THE VALUE OF EARLY ENGAGEMENT BETWEEN STAKEHOLDERS TO ENSURE SUCCESSFUL DEPLOYMENT OF SMRS IN THE GLOBAL SOUTH
An African perspective

I. KIRSTEN
Vienna Center for Disarmament and Non-Proliferation (VCDNP)
Vienna, Austria
ikirsten@middlebury.edu

A.K. STOTT
Vienna Center for Disarmament and Non-Proliferation (VCDNP)
Vienna, Austria

Abstract

There has been limited engagement between developers and potential end-users of SMR technologies in the Global South. To ensure the successful deployment and sustainable operation of these technologies, early engagement between reactor vendors and end-users is essential. NGOs like the Vienna Center for Disarmament and Non-Proliferation (VCDNP) are well positioned to provide a platform for dialogue in an environment that enables frank and open discussion and facilitates better understanding of challenges and priorities. The VCDNP, in collaboration with the African Commission for Nuclear Energy (AFCONE) and other partners, organized a three-day, multi-stakeholder workshop in South Africa from 30 April to 3 May 2024. The workshop focused on challenges to deployment and considered what can be done to better prepare African markets for SMRs. It also provided an opportunity for international financial institutions, investment funds and philanthropic foundations to understand their critical role in the successful deployment of SMRs. Regulators and policymakers from African countries and international experts, including the IAEA, participated. The paper discusses the process and the outcome of this multi-stakeholder engagement, drawing lessons learned for future engagement with vendors, investors, policymakers and climate change and development assistance communities.

1. INTRODUCTION

In many developing countries, energy poverty is a critical issue, necessitating immediate action to ensure that these countries will have access to clean, affordable, and sustainable energy sources that also meet climate change mitigation aspirations. Among the sustainable energy sources available to developing countries, nuclear power, especially with the advent of advanced reactors including small modular and micro reactors (hereafter "A/SMRs"), holds significant potential to enhance energy security, widen energy access, deliver a just energy transition and further contribute to achieving global climate goals. At the same time it is essential to scale-up peaceful uses applications in developing countries for medical, agriculture, environmental and industrial purposes (hereafter "non-power applications") to improve human and animal health, food safety and food security, water and soil management and industrial development.

However, nuclear power, and non-power applications, face resistance and scepticism. This is partly because the benefits of the peaceful application of nuclear science and technology (hereafter "peaceful uses") and their contribution to achieving the UN Sustainable Development Goals (SDGs) and climate change goals are not widely recognized. Non-power applications are not mainstreamed into development frameworks.

Efforts to promote an inclusive energy transition currently focus on renewable energy and attract investment from, and alliances among, philanthropies, multilateral financial institutions (IFIs), and official development assistance (ODA) funders.

Similar advocacy and financing partnerships are needed to integrate nuclear (both power and non-power) into the development and climate action narrative. Advocacy and partnership building for nuclear power should thus encompass the full scope of peaceful nuclear technology for non-power and power (electric and non-electric) applications. There is however a challenge in aligning the key stakeholders such as national decision and policy makers, technology developers including A/SMR designers, investors, IFIs and climate change and development assistance communities to work together to achieve this goal.

To discuss and find solutions for this challenge, the Vienna Center for Disarmament and Non-Proliferation (VCDNP) together with several partners convened a workshop “Accelerating sustainable development in Africa: scaling up peaceful nuclear uses” in May 2024 in South Africa. This paper discusses the process and the outcome of this multi-stakeholder engagement, drawing lessons learned for future engagement with vendors, investors, policymakers and climate change and development assistance communities.

2. WORKSHOP ON THE “NUCLEAR-DEVELOPMENT-CLIMATE” NEXUS IN AFRICA

The 3-day workshop was jointly organized by the Vienna Center for Disarmament and Non-Proliferation (VCDNP), Wilton Park, Dalberg, and the Sustained Dialogue on Peaceful Uses, in coordination with the African Commission for Nuclear Energy (AFCONE).

The organisers succeeded in bringing a greater-than-usual diversity of stakeholders together, including some nontraditional stakeholders. Among the 70 participants were senior executives (head of organisation) from regulatory bodies, atomic energy commissions, and government departments from 11 African countries interested in nuclear power; A/SMR vendors; representatives from philanthropic organisations and financial institutions; youth and women in nuclear; together with international subject matter experts including from several countries with existing nuclear power programmes, the IAEA and the Nuclear Energy Agency of Organisation for Economic Co-operation and Development (OECD).

South Africa was chosen as the venue due to its extensive experience in operating a nuclear power plant and its well-developed peaceful uses sector. Other African countries were invited based on their interest in nuclear power, which presupposes a commitment to peaceful uses at the highest political level. Of the 20 plus A/SMR developers invited, five accepted the invitation. Of the numerous climate philanthropies invited, one accepted the invitation. Others who did not take up their invitations were representatives from the World Bank, the African Development Bank, and the United Nations Development Programme although the latter was interested in participating.

Participants considered what would be required from African countries, vendors and the international community if Africa is to benefit from the commercial deployment of A/SMRS. The workshop however did not focus exclusively on nuclear power but also considered the expansion of non-power applications as a precursor to nuclear power. This is of particular importance in countries that have little or no peaceful uses activities but are interested in embarking on nuclear power.

Workshop participants discussed the legislative and regulatory frameworks that would be required and the innovations and approaches that can reduce the regulatory burden for countries and developers alike. Several countries shared and discussed their experiences, challenges and lessons learned with developing their regulatory environment and preparing for new reactor technologies. A/SMR developers explained their technologies and their potential electrical, and in some cases non-electrical applications. The financing of nuclear power and non-power applications received considerable attention, from the perspective of existing and new financial instruments for electrical and non-electrical applications, as well as from the perspective of the role of philanthropies, foundations, corporate social responsibility and development agencies in changing the paradigm for nuclear technology in general, and specifically nuclear power. Workforce development and supply chain management in African countries and the use of nuclear power in non-electric applications were other topics considered of key importance and discussed by the workshop participants. The support provided by the IAEA across the entire peaceful uses spectrum was also highlighted.

The format of the workshop included presentations by IAEA and other international experts, sharing of experiences, panel discussions, and small group breakout sessions.

3. KEY FINDINGS

3.1. The Image Problems of Nuclear and Strategies to Mitigate Them

Peaceful nuclear applications contribute to nine of the 17 UN Sustainable Development Goals. However, they are not yet mainstreamed into global development and climate mitigation frameworks. Misconceptions that conflate nuclear technology with nuclear weapons, fears about the long-term impact of nuclear waste, and perceived high costs and safety risks need to be addressed. It is clear that the nuclear narrative has to change, and

that there is a need to significantly scale up advocacy and engagement activities to counter the anti-nuclear rhetoric and promote the benefits of peaceful uses. Such a narrative must emphasize not only the benefits of peaceful uses but also highlight the extensive work of the IAEA, regulators, and the nuclear industry to ensure that nuclear technologies and materials are applied safely, securely, and under safeguards. Nuclear waste management, though often cited as a concern, is a proven and safe technology. Communicating this effectively to the public is crucial.

The energy transition discussion requires discipline, pragmatism, and engagement beyond traditional decision-makers. More platforms are needed to involve policymakers from various sectors. Multistakeholder dialogues between policy makers, philanthropic foundations, multilateral international financial institutions (IFIs), investment banks, industry, and the climate and development communities would facilitate partnerships and increased investment in peaceful uses.

3.2. The Promise of Small Modular Reactors

Addressing energy poverty in Africa requires more than just renewable energy sources. Reliable, cost-effective low-carbon baseload power is necessary, which nuclear energy can provide.

However, in many African countries, the current electricity grids and resources are insufficient for traditional large nuclear power plants. A/SMRs, with smaller footprints, quicker build times, lower costs, and enhanced safety and security features, are a viable alternative. A/SMRs potentially will be able to provide decentralised low-carbon electricity or heating power for energy intensive industries and other activities, including hydrogen production and desalination projects. The A/SMR designs that are in operation by 2030 are likely to be deployed in developed countries, particularly those with existing nuclear power programmes. The early deployment of these designs will have to demonstrate that this technology is licensable, operable, and effective to provide confidence in developing countries interested in new nuclear power programmes using A/SMRs.

3.3. Ensuring the Legislative and Regulatory Framework to Facilitate Expanded Access to Peaceful Uses

States must establish a robust legislative and regulatory framework, both domestically and in adherence to international conventions and IAEA safeguards agreements. Developing comprehensive nuclear laws can take up to three years, so early action is recommended. Challenges include aligning domestic licensing requirements with those of exporting States and harmonizing international standards. Dialogue between exporter and importer regulators is crucial, but complete harmonization is unrealistic. Regulations should be tailored to each State's specific conditions, spanning the entire nuclear fuel cycle. The IAEA’s Nuclear Harmonisation and Standardization Initiative (NHSI) offers support in developing these regulations, particularly for A/SMR development. States with limited regulatory experience can leverage the IAEA’s Milestones Approach and existing conventions, and benefit from the IAEA’s technical guidance, review missions, and advisory services.

3.3.1. Promoting the benefits of an integrated 3S approach

Safety, security and safeguards—while mutually reinforcing—are often treated in silos. A practice that can help address challenges posed by regulatory and legislative requirements is to integrate the approaches to safety, security and safeguards (3S). Often in developing countries, safety, security, safeguards, liability and other regulatory functions are housed under one body. 3S-by-design approaches to regulation by countries would facilitate nuclear newcomers growing their regulatory bodies at scale so the regulatory capacity increases commensurately with the size of the nuclear programme.

Potential end users of A/SMRs can help create demand signal for reactor designers that their designs will be more quickly deployed and face fewer issues with costly retrofits if 3S considerations are integrated into every part of the design process.

3.4. Planting the Seeds for a Nuclear Workforce

It is recognised that for countries to implement and take ownership of a just energy transition, there is a need to implement approaches to workforce that are localised, and which result in long-term employment for local citizens. Countries implementing peaceful uses should begin cultivating homegrown expertise early, even if they

initially rely on international expertise. Workforce planning should precede signing MOUs to avoid dependence on foreign labour, which can increase costs, reduce public confidence, and cause geopolitical complications and public resentment if local workers are sidelined.

With young Africans projected to make up 42% of global youth by 2030[1], there is a need to encourage nuclear science studies and expand educational programs. Universities should collaborate to share experiences, establish nuclear engineering programmes, and harmonize curricula. Raising awareness of nuclear benefits and job opportunities is crucial. Policymakers must clearly signal nuclear expansion plans to ensure students see a viable career path. Communication strategies should be tailored to each country, making nuclear science and technology information accessible to both policymakers and the public.

3.5. Laying the Groundwork for a Sustainable Nuclear Supply Chain

Nuclear supply chain development faces similar challenges as workforce development, such as the need for early preparation and raising awareness among stakeholders. it is incumbent on all stakeholders—especially the designers themselves—to demonstrate the efficacy of A/SMRs in order to create the demand for supply chain development domestically. In this respect, one strategy would be to raise awareness among policymakers and the public of how large-scale A/ SMR deployment could take the burden off industries, including those that are energy intensive utilising fossil-fuel energy sources and consequently are associated with high levels of carbon emissions.

Localizing the supply chain ensures long-term sustainability and civil society buy-in. Supply chain issues should be viewed as part and parcel of domestic and regional nuclear policies, including issues related to radioactive waste management and disposal.

3.6. Financing Peaceful Uses

A/SMRs are set to change the financial landscape for nuclear power, offering lower costs, reduced risks, and diverse applications. However, strong government support and public-private partnerships are essential to attract investment from financial institutions. The absence of multilateral international financial institutions, particularly the World Bank, is concerning, and African policymakers must lobby for their support. Civil society organizations play a crucial role in raising awareness about the benefits of peaceful uses and the ongoing efforts to ensure safety, security, and safeguards. Philanthropic foundations and Official Development Assistance (ODA) funders could be force multipliers for the IAEA's capacity-building efforts and contribute to nuclear technology development and deployment. Combating negative perceptions around nuclear energy requires a concerted effort from the non-proliferation, safety, and security community to highlight the benefits and successful global efforts in ensuring safety.

4. RECOMMENDATIONS

Recommendations to facilitate the deployment of A/SMRs in African countries are categorised under the following four themes:

4.1. Regulatory and Legal Perspectives

- **Enhance Communication**: Improve communication about the benefits of peaceful nuclear uses and the necessary legislative and regulatory requirements for government offices and national parliaments.
- **Develop Comprehensive Nuclear Laws**: Early development of comprehensive nuclear laws is crucial for raising a country's regulatory capacity and future expansion into nuclear power.
- **Early Engagement**: Technology vendors and regulators from exporting countries should engage early with regulators in importing African countries to harmonize licensing standards.
- **Promote Safeguards-by-Design**: Utilize safeguards-by-design to ease the regulatory burden and save costs for regulators, and end-users.

[1] World Economic Forum, https://www.weforum.org/agenda/2022/09/why-africa-youth-key-development-potential/

— **Grow Regulatory Bodies**: Expand regulatory bodies in proportion to the growth of the national peaceful uses programme.

4.2. Financing Perspectives

— **Publishing Briefs**: NGO's and think-tanks should publish briefs to raise awareness among policymakers about the benefits of peaceful nuclear uses and potential financing options.
— **Develop Risk Analysis Models**: Comprehensive risk analysis models that identify threats, determine risk ownership, assess costs, and propose mitigation strategies are crucial for mitigating risks and risk perceptions associated with financing nuclear projects
— **Learn from Large Projects**: Lessons from other large projects financed by international financial institutions, although rare for nuclear power, should be studied, expanded upon, and widely shared by the non-governmental expert community to inform future nuclear financing efforts.
— **Fund Research on Financing**: National governments should fund research to gather specific data points to improve the perception of nuclear technology's attainability.
— **Engage Philanthropic Foundations and ODA Funders**: Scale up efforts to engage philanthropic foundations and ODA funders in supporting the deployment of A/SMRs and integrating peaceful uses into development and climate frameworks.

4.3. Stakeholder Involvement and Perception Perspectives

— **Create Parliamentary Committees**: National governments should create parliamentary committees to explore nuclear technology's developmental role, identify national challenges, and consult early with all stakeholders to address these challenges.
— **Simplify Communication**: Use simple language and accessible data when communicating with policymakers, the public, and other stakeholders.
— **Create an Information Platform**: Develop a platform with accessible information and data on the benefits of nuclear technology, safety, security, and safeguards.
— **Engage Traditional Leaders**: Start public engagement with local traditional leaders to gain support for nuclear power development.
— **Establish World Nuclear Day**: Propose a UN World Nuclear Day to highlight the nuclear-climate-development nexus.

4.4. Infrastructure Perspectives

— **Promote Political Will**: Advocate for the inclusion of nuclear technology in Africa's Agenda 2063 and promote its benefits to international financial institutions.
— **Early Human Resource Development**: Begin education on nuclear technology from elementary through tertiary levels to build human resources and public acceptance.
— **University Collaboration**: Encourage universities to share experiences, establish nuclear engineering programmes, and harmonize curricula.
— **Engage with Grid Operators**: Increase engagement between grid operators, reactor designers, and international experts on nuclear power's grid-related needs.
— **Focus on Siting Issues**: Dedicate more research to siting nuclear facilities, including public engagement and prioritizing socio-economic development in identified areas.
— **Utilize IAEA Resources**: Leverage IAEA resources such as the IAEA Nuclear Harmonization and Standardization Initiative (NHSI), SMR Platform, and Milestones Approach for support and guidance.

5. LESSONS LEARNED AND CONCLUSION

Ultimately the workshop's location contributed to the success of the workshop enabling the participation by the South African regulator, nuclear energy commission, and prominent energy and policy experts. A/SMR developers noted that this was the deciding factor for their participation. These developers also noted that they benefited substantially from engaging with and hearing the views of many different countries in one meeting.

Of particular benefit was the participation by a prominent philanthropic foundation that has to date had no engagement with peaceful uses. It is hoped that the participation of this philanthropy can be leveraged to get more philanthropies to the table in future.

Workshop participants agreed on the need to maintain this momentum by establishing a long-term, multi-stakeholder process to promote the nuclear-development-climate nexus, expand partnerships for nuclear financing, and generate further engagement with non-traditional stakeholders for the expansion of peaceful uses in Africa.

ACKNOWLEDGEMENTS

This workshop was made possible through the strong support of our participants, as well as with generous financial support from the Sustained Dialogue on Peaceful Uses.