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ATOMS FOR ASEAN: GREAT POWER COMPETITION, PROLIFERATION RISKS, AND THE CASE FOR MULTILATERAL NUCLEAR ARRANGEMENTS

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EXECUTIVE SUMMARY

Member states of the Association of Southeast Asian Nations (ASEAN) are pursuing nuclear energy for sustainable growth and decarbonization. China, Russia, and the United States are competing to supply Southeast Asia with nuclear technology. Within the ASEAN grouping, Indonesia and Vietnam seek to develop national enrichment and reprocessing (ENR) programs. ENR, sensitive components of the nuclear fuel cycle, provides pathways to nuclear weapons. The current international environment is not conducive to preventing the dangerous spread of such technology as great powers compete to dominate the nuclear marketplace. Historically, intense great power competition has increased nuclear proliferation by undermining coordinated regulation of ENR facilities. Buyers of nuclear technology can exploit such rivalry by playing suppliers against each other and securing access to ENR. ASEAN states are among those positioned to exploit such dynamics. This study argues that multilateral nuclear arrangements represent the most viable path for sustaining non-proliferation commitments in Southeast Asia. Such arrangements offer non-proliferation and economic advantages over national ENR programs, providing ASEAN states a credible and cost-effective path toward civilian nuclear energy. Without them, great power rivalry, institutional shortfalls, and deteriorating security conditions across the Asia-Pacific risk accelerating the spread of sensitive nuclear technologies in the region.

KEY FINDINGS

1 Indonesia and Vietnam are determined to develop the full nuclear fuel cycle as a matter of nuclear sovereignty. Both states interpret the NPT's Article IV as granting the legal right to ENR.

2 China, Russia, and the United States are each pursuing nuclear export deals across Africa, Asia, Europe, and South America. Russia leads the global nuclear marketplace, followed by the United States, while China seeks to expand its limited export footprint. Canada, Japan, and South Korea have also indicated interest in working with ASEAN members for the development of nuclear energy.

3 Multipolarity has eroded nuclear supplier cartel cohesion, making coordinated restrictions on ENR increasingly difficult to sustain. Washington's willingness to accommodate ENR ambitions among select partners, such as South Korea and Saudi Arabia, provides ASEAN members with grounds to resist restrictions on ENR.

4 ENR is not solely a question of sovereignty over peaceful nuclear energy but a strategic calculation by states seeking to retain the option to develop nuclear weapons. ASEAN's institutional shortcomings, a deteriorating security environment, and growing pro-nuclear sentiment among elites and the general public would accelerate the pathway to nuclear weaponization in Southeast Asia.

5 ASEAN actively cooperates with the International Atomic Energy Agency (IAEA). However, ASEAN's regional and national institutions face limitations. ASEANTOM, ASEAN's platform for regional nuclear cooperation, is functionally limited as an effective body as it does not pursue enhanced regional nuclear regulations and does not conduct inspections. National regulatory frameworks also frequently fall short of full alignment with international practices, including those recommended by the IAEA. Moreover, ASEAN does not have a concrete nuclear waste management strategy.

6 Europe's experience in establishing multilateral enrichment facilities, spent fuel management, and the EURATOM regional safeguards system offers ASEAN a model for developing its own multilateral nuclear infrastructure and a legally binding regional safeguards system to strengthen nuclear governance in Southeast Asia.

ZUSAMMENFASSUNG

Die Mitgliedstaaten des Verbandes südostasiatischer Staaten (ASEAN) setzen auf Kernenergie, um nachhaltiges Wachstum und die Dekarbonisierung voranzutreiben. China, Russland und die Vereinigten Staaten konkurrieren um die Lieferung von Nukleartechnologie nach Südostasien. Innerhalb der ASEAN streben Indonesien und Vietnam den Aufbau nationaler Anreicherungs- und Wiederaufbereitungsprogramme (ENR) an. ENR, sensible Komponenten des Kernbrennstoffkreislaufs, eröffnen Wege zur Herstellung von Kernwaffen. Das derzeitige internationale Umfeld ist nicht förderlich für die Verhinderung der gefährlichen Verbreitung solcher Technologien, da die Großmächte um die Vorherrschaft auf dem Nuklearmarkt konkurrieren. Historisch gesehen hat der intensive Wettbewerb der Großmächte die Verbreitung von Kernwaffen verstärkt, indem er die koordinierte Regulierung von ENR-Anlagen untergraben hat. Käufer von Nukleartechnologie können diese Rivalität ausnutzen, indem sie die Lieferanten gegeneinander ausspielen und sich so den Zugang zu ENR sichern. Die ASEAN-Staaten gehören zu den Ländern, die in der Lage sind, solche Dynamiken auszunutzen. Diese Studie argumentiert, dass multilaterale nukleare Vereinbarungen den tragfähigsten Weg zur Aufrechterhaltung der Nichtverbreitungsverpflichtungen in Südostasien darstellen. Solche Vereinbarungen bieten gegenüber nationalen ENR-Programmen Vorteile in Bezug auf Nichtverbreitung und Wirtschaftlichkeit und eröffnen den ASEAN-Staaten einen glaubwürdigen und kosteneffizienten Weg zur zivilen Kernenergie. Ohne sie besteht die Gefahr, dass die Rivalität der Großmächte, institutionelle Defizite und sich verschlechternde Sicherheitsbedingungen im asiatisch-pazifischen Raum die Verbreitung sensibler Nukleartechnologien in der Region beschleunigen.

WESENTLICHE EMPFEHLUNGEN

1 Indonesien und Vietnam sind entschlossen, den vollständigen Kernbrennstoffkreislauf als Ausdruck ihrer nuklearen Souveränität zu entwickeln. Beide Staaten legen Artikel IV des Atomwaffensperrvertrags so aus, dass er ihnen das gesetzliche Recht auf die Erzeugung von Kernbrennstoffen gewährt.

2 China, Russland und die Vereinigten Staaten streben jeweils Nuklearexportgeschäfte in Afrika, Asien, Europa und Südamerika an. Russland ist weltweit führend auf dem Nuklearmarkt, gefolgt von den Vereinigten Staaten, während China bestrebt ist, seine bislang begrenzte Exportpräsenz auszubauen. Auch Kanada, Japan und Südkorea haben Interesse an einer Zusammenarbeit mit ASEAN-Mitgliedern bei der Entwicklung der Kernenergie bekundet.

3 Die Multipolarität hat den Zusammenhalt des Kartells der Nuklearlieferanten untergraben, wodurch es zunehmend schwieriger wird, koordinierte Beschränkungen der Anreicherung- und Wiederaufbereitungsprogramme aufrechtzuerhalten. Die Bereitschaft Washingtons, den Anreicherung- und Wiederaufbereitungsprogramme -Ambitionen ausgewählter Partner wie Südkorea und Saudi-Arabien entgegenzukommen, liefert den ASEAN-Mitgliedern Gründe, sich gegen Beschränkungen der Anreicherung- und Wiederaufbereitungsprogramme zu wehren.

4 Bei der Anreicherung- und Wiederaufbereitungsprogramme geht es nicht nur um die Souveränität über die friedliche Nutzung der Kernenergie, sondern um eine strategische Kalkulation von Staaten, die sich die Option zur Entwicklung von Kernwaffen offenhalten wollen. Die institutionellen Defizite der ASEAN, ein sich verschlechterndes Sicherheitsumfeld sowie eine wachsende Befürwortung der Kernenergie in den Eliten und der breiten Öffentlichkeit würden den Weg zur nuklearen Aufrüstung in Südostasien beschleunigen.

5 Die ASEAN arbeitet aktiv mit der Internationalen Atomenergie-Organisation (IAEO) zusammen. Die regionalen und nationalen Institutionen der ASEAN stoßen jedoch an Grenzen. ASEANTOM, die Plattform der ASEAN für regionale nukleare Zusammenarbeit, ist in ihrer Funktionsweise als wirksames Gremium eingeschränkt, da sie keine verschärften regionalen Vorschriften im nuklearen Bereich und keine Inspektionen durchführt. Auch die nationalen Regulierungsrahmen entsprechen häufig nicht vollständig den internationalen Praktiken, einschließlich der von der IAEO empfohlenen. Darüber hinaus verfügt die ASEAN über keine konkrete Strategie zur Entsorgung nuklearer Abfälle.

6 Die Erfahrungen Europas beim Aufbau multilateraler Anreicherungsanlagen, bei der Entsorgung abgebrannter Brennelemente und beim regionalen EURATOM-Sicherungssystem bieten der ASEAN ein Modell für die Entwicklung einer eigenen multilateralen nuklearen Infrastruktur und eines rechtsverbindlichen regionalen Sicherungssystems zur Stärkung der nuklearen Governance in Südostasien.

INTRODUCTION

Member states of the Association of Southeast Asian Nations (ASEAN) are pursuing nuclear energy for sustainable growth and decarbonization (World Nuclear Association, 2025; Mai & Natalegawa, 2024).[1] Potential suppliers competing for nuclear technology exports include China, Russia, and the United States. Within the ASEAN grouping, Indonesia and Vietnam stand out as countries seeking to develop national enrichment and reprocessing (ENR) programs. ENR, sensitive components of the nuclear fuel cycle, provides pathways to acquiring nuclear weapons. With the production of highly enriched uranium and separated plutonium in ENR facilities, states can potentially abandon their non-proliferation commitments and develop nuclear weapons within a short timeframe (McGoldrick, 2011, 1). The current international environment is one of multipolarity where great powers compete intensely to dominate the nuclear marketplace. In the past, great power competition has prevented nuclear suppliers from effectively coordinating and maintaining restrictions on ENR. Buyers of nuclear technology can potentially exploit such rivalry by playing suppliers against each other and securing lenient terms of nuclear cooperation, including access to ENR. ASEAN states are among those positioned to exploit such dynamics.

ASEAN states face three available paths in pursuit of nuclear energy: (1) the development of national ENR programs, (2) the full renunciation of ENR, and (3) the adoption of multilateral nuclear arrangements. This paper argues that multilateral approaches to the nuclear fuel cycle represent the most viable path for Southeast Asia in sustaining non-proliferation commitments. Multilateral nuclear arrangements would encompass the full nuclear fuel cycle without closing off any component, including enrichment. Participating states would relinquish national nuclear facilities and instead invest in shared civilian nuclear infrastructure. National and international experts would staff these facilities, and the International Atomic Energy Agency (IAEA) would closely monitor their activities. Such arrangements would limit the number of sensitive nuclear sites, subject participating states to mutual scrutiny, and establish a "proliferation firewall" in Southeast Asia (Malley & Ogilvie-White, 2009). However, participating states should avoid reprocessing given the significant costs and waste management challenges it presents. Without such arrangements, Southeast Asia risks becoming a region where great power rivalry, institutional shortfalls, and deteriorating security conditions across the Asia-Pacific accelerate the spread of sensitive nuclear technologies.

First, the paper maps the landscape of nuclear suppliers available to ASEAN. It also examines Indonesian and Vietnamese ambitions to develop national ENR programs. Second, it situates ASEAN's nuclear energy pursuit within the contest for nuclear export dominance among China, Russia, and the United States. Third, it analyzes how multipolarity has prevented great powers from working in unison to restrict the spread of ENR technology and enabled buyer states to exploit this rivalry to secure ENR access. Fourth, it assesses the proliferation risks arising from national ENR programs in

1 The ASEAN membership consist of Brunei Darussalam, Cambodia, Indonesia, Laos, Malaysia, Myanmar, Philippines, Singapore, Thailand, Timor-Leste, and Vietnam.

Southeast Asia. This includes examining how states use ENR to keep the nuclear weapons option open, how ENR capabilities combined with growing pro-nuclear sentiment among elites and the public could accelerate nuclear weaponization, and the institutional and regulatory shortcomings that leave the region ill-equipped to manage these risks. Fifth, it argues in favor of multilateral nuclear arrangements. It further recommends that ASEAN build on existing nuclear non-proliferation dialogue with the European Union (EU) (Council of the EU and the European Council, 2026). In particular, it recommends ASEAN make use of EU expertise in establishing multilateral nuclear facilities and adopt a legally binding regional safeguards system in Southeast Asia.

1. ASEAN'S PROSPECTIVE PARTNERS FOR NUCLEAR ENERGY DEVELOPMENT

ASEAN states have access to a broad array of nuclear technology suppliers as they explore nuclear power for energy security and sustainable development. For instance, Indonesia's potential partners include China, Russia, and the United States (Asia Power Monitor Today, 2025). Vietnam's prospective collaborator is Russia (Energy Monitor Worldwide, 2026b). The Philippines will likely partner with the United States, while Thailand has pursued both the United States and China for its nuclear energy ambitions (Energy Monitor Worldwide, 2024a; Energy Monitor Worldwide, 2025a).

The three great powers are not the only suppliers working to conclude contacts with ASEAN states. Canada, Japan, and South Korea have had discussions with various members. Canada has been in talks with Indonesia and Vietnam (Primayanti, 2025; Energy Monitor Worldwide, 2024b). Japan is interested in working with Indonesia, Vietnam, and Malaysia (Asia Power Monitor Today, 2026a; Energy Monitor Worldwide, 2026; New Straits Times, 2025). South Korea, which was successful in supplying the United Arab Emirates (UAE) with the Barakah nuclear power plant, is also a contender as it seeks to collaborate with Indonesia, Vietnam, and the Philippines (Kurmala, 2026; Energy Monitor Worldwide, 2026a; Asia Power Monitor Today, 2026b).

In pursuit of nuclear energy, Indonesia and Vietnam's objective is to master the nuclear fuel cycle (Viet Nam News, 2025; National Research and Innovation Agency, Government of Indonesia, 2026). The nuclear fuel cycle includes a set of processes that enable nuclear power reactors to produce electricity. Uranium serves as the primary raw material for nuclear fuel which requires multiple procedures in processing before used in generating electricity. Once consumed, there is the necessary step of managing spent fuel through either reprocessing or disposal. The nuclear fuel cycle consists of the "front-end" which involves the preparation of fuel, the "service period" in which the fuel powers a reactor to generate electricity, and the "back-end" which covers the handling of spent fuel including reprocessing and disposal. If the cycle is classified as "open" or "once-through," the spent fuel is not reprocessed. If the cycle is classified as "closed," the spent fuel undergoes reprocessing (International Atomic Energy Agency, 2018).

The stance that countries possess the legal right to the full nuclear fuel cycle, which encompass uranium enrichment and spent fuel reprocessing, remains a source of contention between developing nations and the United States. The NPT, established in 1968, was designed to prevent the spread of nuclear weapons beyond the five recognized nuclear-weapon states; the United States, Russia, the United Kingdom, France, and China. The NPT's bargain was that in exchange for renouncing nuclear weapons, signatory states under Article IV would have the right to utilize nuclear energy for peaceful purposes. Developing states contend that the NPT grants them the right to develop domestic nuclear fuel cycle technology, and that the treaty draws no distinction between "sensitive" and non-sensitive technologies. The United States argue that Article IV does not explicitly state a guarantee to the access of any specific technology, nor does it compel supplier states to facilitate such transfers (Goodman, 2026).

Indonesia falls into the category of nations that interpret Article IV as granting the legal right to develop national ENR programs. In IAEA and NPT conferences, Indonesia has repeatedly argued that it has the "sovereign right" to establish the full nuclear fuel cycle for peaceful purposes without discrimination (The Republic of Indonesia, 2024; The Republic of Indonesia, 2025). Indonesia views ENR as a step toward nuclear fuel and technology independence. To alleviate concerns, Indonesia's Nuclear Energy Regulatory Agency (BAPETEN) has emphasized that its plans for the nuclear fuel cycle will be peaceful as it will be pursued in accordance with IAEA safeguards to prevent the diversion of nuclear materials for military purposes (National Research and Innovation Agency, Government of Indonesia, 2026).

Vietnam is another ASEAN country insisting on retaining the option to develop the full nuclear fuel cycle while also demanding the United States provide lenient terms in its nuclear agreements. In 2014, Vietnam and the United States signed a nuclear agreement which did not include a legally binding provision prohibiting Hanoi from building ENR facilities (World Nuclear News, 2014). The agreement was unlike the "gold standard," where the United States in 2009 imposed a legal obligation on the United Arab Emirates (UAE) to renounce the construction of ENR facilities (Davenport & Kimball, 2023). In negotiations with the United States, Vietnam insisted it would not agree to permanent restrictions on ENR technology (Pomper, 2014). Hanoi was in a strong negotiating position as it could turn to Russia, who in 2010 agreed to build Vietnam's first nuclear power plant, had the United States insisted on the gold standard (World Nuclear News, 2010). Vietnam ended up choosing Russia as its partner to construct its first nuclear power plants but had to abandon the project in 2016 due to economic setbacks (Nguyen & Minh, 2016).

2. GREAT POWER PURSUIT FOR NUCLEAR EXPORT DOMINANCE

Under the presidencies of Donald Trump (2017–2021) and Joe Biden (2021–2025), the United States embarked on a mission to improve its competitiveness for nuclear technology exports, especially with Russia being the dominant supplier in the international marketplace (Cohen, 2024). The first

Trump administration's unfulfilled mission was to dissuade countries from partnering with China and Russia. The aim was to increase the number of countries working with U.S. government agencies and companies (DiChristopher, 2019). Similarly, the Biden administration regarded nuclear cooperation a foreign policy tool. It wanted to promote U.S. technology as a solution for ASEAN concerns over the issue of dependency on Chinese and Russian energy (Mauldin & Hiller, 2024).

With Donald Trump back in office, the United States has again attempted to intensify its pursuit of exporting nuclear technology in competition with China and Russia. In May 2025, Trump signed an executive order to deploy nuclear technologies in "support of national security objectives" (The White House, 2025). Trump instructed the U.S. government to negotiate agreements with partner countries, increase financing for U.S. nuclear projects, and to execute a plan to improve the competitiveness of U.S. companies in the nuclear marketplace. In Europe, the Trump administration aimed its nuclear reactor exports towards Poland, Bulgaria, Romania, Hungary, and Slovakia (Business Wire, 2026; Contify Energy News, 2025; Intellinews - Romania This Week, 2025; CE Noticias Financieras English, 2026b). In South America, prospective partners include El Salvador and Argentina (CE Noticias Financieras English, 2026c; U.S. Department of State, 2026). In West Asia, the focus is on Saudi Arabia and Türkiye. As of late 2025, the United States is competing with Russia to construct Türkiye's second nuclear power plant (The Saudi Gazette, 2025; Reuters, 2025).

Russia is the leading global nuclear exporter. Russia's ongoing projects include Bangladesh, Belarus, China, Egypt, Hungary, India, Iran, and Türkiye (Nakano, 2026). Russia's state nuclear company, Rosatom, offers its customers "all-inclusive" packages covering expertise in plant construction, safety training, operational support, security, spent fuel management, and flexible financing options through Russian government loans. In other words, Rosatom has attracted many potential buyers in the Global South by taking on the technical, regulatory, and financial burdens that make nuclear projects complex and costly (Schepers, 2019).

Russia's nuclear export ambitions extend to countries where the United States has strategic interests. In Latin America, Rosatom is pursuing deals with Argentina and El Salvador. Rosatom is also interested in Brazil and Nicaragua (CE Noticias Financieras English, 2026a). Beyond the Americas, Rosatom has its sights on Algeria, Niger, Uganda, Kazakhstan, and Sri Lanka (Business Insider Africa, 2025; Sri Lanka Guardian, 2025; Central Asia Economic Outlook, 2025). These targets reflect Russia's broader aim of expanding its nuclear footprint across the Global South.

China's track record for nuclear exports remains limited. However, it has emerged as a leader in the prospective development of domestic nuclear reactors. As of late 2025, China operates 57 reactors and plans to build an additional 150 by 2035 (Nuclear Business Platform, 2025). China's nuclear export ambitions have hit roadblocks with the exception of securing contracts with Pakistan. Political tensions and security concerns of potential buyers play an

important role in Beijing's limited success. In 2020, Romania cancelled a reactor deal with China in favor of the United States. The following year, Czechia barred China and Russia from bidding to build nuclear power plants in the country. In 2022, the United Kingdom ended China's involvement in its civil nuclear program citing security risk concerns (Kim, 2023; Reed, 2022). China's 2022 reactor deals with Argentina faces delays. Argentina's growing alignment with the United States and financial disagreements with China have stalled progress (Gilardini, 2025).

While China's nuclear export record remains limited, it still has ambitions of becoming a key player in the nuclear marketplace. By 2030, China aims to supply 30 reactors through its Belt and Road Initiative (BRI) (Nuclear Business Platform, 2025). In Africa, potential partners include Ghana, Kenya, Nigeria, and South Africa (Energy Monitor Worldwide, 2025b). In Central Asia, China, alongside Russia, has turned to Kazakhstan (EuroNews, 2026). In addition to Thailand and Indonesia, China has had discussions with Malaysia in Southeast Asia (Asia Times, 2026).

3. GREAT POWERS AND THE SPREAD OF ENR TECHNOLOGY

Historically, the United States has proven effective in curbing nuclear proliferation. U.S. effectiveness in preventing the spread of ENR and nuclear weapons has been shaped by the structure of the international system. Thwarting has been most effective under unipolarity, least effective under multipolarity, and somewhat effective under bipolarity. During the early Cold War period, the absence of great power cooperation fostered an increase in the number of nuclear suppliers and intense competition among them to provide export sales. ENR sales during this period were largely unrestricted which explains why seven nuclear weapons states emerged between 1945 and 1974.[2] In 1975, the United States and the Soviet Union established the Nuclear Suppliers Group (NSG). This cartel restricted ENR sales and tightened the terms under which reactors could be transferred. Consequently, buyers had fewer suppliers to turn to. U.S. unipolarity between 1991 and 2014 largely continued to constrain nuclear proliferation (Gheorghe, 2019). Recently, however, the United States has approached non-proliferation on a case-by-case basis. It has considered authorizing selected allies and partners, such as South Korea and Saudi Arabia, to develop ENR programs, all while restricting Iran's nuclear program (Sokolski, 2026). The current multipolar environment of intensified supplier competition makes non-proliferation increasingly difficult to sustain.

While there may be special circumstances in which suppliers authorize the sale of ENR technology, a functioning cartel would mandate that comprehensive safeguards accompany such sales. The cartel would have the ability to work in unison under common rules in its export policies. It would impose comprehensive safeguards that track fissile materials and verify whether nuclear installations serve

2 The seven nuclear weapon states that emerged between 1945 and 1974 were the United States (1945), the Soviet Union (1949), the United Kingdom (1952), France (1960), China (1964), Israel (1967), and India (1974).

peaceful purposes. The most effective are full-scope safeguards which apply not only to imported technologies but also to all of a buyer's nuclear facilities. Full-scope safeguards prevent buyers from using imported and indigenous technologies to pursue nuclear weapons programs. In intense rivalry, however, the cartel faces internal conflicts which makes it vulnerable to manipulation by buyers. Without an effective NSG, buyers can gain leverage by playing suppliers against one another and in the hopes of attaining ENR. Such dynamics facilitate the spread of nuclear material and technology, enabling states to either acquire nuclear weapons or become nuclear latent states, that is, states standing at the threshold of nuclear weaponization (Gheorghe, 2019).

U.S. engagement with Saudi Arabia on nuclear energy represents a case where the United States has considered authorizing ENR. Saudi Arabia is planning to enrich uranium domestically. Washington D.C. and Riyadh have negotiated a nuclear cooperation agreement that appears to have neglected the requirement for an Additional Protocol with the IAEA. In other words, the two countries agreed to a bilateral safeguards agreement applying only to facilities where U.S.-Saudi cooperation takes place, rather than to Saudi Arabia's entire nuclear program. The Trump administration has justified its negotiations with Saudi Arabia as serving U.S. national security interests and as a means to restore U.S. leadership in the global civilian nuclear energy market (Davenport, 2026b).

Another example that represents U.S. openness towards its allies acquiring ENR capabilities is South Korea. In 2025, President Trump pledged support for South Korea to enrich uranium and separate plutonium for civil nuclear purposes. These capabilities would provide South Korea with the means to produce fissile material for nuclear weapons. This raises proliferation risks, particularly given the active debate in Seoul over pursuing a national nuclear weapons deterrent (Kim, 2024). Nevertheless, the United States has indicated that ENR activities must remain consistent with the bilateral 123 agreement under the U.S. Atomic Energy Act. Under this agreement, South Korea must implement comprehensive IAEA safeguards and obtain advance U.S. consent before enriching or reprocessing any nuclear materials (Davenport, 2025).

The cases of South Korea and Saudi Arabia are relevant for ASEAN states interested in nuclear energy. ASEAN operates in an environment absent of cartel cohesion and thereby may be able to play off suppliers against each other with the aim of attaining ENR. China and Russia generally do not require the renunciation of ENR as a standard precondition of nuclear cooperation. This is not to suggest that China and Russia lack export controls. Both are members of the NSG. However, as previously noted, the distinction is that the United States typically requires recipient states to adopt the IAEA Additional Protocol and to accept constraints on ENR capabilities, or ideally to renounce them altogether. Commercial interests play an important role in China and Russia imposing fewer conditions on prospective customers. When combined with generous state-backed financing arrangements, such less restrictive approaches render the two countries as attractive partners (Einhorn, 2020). Russia's

position as the front-runner for ASEAN's nuclear energy needs presents the countries of the region with an opportunity to secure less restrictive terms for nuclear cooperation when engaging with the United States. With divergent supplier standards and a lack of cartel unity, Southeast Asia risks becoming another region susceptible to nuclear proliferation.

4. NUCLEAR PROLIFERATION RISKS AND INSTITUTIONAL SHORTCOMINGS

ENR programs are not solely a question of sovereignty over peaceful nuclear energy. They are also a strategic security calculation by states seeking to retain the option to develop nuclear weapons if security conditions demand it. U.S. tolerance of nuclear latency in states such as South Korea and Saudi Arabia risks undermining the non-proliferation regime. It can create a precedent in which Indonesia and Vietnam also pursue ENR. South Korean experts and officials have advocated for nuclear latency as an insurance policy in response to nuclear threats from North Korea. The South Korean view is that nuclear latency would allow the country to develop nuclear weapons quickly and at relatively low cost should security conditions require it (Kim, 2024). Saudi Arabia's pursuit of uranium enrichment coincides with concerns over Iran's nuclear ambitions. Riyadh has stated that it would develop nuclear weapons should Iran acquire them (Davenport, 2026a). These cases suggest that national ENR programs carry strategic dimensions that extend beyond peaceful nuclear energy and that the security environment plays a role in the deliberations of whether states will ultimately exercise nuclear restraint.

In a scenario where ASEAN states pursue national ENR programs, regional security pressures will shape their commitments to non-proliferation. At stake is the Southeast Asian Nuclear-Weapon-Free Zone (SEANWFZ). ASEAN's 1995 Bangkok Treaty establishing the SEANWFZ is under strain as nuclear weapon states resist negative security assurances. ASEAN has invited the P5 (China, France, Russia, the United Kingdom, and the United States) to sign a protocol of accession committing them not to use or threaten the use of nuclear weapons against states in the region. Despite negotiations since 2011, the P5 have declined to sign the treaty (Caballero-Anthony & Trajano, 2023). In 2025, however, China indicated its intention to sign the SEANWFZ (Reuters, 2025). In Northeast Asia, growing South Korean support for an indigenous nuclear weapons capability and wavering positions among Japanese officials on the country's non-nuclear principles signal that nuclear weapons are becoming an immediate regional concern. If nuclear weapons draw closer to ASEAN's doorstep and the great powers continue to disregard the SEANWFZ, the ASEAN governments may struggle to remain committed to non-proliferation (Taylor, 2026).

The path towards a decision on developing an indigenous nuclear weapons capability would hinge on the emergence of a pro-nuclear-weapon lobby in an ASEAN state. While today, political rhetoric in ASEAN supporting nuclear weaponization does not carry significant weight, an ASEAN state with a future indigenous ENR program would cause concern. Indonesia has been a steady advocate for non-proliferation

in international forums, with the notable exception of President Sukarno's interest in acquiring nuclear weapons in the mid-1960s (Cornejo, 2000; Zhou, 2019). However, prominent officials have made statements diverging from this position. In 2020, Maritime Affairs and Investment Minister Luhut Pandjaitan stated that Indonesia had the capacity to build nuclear weapons should it have the desire. The comment reportedly was prompted by the perception that Indonesia was being overlooked by U.S. officials at a meeting attended by representatives from nuclear-armed states (Lidyana, 2020). This statement is best understood as domestic political posturing, devoid of actual assessments of economic, political, and technical realities regarding the costs and know-how of fissile material production and warhead development and deployment. However, should such rhetoric become more widespread in the future, an ENR-capable Indonesia would warrant nuclear anxiety among its regional partners and the international community.

The combination of regional security pressures and potential national ENR programs in Southeast Asia also calls into question a scenario in which policymakers shift to revisiting domestic and international legislation such as the NPT that tie nations into non-proliferation commitments. In 2023, Indonesia's former president Megawati Sukarnoputri suggested that North Korea could serve as a model for Indonesia's nuclear energy program with its limited financial resources (South China Morning Post, 2023). While Megawati did not explicitly call for withdrawal from the NPT, even a generous reading of this incoherent statement cannot ignore how North Korea withdrew from the NPT in 2003 and has since failed to develop operational nuclear power plants. It has also become a de facto nuclear-armed state with an estimated arsenal of 50-90 warheads (Arms Control Association, 2024). In the Philippines, Juan Ponce Enrile, the Chief Presidential Legal Counsel (2022–2025) under President Ferdinand Marcos Jr., stated that he favored removing the ban on nuclear weapons enshrined in the 1987 Philippine Constitution. Enrile argued that nuclear weapons offered small countries protection against nuclear superpowers (Philippines Daily Inquirer, 2023). Vietnam appears to be the exception. There is no public record of political elites stating a position in favor of nuclear weapons acquisition. While the statements by the Indonesian and Filipino politicians did not represent official policy, the option of having a quicker pathway to nuclear weaponization will provide ASEAN states an opportunity to reevaluate non-proliferation principles in a deteriorating security environment.

Public opinion in the Asia-Pacific also appears broadly supportive of nuclear armament which reduces a key domestic constraint on proliferation. National ENR programs would speed up the process. For example, according to a 2023 survey involving participants from Indonesia, Taiwan, South Korea, Australia, and Japan, interest in nuclear proliferation appeared to be widespread across the Asia-Pacific. In Indonesia and Taiwan, 62% and 60% of respondents were in favor of a national nuclear weapons program. Respondents from South Korea also supported nuclear weaponization at 69%. In Australia and Japan, proponents of nuclear armament were more limited in comparison (Sukin & Seo, 2024). Consensus among the

majority of ruling elites, experts, and the general public on the necessity of nuclear armament would upend decades of ASEAN non-proliferation policy.

ASEANTOM serves as ASEAN's primary platform for regional nuclear cooperation. However, it is functionally limited as an effective body. Established in 2013, ASEANTOM connects nuclear regulatory authorities across Southeast Asia to share information on nuclear safety and security. Through expert exchanges, technical workshops, and cooperation projects with the IAEA and the European Union, it has strengthened knowledge and expertise across member states (Caballero-Anthony & Trajano, 2023). However, ASEANTOM lacks a secretariat and confines its activities to workshops. It does not pursue enhanced regional nuclear regulations, nor does it conduct inspections. Its role encompasses information exchange rather than meaningful oversight (Findlay, 2022). Such shortcomings reflect ASEAN's broader make-up. The absence of legally binding agreements and compliance mechanisms has hampered the organization's ability to manage regional economic and security challenges effectively (Caballero-Anthony, 2022). ASEANTOM's structural constraints suggest that without meaningful institutionalization, regional nuclear governance will remain limited in its capacity to enforce non-proliferation commitments.

At the national level, ASEAN states face significant regulatory shortcomings that could undermine the safe pursuit of nuclear energy. For Indonesia and Vietnam specifically, the concern is whether their nuclear programs would be seen as credible and transparent by the international community. It is important to note that all ASEAN members, with the exception of Brunei, have signed the IAEA Additional Protocol, which meets the prerequisite for nuclear transparency. However, regardless of political adherence to the non-proliferation regime, others may question the credibility of Indonesian and Vietnamese nuclear governance, given that both countries struggle with high levels of corruption (Nguyen & Yim, 2018). Governance deficits in infrastructure development could ultimately generate distrust about nuclear intentions among regional neighbors.

National regulatory frameworks frequently fall short of full alignment with international practices, including those recommended by the IAEA. For example, gaps exist in areas such as liability for nuclear damage and the safe transport of radioactive materials. A second shortcoming is the absence of a clear nuclear waste management agenda. Problems in effective nuclear waste management, however, are not unique to ASEAN. It is a global issue. Many countries grapple with the problem of storing and disposing of radioactive materials over the long term (Southeast Asia Public Policy Institute, 2025; Yong, 2026). Should Indonesia or Vietnam pursue nuclear energy programs, gaps in regulatory frameworks and spent fuel oversight would produce serious proliferation risks in Southeast Asia (Desai, 2026).

5. MULTILATERAL NUCLEAR ARRANGEMENTS AND AVENUES FOR ASEAN–EU ENGAGEMENT

ASEAN states pursuing nuclear energy have three available paths moving forward. Given

the gaps in institutional frameworks, each path will have varying degrees of effectiveness in preventing a trajectory toward nuclear weaponization. The options are: (1) the adoption of national ENR programs, whereby each member state pursuing nuclear energy develops its own individual ENR facilities; (2) the adoption of the non-proliferation gold standard, whereby ASEAN states formally renounce the development of national ENR programs; and (3) the adoption of multilateral nuclear arrangements, whereby member states seek the shared ownership of new ENR facilities.

The first path, national ENR programs, presents the greatest proliferation risk. Waste disposal and security would fall entirely to each individual country. Transparency in nuclear activities would not be guaranteed as a result (Hippel & Hayes, 2018). ASEAN's existing institutional infrastructure is ill-equipped to oversee national ENR programs effectively. This further raises the proliferation risks associated with this path.

The second option, the renunciation of ENR, is the most effective in guarding against nuclear weaponization. However, Indonesia and Vietnam consider ENR a legal right and are unlikely to renounce it. Great power competition between China, Russia, and the United States over the nuclear marketplace further reduces the likelihood of coordinated pressure on buyer states. Additionally, if the United States authorizes ENR for South Korea and Saudi Arabia, Indonesia and Vietnam would likely cite discrimination as grounds to resist similar pressure on their own programs.

The third path, multilateral approaches to the nuclear fuel cycle, offers a middle ground to sustain non-proliferation commitments. Such arrangements would involve the construction of new regional joint facilities for uranium enrichment, spent fuel reprocessing, and spent fuel storage and disposal (International Atomic Energy Agency, 2005). Shared facilities would give participating states greater visibility into each other's nuclear activities and serve as concrete confidence-building measures among ASEAN members.

While pursuing multilateral nuclear arrangements, this study recommends ASEAN prioritize the once-through nuclear fuel cycle and pathways towards spent fuel disposal over reprocessing. Reprocessing introduces risks as it produces purified plutonium which actors can use for nuclear weapons. In practice, reprocessing also leaves the majority of recovered material unused. Rather than reducing nuclear waste, reprocessing can generate additional radioactive waste that are difficult and costly to manage, while still requiring permanent disposal (Matzkin-Bridger, 2025). For ASEAN states, reprocessing would be an economically costly and proliferation-sensitive undertaking.

Multilateral nuclear arrangements hold non-proliferation advantages over national ENR programs. They reduce the number of sites where sensitive nuclear activities take place. This limits opportunities for the misappropriation of sensitive material and reduces proliferation risks associated with unnecessary separation of plutonium. Joint facilities with multinational staff place all participating states under greater peer scrutiny. This provides assurance to the international community that the fuel cycle

is less vulnerable to misuse for weapons. Multilateral arrangements can also serve as an obstacle to nuclear breakout by host states. While they do not provide a fool-proof measure, if operated under full IAEA safeguards, they would be more effective in preventing nuclear breakout than solely national facilities (International Atomic Energy Agency, 2005, 13–14, 38–39, 119–120; Bunn et al., 2001, 64–67). For ASEAN states, multilateral arrangements would therefore offer a credible and verifiable path toward civilian nuclear energy.

Multilateral nuclear arrangements would also deliver economic benefits that make them a practical option for states with limited resources. They would generate economies of scale. Such facilities would be cheaper to operate than multiple national facilities. They would avoid large-scale duplication of efforts involved in building separate national geological repositories. States that lack the territory or financial capacity to construct their own geological repositories would find a shared regional facility a cost-effective alternative. Host countries would also benefit directly from the large capital investment and job creation that comes with hosting a multilateral facility (International Atomic Energy Agency, 2005, 13–14, 38–39; Bunn et al., 2001, 64–67). The convergence of non-proliferation and economic incentives makes multilateral arrangements a compelling policy option for ASEAN states pursuing nuclear energy.

In the case that ASEAN moves forward with multilateral nuclear arrangements, the European Union's (EU) experience in regional nuclear cooperation can provide direction for the organization. Existing ASEAN–EU collaboration consists of nuclear emergency preparedness, information exchange, and risk mitigation, and commitment to institutional capacity building. Since 2014, the European Commission has supported ASEANTOM through an Emergency Preparedness and Response (EP&R) project aimed at developing a regional platform for coordinating responses to nuclear and radiological emergencies (Caballero-Anthony & Trajano, 2022, 153). Moreover, the ASEAN–EU Strategic Partnership Plan of Action (2023-2027) committed to strengthening ASEANTOM's technical and institutional capacity. Topics included nuclear safety and security and mitigating chemical, biological, radiological, and nuclear (CBRN) risks. Broader commitments included preserving the SEANWFZ, advancing disarmament and non-proliferation, and promoting peaceful uses of nuclear energy (The ASEAN Secretariat, 2022).

While existing ASEAN–EU engagement is promising, it has yet to substantially address the back-end of the nuclear fuel cycle. ASEAN would benefit from EU experience in studying spent fuel management. In 2006, the European Commission launched the Strategic Action Plan for Implementation of European Regional Repositories (SAPIERR II) to assess the feasibility of shared repositories for high-level nuclear waste. The project examined organizational, legal, economic, safety, and public acceptance issues related to shared repositories. Building on these findings, 14 countries established the European Repository Development Organization (ERDO) in 2009 and created a working group to study multinational waste

management. [3] The working group considered a dual-track model in which countries pursue national disposal plans alongside shared facilities (McCombie & Chapman, 2015; World Nuclear Association, 2025). This body of experience provides ASEAN with a foundation from which to initiate collaboration with the EU on spent fuel management.

ASEAN members should also conduct expert group studies with the EU on multilateral facilities as applied to the Southeast Asian region to help assess the advantages and challenges of constructing enrichment facilities. The EU's experience with Urenco and Eurodif offers precedents for evaluating the possibilities and complexities of regional nuclear cooperation. In 1971, the United Kingdom, Germany, and the Netherlands established Urenco, operating enrichment plants in Almelo, Netherlands and Capenhurst, United Kingdom. In 1973, France, Italy, Belgium, Spain, and Sweden established Eurodif as a multinational joint stock company and built an enrichment plant at the Tricastin nuclear power plant in France. By 1983, these two centers had become major producers. Eurodif's Tricastin plant produced 10.8 million separative working units (SWU) annually, while Urenco's plants each produced 500,000 SWU (Nuti, 2023). Institutional and technical lessons from Urenco and Eurodif would provide ASEAN a concrete foundation for pursuing multilateral facilities.

The prospect of ENR in Southeast Asia calls for legally binding nuclear governance that ensures rigorous inspections, verification, and accountability over nuclear activities. ASEAN, therefore, should transform ASEANTOM into a supranational body modeled after EURATOM. The aim would be to have an organization capable of establishing regional safeguards that complement IAEA oversight of nuclear fuel cycle facilities. For instance, in EURATOM's case, Article 77 provides the legal foundation for safeguards obligations. It requires member states to refrain from diverting nuclear materials away from peaceful uses and ensures compliance with obligations under international agreements. In other words, EURATOM addresses both non-diversion and non-proliferation commitments under agreements with the IAEA and supplier countries. The partnership operates through formal working groups and committees. EURATOM and the IAEA jointly conduct around 60% of inspections and share the costs of verification equipment (Ciccarello & Lechner, 2018). An ASEANTOM modeled after EURATOM would help ASEAN establish stronger safeguards that complement IAEA oversight and future-proof the region against nuclear proliferation.

Finally, ASEAN should explore a EURATOM-style safeguards system to strengthen the SEANWFZ. While scholars typically apply EURATOM's model to a potential Middle East nuclear-weapon-free zone, its framework is relevant to the SEANWFZ.

3 The 14 countries involved in the creation of ERDO were Austria, Bulgaria, Czech Republic, Denmark, Estonia, Ireland, Italy, Latvia, Lithuania, Netherlands, Poland, Romania, Slovakia, and Slovenia.

EURATOM's experience demonstrates that regional nuclear confidence depends on sustained institutional engagement. This includes high-level political negotiations, unified governance structures, member state transparency, and technical collaboration between nuclear energy commissions. A EURATOM-style system would deliver operational benefits by pooling resources with the IAEA and applying a uniform standard for safeguards across member states regardless of their individual technical capacity. Together, such measures have established the foundation for meaningful non-proliferation commitments at the bilateral, regional, and international levels (Szymanski, 2011; Kibaroglu, 2013). Adopting a regional safeguards system would reinforce the SEANWFZ and strengthen its credibility as a legally binding non-proliferation instrument in Southeast Asia.

CONCLUSION

ASEAN states are pursuing multiple nuclear suppliers for their nuclear energy programs. The current international environment is one of intense great power rivalry, where China, Russia, and the United States are competing for global dominance of civil nuclear exports. This rivalry has eroded the cohesion of the nuclear supplier cartel, as divergent standards among suppliers and the United States' willingness to authorize ENR for select allies and partners have weakened the coordinated pressure that once constrained the spread of sensitive nuclear technologies. Without cartel unity, buyer states such as Indonesia and Vietnam are well positioned to play suppliers off one another to secure favorable terms in nuclear cooperation agreements, including rights to ENR.

For Indonesian and Vietnamese officials, national ENR programs are a matter of nuclear sovereignty. However, ENR facilities pose proliferation risks. Moreover, the security environment in the broader Asia-Pacific, including growing support for nuclear armament in Northeast Asia may over time erode the domestic and regional constraints that have kept ASEAN states committed to non-proliferation. Should a pro-nuclear weapons lobby consolidate among ruling elites and the general public in an ENR-capable ASEAN state, the pathway toward nuclear weaponization would become considerably shorter. Yet ASEAN states lack the institutional infrastructure to manage these dangers. The region lacks stringent legally binding rules capable of effectively tracking nuclear activities and ensuring non-proliferation standards are met. It is precisely these gaps that make the case for multilateral nuclear arrangements.

While ASEAN states have limited influence over nuclear disarmament, securing negative security assurances for Southeast Asia, or dissuading Northeast Asian neighbors from pursuing nuclear weaponization, those members seeking nuclear energy can nonetheless take concrete steps to reduce proliferation risks within the region. ASEAN states should therefore invest in expert study groups, both as an organization and in collaboration with the EU and the IAEA, to

advance multilateral nuclear arrangements including joint facilities and a legally binding regional safeguards system. The aim of such measures is to establish robust inspection and verification mechanisms over nuclear activities and chart a credible path toward non-proliferation in Southeast Asia amid a deteriorating global security environment.

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