THIRD WAY

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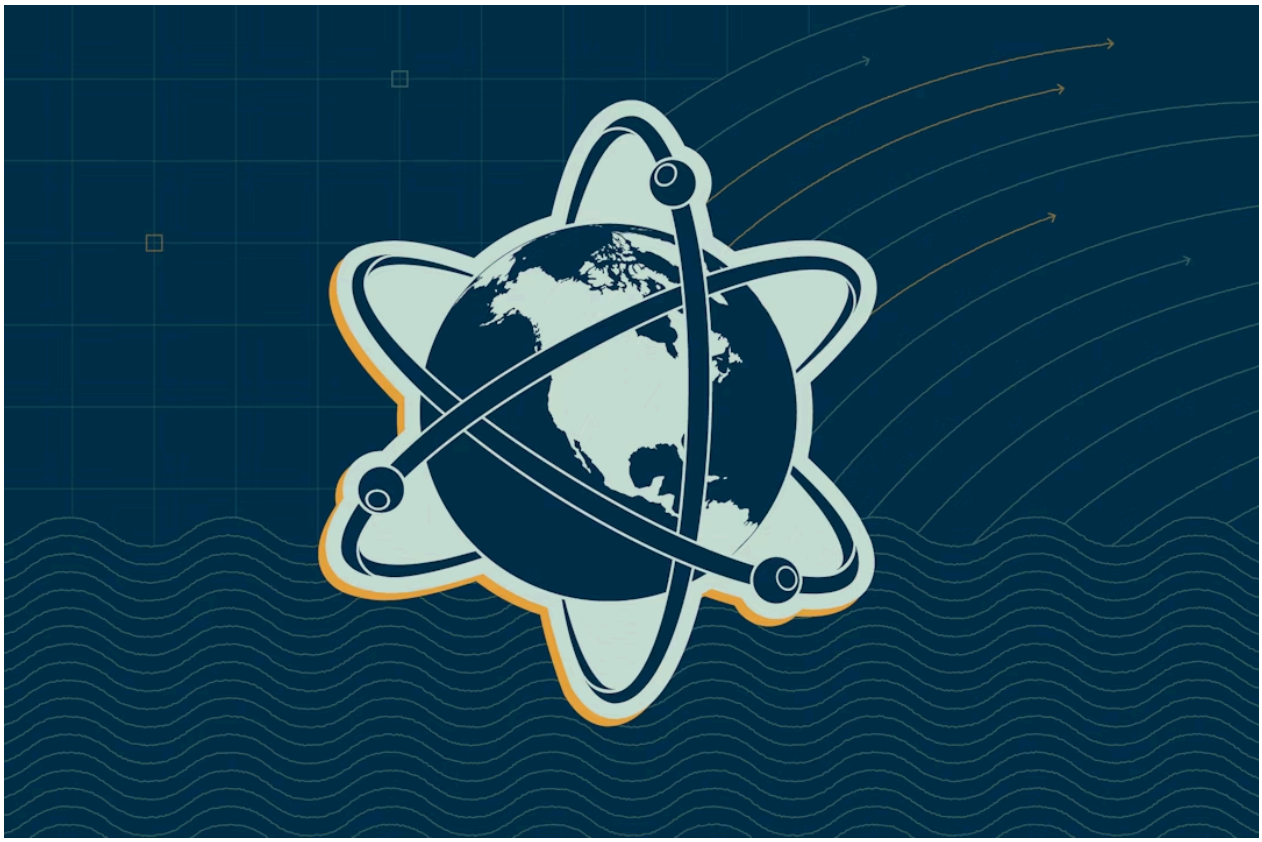
Preparing Advanced Nuclear for Global Deployment



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Global demand for nuclear energy is rising, creating a critical opportunity for US advanced nuclear developers to lead. However, successful exports depend on proactively designing reactors to meet international safeguards and nonproliferation requirements.

To explore strategies to achieve this, Third Way, in collaboration with the US Mission to International Organizations in Vienna, hosted a private convening among Ambassadors and other representatives of advanced nuclear market countries, International Atomic Energy Agency (IAEA) staff, and members of the US nuclear industry. This convening, held on the sidelines of the IAEA's inaugural International Conference on Small Modular Reactors and Their Applications, focused on how the participants can collaborate to prepare to meet the rigorous nonproliferation needs in the majority of potential US nuclear export destinations. Here are the key takeaways and action opportunities Third Way identified from this convening:

- **Evolving IAEA engagement:** Traditional engagements purely at the government-to-government level are insufficient to address the diversity of reactor vendors eyeing the global market. Moving forward,the IAEA and its members must do more to involve private industry and promote nonproliferation as a compelling design feature, not just an obligation.

- **Balancing costs with safeguards guidelines and requirements:** Reactor vendors want to keep the costs of safeguards- and security-by-design (SBD) low by creating standardized products for deployment, but the IAEA's system makes uniform requirements impractical. Finding a balance that works for key stakeholders should be a priority.

- **Expanding the IAEA's technical support**: New nuclear technologies are increasing demands on IAEA technical staff. Leveraging experts from research institutions and beyond can provide auxiliary advice to the industry and reduce the burden on the IAEA.

- **Engaging early and often**: The global need for new nuclear energy deployment is increasingly urgent. As the IAEA adapts to new technologies and deployment scenarios, proactive engagement by industry on nuclear designs gives the IAEA the opportunity to create more efficient solutions to safeguards and security challenges.

Building Nonproliferation into Export-Ready Reactors

Global interest in nuclear energy deployment is rapidly increasing. Meeting the commitment made by over 30 countries since COP28 to triple global nuclear energy means deploying new nuclear energy around the world. As Third Way and Energy for Growth Hub's map of the global nuclear market indicates, future demand is greater than ever, offering a significant opportunity for US reactor developers to lead in both domestic deployment and international export. However, meeting this demand requires more than just scaling production. We need a proactive approach to nonproliferation.

With demand coming both from countries with existing nuclear infrastructure and nuclear newcomers, the potential distribution of nuclear technology and material raises critical considerations for nonproliferation. Implementation of nonproliferation rules and standards is—beyond an ethical imperative—legally required in almost every country that might purchase a US reactor. The agreements concluded between 182 countries and the International Atomic Energy Agency (IAEA) lay out comprehensive, legally binding obligations to detect and deter proliferation through the use of *nuclear safeguards*.

Beyond its active role in inspecting nuclear facilities to verify that nuclear materials are not diverted toward nuclear weapons, the IAEA also provides vital guidance on how to implement safeguards,

secure facilities, and advance nuclear energy technology for a host of applications. Tripling global nuclear energy capacity means that new facilities, new and advanced reactor technology, and new fuels may all require innovative safeguards and security approaches—placing strain on the Agency's resources.

Meeting the US Nuclear Regulatory Commission's standards is the first priority for those reactor vendors aiming to deploy domestically, but exporting reactors adds complexity. Designs will need to meet an additional layer of national requirements related to nonproliferation obligations. Developers that align early with these standards can help streamline the deployment process, reduce delays, and strengthen global trust in US nuclear technologies.

Reactors built with "safeguardability" in mind not only ensure compliance from the start but also gain a competitive advantage in global markets. In addition to being a legal requirement, incorporating "safeguardability" and broader nonproliferation considerations into a design also increases the reactor's export competitiveness, demonstrating the vendor's commitment to upholding the highest nonproliferation standards.

Given the legal and competitiveness implications, stakeholders benefit from proactively engaging on and incorporating nonproliferation considerations into planning around exports and global deployment. This proactive approach is crucial as the IAEA faces growing demands for its expertise. In the next section, we'll examine the key takeaways from our convening that aim to answer the question, "How can we collaboratively prepare to safeguard and secure advanced reactors around the world?"

Key Takeaways: Supporting Greater Coordination

The convening identified several major avenues to greater cooperation on nonproliferation among industry, the IAEA, and market countries. While not exhaustive, these observations point to potential priorities for enabling greater coordination within the international nonproliferation regime.

Challenge 1: Stakeholder Engagement

With a mandate to engage primarily with its Member States, it can be challenging for the IAEA to convene all relevant voices—particularly from the private sector—to discuss safeguards and security for new reactors. Historically, the nuclear industry has been dominated by state-owned or state-affiliated reactor development companies, making this limitation less obvious. However, with the rise of private reactor developers, this traditional approach is less effective in reaching the entities primarily responsible for incorporating safeguards considerations into their reactor

designs, especially if there are sensitivities around perceptions of "picking winners and losers." Without direct engagement, developers responsible for implementing said guidelines may have more difficulty prioritizing critical resources like time, funding, and staff capacity, relying instead on second-hand information and limited guidance.

Creating more opportunities for direct partnership with private industry will be important moving forward to ensure all necessary stakeholders have clear lines of sight to advance the safeguards and security features for their designs. In addition, reshaping the argument for greater industry engagement with the Agency may encourage more involvement by US industry. Framing IAEA engagement not as purely an export obligation but as an opportunity to proactively demonstrate to potential markets their commitment to high safety, security, and safeguards standards can also strengthen US vendors' business cases and enhance their competitiveness in global markets.

Challenge 2: Balancing Requirements vs. Guidelines

Unlike other international organizations such as the International Civil Aviation Organization (ICAO) or International Maritime Organization (IMO), the IAEA does not set binding requirements or regulations. Instead, it offers guidance that Member States *can* adopt as part of their own regulations. But if a developer aims to export to different countries, differences in national regulations may increase costs for deployment. As a result, this creates tension between offering Member States the flexibility to develop their own requirements and creating a suggested path forward that is standardized enough for reactor developers to work across different markets. Reconciling these concerns will certainly require continuing discussion among vendors, Member States, and the IAEA. Deeper engagement with the IAEA will go a long way toward mitigating this issue.

Challenge 3: Maximizing Finite Time and Resources

The IAEA is able to conduct substantial and impactful work with limited resources—and the capacity strain is likely to become more evident as new reactor designs near deployment. The IAEA needs to prepare to safeguard these designs before they can be deployed. To do so, it engages with reactor vendors on an ad hoc basis on "safeguards by design" (SBD), an iterative process to optimize reactors for safeguards application. These engagements are typically not initiated by the IAEA, requiring a proactive approach from vendors and Member States to kickstart that process. This early engagement is a double-edged sword; more engagement is always better, but if many reactor developers begin to overwhelm IAEA staff capacity, they may need to adopt triage approaches.

To ease this burden, some inquiries can be redirected to US national labs, programs like the Gateway for Accelerated Innovation in Nuclear vouchers or National Nuclear Security Administration's Nuclear Nexus, research institutions, or other partners. These experts can help address technical questions or other relevant site needs related to SBD. Leveraging these kinds of auxiliary resources can lighten the IAEA's load while offering an opportunity for creative engagement with additional experts outside of the IAEA. This approach will still require frequent communication with the IAEA, but can create a broader network of nontraditional engagement to meet the rising demand for safeguards/security consultation.

Challenge 4: Engaging Early and Often

The urgency of deploying clean, secure, reliable energy is driving nuclear deployments around the world. As developers strive to deploy their reactors, the IAEA is also working hard—with finite resources—to develop novel safeguards and security approaches for advanced technologies. New safeguards and security techniques can't be developed overnight, and therefore it is vital that vendors work closely with the Agency to prepare. The more lead time is given, the more the Agency can innovate and develop approaches to maximize efficiency and staff capacity. Vendors can help support the swift but effective development of safeguards and security approaches for advanced reactors by engaging early and often with the IAEA.

Conclusion

The enthusiasm and drive to deploy new nuclear energy around the world is undeniable. As governments and private entities look to finance and build these reactors, nonproliferation obligations will impact their deployment opportunities. But beyond obligation, incorporating nonproliferation considerations into a technology's development can improve its attractiveness to potential markets that value meeting the highest safety, security, and safeguards standards. There is still much to do to prepare the IAEA and other stakeholders for widespread global nuclear deployment, but if we are to meet our clean energy goals and preserve our nonproliferation standards, it is imperative that we push for increased collaboration in this area.