



SA's nuclear imperative and its challenges

In light of the recent Nuclear Forum held during the 2026 Africa Energy Indaba in Cape Town from March 3-5, Dr Yves Guenon highlights the critical need and the challenges involved in expanding our nuclear programme in South and Southern Africa.

With over 30 years of experience in South Africa's nuclear industry, Dr Yves Guenon is a prominent nuclear energy expert. Now Chairman of the French South African Chamber of Commerce and Industry (FSACCI), he was a key player in preparing and negotiating Eskom's 2008 Nuclear 1 contract for two light-water reactors for France's Areva, which collapsed because the South African Treasury saw the R120-billion price tag for the two EPR reactors as uncompetitive.

He was also instrumental in the success of the multi-year steam generator replacement (SGR) project at Koeberg, which hopes to extend the operational life of our only nuclear power station by a further 20 years.

The 2026 Nuclear Forum convened following approval of South Africa's revised Integrated Resource Plan (IRP 2025), which proposes investments of R2.23 trillion in

energy infrastructure by 2042. Alongside a massive expansion of renewables – 34 GW of wind, 25 GW of solar PV and 8.5 GW of battery storage – 16 GW of gas and 5.2 GW of new nuclear capacity are envisaged, projected to account for around 16% of generation capacity when installed.

In light of the clean-energy transition, African leaders, policymakers, investors, technology providers and industry experts met at the 15th Nuclear Forum from March 3-5, 2026, as part of the Africa Energy Indaba, to explore the evolving role of nuclear energy.

Nuclear is critical in the energy mix

As the world transitions away from fossil fuels for electricity generation, nuclear power is critical to the energy mix, Guenon says. While supporting renewable energy growth, he notes that intermittent sources cannot sustain the national grid on their own. It will therefore be essential to replace ageing coal-fired plants in South Africa with a solution that offers high energy availability.

Citing France and Germany's power gen-

eration choices, he says that today, France generates electricity with a carbon footprint 10 times smaller than Germany's, despite Germany's strong focus on renewable investments. "As a result, France is attracting a lot more energy-intensive industrial investments, many of these for data centres," he tells MCA.

He cites two key reasons: "First, the availability of experienced engineers, and the second is that France produces clean energy from a mix dominated by its nuclear plants. This is not going to be matched by Germany or South Africa in the near future," he says, adding that this enables producers in France to sell lower carbon products and more easily avoid global carbon taxes.

Highlighting the energy needs of modern data centres, he says that a single large data centre, which must operate 24 hours a day for 360 days per year, will consume the energy equivalent of one entire unit of the Koeberg Power Station. To reduce their carbon footprint, data centre infrastructure will therefore migrate to countries with strong, stable and clean electrical energy networks.



The two-unit Koeberg Nuclear Power Station with a capacity of approximately 1 854 MW is currently the only nuclear power plant on the African continent.

"Not only is nuclear energy clean, but it also offers high reliability with a 90% energy availability factor (EAF), which provides consistent and continuous power that cannot be matched by renewables such as wind or solar," Dr Yves Guenon points out.

The role of Small Modular Reactors (SMRs)

"A key issue at the Nuclear Forum for me is that everybody thinks that smaller is cheaper. While SMRs are cheaper than industrial-scale nuclear reactors, they produce less energy. Now, when one calculates the cost per megawatt generated, the smaller the reactor, the more expensive the cost per MW."

Other key issues affecting the comparative viability of SMRs are regulatory, compliance and licensing requirements. "Most SMRs are small versions of light-water nuclear power reactors (PWRs), so they generally require the same level of licensing complexity as an industrial-scale nuclear power station. In some cases, in fact, because the designs are newer and less proven, the requirements for an SMR may even be more rigorous, which adds to the installation costs," he points out.

SMRs have a role, however. "Even if the price per unit of power is higher, it often makes sense to adopt a smaller nuclear plant solution. Namibia, for example, has a total demand of around 600 MW, so a big reactor is unnecessary," he explains.

Even in some parts of South Africa, such as Phalaborwa, a large PWR reactor would be impossible because it would require access to too much water. In these places, an SMR designed to use dry cooling with air-cooled condensers (ACCs) would be suitable, a cooling solution that is not feasible for large multi-unit nuclear plants.

In addition, most African countries have

very weak power transmission grids, says Guenon, so a few strategically placed SMRs could be a more realistic way to distribute power to where it is needed.

Financing and localisation challenges

Dr Yves Guenon believes that financing a nuclear new build is relatively easy, but warns of the need for realistic expectations regarding the challenges of localising nuclear technology in Africa.

"The first obstacle is the Nuclear Safety Authority, which needs to be strengthened before a new nuclear programme can be established. Engineers must be recruited who are properly trained and experienced in nuclear technology. To do this properly takes time, and even for South Africa's current new reactor plans, the size of the Safety Authority will have to be increased drastically, and not in five years; it must be done now.

"Also, before starting to construct a nuclear plant, the vendor process needs to be put in place. Few people realise the size of this task or the amount of documentation involved – and very few people in Africa are qualified to do this," he adds.

"I think people have to be realistic about what they need and what they can manage. Cheap energy that is locally developed, procured and constructed in African countries, including South Africa, is unrealistic. It is impossible to reach the localisation levels the government wants us to, and there is a huge shortage of local competency. When we negotiated the Nuclear 1 project in 2007, we estimated that 25-30% local procurement was the best we could achieve for local content," he advises.

"The financing itself, though, on an EPC basis, is not complex, but it has been done

country by country," he says, but warns that "the build, own, operate model is very dangerous, particularly now that the world is so politically volatile."

Education and Training for Nuclear Energy

Guenon goes on to express concern about the way engineers and technicians are trained in Africa. In France, he says, engineering students have to complete an internship for every year of study to ensure they emerge with both practical and theoretical knowledge. "And these internships are not projects done online; they are real, hands-on engineering projects where the student works on-site, in the industry for several months at a time," he points out, adding that many of those who study here emerge as good scientists rather than good engineers.

Also, he points out, hands-on internships in the nuclear industry are difficult when there is only one nuclear plant on the continent. "So we need to find ways to change the way we educate nuclear engineers here in Africa," he suggests.

Africa-wide cooperation

"South Africa is the ideal place in Africa to rebuild its base-load energy capacity around nuclear power, because of its economy and the mineral resources that need to be locally benefited. In addition, South Africa is well placed to become the hub for nuclear power in Africa, because no country can afford to go it alone in this industry. Cooperation among African countries to share resources and expertise in nuclear technology, education and training will be essential.

"I must also emphasise the importance of taking a long-term view and establishing realistic goals for all nuclear energy projects in Africa," concludes Dr Yves Guenon.

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