, they enable domestic nuclear fuel production and export opportunities, adding substantial value to natural resources.

The Moral Imperative

For 565 million Sub-Saharan Africans without electricity and billions more in energy poverty, the choice is clear. They cannot gamble futures on intermittent renewables that undermine industrial development. Renewable projects' full lifecycle costs trap developing economies in perpetual debt cycles as consumer nations.

SMRs provide what developing economies need most: reliable baseload power building domestic capability, creating quality employment, and establishing technology platforms for future growth. The alternative—continued energy poverty or import dependency—condemns billions to economic stagnation.

The question isn't whether developing nations should pursue nuclear technology, but whether wealthier nations will support or obstruct this pragmatic choice. For billions living on under $10 daily, electricity policy serving people over ideology represents not just sound policy but moral imperative. Reliable electricity lights the path to prosperity—small modular reactors can illuminate that way.

A LITTLE NUCLEAR CHEER TO END THE YEAR!

Dr Katy Sheen, a physicist at the University of Exeter has used Albert Einstein's maths to show how Father Christmas makes his journey.

She has shown how he does not get spotted by radar, and fits down a chimney.

Sheen calculated that visiting around 700 million children in 31 hours would mean that he would have to travel at ten million kilometres per hour, if he is to deliver presents to every child.

Dr Sheen said that according to Einstein, strange things happen when you start to travel that fast. Relativity indicates that time slows down, so Father Christmas has more time than is first evident.

Secondly, he gets squished by the fast motion, which means that he can fit down a chimney more easily.

... and there you have it!

Some Guy Said...."

I am reading a book about anti-gravity.

I can't put it down.

What do you think about that new restaurant on the Moon?

The food's great, but there is no atmosphere.

... CONTINUED

Thomas Edison introduced Christmas lights to the world in 1880. Before that, people put real candles with flames on their trees.

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It's a law of the universe that your Christmas lights will tangle, no matter how carefully you packed them away the year before.

This is due to the principle of entropy. Physicists have proven that for any cord longer than 2 metres, knots are almost mathematically guaranteed. That's because there's only one way for the string to be "untangled," but endless possibilities for it to get fouled up.

... and there you have it!

Some Guy Said...."

Even if most reindeer can't fly, they do float in water. Their hair traps air, like a puffy jacket. So, if the sleigh of Father Christmas lands in the Vaal Dam the reindeer will be O.K. As for the fellow in the Red Suit...

I was visiting my daughter last night when I asked if she could give me a newspaper. "This is the 21st Century", she said, "We don't waste money on newspapers. Here, use my iPad." I can tell you this, that Fly never knew what hit him.

AFRICA'S NUCLEAR POWER LANDSCAPE.

TOP 2025 HIGHLIGHTS

South Africa Declares a "New Era" for Nuclear Power

South Africa confirmed renewed commitment to nuclear energy in 2025, with the government emphasising the role of nuclear energy in energy security, decarbonisation, and industrial development. Focus areas include extending the life of Koeberg, preparing for new nuclear build, and rebuilding local nuclear skills and supply chains.

South Africa's IRP 2025 Targets 5.2 GW of New Nuclear Capacity

The updated Integrated Resource Plan 2025 makes provision for 5.2 GW of new nuclear capacity by 2039, with flexibility for additional capacity beyond this. The plan positions nuclear as a long-term baseload solution alongside renewables and gas, reinforcing its strategic importance in the national energy mix.

Egypt's El Dabaa Nuclear Plant Advances Toward Completion

Egypt continued major construction progress at the El Dabaa Nuclear Power Plant in 2025. Once completed, it will be Africa's largest nuclear facility and a cornerstone of Egypt's clean energy strategy, significantly strengthening energy security and reducing carbon emissions.

Rwanda & Senegal Join Global Nuclear Capacity Tripling Pledge

Rwanda and Senegal formally joined the global pledge to triple nuclear capacity by 2050, reflecting growing African interest in nuclear energy as a tool for economic development, industrialisation, and climate commitments, even in countries without existing nuclear power plants.

AFRICA'S NUCLEAR POWER LANDSCAPE.

LATEST NEWS

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Small Modular Reactors (SMRs) Gain Strong Momentum Across the Continent

Interest in Small Modular Reactors increased across the continent in 2025. Countries including South Africa, Ghana, and Rwanda explored SMRs as a practical option for scalable, reliable, and lower carbon electricity, particularly suited to Africa's diverse grid sizes and industrial needs.

African Nuclear Summit Highlights Growth & Collaboration

The NEISA 2025 summit brought together policymakers, industry leaders, and nuclear experts to champion nuclear energy's role in Africa's sustainable energy future, emphasising SMRs, microreactors, energy access expansion, and climate resilience as central themes.

WHY SMALL MODULAR REACTORS (SMRS) WILL BE SUCCESSFUL

SHAWN CONNORS

Shawn Connors has great experience using plain language to communicate complex subjects effectively. He is the author of the Quick Read Nuclear Energy Guide, which takes less than one hour to read and is organized into 21 common Q&As, with hundreds of active links for more information. Shawn, who lives in Florida in the US, is an advocate of advancing nuclear energy globally, so he often argues against anti-nuclear advocates.

His recent book, Chain Reaction: A Story About Power in the Age of Climate Change, was written with nuclear energy playing a more accurate role in popular culture. As Shawn puts it, "It's about time the good guys told their story."

Shawn was born the year the nuclear submarine Nautilus was put to sea—Admiral Rickover's Nautilus, not Captain Nemo's. Shawn and his wife, Joanne, have spent a lifetime rescuing greyhound racing dogs. Their current greyhound is named Levi, and he's an honorary co-author of Chain Reaction. Levi is pronuclear.

Many people say that: SMR's do not make sense!

They trumpet out loud; 'So far, they are a science experiment.' They continue, and add: 'They are difficult to control, they lack efficiencies of scale, so they will produce expensive energy. They have been called "zero-advancement, and paper and PowerPoint reactors."
They tell you to be careful investing in them, because someday it could be your freeze-plug that melts. The Freeze Plug refers to a particular category of SMR, the molten salt type.

So let me tell you why the SMR sceptics are wrong.

They are wrong because they are only half right. History is littered with "doomed" innovations which actually came to valuable fruition.

In 1882 Edison's Pearl Street electric power station cost a fortune and only had 59 customers. To compound Edison's problems, his dynamos caught fire and blacked out. Critics pointed out Europe's failed arc-light experiments. But by 1900, electrification was booming as costs fell 90 percent.

The original Wright Brothers first aeroplane, made of wood, linen, bicycle spoke wire, and string.Photo Credit: Kelvin Kemm

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In 1903 the Wright Brothers defied sceptics, including Lord Kelvin who declared that heavier-than-air flight was impossible. But the wise use of wind tunnels and the growing understanding of aerodynamics, led to the two brothers flying a rickety 'plane built with bicycle parts,' for 12 seconds. They did it all, without any available business model, and the result was that aviation was a global phenomenon by 1920.

Russia leads today in SMR development, just like in 2010 when they dominated space launches with cheap rockets. But as NASA and former astronauts snickered at Elon Musk, with crash after crash and $400 million overruns, things changed. As of this date there have been nearly 600 successful landings of SpaceX reusable rockets, with launch costs crashing by 90 percent.

Do not undervalue the wildcard of dramatic innovation. The valid criticisms of SMRs could apply to any new type of technology. Doomed phases last maybe 10 to 20 years before tipping, and some 21st Century SMRs are past year 15. Today's innovators have new alloys, AI digital twins, advanced simulations, and many lessons learned. Computer simulations can fail impressively and fast multiple times, before the developers have to start actually bending metal. Furthermore, the gap from concept to prototype is shrinking fast.

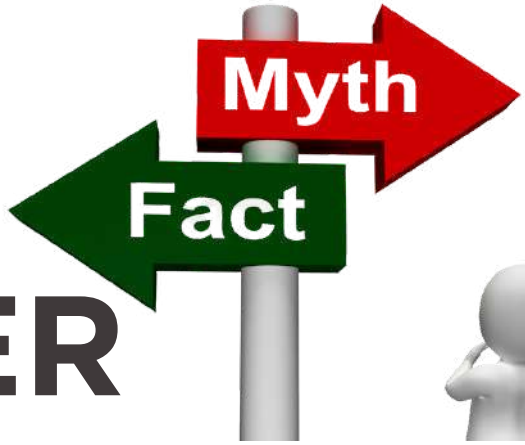
SMR's will join the pantheon of their successful predecessors. It might take a decade longer than one would wish, but at the end of the day, we need hot, fast reactors to power a 21st Century world. Humanity is not going to leave on the table the potential that a supernova gave us for energy abundance.

Chain Reaction, A Story About Power in the Age of Climate Change

A book by Shawn Connors

The year is 2027. A 19-year-old science polymath Amy Austin takes on environmentalist and Academy Award-winning actor Josh Manning in a debate over the fate of a nuclear plant in rural Michigan. But all is not as it seems. Amy is building a new nuclear reactor. The technology is 30 years ahead...Small...Light...Safe... Powerful...and Affordable. The world energy market, already in disarray, is controlled by some of the most powerful people on Earth who start making their moves ahead of the disruption that they know Amy's reactor will cause.

A Chain Reaction ripples around the globe. As an ecoterrorist cell moves against Amy, her loyal group of unlikely characters risks everything to protect and help her. There is no going back. Time is running out. It's now or never in what is a breathtaking and dangerous race to save the planet...from ourselves.



MYTH BUSTER

MYTH:
The "Nuclear = Bomb" Blunder

"If you have nuclear power, you must be building nuclear bombs."

That's like saying owning a pressure cooker means you're opening a restaurant. Calm down … it's just dinner.

FACT:

Nuclear power uses low-enriched fuel that's useless for weapons. The technologies, materials, and rules are entirely different.

A power plant is not a bomb factory — it's a clean-energy engine.

MYTH:
The "Too Dangerous" Drama

"Nuclear energy is too dangerous — the risks are too high."

You're statistically more likely to be injured by a selfie than by nuclear power. (Yes, really.)

FACT:

Nuclear has one of the lowest accident rates of any major energy source and the highest safety standards on the planet.

SMRs aren't "tiny disasters"; they're some of the safest, smartest energy tech ever designed.

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WHY G20 2025 MAKES AFRICA THE NEXT BILLION-DOLLAR NUCLEAR MARKET

EDITORS VIEW

When the motorcades rolled into Nasrec for the first-ever G20 summit on African soil, most headlines focused on the political theatre: a US boycott, tense negotiations, and a declaration adopted at the beginning rather than the end of the meeting. Yet from where we sit at N²A, Nuclear Network Africa, the real story of G20 South Africa 2025 is far more consequential. Johannesburg has redrawn the energy conversation, placing Africa firmly at the centre of global development, and opening the door wide for a nuclear renaissance.

What the Johannesburg Declaration unlocked

The 120-point declaration touches everything from finance to food systems, but three commitments stand out for nuclear: equity, technology neutrality, and finance.

Firstly, the summit elevated Africa's role in shaping global energy and environmental stability. The declaration emphasises equitable transitions, resilience, and support for countries burdened by rising resource stress and economic pressures. This positions Africa not as a passive recipient, but as a driver of global energy evolution.

Secondly, leaders endorsed the deployment of "zero and low-emission technologies tailored to national contexts," insisting that transitions be technologically neutral. This language is precise enough to include nuclear energy unequivocally. No longer is nuclear the awkward stepchild; it stands shoulder to shoulder with renewables as a legitimate tool for stable, low-emission development.

Thirdly, the G20 acknowledged the enormous investment needed for sustainable, resilient infrastructure and backed new financing tools through multilateral development banks. For African treasuries, long told that nuclear is financially "too difficult", this declaration acts as a political lever.

Johannesburg, South Africa. The City where the G20 was held in November 2025. This Summit, the first ever on African soil, spotlighting Solidarity, Equality, and Sustainability.

In short, South Africa's presidency secured principles that place all low-emission solutions on equal footing, while demanding fair access to funding. It is a critical shift

Africa's nuclear moment

The declaration did not emerge in isolation. Earlier in the year, the G20 Energy Transitions Working Group at Sun City held unprecedented discussions on nuclear's role in strengthening energy reliability and environmental stability. These dialogues helped shape the final text's strong neutral language.

For South Africans, this moment resonates deeply. We have endured load-shedding, economic stagnation, and collapsing energy security. Yet we also operate Africa's only commercial nuclear plant at Koeberg, which has provided safe, reliable power for decades. Johannesburg's G20 has effectively given momentum to:

- South Africa's plans for new nuclear procurement.
- The continent's emerging nuclear programmes: Egypt, Ghana, Kenya, Nigeria, Rwanda.
- The rapid rise of Small Modular Reactors (SMRs), ideally suited to Africa's grid realities and industrial ambitions.

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Globally, momentum is rising too. Many G20 states operate nuclear fleets, and several support the international ambition to triple nuclear capacity by 2050. The International Atomic Energy Agency has consistently championed nuclear as essential for environmental stability and energy security. What is new is that this message now carries the voice of the Global South.

What to expect in the next 12 months

Declarations alone do not power economies; projects do. But as editor of N²A, here is what the next year is likely to bring:

Nuclear enters mainstream development finance discussions

As G20 commitments are translated into financing frameworks, nuclear will begin appearing in Africa's development pipelines under categories such as baseload reliability, industrial growth, and long-term environmental stability. African governments now have the political backing to demand that nuclear be treated equally.

Feasibility advances across Africa

Several states are expected to shift from high-level agreements to concrete steps: feasibility studies, site assessments, grid planning, and regulatory capacity-building for first large reactors, or SMRs.

A challenging but opportunity-rich US G20 year

Even with political friction expected, nuclear energy remains one of the few areas where major global powers share interests. Attempts to soften Johannesburg's equity-driven language will not erase the reality that nuclear offers unparalleled reliability.

Intensified vendor interest across the continent

Following Africa's elevated G20 profile, global nuclear vendors will increase their pursuit of partnerships, localisation deals, and skills development. South Africa is well-placed to become a manufacturing and services hub.

A more unified African nuclear voice

African nations are increasingly speaking collectively on development priorities. Expect stronger advocacy for whole-system energy strategies, including nuclear, that support resilience, economic expansion, and environmental balance.

The G20 2025 may be remembered for diplomatic tension, but its deeper legacy is the repositioning of Africa as a pivotal force in the global energy landscape. Johannesburg marks the moment the continent claimed its place not just as a beneficiary of global policy, but as an architect of it.

In that vision, nuclear energy is not an optional extra. It is the backbone of Africa's stable, prosperous, load-shedding-free future.

Mandela Bridge spans Johannesburg's skyline, symbolising connection, resilience, and progress in a city shaped by history and bold urban renewal.

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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