

Altyapının Ötesinde: 2015-2025 Döneminde Balkanlar'da Nükleer Güvenlik ve Düzenleyici Uyum**Beyond Infrastructure: Nuclear Security and Regulatory Alignment in the Balkans (2015-2025)***Bahar AKIN¹*

Atıf/Citation: Akın, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

Özet

Bu makale, 2015–2025 döneminde Balkanlar'da nükleer güvenliğin giderek düzenleyici ve normatif bir nitelik kazandığını incelemektedir. Bölgedeki nükleer güvenlik, askerî rekabet ya da stratejik çatışmadan ziyade kurumsal eşgüdüm, düzenleyici hazırlık ve uluslararası normlarla sürdürülen etkileşim üzerinden şekillenmiştir. Balkanlar literatürünün büyük ölçüde enerji jeopolitiği ve altyapı temelli güvenlik tartışmalarına odaklandığı bir bağlamda, bu çalışma nükleer güvenliğin daha az görünür ancak etkili bir dönüşümünü düzenleyici alan üzerinden ele almaktadır.

Bulgaristan, Romanya ve Sırbistan örneklerine odaklanan analiz, nükleer güvenliğin nükleer altyapının eşitsiz dağılımı ve kurumsal kapasite farklılıkları doğrultusunda farklı ulusal yönelimler izlediğini göstermektedir. Bulgaristan ve Romanya, faal nükleer tesislerin denetimine dayalı süreklilikçi yaklaşımları temsil ederken, Sırbistan nükleer enerji altyapısının bulunmadığı bir bağlamda nükleer güvenliği daha temkinli ve öngörüye dayalı bir çerçevede ele almaktadır. Türkiye ise bu bölgesel görünüm içinde ayrı bir konumda yer almaktadır. Türkiye'nin yaklaşımı doğrudan düzenleyici ve uygulamaya dönük deneyimle şekillenmiş olmakla birlikte, bu deneyim bölgesel güç projeksiyonundan ziyade iç kurumsal kapasitenin güçlendirilmesine yöneliktir.

Anahtar Kelimeler: *Balkanlar, Askeri Olmayan Güvenlik, Düzenleyici İşbirliği, Nükleer Güvenlik, Bölgesel güvenlik kompleksi, Türkiye*

Abstract

This article explores how nuclear security has acquired a distinct and increasingly regulatory character in the Balkans between 2015 and 2025. Rather than being driven by military competition or strategic rivalry, nuclear security in the region has evolved primarily through institutional coordination, regulatory preparedness, and sustained engagement with international norms. While much of the existing literature approaches the Balkans through the perspective of energy geopolitics and infrastructure-centered security concerns, this study draws attention to a quieter but consequential transformation taking place in the regulatory domain.

Focusing on Bulgaria, Romania, and Serbia, the article demonstrates that nuclear security follows different national trajectories shaped by uneven nuclear infrastructure and varying institutional capacities. Bulgaria and Romania reflect continuity-oriented approaches grounded in the oversight of operating nuclear facilities, whereas Serbia engages with nuclear security in a precautionary and forward-looking manner despite the absence of nuclear power infrastructure. Turkey occupies a distinct position within this regional landscape. Its approach is informed by direct regulatory and operational experience, yet it remains oriented toward internal institutional consolidation rather than outward power projection.

Keywords: *Balkans, non-military security, regulatory cooperation, Nuclear Security, regional security complex, Türkiye*

Article Type

Research Article

Application Date

July 7 2026

Admission Date

September 21 2026

¹ Dr., Independent Researcher,
baharbarutakin@gmail.com,
ORCID: 0009-0007-9597-3444

Atıf/Citation: Akın, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

1. INTRODUCTION

Energy has long constituted a central component of security debates in the Balkans, particularly in relation to supply routes, transit corridors, and the strategic involvement of external actors. Within this literature, Türkiye's regional role has predominantly been examined through the prism of energy diplomacy and infrastructural connectivity, emphasizing projects such as TurkStream and the Trans-Balkan system as key instruments shaping regional influence and alignment (Erşen, 2019; Virág, 2018; Novikau, 2023). These studies have significantly advanced our understanding of the geopolitical and economic dimensions of Türkiye's engagement. At the same time, they have tended to associate security primarily with energy flows and market dynamics while giving comparatively limited attention to the regulatory and normative dimensions of security that increasingly accompany energy cooperation. The Balkans constitute a broad and heterogeneous regional setting and can equally be approached through alternative frameworks such as the Western Balkans or wider European energy corridors. This study, however, does not aim to provide a comprehensive account of regional energy competition or supply dynamics. Issues such as Eastern Mediterranean gas reserves, LNG infrastructure, or competitive energy routes involving actors like Greece and Italy, while relevant for European energy markets, are addressed here only as part of the broader background. The analytical focus is instead placed on nuclear security as a regulatory and norm-based domain, where institutional interaction, preparedness, and alignment with international standards play a more central role than market competition or strategic rivalry. Since the mid-2010s, developments in nuclear energy have introduced a qualitatively different set of security considerations into the Balkan context. Reactor lifetime extensions and expansion plans in Bulgaria and Romania, renewed debates on nuclear options in Serbia, and Türkiye's regulatory and operational experience through the Akkuyu Nuclear Power Plant have collectively brought nuclear energy into regional discussions not merely as an energy source but as an issue closely linked to risk management, regulatory oversight, and international standards. Unlike conventional energy corridors, nuclear energy entails security concerns that are addressed less through market mechanisms or infrastructure alone than through sustained compliance with internationally defined rules and monitoring practices.

This transformation is particularly salient in a regional setting characterized by the absence of a Balkan-centered military power and limited prospects for hard power competition. Regional security scholarship has emphasized that security dynamics are shaped not only by material capabilities but also by patterns of interaction and institutional density within a given regional context (Buzan & Wæver, 2003). In the Balkans, nuclear security concerns increasingly materialize through regulatory alignment, reporting obligations, and oversight mechanisms, rather than through deterrence or coercive enforcement.

According to Stephen Krasner's regime determination, the functioning of regimes depends on the ability of relevant actors to come together around shared principles with strong political will, to develop rules that translate these principles into patterns of behavior, and to apply sound and credible decision-making processes. It also requires all relevant actors to engage in the process with sustained commitment.

From this perspective, we can understand nuclear security as part of a regime-based security environment, in which shared norms, rules, and procedures structure state behavior. International frameworks from the International Atomic Energy Agency and European regulatory standards define expectations for transparency, safety, and security, influencing national policies without relying on military instruments. This mode of security production corresponds with the logic of complex interdependence, where outcomes emerge from dense networks of cooperation and mutual constraint rather than hierarchical power relations (Keohane & Nye, 1977).

Atıf/Citation: Akın, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

Against this backdrop, this article contends that security dynamics in the Balkans between 2015 and 2025 cannot be adequately captured through prevailing accounts that prioritize energy diplomacy, infrastructural connectivity, or geopolitical leverage. As nuclear energy re-enters regional debates, security concerns increasingly revolve around regulatory compliance, risk management, and adherence to internationally defined standards rather than military competition or strategic coercion. Within this context, no regional actor, Türkiye included, emerges as one seeking to construct new regional institutions or to project power through nuclear capabilities. Instead, engagement takes the form of embedded participation in the regional internalization and application of existing international nuclear security regimes.

Accordingly, this study asks the following research question: How has nuclear security emerged as a regulatory and norm-based security domain within the Balkan regional security complex between 2015 and 2025, and how do states with markedly different nuclear infrastructures — Bulgaria, Romania, Serbia, and Türkiye — become embedded within this domain?

By addressing this question, the article aims to offer a more context-sensitive understanding of how nuclear security operates within the Balkan security environment and to contribute to broader debates on regional security and international regimes by highlighting nuclear security as a regulatory and normative domain.

This article contributes to the literature by conceptualizing nuclear security in the Balkans as a non-military, regulatory security domain and by positioning Türkiye not as a power-projecting actor but as an embedded participant in the regional internalization of international nuclear security norms.

The article proceeds by first clarifying the conceptual and theoretical framework, followed by an examination of the evolving nuclear landscape in the Balkans and Türkiye's engagement within this context during the 2015–2025 period. The concluding section discusses the implications of these findings for the study of regional security and norm-based forms of cooperation. The temporal focus on the 2015–2025 period reflects a broader transformation in the Balkan energy architecture, marked by the emergence of new natural gas corridors such as TurkStream and the parallel re-entry of nuclear energy and nuclear security considerations into regional policy debates.

2. THEORETICAL FRAMEWORK

This study draws on established approaches in international relations theory to conceptualize nuclear security in the Balkans as a non-military and regionally embedded security domain. Rather than treating security as a phenomenon produced primarily through military competition or deterrence, the analysis starts from the premise that security dynamics are often shaped by patterns of interaction, institutional density, and regulatory alignment at the regional level. In this respect, the Regional Security Complex Theory offers a useful framework for understanding how security concerns cluster geographically and how regional settings structure the ways in which threats, vulnerabilities, and responses are articulated (Buzan & Wæver, 2003).

Within the Balkan context, this regional perspective is particularly relevant. The absence of a single local military hegemon and the enduring influence of external actors have produced a security environment in which direct military rivalry among regional states plays a limited role. Instead, security is frequently mediated through external normative frameworks, institutional commitments, and regulatory practices associated with European and international organizations. As Buzan and Wæver emphasize, such configurations do not indicate the absence of security dynamics but rather point to

Atıf/Citation: Akin, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

forms of security that are shaped through indirect, institutional, and often non-militarized mechanisms. This understanding allows the analysis to move beyond conflict-centered readings of the Balkans and to recognize regulatory domains as integral components of regional security. In line with regional security approaches, the Balkans are treated here less as a space defined by fixed alliance patterns or explicit rivalry and more as a regional context shaped by shared risk perceptions and dense institutional interaction. In this sense, security dynamics emerge primarily through regulatory coordination and overlapping governance practices rather than through formal regional organizations or clearly articulated friend–enemy configurations.

At the same time, the logic of complex interdependence highlights how security outcomes in such settings emerge through multiple channels of interaction that extend beyond traditional state-to-state or military relationships (Keohane & Nye, 1977). Regulatory authorities, technical agencies, and international organizations play a central role in shaping behavior by establishing rules, standards, and expectations that constrain and guide state action over time. In areas characterized by high technical complexity and shared risk, such as nuclear energy, military force offers little utility as a security instrument. Instead, security is produced through compliance, monitoring, and the internalization of internationally defined norms.

Taken together, these theoretical perspectives provide the analytical foundation for approaching nuclear security in the Balkans as a regulatory and norm-based form of regional security. They make it possible to examine how nuclear security practices become embedded within regional interaction patterns without presupposing military competition or power projection as the primary drivers of security. This framework also creates conceptual space for situating Türkiye not as a dominant security provider, but as an embedded participant whose role is shaped through engagement with existing regulatory regimes and institutional practices within the broader Balkan security environment.

3. METHODOLOGY

This article adopts a qualitative research design to examine Türkiye’s engagement with nuclear security dynamics in the Balkans during the 2015–2025 period. The study is exploratory in nature and aims to trace how nuclear security has emerged as a regulatory and norm-based domain within the broader regional security environment, rather than as a field shaped by military competition or coercive power.

This approach is consistent with broader security studies scholarship that conceptualizes security as increasingly institutionalized and governed through rules, standards, and compliance mechanisms (Buzan & Wæver, 2003; Keohane & Nye, 1977).

The analysis relies primarily on document analysis and process tracing. Key sources include official documents and reports produced by international organizations such as the International Atomic Energy Agency (IAEA), relevant European Union regulatory frameworks, national nuclear and energy strategies of selected Balkan states, and Türkiye’s regulatory and institutional arrangements related to nuclear energy and nuclear security. Academic literature on regional security, energy cooperation, and non-military forms of security interaction complements these materials.

The study employs process tracing to identify critical developments and patterns that link changes in regional energy connectivity with the growing salience of nuclear security considerations. Rather than seeking causal generalization, the study focuses on reconstructing how regulatory practices,

Atıf/Citation: Akın, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

institutional alignments, and norm internalization processes have evolved and how Türkiye has become embedded within these regional dynamics. Particular attention is paid to moments of regulatory convergence, international peer review mechanisms, and cooperative safety and security initiatives that illustrate the functioning of nuclear security beyond traditional military frameworks.

The geographical scope of the study centers on the Balkans, with a focused examination of Bulgaria, Romania, and Serbia, where nuclear energy debates and regulatory developments have been most visible during the selected period. Türkiye is analyzed not as a dominant security provider but as a regional actor whose engagement with nuclear security is shaped through participation in international regulatory practices and interaction with regional institutional environments. This methodological approach allows for a contextualized and nuanced assessment of nuclear security as a component of regional security in the contemporary Balkans.

The research relies primarily on document analysis and process tracing, methods commonly employed to examine institutional change and norm diffusion in international security and regulatory settings (George & Bennett, 2005; Checkel, 2005). Core sources include official documents and reports produced by the International Atomic Energy Agency (IAEA), European Union nuclear safety and security frameworks, and national nuclear and energy strategies of selected Balkan states. These materials draw on academic literature on regional security, non-military security practices, and the governance of complex technological risks (Duffey & Zio, 2015; Goldschmidt, 2010). Process tracing is used to identify key developments through which regulatory practices, institutional alignment, and norm internalization have evolved across the region since the mid-2010s.

Selection: Bulgaria, Romania and Serbia

The empirical focus of the study is on Bulgaria, Romania, and Serbia, selected for their distinct yet complementary positions within the evolving nuclear landscape of the Balkans. Bulgaria and Romania represent cases with established nuclear energy infrastructures that operate under European nuclear safety and security regimes, including EU-level regulatory oversight and peer review mechanisms, making them particularly relevant for examining institutionalized nuclear security practices (European Commission, 2014; International Atomic Energy Agency [IAEA], 2016). Serbia, by contrast, does not operate a nuclear power plant but has increasingly engaged in nuclear energy debates, research cooperation, and regulatory capacity-building initiatives since the mid-2010s, offering insight into emerging nuclear security dynamics in the absence of operational facilities (IAEA, 2023; World Nuclear Association, 2022). Together, these cases capture variation in regulatory experience, institutional embeddedness, and nuclear policy trajectories within the region, while remaining sufficiently comparable to support a focused qualitative analysis.

Türkiye is not treated as a separate case in this analysis, as the study does not aim to conduct a country-level comparison. Instead, Türkiye is approached as a contextual and relational actor whose regulatory experience, institutional learning processes, and engagement with international nuclear standards shape the regional nuclear security environment of the Balkans, which in turn shapes Türkiye's own regulatory experience, institutional learning processes, and engagement with international nuclear standards. This positioning reflects broader patterns of regional security interaction in which states influence security outcomes through participation in international regulatory practices rather than through direct coercive power (Keohane & Nye, 1977; Buzan & Wæver, 2003).

The selection of Bulgaria, Romania, and Serbia is guided by their distinct yet complementary positions within the evolving nuclear landscape of the Balkans. Bulgaria and Romania represent countries with established nuclear energy infrastructures that are deeply embedded within European regulatory frameworks, offering insight into how nuclear security practices operate in settings

Atıf/Citation: Akin, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

characterized by high levels of institutional alignment. Serbia, by contrast, does not operate a nuclear power plant but has increasingly engaged in nuclear energy debates and regulatory discussions during the post-2015 period, providing a contrasting case of emerging regulatory interest without operational capacity. Together, these cases capture variation in regulatory experience, institutional embeddedness, and nuclear policy trajectories within the region, while remaining sufficiently comparable to support a focused qualitative analysis.

Developments following the war in Ukraine after 2022 have increased the strategic visibility of energy infrastructure projects such as TurkStream and reshaped European supply routes more broadly. While these shifts form an important part of the regional backdrop, this article approaches them as contextual conditions rather than as primary drivers of the analysis, which remains focused on nuclear security as a regulatory and institutional domain.

4. EMPIRICAL ANALYSIS: NUCLEAR SECURITY DYNAMICS IN THE BALKANS (2015–2025) |

This section examines how nuclear security has taken shape in the Balkans during the 2015–2025 period through regulatory practices, institutional interaction, and international alignment. Rather than approaching nuclear security as a function of military capabilities or strategic competition, the analysis focuses on how shared risk perceptions, internationally circulating norms, and regulatory expectations structure security dynamics in the region. In line with the methodological framework outlined earlier, the section proceeds from the international framing of nuclear security toward country-specific regulatory practices, reflecting the non-military and institutionally embedded character of nuclear security in the Balkans. The 2015–2025 period captures a gradual transformation in the Balkan energy and security landscape, marked by the consolidation of regulatory practices, the expansion of transnational energy infrastructure, and the re-emergence of nuclear energy and nuclear security considerations in regional policy debates. Rather than reflecting abrupt shifts or crisis-driven change, this period allows for tracing how nuclear security practices evolved incrementally through institutional learning and regulatory alignment.

This empirical section is guided by the following analytical question: *how does nuclear security take shape in a regional context where nuclear power infrastructure is unevenly distributed and where security concerns are addressed primarily through regulatory and institutional mechanisms rather than military instruments?* By focusing on Bulgaria, Romania, Serbia, and Türkiye, the analysis examines how differing national starting points generate distinct policy logics while remaining embedded within a shared regional and international nuclear security environment. While Bulgaria and Romania are shaped by the operational demands of existing nuclear power plants, Serbia's approach remains anticipatory in the absence of nuclear infrastructure, and Türkiye occupies a distinct position informed by direct regulatory and operational experience (Buzan & Wæver, 2003; Bunn, 2016).

4.1. Shared Risk Perceptions and the International Framing of Nuclear Security in the Balkans

In the Balkans, nuclear security has not developed in response to direct military threats or strategic competition, but through a more gradual process shaped by shared risk awareness and international policy diffusion. The management of nuclear and radiological materials has increasingly been framed as a matter of collective concern, grounded in the recognition that potential incidents are unlikely to remain confined within national borders. This framing reflects a broader shift in international security thinking, where certain categories of risk are understood as transboundary by nature and therefore resistant to purely national solutions (Goldschmidt, 2010; Dunn Cavelty, 2008).

Rather than being articulated through emergency-driven narratives, nuclear security has entered regional agendas in the Balkans through regulatory, administrative, and institutional channels. It has

Atıf/Citation: Akin, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

become associated with routine governance practices concerned with prevention, oversight, and preparedness. In this sense, nuclear security aligns with what has been described in the literature as a form of non-military security production, in which stability is generated through rules, procedures, and institutional coordination rather than through deterrence or coercion (Keohane & Nye, 1977; Buzan & Wæver, 2003).

The international framing of nuclear security has also intersected with broader processes of institutional alignment and credibility-building in the region. Engagement with external regulatory frameworks and internationally recognized standards has functioned not only as a technical requirement but also as a means of signaling administrative capacity and political reliability. In regions characterized by sustained interaction with European and multilateral institutions, security practices increasingly operate as indicators of institutional maturity and regulatory competence (Checkel, 2005; Zürn, 2018). Within this context, nuclear security has become embedded in wider expectations regarding transparency, rule adherence, and participation in cooperative oversight mechanisms.

At the same time, the diffusion of shared understandings has not produced a uniform regional landscape. Differences in historical experience, regulatory capacity, and institutional resources continue to shape how Balkan states interpret and implement nuclear security. However, these differences unfold within a broadly accepted international framework that structures interaction and renders divergence manageable. Rather than undermining cooperation, variation becomes an integral part of a rule-based environment in which adjustment and institutional learning remain ongoing processes (Duffey & Zio, 2015; Goldschmidt, 2010).

Taken together, these dynamics suggest that nuclear security in the Balkans has emerged as a non-military, internationally constituted domain of regional security, shaped by shared risk perceptions, regulatory convergence, and institutional learning. This framing provides the analytical foundation for examining how internationally articulated expectations are translated into concrete regulatory arrangements at the national level, beginning with cases where nuclear security has been most firmly institutionalized.

4.2. Regulatory Alignment and Nuclear Security Practices in Bulgaria and Romania

Bulgaria and Romania show how nuclear security has been gradually incorporated into national regulatory frameworks, through the long-term establishment of independent regulatory bodies and ongoing harmonization with Euratom and IAEA requirements. The operation of the civil nuclear power programmes in both countries has necessitated continuous regulatory oversight, licensing, inspection, emergency preparedness and periodic revision of national legislation in accordance with international nuclear safety and security obligations. This slow process of institutionalization has improved national regulatory capacity and has made nuclear security a part of everyday administrative and regulatory work rather than one-off policy initiatives (European Atomic Energy Community [Euratom], 2022; Bulgarian Nuclear Regulatory Agency [BNRA], 2025; International Atomic Energy Agency [IAEA], 2025).

In Bulgaria, nuclear security practices have evolved in close connection with the regulatory environment surrounding the Kozloduy Nuclear Power Plant. Research on post-socialist regulatory governance indicates that, in such contexts, alignment with European standards often proceeds through incremental adjustments rather than wholesale transformation (Heinrich & Pleines, 2018). Following Bulgaria's accession to the European Union, regulatory oversight increasingly reflected European expectations regarding documentation, inspection routines, and regulatory transparency. Post-Fukushima evaluations reinforced these expectations, not by redefining nuclear security as an exceptional concern, but by consolidating it within existing administrative procedures and review mechanisms.

Romania displays a comparable trajectory, shaped by a strong emphasis on regulatory professionalism and technical expertise. Analyses of nuclear governance in Central and Eastern Europe underline that Romania's nuclear sector has been characterized by relatively stable institutional

Atıf/Citation: Akin, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

arrangements and a technocratic approach to oversight (IAEA, 2023). Within this setting, nuclear security has been addressed through regular inspection cycles, reporting practices, and engagement with transnational regulatory communities, allowing security considerations to remain embedded within everyday regulatory activity rather than being elevated to the level of political controversy.

In addition to its established nuclear power operations, Romania has recently signaled interest in advanced nuclear technologies by positioning itself at the forefront of small modular reactor (SMR) deployment in Europe. According to reporting by *Euronews* (Congar, 2023), Romania is expected to become the first European country to adopt modular nuclear power systems through the so-called Phoenix Project, supported by technical and financial cooperation with the United States. This initiative reflects broader efforts to diversify energy sources and strengthen long-term energy security while remaining aligned with international regulatory standards. From a nuclear security perspective, Romania's engagement with SMR technology underscores the growing importance of regulatory preparedness, institutional capacity, and forward-looking governance arrangements in shaping nuclear security practices beyond traditional large-scale reactor models (International Atomic Energy Agency, 2022). From a regulatory perspective, small modular reactors occupy an intermediate position between established nuclear technologies and future-oriented energy solutions, intensifying the importance of licensing procedures, oversight capacity, and long-term regulatory planning in nuclear security governance.

Romania's integration into international nuclear security and emergency response frameworks became particularly visible in 2025, when it hosted the ConvEx 3 global nuclear emergency exercise. Designed to simulate a nuclear or radiological emergency with cross-border consequences, the exercise assessed international coordination, information recall, and crisis management capacities under realistic conditions. Romania's role in hosting ConvEx 3 highlights how nuclear security in the Balkan context increasingly materializes through preparedness, regulatory coordination, and internationally embedded crisis management practices rather than through military-oriented security mechanisms (IAEA, 2025).

What links the Bulgarian and Romanian experiences is not uniformity, but the manner in which nuclear security is sustained through institutional continuity. Comparative research on Europe's energy and nuclear infrastructures highlights that regulatory convergence often occurs through shared professional standards and repeated interaction rather than through direct enforcement or coercion (Högselius et al., 2013). In both cases, nuclear security benefits from this mode of governance, remaining anchored in civilian regulatory institutions while retaining sufficient flexibility to adapt to evolving international expectations.

Taken together, Bulgaria and Romania illustrate how nuclear security in the Balkans can be maintained as a non-militarized policy domain through stable regulatory engagement and long-term institutional learning. Their experience demonstrates that where nuclear governance is grounded in professional expertise and administrative routines, nuclear security is less likely to become politicized and more likely to function as an integral component of routine oversight. This institutionalized model provides a robust reference point for assessing other forms of nuclear engagement in the region, particularly cases where operational nuclear infrastructure is absent but interaction with international regulatory frameworks nonetheless shapes security practices.

The 2015–2025 period captures a gradual transformation in the Balkan energy and security landscape, marked by the consolidation of regulatory practices, the expansion of transnational energy infrastructure, and the re-emergence of nuclear energy and nuclear security considerations in regional policy debates. Rather than reflecting abrupt shifts or crisis-driven change, this period allows for tracing how nuclear security practices evolved incrementally through institutional learning and regulatory alignment.

4.3. Serbia and the Regulatory Turn in Nuclear Security

Serbia represents a distinct case in the Balkan nuclear security landscape, as it engages with nuclear security frameworks despite the absence of operational nuclear power infrastructure. Unlike

Atıf/Citation: Akin, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

Bulgaria and Romania, Serbia does not operate nuclear power plants and has long maintained a cautious stance toward nuclear energy development. Nevertheless, nuclear security has gradually entered the country's policy agenda through regulatory engagement, institutional preparation, and participation in international nuclear governance processes. This positioning makes Serbia a useful case for examining how nuclear security can take shape in contexts where material capabilities are limited, but regulatory and normative interaction remains significant.

Scholarly analyses of nuclear governance emphasize that nuclear security is not solely dependent on the presence of nuclear installations but also on the management of radioactive sources used in medicine, industry, and research (Bunn, 2016). In Serbia, concerns related to radiological materials, legacy issues from the Yugoslav period, and regional risk awareness have provided an entry point for nuclear security discussions. These concerns have been addressed primarily through regulatory and administrative measures rather than through strategic or political framing, reinforcing the civilian and non-militarized character of nuclear security in the Serbian context. Serbia's engagement with nuclear security during the 2015–2025 period reflects a gradual but increasingly visible policy shift toward regulatory preparedness and institutional learning rather than immediate nuclear deployment. For decades, Serbia maintained a legal ban on nuclear power plant construction, a legacy of the post-Chernobyl period that distinguished it from other former Yugoslav republics. This position began to change in the early 2020s, as energy security concerns, decarbonization pressures, and long-term diversification debates gained prominence in national policy discussions. Serbia's Energy Sector Development Strategy up to 2040 with projections to 2050 explicitly frames nuclear energy as a potential long-term option, emphasizing the need for regulatory capacity, technical expertise, and alignment with international safety and security standards rather than short-term investment decisions (Balkan Green Energy News, 2024). The legal dimension of this shift became explicit in late 2024, when Serbia's parliament formally repealed the long-standing ban on nuclear power plant construction. This decision represented a significant institutional shift, indicating a renewed willingness to engage with nuclear energy governance after more than three decades of legal exclusion (World Nuclear News, 2024). Importantly, this move did not translate into immediate construction plans but instead opened space for regulatory adaptation and strategic assessment. Parallel to this legal change, Serbia expanded its cooperation with international nuclear institutions, particularly the International Atomic Energy Agency, focusing on safety (2024). Beyond culture, regulatory oversight, and preparedness for radiological and nuclear risks (Srbatom, 2024). Beyond legislative change, institutional and educational initiatives have reinforced Serbia's nuclear engagement. Government-supported programs have emphasized training, expert development, and inter-institutional coordination, reflecting a competence-building approach rather than one focused on infrastructure expansion. International assessments and industry analyses similarly describe Serbia's nuclear trajectory as exploratory and conditional, shaped by feasibility studies and long-term planning rather than firm commitments to reactor construction (World Nuclear Association, n.d.; World Nuclear News, 2025). These developments indicate that Serbia's nuclear security posture is best understood as anticipatory and regulatory in nature, oriented toward institutional readiness and normative alignment within the international nuclear security regime rather than near-term nuclear deployment.

Serbia's engagement with nuclear security has also been shaped by its interaction with international and regional frameworks. Studies on aspirational alignment in non-member states suggest that regulatory participation often precedes full institutional integration, allowing states to signal competence and reliability without committing to extensive infrastructural investments (Noutcheva, 2018). In this regard, Serbia's cooperation with international nuclear governance mechanisms reflects a broader strategy of institutional positioning, where alignment with external standards functions as a means of enhancing regulatory credibility rather than as a step toward immediate nuclear energy expansion. Serbia's experience highlights a negative case that is analytically significant: the absence of nuclear power infrastructure has not resulted in the absence of nuclear security practices. Instead,

Atıf/Citation: Akin, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

security is produced through anticipation, regulatory preparedness, and alignment with international expectations, reinforcing the non-military character of the regional nuclear security environment.

The absence of nuclear power infrastructure (operational) has, in some respects, allowed Serbian authorities to approach nuclear security in a pragmatic and narrowly defined manner. Without the operational pressures associated with nuclear energy production, regulatory efforts have focused on capacity-building, training, and the gradual development of oversight mechanisms. Research on nuclear security capacity-building highlights that such incremental approaches can be effective in establishing baseline security practices, particularly in regions where nuclear risks are perceived as indirect but nonetheless consequential (Potter, 2018). In Serbia's case, this approach has resulted in a form of engagement that prioritizes preparedness and regulatory learning over technological ambition.

In contrast to Bulgaria and Romania, where nuclear security is driven by the operational demands of existing nuclear power plants and embedded within long-established regulatory regimes, Serbia's approach is shaped by a different set of drivers and pressures. In the absence of nuclear power infrastructure, nuclear security in Serbia is not oriented toward operational risk management but toward anticipatory regulation, preparedness, and alignment with international expectations. This divergence reflects a distinct policy logic: while Bulgaria and Romania prioritize continuity and oversight of functioning facilities; Serbia's engagement is primarily precautionary and forward-looking (Bunn, 2016; Potter, 2018).

During recent discussions at the World Economic Forum in Davos, Serbia presented several initiatives related to transportation and energy infrastructure, reflecting its longer-term strategic interest in diversifying energy sources and strengthening connectivity. In parallel, according to the World Nuclear Association, Serbia has outlined plans to introduce its first nuclear capacity by 2042, with an initial target of approximately 250 megawatts. (Kossev, 2024)(Kossev, 2024) While these plans remain at an early and exploratory stage, they indicate a gradual shift in Serbia's energy outlook and reinforce the relevance of anticipatory nuclear security frameworks, regulatory preparedness, and institutional capacity-building even in the absence of an operational nuclear power sector (World Nuclear Association, 2022).

Overall, Serbia illustrates how nuclear security can function as a regulatory and normative interface rather than as an infrastructure-driven policy domain. Its experience demonstrates that participation in nuclear security frameworks does not require operational nuclear capacity but can instead be sustained through institutional learning, regulatory alignment, and selective engagement with international norms. This case thus complements the experiences of Bulgaria and Romania by highlighting a different pathway through which nuclear security becomes relevant in the Balkans—one grounded in anticipation, capacity-building, and regulatory signaling rather than in long-established nuclear operations.

4.4. Interim Assessment: Patterns of Nuclear Security Engagement in the Balkans

The preceding sections reveal that nuclear security in the Balkans does not follow a single, uniform trajectory. Instead, it takes shape through different pathways that reflect variations in institutional capacity, regulatory experience, and degrees of integration with international frameworks. What unites these pathways, however, is the absence of militarized nuclear dynamics and the predominance of civilian, regulatory, and norm-based forms of engagement. Across the cases examined so far, nuclear security emerges less as a response to immediate threats and more as an outcome of sustained interaction with international expectations and practices.

The cases of Bulgaria and Romania illustrate a model in which nuclear security is deeply embedded within established regulatory systems. In these contexts, long-standing civilian nuclear operations and integration into European regulatory structures have normalized nuclear security as part of everyday administrative governance. Security practices are maintained through routine oversight,

Atıf/Citation: Akın, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

professional expertise, and institutional continuity, allowing nuclear security to function as a stable policy domain without requiring explicit securitization or political elevation.

Serbia, by contrast, demonstrates that nuclear security can become relevant even in the absence of operational nuclear infrastructure. Here, engagement is shaped by anticipation rather than experience, with regulatory preparation and capacity-building preceding any concrete technological commitments. Nuclear security in this context functions as a form of institutional positioning, signaling regulatory credibility and readiness to align with international norms without necessitating immediate infrastructural development.

Taken together, these cases point to a regional nuclear security landscape characterized by variation within a shared framework. Differences in material capacity and institutional depth do not undermine cooperation; rather, they structure distinct modes of engagement that coexist within broadly accepted international understandings of nuclear security. This pattern suggests that nuclear security in the Balkans operates as a flexible regulatory space, accommodating both mature nuclear programs and aspirational forms of participation.

This variation also highlights actors whose positions existing case categories cannot fully capture. The patterns identified thus far create the analytical conditions for examining how a state with its own emerging nuclear program, but without direct regulatory authority over Balkan nuclear infrastructures, interacts with this regional security space. It is within this context that Türkiye's role can be meaningfully assessed not as an external influence or regional leader, but as an actor embedded within the same regulatory and normative environment that shapes nuclear security engagement across the Balkans.

4.5. Türkiye's Nuclear Security Engagement in the Balkan Context (2015–2025)

Between 2015 and 2025, Türkiye's engagement with nuclear security evolved within a broader transformation of its role in regional energy and infrastructure networks. During this period, Türkiye was simultaneously developing its civilian nuclear energy program and consolidating regulatory institutions responsible for nuclear and radiological oversight. This dual process distinguishes Türkiye from the Balkan cases examined earlier and situates it within the regional nuclear security landscape in a manner that is neither peripheral nor directive but structurally embedded.

In the earlier phase of this period, Türkiye's nuclear security efforts were largely inward-looking. As highlighted in the literature on late-entry nuclear programs, emerging nuclear states tend to prioritize regulatory construction, institutional learning, and compliance with international norms before engaging more visibly in regional security dynamics (Sovacool & Valentine, 2012). For Türkiye, this phase translated into a focus on domestic oversight mechanisms, professional training, and regulatory preparedness related to nuclear and radiological materials. Although these developments were primarily national in scope, they unfolded within an international normative environment that also shapes nuclear security practices across the Balkans.

From the late 2010s onward, Türkiye's nuclear security posture increasingly intersected with its expanding role in regional energy connectivity. Projects such as TurkStream reinforced Türkiye's position as a critical transit state linking energy producers and consumers across the Balkans and Southeast Europe. While TurkStream itself is not a nuclear project, studies of energy corridors emphasize that large-scale infrastructure networks generate shared security concerns related to risk management, regulatory coordination, and infrastructure protection (Virág, 2018; Erşen, 2019). Within this broader infrastructural security environment, nuclear security considerations gained additional relevance as part of a wider regulatory ecosystem governing transboundary risks.

This interaction between energy infrastructure and nuclear security reflects a key insight of the theoretical framework adopted in this study: security in technically governed domains is produced through interdependence, institutional interaction, and shared expectations rather than through unilateral control. Türkiye's engagement during this period illustrates how regulatory alignment and participation

Atıf/Citation: Akın, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

in international governance frameworks can embed a state within a regional security space without conferring leadership or dominance. Rather than shaping Balkan nuclear security agendas directly, Türkiye's role emerged through parallel alignment with norms and practices circulating within international nuclear governance.

Comparative analysis further clarifies Türkiye's position. Unlike Bulgaria and Romania, where nuclear security is deeply institutionalized within mature regulatory regimes shaped by long-standing nuclear operations, Türkiye approached nuclear security as part of an ongoing process of institutional consolidation. This asymmetry limited immediate comparability but did not preclude meaningful engagement. Research on regulatory governance suggests that such differentiated institutional trajectories can coexist within shared security frameworks, allowing states to participate according to their level of capacity and experience (Högselius et al., 2013; Heinrich & Pleines, 2018).

The contrast with Serbia highlights a different dimension of Türkiye's engagement. Whereas Serbia's nuclear security practices are shaped by anticipation and capacity-building in the absence of nuclear power infrastructure, Türkiye's practices evolved alongside the physical construction of nuclear facilities. Despite this divergence, both cases highlight the growing importance of preparedness, regulatory competence, and norm-based participation as defining elements of contemporary nuclear security. As emphasized in studies on nuclear security beyond nuclear power, these elements increasingly matter regardless of whether a state operates nuclear power plants (Bunn, 2016; Potter, 2018). Had Türkiye pursued direct nuclear projects or bilateral nuclear cooperation in the Balkans, its regional role might have assumed a more visible or assertive character. The absence of such initiatives instead demonstrates the importance of Türkiye's embedded and indirect engagement within existing regulatory and normative frameworks.

Türkiye's significance within the Balkan nuclear security environment derives not from its capacity to directly shape regional outcomes, but from its position as a new regulatory actor undergoing an intensive process of institutional learning under sustained international oversight. The Akkuyu process illustrates how a state newly entering the nuclear field internalizes international safety and security standards through peer-review missions, external inspections, and continuous regulatory alignment. In this respect, Türkiye functions less as a source of regulatory diffusion than as an embedded reference case that demonstrates how international nuclear security regimes structure national policy processes during periods of institutional transformation (Bunn, 2016; Potter, 2018; International Atomic Energy Agency [IAEA], 2022).

Across the 2015–2025 period, Türkiye's nuclear security engagement therefore reflects a pattern of embedded interdependence rather than strategic assertion. Its role in the Balkan context is neither that of a regulatory model nor that of an external influencer. Instead, Türkiye participates in the same multilayered regulatory and normative environment that structures nuclear security engagement across the region. This positioning aligns with theoretical perspectives that conceptualize regional security as an outcome of interaction, learning, and institutional embeddedness rather than hierarchy or power projection. Importantly, the regulatory processes through which Türkiye has internalized international nuclear safety and security standards are not unique to its national trajectory; rather, they overlap temporally and procedurally with the review cycles, reporting frameworks, and preparedness mechanisms in which Bulgaria, Romania, and Serbia are likewise embedded. Table 1 is constructed on the basis of a comparative synthesis of publicly available and internationally recognized regulatory materials, including the International Atomic Energy Agency's peer-review and reporting mechanisms, such as the Integrated Regulatory Review Service (IRRS) and emergency preparedness reviews; European Union nuclear safety and preparedness frameworks applicable to Bulgaria and Romania; and national regulatory strategies and policy documents discussed in the country sections for Serbia and Türkiye.

Atıf/Citation: Akın, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

Table 1. Uneven Regulatory Integration in the Balkan Nuclear Security Space

Country	Nuclear Infrastructure Status	Key Regulatory Instruments	Forms of Regional Security Interdependence	Level of Regulatory Integration
Bulgaria	Operational nuclear power plant	EU Nuclear Safety Directive; national nuclear regulatory authority; regular IAEA IRRS missions	Continuous participation in EU and IAEA reporting cycles; cross-border emergency preparedness; information exchange mechanisms	High
Romania	Operational nuclear power plant; SMR planning	National Nuclear Regulatory Authority (CNCAN); participation in IAEA ConvEx and EPREV exercises; EU regulatory compliance	Multinational emergency response exercises; shared preparedness scenarios; harmonized reporting frameworks addressing transboundary nuclear risk	High
Serbia	No operational nuclear power plant	Serbian Radiation and Nuclear Safety and Security Directorate; regulatory preparedness mechanisms; training and education MoUs	Capacity-building programs; participation in international peer-review, training, and reporting networks shaping anticipatory regulatory alignment	Emerging
Türkiye	Nuclear power plant under construction (Akkuyu)	National nuclear regulatory authority; licensing and inspection regime aligned with IAEA safety standards; participation in peer-review and reporting mechanisms	Indirect regulatory interdependence through shared peer-review cycles, reporting obligations, and cross-border risk frameworks; reference point for regulatory learning despite the absence of formal regional coordination	Medium

Note: IAEA (International Atomic Energy Agency), IRRS (Integrated Regulatory Review Service), EU (European Union), CNCAN (National Commission for Nuclear Activities Control), ConvEx (Convention on Early Notification of a Nuclear Accident Exercise), EPREV (Emergency Preparedness Review), SMR (Small Modular Reactor), MoU (Memorandum of Understanding). Levels of regulatory integration are classified as High (mature, operationally driven regimes), Medium (consolidating regimes) and Emerging (anticipatory, capacity-building regimes). Abbreviations used in the table include IAEA (International Atomic Energy Agency), IRRS (Integrated Regulatory Review Service), EU (European Union), CNCAN (National Commission for Nuclear Activities Control), ConvEx (Convention on Early Notification of a Nuclear Accident Exercise), EPREV (Emergency Preparedness Review), SMR (Small Modular Reactor), and MoUs (Memoranda of Understanding). Reading together with the country analyses, the table shows that nuclear security in the Balkans is shaped less by centralized coordination than by overlapping regulatory practices across uneven national settings. While Bulgaria and Romania anchor this space through operational nuclear infrastructures and established oversight mechanisms, Serbia and Türkiye are integrated through anticipatory regulation, capacity-building, and sustained engagement with international review and reporting processes. This configuration reflects a regional security environment defined by shared vulnerability and mutual sensitivity to transboundary nuclear risk, where states act separately but not independently.

5. DISCUSSION

The empirical analysis presented in this study indicates that nuclear security in the Balkans between 2015 and 2025 has evolved through layered and context-specific pathways rather than through linear convergence or strategic alignment. Across the cases examined, nuclear security does not emerge as a response to immediate threat perceptions nor as an extension of military competition. Instead, it develops as a regulatory and institutional process shaped by administrative capacity, professional expertise, and sustained engagement with international norms. Similar observations have been made in the broader literature on technically governed security domains, where security outcomes are increasingly produced through routine practices and institutional interaction rather than crisis-driven politics (Dunn Cavelty, 2008; Sovacool, 2011).

Atıf/Citation: Akin, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

A closer examination of the individual cases highlights how different institutional starting points give rise to distinct modes of engagement without fragmenting the regional nuclear security environment. In Bulgaria and Romania, long-standing civilian nuclear programs have produced highly institutionalized regulatory systems in which nuclear security has become normalized and largely depoliticized. Oversight mechanisms, peer review processes, and professional regulatory communities play a central role in sustaining security practices over time. Comparative studies of regulatory governance in Europe suggest that such forms of institutional maturity tend to enhance stability precisely because they reduce the need for political intervention and securitizing discourse (Högselius et al., 2013; Heinrich & Pleines, 2018).

Serbia presents a contrasting, yet analytically complementary, pathway. In the absence of nuclear power infrastructure, nuclear security in Serbia is not anchored in operational necessity but in anticipation and preparedness. Engagement with nuclear security norms functions primarily as a means of institutional positioning and regulatory learning, allowing the country to align with international expectations without committing to immediate technological development. This pattern reflects broader dynamics identified in studies on aspirational alignment, where compliance and participation serve as signaling mechanisms in the absence of formal integration or material capability (Noutcheva, 2018; Bunn, 2016).

Türkiye's position further complicates the regional picture. Over the 2015–2025 period, Türkiye has simultaneously pursued the development of nuclear facilities and the consolidation of domestic regulatory capacity. This dual trajectory distinguishes Türkiye from both the mature regulatory regimes of Bulgaria and Romania and the infrastructure-absent engagement observed in Serbia. Research on late-entry nuclear programs highlights that such trajectories tend to prioritize regulatory learning, institutional adaptation, and conformity with international standards rather than external influence or leadership claims (Sovacool & Valentine, 2012). In this sense, Türkiye's nuclear security posture reflects a process of embedding within an existing normative environment rather than an attempt to reshape regional dynamics (Bunn & Sagan, 2016).

Across these cases, nuclear security in the Balkans appears to operate as a flexible but coherent regulatory environment. Variation in institutional depth, infrastructure, and experience does not undermine cooperation; instead, it produces differentiated roles that coexist within a shared framework of expectations. This observation challenges assumptions that effective nuclear security depends on uniform regulatory capacity or centralized authority. Instead, it supports arguments that contemporary nuclear security regimes are sustained through distributed practices, professional norms, and iterative learning processes (Potter, 2018).

A brief return to the theoretical framework outlined at the outset helps clarify the broader implications of these findings. The empirical patterns observed across the Balkan cases align with approaches that conceptualize security as an outcome of embedded institutional practices and norm-based interaction rather than as a function of material power or coercive capacity. Rather than serving as a rigid explanatory template, the theoretical framework functions here as an interpretive guide, illuminating how diverse forms of engagement can coexist within a shared regional security environment.

From this perspective, the Balkan experience during the 2015–2025 period contributes to broader debates on non-militarized security and institutionalized cooperation by demonstrating how nuclear security can function as a durable and resilient policy domain. The findings suggest that regulatory interaction and normative alignment can sustain nuclear security even in regions marked by political diversity and uneven institutional development, extending existing theoretical discussions beyond contexts defined by nuclear weapons, crisis-driven politics, or traditional deterrence

Atıf/Citation: Akın, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

frameworks.

6. CONCLUSION

This article has examined the evolution of nuclear security in the Balkans between 2015 and 2025 by focusing on regulatory practices, institutional interaction, and norm-based forms of cooperation rather than military or deterrence-driven dynamics. By analyzing the cases of Bulgaria, Romania, Serbia, and Türkiye, the study has shown that nuclear security in the region is neither absent nor marginal but operates through differentiated and largely civilian pathways shaped by institutional capacity, regulatory learning, and participation in shared governance frameworks. In this sense, the article demonstrates how nuclear security can function as a non-military, regulatory, and anticipatory security domain in regions where hard power competition is limited or absent.

The comparative analysis highlights that variation in nuclear infrastructure and institutional depth does not undermine regional coherence. Bulgaria and Romania illustrate how nuclear security becomes routinized within mature regulatory regimes, while Serbia demonstrates that meaningful engagement can emerge even in the absence of nuclear power infrastructure through anticipation and preparedness. Türkiye's experience adds a distinct dimension to this landscape, reflecting a trajectory in which regulatory consolidation and nuclear development proceed simultaneously, embedding the country within the same normative environment that structures nuclear security engagement across the Balkans.

By situating nuclear security beyond military frameworks, the findings challenge conventional approaches that associate security primarily with strategic rivalry or crisis-driven politics. Instead, the Balkan experience underscores the importance of regulatory cooperation, professional networks, and norm internalization in sustaining nuclear security across diverse national contexts. Theoretically, the study contributes to debates on non-militarized and institutional approaches to security by demonstrating how regime-oriented thinking, complex interdependence, and regional security dynamics jointly illuminate nuclear security practices in a region marked by political diversity and uneven institutional development. Rather than privileging a single explanatory framework, the analysis shows how these approaches complement one another in capturing the layered and process-driven nature of nuclear security.

Two implications follow for policy and practice. First, nuclear security should not be treated solely as the responsibility of states operating nuclear power plants. The Balkan experience demonstrates that meaningful nuclear security practices can be developed even where nuclear infrastructure is limited or entirely absent, provided that emphasis is placed on regulatory preparedness, transparency, and sustained alignment with international norms; for non-nuclear states it is best approached not as an advanced technical capacity to be achieved only at later stages, but as a process of incremental institutional learning. Second, nuclear security regimes can function without reliance on military deterrence or coercive enforcement. Capacity-building, reporting obligations, training activities, and peer-review mechanisms appear particularly well suited to fostering trust among states with differing levels of technological capability, positioning nuclear security as a confidence-building domain grounded in administrative practice rather than hard security instruments.

Overall, the article argues that nuclear security in the Balkans during the 2015–2025 period is best understood as a regulatory and normative domain embedded within broader energy, infrastructure, and governance networks. This conclusion broadens the analytical scope of nuclear security studies beyond traditional military paradigms and offers a grounded account of how security can be produced and sustained through institutional interaction in regions where strategic competition is present but not

Atıf/Citation: Akin, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

determinative.

Information About Ethics Committee Approval: Ethics committee approval was not required.

Research And Publication Ethics Statement: The authors declare that the ethical rules are followed in all preparation processes of this study. In the event of a contrary situation, the ASSAM International Refereed Journal has no responsibility and all responsibility belongs to the author of the study.

Conflict Of Interest Statement: There is no conflict of interest among the authors and/or any institution.

Contribution Rate Statement: The authors contributed equally to the work.

REFERENCES

- Balkan Green Energy News (2024) What does Serbia's new Energy Sector Development Strategy bring. November 29. <https://balkangreenenergynews.com/what-does-serbias-new-energy-sector-development-strategy-bring/> (Accessed: 18.12.2025).
- Bulgarian Nuclear Regulatory Agency. (2025). *National report of the Republic of Bulgaria under the Convention on Nuclear Safety*. Sofia: Bulgarian Nuclear Regulatory Agency.
- Bunn, M. (2016) Nuclear security beyond nuclear power. *Daedalus* 145(2), 149–161. https://doi.org/10.1162/DAED_a_00377.
- Bunn, M. & Sagan, S. D. (2016) A worst practices guide to insider threats: Lessons from past mistakes. Cambridge, MA: American Academy of Arts and Sciences.
- Buzan, B. & Wæver, O. (2003) *Regions and powers: The structure of international security*. Cambridge: Cambridge University Press.
- Checkel, J. T. (2005) International institutions and socialization in Europe: Introduction and framework. *International Organization* 59(4), 801–826. <https://doi.org/10.1017/S0020818305050289>.
- Duffey, R. B. & Zio, E. (2015) *Analytical methods for nuclear risk assessment*. Cham: Springer. <https://doi.org/10.1007/978-3-319-04159-2>.
- Dunn Cavelt, M. (2008) *Cyber-security and threat politics: US efforts to secure the information age*. London: Routledge.
- Erşen, E. (2019) Turkey and the changing energy geopolitics of Eurasia. *Energy Policy* 128, 635–644. <https://doi.org/10.1016/j.enpol.2019.01.021>.
- European Commission (2014) *EU stress tests and peer review of nuclear power plants*. Luxembourg: Publications Office of the European Union.
- European Atomic Energy Community (2022). *Joint 8th and 9th review meeting under the Convention on Nuclear Safety: Euratom national report*. International Atomic Energy Agency.
- Euronews (2023) Romanya Avrupa'da modüler nükleer santral sistemlerini kullanan ilk ülke olacak. September 12. <https://tr.euronews.com/green/2023/09/12/romanya-avrupada-moduler-nukleer-santral-sistemlerini-kullanan-ilk-ulke-olacak> (Accessed: 19.12.2025).
- George, A. L. & Bennett, A. (2005) *Case studies and theory development in the social sciences*. Cambridge, MA: MIT Press.
- Goldschmidt, P. (2010) *The safety and security of radioactive sources*. Dordrecht: Springer. <https://doi.org/10.1007/978-90-481-3016-8>.
- Heinrich, A. & Pleines, H. (2018) *Governance and institutional change in post-socialist Europe*. London: Palgrave Macmillan. <https://doi.org/10.1007/978-3-319-73036-6>.

Atıf/Citation: Akin, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

- Högselius, P., Kaijser, A. & Van der Vleuten, E. (2013) Europe's infrastructure transition: Economy, war, nature. Basingstoke: Palgrave Macmillan. <https://doi.org/10.1057/9781137339897>.
- International Atomic Energy Agency (2016) Convention on Nuclear Safety: National reports. Vienna: IAEA.
- International Atomic Energy Agency (2022) Advances in small modular reactor technology developments. <https://www.iaea.org/publications/14721/advances-in-small-modular-reactor-technology-developments> (Accessed: 07.01.2026).
- International Atomic Energy Agency (2023) Convention on Nuclear Safety: National report of Serbia. Vienna: IAEA.
- International Atomic Energy Agency. (2023). Integrated regulatory review service (IRRS) mission to Romania: Final report (IAEA-NS-IRRS-2023/08). https://www.iaea.org/sites/default/files/documents/review-missions/final_irrs_report_romania.pdf
- International Atomic Energy Agency (2025). *Romania: Tenth national report under the Convention on Nuclear Safety*.
- Keohane, R. O. & Nye, J. S. (1977) Power and interdependence: World politics in transition. Boston: Little, Brown.
- KoSSev (2026) Davos: Sırbistan uçan taksilere ve nükleer santrale kavuşuyor. January 22. <https://kossev.info/tr/davos-srbija-dobija-letece-taksije-i-nuklearku/> (Accessed: 23.01.2026).
- Krasner, S. D. (1983) International regimes. Ithaca & London: Cornell University Press.
- Noutcheva, G. (2018) Fake, partial and imposed compliance: The limits of the EU's normative power in the Western Balkans. *Journal of European Public Policy* 25(4), 555–573. <https://doi.org/10.1080/13501763.2017.1317335>.
- Novikau, A. (2023) Turkey's quest to become a regional energy hub. *Heliyon* 9(1), e12761. <https://doi.org/10.1016/j.heliyon.2023.e12761>.
- Potter, W. C. (2018) Nuclear security norms and practices: The challenge of sustaining cooperation. *The Nonproliferation Review* 25(1–2), 1–17. <https://doi.org/10.1080/10736700.2018.1484606>.
- Serbian Radiation and Nuclear Safety and Security Directorate (2024) Expansion of cooperation between Serbia and International Atomic Energy Agency. November 1. <https://www.srbatom.gov.rs/srbatomm/expansion-of-cooperation-between-serbia-and-international-atomic-energy-agency/?lang=en> (Accessed: 22.12.2025).
- Sovacool, B. K. (2011) Contested energy futures: Shaping renewable energy in Asia. Farnham: Ashgate.
- Sovacool, B. K. & Valentine, S. V. (2012) The national politics of nuclear power: Economics, security, and governance. *Energy Policy* 45, 11–19. <https://doi.org/10.1016/j.enpol.2012.02.015>.
- Virág, A. (2018) The TurkStream Pipeline in Light of the Security of Demand for Russian Gas. *European Scientific Journal* 14(29), 16. <https://doi.org/10.19044/esj.2018.v14n29p16>.
- World Nuclear Association (2022) Nuclear power in Serbia. <https://world-nuclear.org> (Accessed: 05.02.2026).
- World Nuclear Association (n.d.) Serbia – World Nuclear Outlook Report. <https://world-nuclear.org/our-association/publications/world-nuclear-outlook-report/serbia-world-nuclear-outlook-report/> (Accessed: 10.02.2026).
- World Nuclear News (2025a) Nuclear energy a feasible option for Serbia, concludes French-led study. August 12. <https://www.nucnet.org/news/nuclear-energy-a-feasible-option-for-serbia-concludes-french-led-study-8-2-2025> (Accessed: 09.01.2026).

Atıf/Citation: Akin, B. (2026). Beyond infrastructure: Nuclear security and regulatory alignment in the Balkans (2015-2025). *ASSAM International Refereed Journal*, (29), 193-210.
<https://doi.org/10.58724/assam.1990896>

World Nuclear News (2025b) Serbia and Russia ‘in talks’ on first nuclear plant for Balkan country. September 17. <https://www.nucnet.org/news/serbia-and-russia-in-talks-on-first-nuclear-plant-for-balkan-country-9-3-2025> (Accessed: 14.01.2026).

Zürn, M. (2018) A theory of global governance: Authority, legitimacy, and contestation. Oxford: Oxford University Press. <https://doi.org/10.1093/oso/9780198819974.001.0001>.