EXPERT'S REPORT

INTERNATIONAL ATOMIC ENERGY AGENCY

CHURKIN MOSCOW INTERNATIONAL MODEL UNITED NATIONS

PROMOTING THE DEVELOPMENT OF NUCLEAR ENERGY IN AFRICA: STRENGTHENING NATIONAL CAPACITY AND FOSTERING CONDITIONS FOR A SUSTAINABLE FUTURE

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1. INTRODUCTION: THE AFRICAN ENERGY IMPERATIVE

Africa faces a critical energy challenge that demands urgent action. Nearly 600 million people lack access to electricity, a fundamental barrier to sustainable development and economic growth.[1] The challenge is compounded by the political and institutional realities of the continent. Sustaining the long-term national commitment required to launch and maintain a nuclear programme can be difficult amidst political transitions and competing economic priorities, while building the specialised institutional capacity remains a significant undertaking for any country.[2] Rapid population growth, urbanization and economic development are expected to drive a nearly sevenfold increase in electricity demand by mid-century.[3] Heavy reliance on fossil fuels for electricity production is neither sustainable nor sufficient to meet growing demand. Projections indicate Africa will be home to about 20% of the world's population by 2030, underscoring the imperative to scale up clean and reliable power generation to support industrialisation and improve living standards.

Nuclear energy offers a proven, scalable and low-carbon pathway to achieving energy security and sustainable development on the continent. It provides continuous baseload power and enhances grid stability and resilience, which is particularly critical given the technical challenges associated with integrating intermittent renewable sources such as solar and wind into many African power grids, which require greater system flexibility, supplementary generation, and measures to maintain grid stability and security of supply. [4,5]

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1 IAEA, "Nuclear Power in Africa: Opportunities for the Future", IAEA News, 15 May 2026. URL:https://www.iaea.org/newscenter/news/nuclear-power-in-africa-opportunities-for-the-future

2 Orikpete, O.F., Egieya, J.M., & Ewim, D.R.E., "Nuclear fission technology in Africa: Assessing challenges and opportunities for future development", Nuclear Engineering and Design, Vol. 413, 2023. URL: https://doi.org/10.1016/j.nucengdes.2023.112568

3 INTERNATIONAL ATOMIC ENERGY AGENCY, Outlook for Nuclear Energy in Africa, Outlooks, IAEA, Vienna (2025), p. 4, https://doi.org/10.61092/iaea.wwln-g9iw

4 Jawerth, Nicole. "What is the Clean Energy Transition and How Does Nuclear Power Fit In?" Nuclear Power and the Clean Energy Transition, IAEA Bulletin, Sep. 2020, p. 5. URL: https://www.iaea.org/bulletin/61-3.

5 World Bank Group, “ESMAP Variable Renewable Grid Integration Support Program: Supporting Sustainable Grid Integration of Variable Renewable Energy in World Bank Group Client Countries,” World Bank, 10 November 2020.

According to IAEA projections, nuclear electrical generating capacity in Africa could triple by 2030 and increase tenfold by 2050 under the high case scenario, requiring investments exceeding $100 billion. Even under the low case scenario, capacity is expected to double by 2030 and grow fivefold by 2050.[6] In this context, nuclear power represents a strategic solution to Africa's energy deficit, helping countries diversify their energy mix, reduce emissions and support industrial growth.

Africa already contributes meaningfully to the global nuclear fuel cycle, yet its domestic nuclear energy production remains negligible. The continent accounts for approximately 14% of global uranium production, with Namibia, Niger and South Africa ranking among the world's top producers.[7] African countries produce less than 1% of the world's nuclear energy, despite their significant uranium resources.

This report examines the opportunities and challenges of deploying nuclear power in Africa, highlighting energy planning, infrastructure development and innovative financing mechanisms that can help bridge this gap and unlock the continent's nuclear potential for sustainable development.[8]

2. CURRENT STATUS AND CHALLENGES OF NUCLEAR POWER DEPLOYMENT IN AFRICA

2.1. Current Deployment: From Phase 1 to Phase 3

The IAEA has developed a structured methodology known as the Milestones Approach, which guides countries through the process of building the infrastructure necessary for a safe, secure and sustainable nuclear power programme. This framework is organized into three sequential phases, each concluding with a specific milestone against which progress can be assessed. The entire process typically spans 10 to 15 years, though this timeline may vary depending on the resources devoted and the technology chosen.[9]

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6 INTERNATIONAL ATOMIC ENERGY AGENCY, Outlook for Nuclear Energy in Africa, Outlooks, IAEA, Vienna (2025), p. 2, https://doi.org/10.61092/iaea.wwln-g9iw

7 Ibid., p. 10

8 Ibid., p. 29

9 INTERNATIONAL ATOMIC ENERGY AGENCY, Milestones in the Development of a National Infrastructure for Nuclear Power, IAEA Nuclear Energy Series No. NG-G-3.1 (Rev. 2), IAEA, Vienna (2024), https://doi.org/10.61092/iaea.zjau-e8cs

Phase 1 involves pre-feasibility studies and the development of a comprehensive report addressing all relevant infrastructure issues, culminating in Milestone 1: readiness to make a knowledgeable commitment to a nuclear power programme. A further group of countries, including Algeria, Ethiopia, Morocco, Niger, Senegal, Rwanda, Sudan, Tunisia, Uganda and Zambia, remains in Phase 1, conducting studies to inform a knowledgeable decision on whether to proceed.[10] Several countries have already hosted Phase 1 Integrated Nuclear Infrastructure Review (INIR) missions to assess their infrastructure readiness.[11]

Phase 2 begins once that commitment is made, during which the country prepares for contracting and construction; successful completion of this work brings the country to Milestone 2, when it is ready to invite bids or negotiate a contract for the first nuclear power plant (NPP). Several countries have progressed to this stage, having made a firm decision to use nuclear technology for electricity production. Ghana, Kenya and Nigeria have completed their pre-feasibility studies, established Nuclear Energy Programme Implementing Organizations (NEPIOs) and regulatory bodies are now preparing to invite bids or negotiate contracts. Ghana is considering both large reactors and Small Modular Reactors (SMRs)[12] from two vendors, Kenya has published a five-year strategic plan for its nuclear programme and Nigeria has opened a commercial bidding process for its first NPP.[13]

Phase 3 moves into implementation, covering construction, commissioning and preparation for operation, with the final Milestone 3 marking readiness to operate the first NPP. Egypt is currently at this stage, actively constructing a four-unit NPP at El Dabaa with a total capacity of 4.8 GW and the first unit expected in 2028, having already installed core catchers for Units 1 and 2 and received regulatory approval for a spent fuel storage facility in 2025.[14]

South Africa remains the only country on the continent with an operational NPP. The Koeberg NPP, consisting of two units with a combined capacity of 1,854 MW(e), received a licence extension for Unit 1 in 2024, allowing it to operate for an additional 20 years. The country is also pioneering the

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10 INTERNATIONAL ATOMIC ENERGY AGENCY, Outlook for Nuclear Energy in Africa, Outlooks, IAEA, Vienna (2025), p. 13, https://doi.org/10.61092/iaea.wwln-g9iw

11 Ibid., p. 19

12 Ibid., p. 13

13 Ibid., p. 29

14 Ibid., p. 12

repurposing of retiring coal-fired power stations for nuclear deployment, a strategy that could cut capital costs by up to 30% through the reuse of existing infrastructure and allow for the retraining of over 70% of the coal workforce, thereby supporting a just transition.[15] This initiative directly responds to the need to replace approximately 8 GW of coal-fired generation scheduled for decommissioning by 2030, while South Africa's broader commitment involves retiring nine coal-fired power stations by 2035. This context explains why the 2025 Integrated Resource Plan includes 5,200 MW(e) of new nuclear capacity to be added after 2030.[16]

2.2. Infrastructure, Institutions and Persistent Challenges

Progress through the three phases described above requires sustained and coordinated effort across a range of areas and certain challenges tend to recur regardless of a country's specific circumstances. The IAEA Milestones Approach identifies 19 infrastructure issues that need to be addressed in order to enable a knowledgeable commitment, including both 'hard' infrastructure, such as electrical grid connections, and 'soft' infrastructure, such as legal and regulatory frameworks and human resource development.[17] The IAEA's Integrated Nuclear Infrastructure Review (INIR) missions are peer review exercises that assess a country's nuclear infrastructure against these 19 issues. In recent years, 11 such missions have been conducted in nine African countries, with further reviews planned. Drawing on their findings and on broader IAEA experience, several challenges emerge that are relevant to the African context: political considerations, energy planning, financial considerations, public opinion and technical constraints.[18] The following sections provide a concise overview of the challenges in relation to Africa's specific circumstances.

Nuclear power projects can be halted or suspended for fundamentally political reasons: a lack of sustained high-level support, a change in the governing party, or opposition from a key national stakeholder. South Africa perfectly illustrates this. In the 2010s, the government pursued a plan to add 9,600 MW(e) of nuclear capacity and signed a framework agreement with Russia in 2015. The procurement process was later ruled

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15 INTERNATIONAL ATOMIC ENERGY AGENCY, Coal to Nuclear: Supporting a Clean Energy Transition, Outlooks, IAEA, Vienna (2025), https://doi.org/10.61092/iaea.spu2-yaz1

16 Department of Mineral Resources and Energy (DMRE), Integrated Resource Plan 2025, Government Gazette No. 53596, Republic of South Africa, Pretoria (2025), pp. 26, 38. URL: https://sapvia.co.za/wp-content/uploads/2025/10/53596-28-10-MinResEnergy.pdf

17 INTERNATIONAL ATOMIC ENERGY AGENCY, Outlook for Nuclear Energy in Africa, Outlooks, IAEA, Vienna (2025), p. 18, https://doi.org/10.61092/iaea.wwln-g9iw

18 INTERNATIONAL ATOMIC ENERGY AGENCY, Integrated Nuclear Infrastructure Review (INIR): Ten Years of Lessons Learned, IAEA-TECDOC-1947, IAEA, Vienna (2021), p. 21. URL: https://www.iaea.org/publications/14809/integrated-nuclear-infrastructure-review-inir-ten-years-of-lessons-learned

"unconstitutional and unlawful" by the Western Cape High Court in 2017 for failing to follow proper parliamentary and public consultation procedures,[19] illustrating how political and procedural factors, rather than technical or economic ones, can determine a project's fate. By 2018, the plan was formally abandoned. This case demonstrates that even with formal executive backing, a project's survival depends on broad, durable national consensus.

Beyond individual cases, the broader political environment across parts of the continent introduces additional uncertainty. Several African states continue to face significant governance challenges, including unresolved conflicts and contested political authority, which can complicate the long-term planning and international partnerships that nuclear programmes require. These conditions do not preclude nuclear development, but they underscore the importance of stable institutions and sustained political consensus as prerequisites for progress.

Such stability rests on well-established institutional arrangements. The IAEA Milestones Approach emphasizes that three key organizations must function in coordination: The Government retains overall responsibility for safety and is expected to establish a mechanism, such as a NEPIO, to coordinate all parties involved. When broadly representative and with reporting and communication lines to policy authorities, this mechanism helps mitigate the risk of politically driven suspensions.[20] A competent and independent regulatory body must also be created, tasked with safety oversight and verifying compliance with legal and regulatory frameworks. The owner/operator, in turn, must possess the competence to run the plant safely and reliably while meeting regulatory requirements.[21] All three must work in concert throughout the programme, even as their roles and responsibilities shift from one phase to the next.

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19 South African Government News Agency (SAnews), "Government will not appeal nuclear ruling", SAnews.gov.za, 13 May 2017. URL: https://www.sanews.gov.za/south-africa/government-will-not-appeal-nuclear-ruling

20 INTERNATIONAL ATOMIC ENERGY AGENCY, Integrated Nuclear Infrastructure Review (INIR): Ten Years of Lessons Learned, IAEA-TECDOC-1947, IAEA, Vienna (2021), p. 21. URL: https://www.iaea.org/publications/14809/integrated-nuclear-infrastructure-review-inir-ten-years-of-lessons-learned

21 INTERNATIONAL ATOMIC ENERGY AGENCY, Milestones in the Development of a National Infrastructure for Nuclear Power, IAEA Nuclear Energy Series No. NG-G-3.1 (Rev. 2), IAEA, Vienna (2024), p. 7. https://doi.org/10.61092/iaea.zjau-e8cs

A further political aspect is the potential threat to the sovereignty of African states. When a country lacks domestic capacity for reactor design, fuel supply, or regulatory oversight, it may become dependent on external vendors for decades. This is not merely a technical concern but a question of a state's ability to make independent choices about its energy future. In South Africa, public opposition to the 2014 nuclear agreement with Russia was driven in part by concerns that the deal would effectively hand decision-making power over the national nuclear industry to a foreign state.[22] Such apprehension is unlikely to disappear and therefore warrants serious consideration in programme planning.

Closely related to these concerns is the question of public acceptance. Public acceptance is among the issues that must be addressed in building and sustaining a decision, and it is facilitated by strategies that engage stakeholders and communicate openly about benefits and safety concerns.[23] Public opposition can emerge for a variety of reasons, including concerns about safety, cost, environmental impact, or the perceived lack of transparency in decision-making. When these concerns are not addressed early, they can delay or even derail a nuclear programme, regardless of its technical or economic merits. The South African case illustrates this pattern. Public opposition to the 2014 nuclear agreement with Russia stemmed in part from concerns that the deal would cede control over the national nuclear industry to a foreign state, and from the fact that it had been negotiated without public consultation. This shows that public apprehension, when left unaddressed, can halt a programme. It also suggests that engagement strategies should not only inform the public but give stakeholders a genuine opportunity to influence decisions.

Beyond the political sphere, the technical characteristics of a country's energy system also influence what can realistically be implemented. Kenya provides a useful illustration of the technical challenges that African power systems may face when integrating nuclear power.

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22 Горелик Б.М. Формирование южноафриканского общественного мнения об экономическом сотрудничестве России и ЮАР. Ученые записки Института Африки РАН. 2021. № 4 (57). С. 19–33 (DOI: 10.31132/2412-5717-2021-57-4-19-33).

23 INTERNATIONAL ATOMIC ENERGY AGENCY, Integrated Nuclear Infrastructure Review (INIR): Ten Years of Lessons Learned, IAEA-TECDOC-1947, IAEA, Vienna (2021), p. 21. URL: https://www.iaea.org/publications/14809/integrated-nuclear-infrastructure-review-inir-ten-years-of-lessons-learned

A 2023 Kenyan government assessment found that the country's grid was "too small to support NPP at this stage", noting that system capacity, the structure of electricity supply and reserve capacity would need to be strengthened before a nuclear plant could be integrated.[24] The assessment also highlights the importance of grid stability: the loss of a large generating unit can create a risk of system collapse, while long-distance transmission of nuclear-generated electricity is constrained by system stability and transmission losses.[25] These factors illustrate that nuclear deployment requires not only sufficient generation capacity, but also adequate reserves, grid stability and transmission infrastructure.

The availability of qualified personnel is another important factor. Human resource development is a particular challenge for embarking countries (those beginning to develop a nuclear power programme). The knowledge and skills required span scientific, technical, managerial and administrative disciplines, including expertise specific to nuclear power. Building national capabilities requires significant investment in education and training, as well as arrangements for gaining practical experience through cooperation with countries that have established nuclear programmes. While foreign specialists can help address immediate skills gaps, relying heavily on external expertise is not a sustainable substitute for developing national capacity. This is particularly difficult when uncertainty over the future of nuclear projects makes it harder to retain trained specialists over the long term.[26]

Financial considerations represent another recurring challenge. In terms of investment, reaching the high case scenario is likely to require more than $100 billion.[27] The development of nuclear programmes also entails significant public and government expenditure before construction begins, including the establishment of the legal framework, regulatory institutions and the organization executing the nuclear energy development programme. The mechanism ought to be accompanied by human resources, operation plan for emergency contingencies and funding strategies for radioactive waste disposal. Nuclear power projects require relatively low and stable operational expenditures during actual exploitation.

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24 NUCLEAR POWER AND ENERGY AGENCY (NuPEA), Strategic Environmental and Social Assessment Report (SESA) for the Kenya's Nuclear Power Programme, Draft Report, NuPEA, Kenya (2023), p. 60. URL: https://www.nuclear.co.ke/wp-content/uploads/2023/03/SESA-Report-for-the-Kenya-Nuclear-Power-Programme.pdf

25 Ibid., pp. 59-61

26 Orikpete, O.F., Egieya, J.M., & Ewim, D.R.E., "Nuclear fission technology in Africa: Assessing challenges and opportunities for future development", Nuclear Engineering and Design, Vol. 413, 2023. URL: https://doi.org/10.1016/j.nucengdes.2023.112568

27 INTERNATIONAL ATOMIC ENERGY AGENCY, Outlook for Nuclear Energy in Africa, Outlooks, IAEA, Vienna (2025), p. 4, https://doi.org/10.61092/iaea.wwln-g9iw

On the contrary, before commissioning, nuclear initiatives tend to be a considerable challenge due to the high capital outlays tied to extensive project scales. The bankability of such infrastructural programmes, therefore, rests on managing the substantial financing required for even a single undertaking in Phase 2, when it's time to invite bids. The financial plan ought to be established together with a strategy for managing associated financial risks.[28]

This financing challenge is particularly persistent across the African continent, where the scale of investment required for nuclear power remains difficult for individual states to bear independently. Nigeria provides a clear example: despite pursuing nuclear power for several decades, financing remains one of the key obstacles to advancing its nuclear ambitions; building a single nuclear reactor can cost between $5 billion and $10 billion, representing a substantial investment for a country already facing debt pressures and competing infrastructure needs. The scale of such financial commitments, combined with the long timeframe of nuclear projects, makes securing a viable financing structure a persistent challenge for Nigeria's nuclear program.[29]

Underlying all of these challenges is the question of energy planning. Without a realistic assessment of future demand and the role nuclear power can play within it, even well-financed projects risk becoming misaligned with national needs. For many African countries, where electricity demand and the structure of energy systems are still evolving, accurately determining the appropriate scale and timing of nuclear deployment presents an additional challenge. The IAEA can support countries in addressing this challenge by helping them develop a systematic approach to nuclear energy planning and assess their readiness for programme implementation.

3. ENABLING MECHANISMS FOR NUCLEAR DEVELOPMENT

Generally speaking, as it has been stated previously, African states adopt several unresolved instability traits, making the necessity of risk-managing mechanisms obvious. Africa is on the path to developing its sovereign nuclear energy sector, meaning predictable challenges ought to be prevented. In response to these needs, the IAEA offers a range of support mechanisms. These include the Integrated Nuclear Infrastructure

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28 International Atomic Energy Agency. (2015). Milestones in the development of a national infrastructure for nuclear power (STI/PUB/1704). https://doi.org/10.61092/iaea.hff3-zuam

29 JOHNSON, M., "Nigeria: Nuclear Energy Updates," Climate Scorecard (2025). URL: https://www.climatescorecard.org/2025/10/nigeria-nuclear-energy-updates/

Review (INIR), a peer review service that assists Member States in evaluating the status of their nuclear infrastructure. The Integrated Nuclear Infrastructure Training (INIT) provides training courses and workshops addressing the 19 infrastructure issues. Between 2018 and 2024, over 1,100 participants from 25 African countries took part in INIT events and eight African countries had national projects under the 2024–2025 technical cooperation cycle focusing on nuclear power infrastructure development.[30] The Agency also develops Integrated Workplans with Member States and provides support through the Peaceful Uses Initiative (PUI) for countries that do not yet have a national technical cooperation project.[31]

The following chapter presents various financial and regulatory procedures that allow the global community to help African states overcome earlier mentioned issues.

3.1. Small modular reactor technology as a versatile solution

Typically large nuclear power plants with capacities of 1,000 MW(e) or more are generally unsuitable to the overall grid capacity constraints prevalent across numerous African countries, discouraging potential investors. Therefore, the technology of Small Modular Reactors has emerged as a particularly relevant innovation for African contexts. The IAEA defines SMRs as advanced nuclear reactors with a power capacity of up to 300 MW(e) per unit, roughly one-third of the generating capacity of traditional nuclear power reactors. The innovation of SMRs comes from the novel approach of relying on mass-produced systems and components, thus reducing costs and construction risks compared with a traditional construction site. The idea is to compensate for the loss of economies of scale due to their small sizes by achieving economies of series, producing SMRs on an assembly line.[32]

Several features make SMRs especially attractive for African countries. Their smaller outputs make them more suitable for smaller grids, which is a critical consideration given that a single power plant should not exceed about 10% of total installed grid capacity, given that a generating unit must be able to increase its output quickly enough to stabilize system frequency after another unit trips. If a single plant represents too large a share of total

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30 INTERNATIONAL ATOMIC ENERGY AGENCY, Outlook for Nuclear Energy in Africa, Outlooks, IAEA, Vienna (2025), p. 19, https://doi.org/10.61092/iaea.wwln-g9iw

31 Ibid., pp. 18

32 INTERNATIONAL ATOMIC ENERGY AGENCY, Small Modular Reactors: Advances in SMR Developments 2024, Monographs, IAEA, Vienna (2024), p. 8. https://doi.org/10.61092/iaea.3o4h-svum

generation, the remaining units may not be able to compensate for the sudden loss, and the grid could collapse.[33] Most countries on the continent have grid capacities of only a few thousand megawatts, making this rule a significant constraint for large reactors. SMRs can be deployed incrementally, with one module added at a time as demand grows, mobilizing smaller amounts of upfront capital when compared to large NPPs. This incremental approach also means that the first module could become operational and start generating revenue to reduce the financing costs of subsequent units.

SMRs offer operational flexibility that suits Africa's diverse energy needs. They are generally designed to serve remote areas with no grid infrastructure, making them viable for mining operations and isolated communities. Beyond electricity generation, they have potential for non-electric applications such as desalination and district heating. These applications could add significant value to nuclear projects and make them more economically viable, particularly in water-scarce regions or for off-grid mining operations.[34] The infrastructure required to support SMRs may not be as extensive as that of large NPPs, which is a significant advantage for host countries that are still establishing their nuclear infrastructure.

In terms of safety, SMR designs often rely more on passive systems and inherent safety characteristics, such as low power and operating pressure. This means that in such cases no human intervention or external power is required to shut down systems, as passive systems rely on physical phenomena such as natural circulation, convection and gravity. SMRs also have reduced fuel requirements, requiring less frequent refuelling every 3 to 7 years, compared with 1 to 2 years for conventional plants. Some SMRs are designed to operate for up to 30 years without refuelling.

Speaking of financial optimization, building upon existing regional cooperation frameworks for cross-country power transmission and distribution, such as the West African Power Pool, neighbouring states with shared nuclear energy aspirations can establish a consortium of potential nuclear power users. This approach is known as a regional 'order book', increases the SMR's order volume, thereby enhancing the commercial feasibility of procurement, while enabling the pooling and synergizing of human and financial resources essential for project implementation.[35] This cooperative approach further facilitates the distribution of investment risks among participating users.

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33 IAEA, Electric Grid Reliability and Interface with Nuclear Power Plants, IAEA Nuclear Energy Series No. NG-T-3.8, IAEA, Vienna (2012), p. 24. URL: https://www-pub.iaea.org/MTCD/publications/PDF/Pub1542_web.pdf

34 Sah, Abigail, et al. Atoms for Africa: Is There a Future for Civil Nuclear Energy in Sub-Saharan Africa? Center for Global Development, CGD Policy Paper 124, Apr. 2018, p.19.www.cgdev.org/publication/atoms-africa-there-future-civil-nuclear-energy-sub-saharan-africa.

35 INTERNATIONAL ATOMIC ENERGY AGENCY, Outlook for Nuclear Energy in Africa, Outlooks, IAEA, Vienna (2025), p. 23, https://doi.org/10.61092/iaea.wwln-g9iw

For African countries, the relevance of SMRs lies in the combination of these attributes. They offer an entry point into nuclear power that avoids the prohibitive costs and grid demands of large reactors. They can be deployed incrementally in remote areas or industrial hubs and scaled up as demand grows. This is why SMRs are widely regarded as a promising option for expanding energy access across the continent.

Despite these advantages, SMRs are not yet commercially mature. Currently, only two SMR designs are in operation in addition to two high temperature test reactors. In the Russian Federation, the Akademik Lomonosov floating NPP with two KLT-40S reactors of 35 MW(e) each began operation in May 2020, while in China, the two-unit HTR-PM at the Shidaowan site started commercial operation in December 2023. More than 80 commercial SMR designs are being developed around the world, but economic competitiveness is still to be proven in practice. According to IAEA projections, SMRs can be expected to be deployed in large numbers after the mid-2030s, when first-of-a-kind units are commissioned and operated and a global supply chain is established.[36]

3.2. Risk mitigation in financing nuclear power projects

In order to prevent potential mistakes the IAEA actively facilitates Member States embarking on new nuclear power projects by offering a structured roadmap for infrastructural development alongside specialized modeling tools to secure requisite financing. This support is anchored in the Agency's Milestones Approach, which marks extensive commitments and financial obligations essential to establishing a nuclear power programme. To supplement these foundational guidelines, the IAEA further issues targeted financial management publications, including the report on Financing of New Nuclear Power Plants to address the nuanced funding challenges of such large-scale infrastructural undertakings.[37]

Clean energy investments on the continent stand for around 2% of the global total.[38] Upscaling clean energy investment calls for regular and consistent external financial assistance in order to surmount debt burdens, economic risks and constraints that limit private investment.

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36 Ibid., pp. 17

37 International Atomic Energy Agency. (n.d.). Funding and finance. IAEA. https://www.iaea.org/topics/funding-and-finance

38 INTERNATIONAL ENERGY AGENCY, World Energy Investment, IEA, Paris (2024).

Along with national policies and commitments the development requires increased international support and risk management. Considering existing funds and commitments from the World Bank and the African Development Bank, innovative financial solutions are still essential to avoid excessive debt burden. Low sovereign credit ratings, high debt to GDP ratios and the lack of cost-reflective electricity tariffs remain significant barriers to attracting investment in nuclear projects across the continent.[39]

Equity financing is essential for project bankability, particularly for first-of-a-kind projects in countries with low credit ratings. For many African countries, however, equity is scarce and expensive, which increases the overall cost of capital and makes nuclear projects harder to finance. This is why blended finance and guarantees from multilateral banks are critical.

A significant development in global financing occurred on 26 June 2025, when the IAEA and the World Bank formalized a partnership to support the safe, secure and responsible use of nuclear energy for development. The partnership focuses on three key areas: building knowledge related to nuclear safety, security and safeguards, supporting the life extension of existing nuclear power plants and accelerating the development of small modular reactors. This milestone marks the World Bank's first formal reengagement with nuclear power in decades and could serve as a catalyst for broader engagement by other multilateral banks, opening new avenues for African countries to access financing for their nuclear power programmes.[40]

Another financing cooperation mechanism worth mentioning is the Just Energy Transition Partnership (JETP) designed to help overcome a heavily coal-dependent economy. The list of participating countries goes beyond African states, it includes, Senegal, South Africa and Vietnam.[41] A set up between South Africa and the International Partners Group (IPG) seems particularly interesting, committing $8.5 billion, including $329.7 million in grants and US $5.325 billion in sovereign concessional finance, for clean energy transition in coal-dependent South Africa. Other African states similarly expressed their interest in such financing mechanisms as these can upscale investments in African nuclear energy development projects.[42]

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39 NARAN, B., ZHANG, T., GUPTA, I., et al., Understanding Global Concessional Climate Finance 2024, Climate Policy Initiative, London, United Kingdom (2024), https://www.climatepolicyinitiative.org/wp-content/uploads/2024/10/Understanding-Global-Concessional-Climate-Finance-2024.pdf

40 World Bank Group, IAEA Formalize Partnership to Collaborate on Nuclear Energy for Development https://www.worldbank.org/en/news/press-release/2025/06/26/world-bank-group-iaea-formalize-partnership-to-collaborate-on-nuclear-energy-for-development

41 Just Energy Transition Partnerships: An opportunity to leapfrog from coal to clean energy https://www.iisd.org/articles/insight/just-energy-transition-partnerships

42 International Atomic Energy Agency. (2025). Outlook for Nuclear Energy in Africa (IAEA/PAT/011). IAEA. https://doi.org/10.61092/iaea.wwln-g9iw

Additionally, regarding beneficial loans, an illustrative example is Egypt's $25 billion loan from Russia to construct a civilian nuclear power facility near Dabaa. Nowadays Egypt remains the sole African nation constructing a large four-unit nuclear power plant. Here the El Dabaa project benefits from substantial concessional loan provided by the Russian Federation, at an auspicious interest rate and under a favourable repayment period. Such vendor financing levels up the situation for developing countries with the help of deferred payments bypassing the need for traditional loans. This type of investments advance nuclear energy deployment in Africa, especially in areas where both clean energy and climate investment are needed.

Speaking of risk mitigation and interstate investment, a substantial component of governmental responsibility in nuclear power financing, where the state does not directly sponsor the project, centres on risk mitigation. Political risk constitutes a paramount concern for investors and lenders across both developed and developing economies. In this domain, the government portrays a clear and indispensable role in establishing stable regulatory, policy, legal, and fiscal regimes. In assessing country risk relative to nuclear power plant development, banks and equity investors will evaluate several critical dimensions: the rule of law, commitment to non-proliferation and IAEA safeguards and adherence to substantial international nuclear liability regimes. The government maintains pre-eminent authority across all of these areas.[43]

These developments suggest that the financing landscape for nuclear power in Africa is gradually evolving. While significant barriers remain, the emergence of new partnerships and financing models provides foundation for further progress.

3.3. Regional cooperation and market integration as a stabilizing factor

Regional cooperation brings an ability to accelerate Africa's adoption of nuclear power by enabling countries to combine costs, infrastructure and expertise while strengthening networking power with interstate partners. The decision to accelerate a nuclear power programme is the sovereign right of every country, stated in the IAEA Statute.[44] The CSA and the Additional Protocol contain specific rights and obligations undertaken by the country and the IAEA to provide for the effective implementation of safeguards.[45]

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43 International Atomic Energy Agency. (2015). Milestones in the development of a national infrastructure for nuclear power (STI/PUB/1704). https://doi.org/10.61092/iaea.hff3-zuam

44 The Statute of the IAEA https://www.iaea.org/sites/default/files/statute.pdf

45 International Atomic Energy Agency. (2015). Milestones in the development of a national infrastructure for nuclear power (STI/PUB/1704). https://doi.org/10.61092/iaea.hff3-zuam

At the same time, aligned regulations and regional power pools can help countries improve financing terms, integrate power systems and reduce electricity costs. Countries hosting nuclear power plant projects can leverage collaboration to strengthen human resource development, industrial participation, nuclear security and emergency planning.

Africa's power systems are organised into five regional power pools: Eastern African Power Pool (EAPP), Southern African Power Pool (SAPP), Western African Power Pool (WAPP), Central African Power Pool (CAPP) and Comité Maghrébin de l'Électricité (COMELEC) also known as Northern African Power Pool (NAPP). Continental consolidation is advancing through the Africa Single Electricity Market (AfSEM). Launched in 2015, AfSEM aims to create the world's largest single electricity market, improving energy security, sustainability and competitiveness for more than 1.3 billion people.[46] This growing interconnectivity will be able to integrate large nuclear power reactors, which require strong, stable grids with robust transmission.

Industrialisation under the African Continental Free Trade Area (AfCFTA) will require a substantial increase in reliable electricity supply. Intra-African exports already comprise 46% manufactured goods, substantially exceeding the share of fuels or raw commodities. By 2045, the AfCFTA is projected to elevate African trade by 45%, equivalent to approximately $276 billion, with manufacturing and agro-processing emerging as the principal beneficiaries. This framework enables the development of regional value chains, facilitating Africa's transition from raw-material exporter to producer of higher-value goods. Such an industrial transformation will depend on diversified energy resources and stable power supply and nuclear energy is well positioned to contribute to this need.[47]

The African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology (AFRA) provides another example of regional cooperation in the nuclear field. Established by African Member States and in force since 4 April 1990, AFRA offers a framework for countries to consolidate their collaboration through programmes and projects focused on shared needs. At present, 41 states are part of the agreement. Its activities cover a wide range of peaceful applications of nuclear techniques, contributing to national and regional development goals.

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46 AFRICAN UNION, About the Africa Single Electricity Market (AfSEM) (2025): https://au.int/en/afsem

47 Africa cannot industrialize in the dark, says ECA chief as continent weighs nuclear energy future https://www.uneca.org/fr/node/11569

AFRA's regional strategy focuses on optimising existing resources, advancing regional self-sufficiency and securing financial support to enhance the impact of nuclear science and technology on the socio-economic development of its Member States.[48]

The combination of regional power pools, the AfSEM and the AfCFTA creates a market that could support nuclear deployment at a scale few African countries could achieve independently. This regional dimension has the potential to transform nuclear power from a costly national undertaking into a more viable continental project.

4. CONCLUSION

Africa's energy challenge is urgent, and nuclear power offers a promising option for achieving energy security. The task of this committee is to identify how African countries can move from interest to implementation in nuclear power, by building the national capacity, institutional frameworks and regional mechanisms needed to deploy nuclear energy safely and sustainably.

Addressing this task requires action in several areas, and the following recommendations follow from the analysis presented in this report. Countries with limited grid capacity could consider small modular reactors, which offer lower upfront costs, incremental deployment and passive safety features suited to African contexts. Governments and international partners could expand innovative financing mechanisms, using the IAEA-World Bank partnership as a foundation for broader engagement. Regional cooperation frameworks could be strengthened, with power pools and AfSEM serving as platforms for sharing costs, infrastructure and expertise. National governments could invest in human capital and regulatory capacity, recognising these as prerequisites for safe and sustainable deployment of nuclear power projects. Finally, governments may maintain sovereign control over their nuclear programmes while participating in regional collaboration.

Nuclear energy requires long-term planning and sustained commitment. While it does not offer immediate results, it remains a feasible option for countries prepared to make that commitment. With appropriate policies, partnerships and regional frameworks, African countries are able to develop nuclear capacity in support of sustainable development and long-term energy security.

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48 African Regional Cooperative Agreement for Research, Development and Training Related to Nuclear Science and Technology (AFRA). (n.d.). Home [Official website]. AFRA. https://afra.africa/

5. GLOSSARY

AfCFTA – African Continental Free Trade Area
AFRA – African Regional Cooperative Agreement for Research, Development and Training related to Nuclear Science and Technology
AfSEM – Africa Single Electricity Market
CAPP – Central African Power Pool
COMELEC – Comité Maghrébin de l'Électricité (Maghreb Electricity Committee)
EAPP – Eastern African Power Pool
FOAK – First-of-a-kind facility
GW – GigaWatt
HTR-PM – High-Temperature Reactor – Chinese small modular nuclear pebble-bed reactor (contained within a bed of pyrolytic graphite spheres).
IAEA – International Atomic Energy Agency
INIR – Integrated Nuclear Infrastructure Review
INIT – Integrated Nuclear Infrastructure Training
IPG – International Partners Group
JETP – Just Energy Transition Partnership
KLT-40 – (Russian: КЛТ – корабельный ледокол транспортный) Nuclear fission reactor originating from OK-150 and OK-900 ship reactors, was developed to power Taymyr-class icebreakers.
MW(e) – MegaWatt electric
NAPP – Northern African Power Pool
NEPIO – Nuclear Energy Programme Implementing Organization
NPP – Nuclear Power Plant
PUI – Peaceful Uses Initiative
SAPP – Southern African Power Pool
SMR – Small Modular Reactor
WACC – Weighted Average Cost of Capital
WAPP – Western African Power Pool