Forum: Disarmament & International Security Committee (GA1)

Issue: Countering the Security Challenges Posed by Small Modular Reactors (SMRs)

Student Officer: Iris Divari

Position: Co-Chair

Personal Introduction

Dear delegates,

My name is Iris Divari, I am 16 years old and I'm an IB1 student in Psychico College. This year, I have the honor of serving as one of the Co-Chairs of the Disarmament & International Security Committee (GA1) at the 9th ACGMUN Conference. This will be my fourth time chairing, and I am delighted to share this experience with you!

Firstly, I would like to congratulate you on your upcoming participation in the 9th ACGMUN conference. I encourage you to create lasting memories and enjoy the enriching debate experience this conference offers. I also advise you to prepare thoroughly for this conference as it provides an exceptional eye-opening opportunity for you to learn. As a result, I advise you to make the most of this valuable experience.

In this study guide, you will find valuable information regarding the second topic of this committee's agenda. However, I highly encourage you to conduct your own research on the topic so that you can fully comprehend your nation's policy. If any questions on this topic, or anything else regarding the conference arise, please feel free to contact me via my email at: idivari@athenscollege.edu.gr or the Main Chair Rea at: rea.karvouni@gmail.com.

Sincerely,

Iris

Topic Introduction

Nuclear energy has long played an important role in global electricity production due to its ability to generate large amounts of power with minimal carbon emissions. In recent years, attention has increasingly shifted towards Small Modular Reactions (SMR's), a newer development in nuclear technology that has emerged over the past few decades. Unlike conventional nuclear reactors, SMRs are significantly smaller, typically producing only a fraction of the energy generated by traditional plants. Their design is also distinct: major components are manufactured in factories and later transported to the installation site, rather than being built entirely on location.

The growing interest in SMRs is closely linked to modern energy challenges. Rising concerns over fossil fuel dependence, climate change, and the demand for stable electricity supplies have pushed states to search for alternatives. While traditional nuclear power can help address these issues, it is often criticized for its high costs, long construction timelines, and financial risks. As a result, SMRs have gained attention as a potential solution that avoids many of these drawbacks while still offering low carbon, reliable energy.

One of the main advantages of SMRs is their flexibility. Their compact size allows them to be deployed in regions with smaller or isolated energy grids, where large power plants would be impractical. Initial construction costs are lower compared to conventional nuclear facilities, and their modular design makes it possible to adjust capacity by adding or removing units based on demand. In addition, nuclear reactors are among the most consistent energy sources available, and SMRs are designed to operate for long periods with minimal maintenance and limited refueling requirements. These characteristics make them attractive not only to developed states, but also to developing countries and private energy providers.

However, despite their potential benefits, SMRs also raise serious security concerns that cannot be overlooked. Nuclear technology is inherently dual-use, meaning that systems intended for peaceful energy production can be adapted for military purposes. The smaller and more mobile nature of SMRs makes them harder to monitor than traditional reactors, particularly when deployed in remote locations. While these locations often lack access to national power grids, they also tend to have limited emergency response infrastructure, increasing the risks associated with accidents, attacks, or system failures.[1]

[1] Nuvora Research Team. *Nuvora Energy*, 31 May 2025, www.nuvoraenergy.com/media/rise-of-smr-slug

Additionally, newer fuels such as High-Assay Low-Enriched Uranium (HALEU) improve reactor efficiency but also pose heightened proliferation risks due to their potential use and weapons development.[2] Existing international safeguards were largely designed for large, stationary nuclear facilities and may not be fully equipped to address the unique challenges posed by SMRs. The core issue is not whether SMRs should be classified as inherently beneficial or harmful, but how their advantages can lead to severe consequences if they are poorly regulated or inadequately secured.

These concerns have drawn the attention of the international community, particularly regarding the potential impact of SMRs on Global Security and the risk of increased nuclear armament. Given the rapid development and expected expansion of this technology, it is essential to recognize its broader implications.

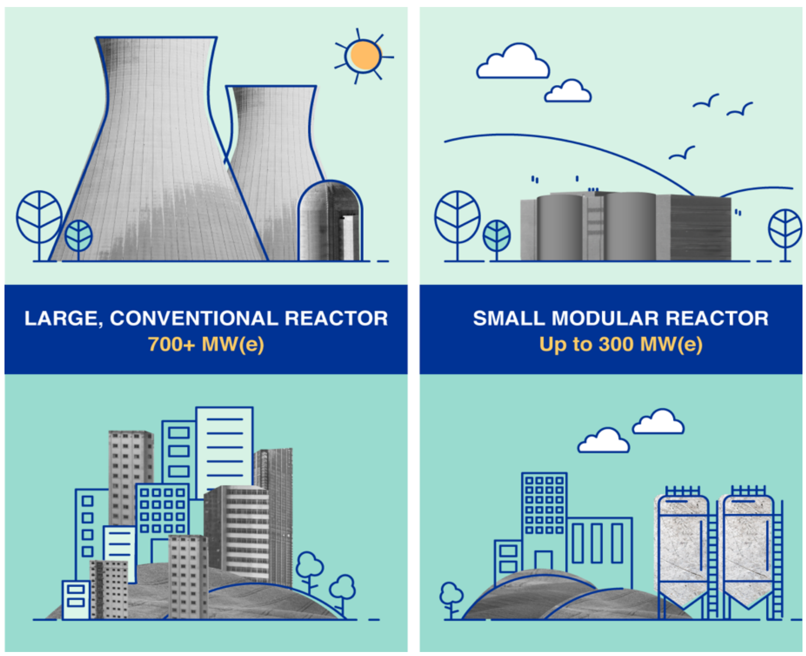

Figure 1: Small modular reactors: flexible and affordable power generation[3]

Definition of Key Terms

Dual-Use Technology

[2] Diaz-Maurin, François. “Declassified Cable Reinforces Proliferation Concerns about High-Assay Low-Enriched Uranium Fuel.” *Bulletin of the Atomic Scientists*, 7 Nov. 2025, thebulletin.org/2025/11/declassified-cable-reinforces-proliferation-concerns-about-high-assay-low-enriched-uranium-fuel

[3] International Atomic Energy Agency. Small and Medium-Sized or Modular Reactors. IAEA, 2025. www.iaea.org/topics/small-modular-reactors

Dual-use technology refers to technological items that possess the ability to be used for civilian applications, but also for potential use in terrorism, military, or weapons of mass destruction (WMD).[4]

High-Assay Low-Enriched Uranium (HALEU)

"HALEU is a subcategory of low-enriched uranium (LEU), which is uranium enriched to below 20 percent uranium-235, and the IAEA has long considered LEU, including HALEU, to be 'indirect-use material'. For the agency, HALEU cannot be used to make a nuclear weapon without converting it to highly enriched uranium (HEU) by further enriching it to 20 percent or above – a significant technical barrier for all but a few countries. Consequently, HALEU is subject to far less stringent international safeguards than HEU. Without appropriate constraints, large-scale production and use of HALEU may greatly increase the risks of nuclear proliferation and terrorism." [5]

Nuclear Security

"Nuclear security refers to measures designed to address the risks associated with theft and trafficking in nuclear and radiological materials, sabotage of nuclear facilities, and the danger of terrorists acquiring and using it for a nuclear weapon."[6]

Nuclear Safeguards

"Safeguards are a set of technical measures that are applied by the IAEA on nuclear facilities and material. Through these technical measures, the IAEA seeks to independently verify a State's legal obligation that nuclear facilities are not misused, and nuclear material is not diverted from peaceful uses. States accept these measures through the conclusion of safeguards agreements."[7]

Radiological Release

A radiological release is the intentional or unintentional uncontrolled dispersion of radioactive materials into the environment, which poses high risks to living organisms and regional security. [8]

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[4] "Emerging Technology and Military Application: Security-Policy Nexus of Emerging Technology." *Concordia University*, www.concordia.ca/ginacody/research/spnet/themes/technology.html.

[5] "Emerging Technology and Military Application: Security-Policy Nexus of Emerging Technology." *Concordia University*, wwhichw.concordia.ca/ginacody/research/spnet/themes/technology.html.

[6] "Safeguards Explained." *IAEA*, IAEA, 8 June 2016, www.iaea.org/topics/safeguards-explained

[7] International Atomic Energy Agency. *IAEA Safeguards Glossary.* International Nuclear Verification Series No. 3, IAEA, 2001,
https://www.iaea.org/sites/default/files/iaea_safeguards_glossary.pdf

[8] World Health Organization. *WHO Radiological Emergency Terminology.* WHO, 2017,
https://apps.who.int/iris/bitstream/handle/10665/254746/WHO-HSE-GAR-2017.01-eng.pdf

Small Modular Reactor (SMR)

A Small Modular Reactor is a nuclear reactor that generates up to 300 MWe per unit and is designed for modular factory fabrication, allowing components to be manufactured off-site and transported for installation. SMRs are cheaper to create and maintain. Given their size, construction time, and costs, deployment becomes increasingly flexible in remote or smaller-grid regions.[9]

Background Information

Historical Background

The beginning of SMRs

The earliest use of compact nuclear reactors dates to their application in naval propulsion systems, particularly submarines and military vessels.[10] These early reactors were designed to be small, self-contained and capable of operating for long periods without refuelling. Their compact size and operational autonomy were core priorities, and these same characteristics later influenced the development of modern SMRs. The success of naval compact reactors demonstrated the feasibility of standardized, small scale nuclear systems.

Alongside naval applications, small nuclear reactors also began to appear in civilian and academic contexts during the mid 20th century. Universities and research institutions deployed low power reactors for experimental electricity generation, scientific research, reactor physics testing, and the education of nuclear engineers. These reactors played a key role in expanding global nuclear expertise and introducing new safety concepts including low power reactor protection systems and alternative cooling methods that remain relevant today.[11]

The International Atomic Energy Agency (IAEA) has identified these experimental civilian reactors as direct precursors to SMRs. This classification is based on their proven ability to be safely licensed and operated outside natural power grids, a principle that continues to guide modern SMR deployment strategies.[12]

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[9] International Atomic Energy Agency. *What Are Small Modular Reactors (SMRs)?* IAEA, 29 Nov. 2022, https://www.iaea.org/newscenter/news/what-are-small-modular-reactors-smrs

[10] World Nuclear Association. "First Small Modular Reactors Open a New World of Applications." WNA, 19 Dec. 2019. https://world-nuclear.org/news-and-media/press-statements/first-small-modular-reactors-open-a-new-world-of-a

[11] World Nuclear Association. "First Small Modular Reactors Open a New World of Applications." WNA, 19 Dec. 2019. https://world-nuclear.org/news-and-media/press-statements/first-small-modular-reactors-open-a-new-world-of-a

[12] International Atomic Energy Agency. Small Modular Reactors: A New Nuclear Energy Paradigm. IAEA, 2022. https://nucleus.iaea.org/sites/smr/Shared%20Documents/Small%20Modular%20Reactors%20a%20new%20nuclear%20energy%20paradigm.pdf

During the early 2000s, growing concerns over energy security, fuel availability, and the Global energy crisis renewed interest in diversified and resilient power sources. The IAEA's 2024 report highlights the pressures as major drivers of renewed nuclear development.[13] However, the high costs, long construction timelines, and workforce demand of traditional nuclear plants limited their feasibility, particularly for developing countries and regions with limited grid capacity. As a result, compact and scalable nuclear reactors were increasingly viewed as a practical alternative, laying the foundation for modern SMR development.[14]

Modern Construction Concepts

Traditional nuclear power plants are complex, resource-intensive projects that require long construction periods and significant financial investment. In response to these challenges, the concept of modular construction emerged in the mid 2000s[15]. This approach involves manufacturing standardized reactor components and controlled factory environments before transporting them to the installation site for assembly.

Factory-based production improves quality control, consistency and safety while significantly reducing construction delays and cost overruns. The IAEA has identified modular construction as a key response to the historical economic challenges of nuclear power development. This concept enabled the transportable components, repeatable designs, and comparatively lower costs that define modern SMRs.

Drivers of SMR Adoption

Economic drivers

Economic considerations are among the strongest factors driving SMR adoption. Compared to the conventional nuclear plants, SMRs require significantly lower upfront capital investment, making nuclear energy more accessible to a broader range of countries and energy providers. Their factory-based manufacturing model also reduces financial uncertainty by minimizing construction delays on on-site complexity. Additionally, SMRs are well suited for deployment in remote or off-grid regions where energy demand is lower and budgets are limited.

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[13] International Atomic Energy Agency. Small Modular Reactors: A New Nuclear Energy Paradigm. IAEA, 2022. https://nucleus.iaea.org/sites/smr/Shared%20Documents/Small%20Modular%20Reactors%20a%20new%20nuclear%20energy%20paradigm.pdf

[14] ibid

[15] ibid

In such contexts, large nuclear reactors are often impractical, whereas SMRs offer viable alternatives. A further economic advantage is incremental capacity expansion, which allows operators to add reactor models as energy demand increases. This flexibility enables regions with limited grid access to scale energy production gradually rather than committing to a single, large investment upfront, reinforcing the economic appeal of SMRs.

Energy Policy and Climate

Climate energy policies have become major forces shaping the development of the energy sector, making it reasonable to expect that SMRs align closely with these priorities. As a low carbon and reliable energy source, SMRs fit well within modern climate strategies aimed at reducing emissions while maintaining energy security.[16]

One of the strongest policy drivers is the ability of SMRs to offer a sustainable alternative that meets regulatory standards and performs favorably compared to many conventional energy sources. Their modular design also allows for phased deployment, enabling states to gradually expand nuclear capacity in line with policy goals and regulatory requirements.[17]

SMRs can also replace high emission diesel generators, which are commonly used in remote or isolated regions that lack access to national power grids. Transitioning from diesel to SMRs would significantly reduce emissions while providing a more stable and environmentally friendly energy supply. In addition, SMRs can support renewable energy systems such as wind and solar power. While renewables are environmentally beneficial, they are also often intermittent due to weather dependence. SMRs can provide consistent low emission backup power, improve grid stability and encourage greater Reliance on renewable sources.

Beyond electricity generation, SMRs may also be applied to non-traditional uses such as District Heating, desalination, and other industrial processes. Their compact size, safety features, and relatively low costs make it possible to replace High emission systems in these sectors with cleaner and more efficient alternatives.

Non-Proliferation and Security

[16] ibid

[17] International Atomic Energy Agency. Small and Medium-Sized or Modular Reactors. IAEA, 2025. https://www.iaea.org/topics/small-modular-reactors

Safety and Security considerations are key drivers behind the adoption of SMRs. Many Smart Designs incorporate inherent and passive safety systems that rely on natural physical processes such as gravity and convection. These systems are designed to function automatically, shutting down the reactor in the event of a malfunction without requiring human intervention, thereby reducing the risk of human error or system failure.

Another important security feature is the use of centralized fuel fabrication and fuel take back arrangements. In this model, nuclear fuel is manufactured at specialized facilities and delivered to SMR sites ready for use. Once spent, the fuel is returned to secure facilities for processing. This approach significantly limits on site fuel handling and reduces the number of locations where nuclear material is present lowering the risk of theft or misuse.

Standardized SMR designs further strengthen non-proliferation efforts. Because SMRs are based on repeatable models, international safeguards and regulatory oversight can be applied more consistently across multiple sites. This uniformity simplifies monitoring and inspection processes for international organizations.

Finally, SMRs require smaller amounts of fuel material due to their compact reactor core and limited fuel inventories. While facia material is essential for energy production, it also poses security risks. The reduced quantities used in the SMRs make nuclear material easier to track, manage, and safeguard, thereby lowering the likelihood of proliferation related incidents.

Proliferation Concerns

Even though there are many positive aspects to proliferation, there are also some concerns. As more states adopt SMRs, uneven regulatory oversight increases the risk of theft, diversion, or misuse of nuclear materials. Although SMRs include design features intended to limit proliferation, important vulnerabilities remain.

A central concern is the use of HALEU. This contains higher concentrations of fissile material than conventional nuclear fuel. It is closer to weapons grade uranium. If diverted or further enriched, it could significantly shorten the pathway to nuclear weapons development. At present, international regulation of HALEU Supply chains remain limited, as Global safeguards have not yet fully adapted to its growing use.

Fuel transportation also presents risks. Unlike traditional reactors, SMRs require fuel to be transported between fabrication facilities and reactor sites. Mobile nuclear material is harder to protect than fuel stored at fixed facilities, increasing vulnerability during transit. In addition, long refuelling intervals reduce the frequency of on-site inspections, making undeclared diversion more difficult to detect despite remote monitoring systems.

Safeguard Gaps

Existing International safeguards were largely designed for traditional nuclear reactors and do not fully account for SMRs' compact designs, novel Technologies and remote deployment. Some SMRs use alternative cooling methods, extended core lifetimes, and highly integrated systems, creating verification blind spots and limiting the effectiveness of current monitoring tools. remote deployment, further we can safeguard. SMRs are often located in isolated areas with minimal on-site staff, increasing reliance on automated systems that may be vulnerable to failure or tampering.

Radiological Safety & Sabotage

Although SMRs incorporate passive safety systems, your compact design and limited operational history raise concerns in the event of sabotage or attack. Remote locations can delay emergency response and radiation containment, increasing the risk of uncontrolled radiological release. Additionally, many SMRs integrate multiple safety functions into a single vessel. Damage to this component could disable several safety systems simultaneously, increasing vulnerability to both accidents and deliberate attacks.

Nuclear Waste & Spent Fuel Challenges

While individual SMRs produce less waste than large reactors, widespread deployment disperses radioactive material across many locations. This increases the number of sites requiring protection and can strain security resources. Responsibility for securing spent fuel often falls on regional authorities, which may lack sufficient expertise or funding. Transporting used fuel and nuclear waste becomes another major vulnerability because materials are most exposed when outside heavily protected facilities.

Military Security Challenges

Some states are considering SMRs to provide reliable power for military installations, particularly in conflict environments. However, SMRs deployed in military complexes may become high value targets as any attack could result in severe radiological consequences. Civilian SMR technology also overlaps with naval nuclear propulsion. Because Naval reactors are exempt from IAEA safeguards, civilian nuclear materials and Technologies may be transferred to military use with limited transparency. This loophole risks accelerating original arms racist and weakening international non-proliferation efforts.

Major Countries and Organizations Involved

China

China is among the world's fastest growing nuclear energy developers and has successfully constructed the High Temperature Pebble-Bed Module (HTR-PM) SMR. This reactor uses high temperature technologies and spherical fuel elements to generate electricity with low carbon emissions. In 2021, China connected the HTR-PM to its national grid, marking a major milestone in SMR deployment. The country primarily uses SMRs for industrial energy production, district and long-term energy expansion. Its strategy focuses on developing countries with growing energy demand and limited grid capacity. Due to its early and large-scale development, China is well positioned to influence global SMR standards, including safety practices and fuel supply arrangements.[18]

India

India has shown growing interest in SMRs as part of its efforts to expand electricity generation and strengthen energy access. As a developing country, India faces challenges in building large power plants and extensive national grids, making SMRs an attractive alternative. However, India's involvement raises international concern. India is not a signatory to the Nuclear Non-proliferation Treaty (NTP), meaning its nuclear activities are not fully subject to IAEA safeguards. However, many of its civilian reactors are regulated under bilateral agreements, making them less volatile. Given ongoing regional tensions, the development of SMR Technologies may indirectly strengthen India's nuclear capabilities and raise security concerns among neighboring states.

United States of America (USA)

The United States play a crucial role when it comes to SMR development and exports. A key focus of US policy has been expanding domestic production of HALEU, a fuel required for many advanced SMR designs. In March 2023, the US formally prioritized HALEU production as part of its national energy strategy. Through this approach, the USA strengthens its influence over global SMR

[18] Ottinger, Lily. "China's Arctic Leverage." Chinatalk.media, ChinaTalk, 20 Jan. 2026, www.chinatalk.media/p/chinas-arctic-leverage.

standards while also raising non-proliferation concerns related to fuel supply dominance. The US government strongly supports SMRs as tools for decarbonization and allied energy security. Alongside this policy, the Department of Energy (DOE) has funded multiple SMR demonstration projects to accelerate commercial deployment.

International Atomic Energy Agency (IAEA)

The International Atomic Energy Agency (IAEA) is the primary international body responsible for nuclear safeguards, safety standards, security guidance and civilian nuclear oversight. Since the early 2000s, the agency has expanded its focus on SMRs to ensure that their deployment does not undermine non-proliferation norms. The IAEA supports developing countries through regulatory capacity building programs and issues guidance on safeguards and safety measures. Its role is central to ensuring that SMR development and deployment remain compliant with international regulations and security standards.

Blocs Expected

Alliance 1 - Pro-Development Alliance

This alliance will consist of nations that strongly support the adoption and deployment of SMRs for energy diversification and climate goals. These include nations that advocate for flexible modular reactor designs and encourage development under standardized safety and security guidelines, but nevertheless prioritize technological advancement and accessibility. Potential members of this alliance include, but are not limited to, the USA, China, Russia, Canada, Argentina, the United Kingdom, and India.

Alliance 2 - Caution & Security Alliance

This alliance will consist of nations that emphasize strict safety, security, and non-proliferation measures for SMRs. These are nations that advocate for controlled, phased deployment or pilot projects rather than widespread expansion. The nations prioritize environmental protection, risk mitigation, and prevention of dual-use or military applications. Members of Alliance 2 include countries such as, but not limited to, France, Germany, Japan, Sweden, and Austria.

Timeline of Events

Date	Description of Event
January 1st, 1955	First military small reactors on submarines.
March 15th, 1963	Early civilian experimental reactors were used for the education and training of nuclear engineers.
September 10th, 2005	The modular construction concept was developed.
June 15th, 2021	IAEA's regulators' forum platform was established.
September 20th, 2021	China's HTR-PM SMR began commercial operation.
May 5th, 2022	Argentina's CAREM SMR began commercial operation.
March 3rd, 2023	The USA focuses on domestic HALEU production.

Relevant UN Resolutions, Treaties & Events

Treaty on the Non-Proliferation of Nuclear Weapons (NPT)

The NPT is the cornerstone of the global nuclear non-proliferation regime. Its primary objective is to prevent the spread of nuclear weapons while allowing the peaceful use of nuclear energy under strict international oversight. Under the treaty, nuclear armed states commit to pursuing disarmament, while non-nuclear weapons states agree to place their nuclear activities under IAEA safeguards to ensure compliance. The NPT has served as the foundation for many subsequent non-proliferation agreements and frameworks.[19]

Security Council resolution 1540 (2004)

[19] United Nations Office for Disarmament Affairs. Treaty on the Non-Proliferation of Nuclear Weapons. United Nations, https://disarmament.unoda.org/en/our-work/weapons-mass-destruction/nuclear-weapons/treaty-non-proliferation-nuclear-weapons

UNSC resolution 1540 obligates all states to take measures to prevent non-state actors from acquiring nuclear, chemical or biological weapons. It requires the adoption of national legislation, export controls and security measures to protect sensitive materials. The resolution also promotes international cooperation and regular reporting to the UN, strengthening global efforts against proliferation and terrorism.[20]

Conventional Physical Protection of Nuclear Material (CPPNM)

The CPPNM sets international standards for the protection of nuclear material. It covers use, storage and transport. States are required to secure all nuclear material on their territory. Theft, sabotage or loss should be reported. An amendment made in 2005 expanded the treaty to include domestic nuclear material, which effectively reduces the risk of misuse of nuclear material, which could lead to negative consequences.

UN Security Council resolution 1887 (2009)

This resolution calls for global nuclear disarmament and non-proliferation. It emphasizes the peaceful use of nuclear energy. States are urged to enhance safeguards, security and transparency. It also encourages dialogue on reducing nuclear risks. The resolution builds on previous frameworks to improve global nuclear governance.[21] The resolution on nuclear disarmament and non-proliferation emphasizes the peaceful use of nuclear energy while urging states to strengthen safeguards, security, and transparency. It encourages dialogue on reducing nuclear risks and builds on existing frameworks to improve global nuclear governance. This directly relates to SMRs, as their deployment for energy production must comply with these safeguards and transparency measures, contributes to lowering nuclear risks through enhanced safety features, and aligns with the resolution's goal of promoting safe and peaceful nuclear technology.

Previous Attempts to Solve the Issue

SMR-tailored safety & security guidelines No. 123 by the IAEA

The International Atomic Energy Agency (IAEA), recognizing the need, published safety & security guidelines specifically for SMRs, namely the IAEA Safety Standard Series. The said guidelines

[20] United Nations Security Council. Resolution 1540 (2004). S/RES/1540(2004). United Nations, 28 Apr. 2004, https://documents.un.org/doc/undoc/gen/n04/328/43/pdf/n0432843.pdf
[21] United Nations Security Council. Resolution 1887 (2009). S/RES/1887(2009). United Nations, 24 Sept. 2009 https://digitallibrary.un.org/record/665529?ln=en

provide national authorities with practical tools to evaluate the risks associated with SMRs, including accident scenarios and sabotage. It is through these guidelines that countries are encouraged to deploy SMRs, as internationally recognized safeguards are set up, promoting a sense of security. Additionally, by following those standards, uncertainty for both operators and investors is reduced. Operators feel more confident in their ability to conduct their duties safely and properly, and investors are reassured that they are investing in something stable, backed up by safeguards and safety measures. [22]

IAEA workshops and oversight efforts on HALEU supply and SMR fuel-cycle issues

The IAEA conducts workshops and advisory missions focused on SMR fuel management oversight. Particular attention is given to HALEU due to its complexity and proliferation risks. Key areas of oversight include long-term waste storage and refueling practices, which are especially important for SMRs designed to operate for multiple years without refueling. Given the technical complexity of these systems, even minor errors can have serious safety and regulatory consequences. By bringing together technical experts, these initiatives help develop new safeguards, share best practices and strengthen international confidence in SMR development.

The IAEA SMR Regulators' Forum

The IAEA SMR Regulators Forum, established in June 2021, is a platform that connects national nuclear regulators to exchange expertise and develop common approaches to SMR licensing, safety, and regulation. The forum addresses challenges not fully covered by traditional reactor regulators, including modular construction and the extended refueling intervals. Through promoting regulatory cooperation and shared standards, the forum helps reduce accident risk and operational vulnerabilities while supporting the safe and consistent deployment of SMRs worldwide.

Possible Solutions

Strengthening Safeguards and Regulatory Oversight

Recognizing existing safeguards and regulations, states are strongly encouraged to expand IAEA inspection protocols for underground and mobile SMRs to ensure operational safety and mitigate proliferation risks. Standardized reporting for HALEU production and transport, this could be done by

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[22] International Atomic Energy Agency. *Applicability of IAEA Safety Standards to Non-Water-Cooled Reactors and Small Modular Reactors*. Safety Reports Series No. 123, IAEA, 2023,https://www-pub.iaea.org/MTCD/Publications/PDF/PUB2027_Web.pdf

improving transparency and trust, given the high proliferation potential of the material. Furthermore, additional protocols for all SMR importing states is suggested, reinforcing safeguards through national legal frameworks to promote global oversight and ensure that nuclear materials are used lawfully and responsibly.

Enhancing Physical Protection Measures

Acknowledging the specific vulnerabilities of remote and floating SMRs, states are urged to implement robust hardening requirements to reduce the risk of sabotage or accidental damage. The creation of shared regional response teams is proposed to enable rapid intervention and improve deterrence. Coordinated training exercises and legal agreements would support this initiative, helping rebuild trust between states while addressing urgent security needs. In addition, updating existing guidelines for mobile reactor protection is encouraged to ensure consistent security standards across borders and prevent potential misuse.

Improving Export Controls and Transparency

With SMRs increasingly distributed and spent fuel posing security concerns, the establishment of international fuel take-back arrangements is recommended to reduce domestic waste and minimize proliferation risks. Annual reporting to oversight bodies would enhance transparency and dual use SMR testing, lowering the risk of covert military applications in fostering trust among previously tense regions. Additionally, states are encouraged to adopt standardized nuclear liability frameworks for importing countries, clearly defining responsibilities and ensuring proper compensation in the event of incidents

Promoting Responsible Waste Management and Fuel Take Back

To address the need for improved waste management, countries are encouraged to Implement International fuel take back agreements, requiring fuel suppliers to retrieve spent fuel after use. This reduces local storage and security risks and limits proliferation potential, particularly in countries lacking long-term storage capabilities. The creation of shared interim storage facilities is also proposed, allowing multiple Nations to store spent fuel securely under regional treaties or agreements, often with IAEA oversight. Such centralized, state of the art facilities would reduce national costs while strengthening non-proliferation controls.

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