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POLICY BRIEF

SHOULD AFRICA GO NUCLEAR?



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Africa is facing a massive electricity deficit that is impacting its economic and social development, and its ability to catch up with the rest of the world. It is imperative that the continent increase its electricity production to connect the 600 million people who are currently without access and to improve the quality of service for the millions who are suffering from frequent blackouts and load-shedding. Economic development in the 21st century will crucially depend on the digital economy and on artificial intelligence (AI), and both are big consumers of electricity.

The last decade has seen major advances in nuclear technology and the development of small modular reactors (SMRs). Recently the World Bank has changed its policy to allow it to finance nuclear energy projects in developing countries. This policy brief examines whether those developments are an opportunity for Africa. Are SMRs the solution to Africa's electricity problem?

The policy brief is divided into six sections. After this introduction, section 2 describes Africa's electricity deficit and its impact on the continent's development. Section 3 explains why Africa needs more mini grids. Section 4 describes the evolution of SMR technology. Section 5 compares the costs and benefits of nuclear energy using SMRs to the cost and benefit of renewables and of natural gas. Section 6 concludes by trying to answer the question of whether Africa should go full speed toward adopting SMR technology.

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AFRICA NEEDS MUCH MORE ELECTRICITY

The link between energy availability and economic development has been well documented¹. Energy scarcity imposes a strong constraint on the economy. Electricity is important for developing the industrial and high value-added services sectors that are key to future growth and job creation. Electricity is also important for the delivery of social services. Quality health and education are more difficult to deliver without electricity.

Access to electricity is becoming even more important because it is essential for the internet and AI. According to the [World Bank \(2025\)](#) digitalization is one of the most powerful development opportunities of our time. Digital connectivity is today essential for delivering health care and education. Digitalization is also important for agricultural and industrial development, as well as for improving government services. The same World Bank report adds that the rise of AI presents a defining moment for global development. Countries need to embrace AI to maintain competitiveness and open new opportunities for growth and the creation of high-quality jobs. The World Bank argues that AI provides developing countries with an opportunity to leapfrog, but there is also a real risk of some being left behind so that the inequality between developed and developing countries would increase.

So far Africa is lagging behind the rest of the world. Only 38% of Africans use the internet, compared with a world average of 68%². This also reflects problems of access to electricity. Only 65% of Africans have access to electricity, compared with nearly universal access in the rest of the world³. The 600 million Africans who do not have access represent 80% of the electricity poor population in the world. Without electricity there can be no industrial or agricultural development. There can be no digitalization or AI. Africa will be left behind while the rest of the world moves on. That is why improving access to electricity in Africa is a top priority.

MINI GRIDS ARE WELL-SUITED TO AFRICA'S NEEDS

Low population density is one of the reasons why expanding electricity access in Africa has been slow and expensive. Connecting remote and sparsely populated areas to a centralized national grid can be very costly and usually has very low rates of return. In those situations, mini grids could be the solution. Mini grids are defined as electric power generation and distribution systems that provide electricity to either a few customers in a remote area or to thousands of customers in a town or city, and that are not connected to the national grid. Mini grids are not a new phenomenon. Most centralized electricity grids began as isolated mini grids that were connected with each other over time.

According to the [World Bank \(2022\)](#), there are some 291,000 population clusters in Africa that have profiles favoring the deployment of mini grids. That is, they are at least 1 km away from the main grid and have a population density of more than 1,000 people per square km. The World Bank report calculates that with an investment of US\$91 billion about 380 million Africans—nearly two-thirds of the people with no access—could be connected by mini grids.

1. For example, see [Stern \(2011\)](#)

2. See [ITU \(2025\)](#).

3. See [World Bank data](#).

About one-half of all the mini grids in the world today use solar energy, 35% use hydropower and the remainder use fossil fuels. The use of solar mini grids is rising fast. A typical modern solar hybrid mini grid consists of a generation unit made up of solar panels, batteries, charge controllers, inverters, and diesel back-up generators; and a distribution network which consists of poles and low voltage wire. The levelized cost of energy (LCOE)⁴ from this type of mini grid has fallen from US\$0.55/kwh in 2018 to US\$0.38/kwh in 2021 and is projected to fall further to US\$0.29/kwh in 2030.

THE DEVELOPMENT OF SMRS

Moreover, SMRs are also well suited for mini grids. The World Nuclear Association [defines SMRs](#) as “nuclear reactors, generally 300 MW equivalent or less, designed with modular technology, using module factory fabrication, pursuing economies of series production and short construction time.” This is a very new technology with less than a handful of commercial SMRs in operation today. However, it is growing very fast. There are 70 SMR designs at different active stages of development and deployment worldwide.

The concept of small nuclear reactors is not new. After all, compact reactors have been used for many years in naval propulsion. Nuclear submarines are an example of that. The modern SMR movement came about from concerns about the high costs and construction delays associated with conventional nuclear power plants. The idea is to develop smaller reactors that could be manufactured in factories and assembled on site using modular construction techniques.

Projections of the [International Atomic Energy Agency \(IAEA\)](#) see nuclear electrical generating capacity in 2050 being two and a half times greater than today, with 25% of that new capacity coming from SMRs. The IAEA argues that SMRs have a lot going for them. They are well suited to replace fossil fuel generation in remote communities and industries. They can also work flexibly alongside renewables to ensure continued supply of electricity.

Given their size and lower upfront capital costs, SMRs offer a new nuclear power option for African countries for which large nuclear power reactors may not be suitable. According to the IAEA, several African countries—including Ghana, Kenya, Uganda and Zambia—are considering the use of SMRs. Even countries that already have a functioning nuclear program, such as South Africa, are including SMRs in their technology considerations.

The availability of uranium on the continent adds to the attractiveness of SMRs for African countries. Africa is responsible for about 15% of the world’s production of uranium⁵. Namibia, Niger, and South Africa are the main African producers of uranium. Significant reserves have also been identified in Botswana, Tanzania, and Zambia. Nearly all of Africa’s uranium is exported to developed countries where conversion, enrichment, fuel fabrication, and reactor services take place. This looks like the old colonial model where Africa produces the raw material and value addition happens elsewhere. It may make sense for Africa to start using its own uranium to produce clean electricity.

4. The levelized cost of energy (LCOE) is defined as the average cost of producing one unit of electricity over the entire life of the power plant. It is calculated as the present value of total lifetime costs divided by total lifetime electricity generation; where total lifetime costs include the cost of construction, financing, fuel, and operations and maintenance, and in some cases decommissioning.

5. See [World Nuclear Association \(2026\)](#).

The shift in the international community's position on the use of nuclear energy is another factor encouraging African countries to consider the use of SMRs. This shift started at COP28 in the United Arab Emirates. Nuclear energy was recognized as a possible tool for both decarbonization and energy security. A coalition of 25 countries signed a declaration on the sidelines of COP28, committing to triple nuclear energy capacity by 2050. Two African countries, Morocco and Ghana, were among the initial 25 signatories of the declaration.

The change in the international community's view of nuclear energy was concretized by a major shift in World Bank policy which opens up new opportunities for African countries to finance SMRs⁶. On June 11, 2025, the World Bank lifted its longstanding ban on financing nuclear energy projects, reflecting growing global support for nuclear energy as a source of clean electricity that can help achieve net zero targets. Developing countries supported this change because nuclear technologies, notably SMRs, have the potential to meet their enormous energy needs. Subsequently, the World Bank entered a [partnership with the IAEA](#) to provide technical assistance to countries interested in building nuclear energy capacity, and help standardize policies and regulations, as well as enhance access to technology needed to expand the use of SMRs.

COMPARING SMRS, RENEWABLES AND NATURAL GAS

It is worth considering that SMRs face strong competition from renewables, where Africa has a huge potential. The continent has exceptional solar irradiation across the Sahara, Sahel, and Southern Africa; strong wind corridors along the Atlantic and Red Sea coasts, and in parts of East and Southern Africa; and substantial hydropower potential in the Nile, Congo, Zambezi, and Niger river basins. Hydropower has historically been Africa's dominant renewable resource. Today, however, solar and wind are expanding rapidly, while battery storage is emerging as a critical technology that can make intermittent renewables more reliable. Together, these technologies are reshaping Africa's energy landscape.

The cost of renewable energy has been declining rapidly. According to the International Renewable Energy Agency (IRENA) the LCOE for solar was around US\$0.043 per kwh in 2024, down by 90% compared with 2010; similarly, the LCOE for onshore wind was US\$0.034 in 2024 which is 70% lower than its value in 2010⁷. And those costs are continuing to fall, making it difficult for SMRs to be competitive.

Africa is also a large producer and exporter of natural gas. The continent exports about 95 billion cubic tons of natural gas every year, with the largest exporters being Nigeria, Algeria, Egypt, Angola and Mozambique. [Stanley, Schlotter and Eberhard \(2014\)](#) argue that if Africa makes full use of its natural gas resources it could double its total electricity generation. Moreover, at about US\$0.09/kwh, natural gas is a competitive source of baseline electricity.

The increased use of natural gas for electricity production in Africa is subject to debate. Opponents of natural gas point to the negative impact of methane gas on the environment, and on climate change. The risk of methane leakage during production, transportation, and processing is considered to be too high. Hence, the argument goes that Africa should not use natural gas to produce electricity; especially since renewables are abundant and are increasingly competitive. Proponents of natural gas argue that it emits substantially less CO₂ than either coal or oil. The African Development Bank even considers natural gas as an integral part of a [just energy transition](#).

6. See [CGD \(2025\)](#).

7. See [IRENA \(2025\)](#).

Given Africa's electricity poverty, and its limited contribution to global greenhouse gas emission, it seems unfair to ask it not to use its own abundant gas resources to produce electricity. A middle position would be to support gas-to-electricity projects in Africa provided they meet five criteria: (1) they truly expand electricity access; (2) they are the lowest cost option; (3) they complement rather than replace renewables; (4) they minimize methane leakage; and (5) they fit into a national strategy of just transition to low carbon sources of energy.

The availability of renewables and natural gas could explain why some observers are skeptical about the economic viability of SMRs. [Schlissel and Wamsted \(2024\)](#) at the Institute for Energy Economics and Financial Analysis (IEEFA) analyzed data from the four SMRs that were in operation or under construction in 2024. They also looked at information about projected costs from some of the leading SMR developers in the United States. The result of their analysis was that SMRs were still too expensive, too slow to build, and too risky to play a significant role in the transition from fossil fuels in the next 10 to 15 years. They called upon regulators, utilities, investors, and government officials to accept the reality that renewables, not SMRs, are the near-term solution to the energy transition.

However, not everyone agrees with this negative assessment of the future of SMRs. The [IAEA Director General stated](#) at the signing of the agreement with the World Bank that: "SMRs have great potential to cleanly and reliably power progress and fight poverty." [Katsiotis \(2025\)](#) argues that SMRs offer an unparalleled combination of scalability, stability, and low carbon intensity and are uniquely positioned to meet the energy needs of the 21st century. Renewable sources cannot provide uninterrupted 24/7 baseload power as SMRs can. Solar and wind suffer from intermittency issues and geographical constraints.

In addition, SMR costs are decreasing as production models are standardized and factory production starts. Soon, SMRs are expected to be commercially produced in the same way as commercial aircraft, which would significantly reduce the initial capital requirement. In this case the LCOE of SMRs could be in the range of US\$0.05 to US\$0.075 per kwh; which would be competitive with solar and wind without intermittency limitations.

Another positive aspect of SMRs is that they do not require large public investments. They can attract private investors, due to their lower individual unit costs and their modular nature. Moreover, the return on investment for SMRs can be relatively high, especially when considering co-generation possibilities where SMRs produce industrial heat and hydrogen in addition to electricity.

AFRICA'S WAY FORWARD

Africa does not need to choose between renewables, gas and SMRs. Given its huge needs, it can use all three depending on the context. In other words, the continent should adopt what the World Bank's president refers to as the "[all of the above](#)" approach. For Africa, "all of the above" includes nuclear, gas, solar, wind, geothermal, and hydropower.

Achieving universal access to electricity in Africa requires huge investments and cannot be done by public money alone. There is a need to attract private investment. The [IEA estimates](#) that US\$150 billion will be required to finance grid expansions, mini grids, stand-alone solar systems, generation capacity, transmission and distribution infrastructure, and connection costs. Some of those investments—for example, transmission infrastructure—will need to be borne by the public sector. But most investments—including mini grids, generation, and distribution—could be taken on by the private sector. That is why it is important for African countries to put in place appropriate institutional and regulatory frameworks to encourage

private investment in the energy sector. Africa's international partners and multilateral development banks can also help by providing partial risk guarantees to foreign investors interested in coming to Africa.

African countries will also need to build capacity in the nuclear field if they want to invest in SMRs. A first priority is to ensure that countries have the right personnel, engineers, and managers with nuclear knowledge. Nuclear energy raises important safety issues; hence, the need to create independent nuclear regulators, to build emergency response systems, and to put in place nuclear waste management arrangements.

In conclusion, the answer to the question of whether Africa should go nuclear is yes. Unquestionably, SMRs appear to offer very interesting options for developing countries. However, going nuclear does not mean ignoring other sources of energy, especially renewables and natural gas. Africa has huge energy needs, and it can meet those needs through diverse energy sources. Immediate priorities are to put in place the legal and regulatory frameworks to attract private investment in energy, and to build the institutions and capacity to supervise and develop a safe and efficient nuclear sector.

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Hafez Ghanem – who holds a PhD in Economics from the University of California, Davis – is Senior Fellow at the Policy Center for the New South, a development expert with a large number of academic publications; and more than forty-year experience in policy analysis, project formulation and supervision, and management of multinational institutions. He has worked in over 40 countries in Africa, Europe and Central Asia, Middle East and North Africa, and South East Asia.

Between 2015 and 2022 he was Vice President of the World Bank, initially responsible for the Middle East and North Africa, then for Sub-Saharan Africa and then East and Southern Africa. In this latter capacity he was responsible for developing and implementing the World Bank's strategy in the region, including a nearly \$20 billion annual lending program and a large volume of analytical work and policy papers.

During 2012-15 he was a senior fellow in the Global Economy and Development program of the Brookings Institution. His research focused on the Arab countries in transition: Egypt, Jordan, Libya, Morocco, Tunisia and Yemen. He continues his connection with Brookings as a Nonresident Senior Fellow. [Read more](#)

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