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Exemption Mechanisms and Sandbox Regimes for Energy Innovation in Czech Nuclear Law

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La regolamentazione dell'innovazione energetica mette sempre più alla prova la capacità dei quadri giuridici di adattarsi a innovazioni impreviste. Il diritto nucleare, in cui quadri normativi complessi e orientati alla sicurezza si combinano con un crescente interesse per nuove tecnologie come i piccoli reattori modulari (SMR), rappresenta un buon caso di studio per questa tendenza. Gli SMR sono pubblicizzati come un modo per combinare l'affidabilità dell'energia nucleare con la flessibilità, la scalabilità e l'adattabilità dei moderni sistemi energetici. Allo stesso tempo, la loro attuazione mette in discussione i quadri giuridici creati per enormi impianti nucleari tradizionali. La Repubblica Ceca fornisce un prezioso caso di studio di questo più ampio dilemma normativo. Questo articolo esamina se le normative basate sulle esenzioni possano fungere da approccio adeguato e sostenibile per disciplinare gli SMR ed illustra le tensioni che sorgono quando un sistema di esenzioni caso per caso viene utilizzato in sostituzione di una regolamentazione dettagliata.

The regulation of energy innovation increasingly tests legal frameworks' ability to adapt to unanticipated innovations. Nuclear law, where complex and safety-oriented regulatory frameworks combine with increased interest in novel technology like small modular reactors (SMRs), is a good case study for this tendency. SMRs are touted as a way to combine nuclear energy's reliability with modern energy systems' flexibility, scalability, and adaptability. At the same time, their implementation calls into question the legal frameworks, which were created for huge, traditional nuclear power facilities. The Czech Republic provides a valuable case study of this broader regulatory dilemma. This article examines whether exemption-based regulations can serve as an adequate and sustainable approach to governing SMRs and exposes the tensions that arise when a system of case-by-case exemptions is used as a substitute for detailed regulation.

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1. Introduction

Technological innovation increasingly tests the capacity of public law to respond to developments that were not anticipated at the time of legislative drafting^[1]. This tension is particularly visible in the field of energy regulation, where long investment cycles, high capital intensity, and strong public interests intersect with rapidly evolving technological solutions. For instance, in recent years, small modular reactors (SMRs) have emerged as one of the most discussed innovations in nuclear energy. They are frequently presented as a means of reconciling nuclear power with demands for greater flexibility, scalability, and adaptability of energy systems. At the same time, their development raises complex legal questions, especially in jurisdictions whose nuclear legislation was designed around the paradigm of large, conventional nuclear power plants.

The Czech Republic provides an illustrative example of this challenge. Nuclear energy plays a central role in its long-term energy policy^[2], and the state has explicitly linked its strategic objectives with the potential deployment and development of SMRs. This political and strategic orientation has brought renewed attention to the suitability of the existing legal framework, in particular the (Czech) Atomic Act^[3], which constitutes the backbone of Czech nuclear regulation. While the Atomic Act establishes a comprehensive and detailed

system of safety requirements, licensing procedures, and regulatory oversight, it was adopted in a context in which small modular reactors did not form part of the regulatory imagination. As a result, the application of this framework to new reactor concepts has exposed points of friction between legal design and technological innovation. Although the analysis in this article is centered on the case study of SMRs, this focus is primarily methodological. Within the Czech nuclear sector, it were the SMRs which prompted the legislator to depart from the existing regulatory model and introduce an extraordinary mechanism. This makes them a particularly suitable empirical basis for examining broader questions of regulatory design. The issues identified in this context are, however, not limited to SMRs as such, but reflect more general challenges associated with the legal governance of emerging technologies.

In response to these concerns, the Czech legislator recently amended the Atomic Act by introducing a new exemption mechanism substantiated in newly introduced Section 228b^[4]. This provision empowers the nuclear regulator to approve exemptions from certain statutory requirements, provided that specific conditions are met. The amendment is commonly presented as a means of introducing flexibility into an otherwise rigid legal framework and of enabling the regulator to address situations that the legislation did not explicitly foresee. At the same time, the introduction of such an exemption-based mechanism raises broader questions about the role of discretion, the structure of regulatory decision-making, and the relationship between legislative design and administrative practice in the governance of innovative technologies.

In this context, the relevance of the Czech case extends beyond the specificities of national nuclear legislation. The regulatory challenge posed by SMRs is not unique to the Czech Republic, nor is the dilemma faced by its legislator. Across jurisdictions, lawmakers and regulators are confronted with a recurring structural question of public regulation: whether emerging technologies should be accommodated primarily through flexible, discretion-based administrative mechanisms operating within a relatively minimalist legislative framework, or through more detailed and prescriptive regulation that seeks to anticipate technological developments but may require frequent amendment. The Czech Atomic Act offers a useful focal point for analysis precisely because it makes this tension visible in a clear and explicit manner. In this sense, the Czech case is not

examined for its sector-specific features alone, but as an instance of a wider regulatory pattern in which legal systems respond to innovation through a combination of rigid statutory frameworks and flexible administrative mechanisms.

In light of these considerations, this article examines Section 228b of the Czech Atomic Act as a case study in the use of exemption mechanisms to accommodate technological innovation in nuclear law, with the sectoral focus on nuclear law and SMRs serving as an analytical lens through which more general questions of public regulation can be explored. Rather than treating Czech nuclear law as an isolated or jurisdiction-specific example, the article approaches it as a manifestation of a more general regulatory strategy that can be observed, in different forms, in many legal systems. The central research question of this article is whether exemption-based regulatory mechanisms, naturally relying on broad administrative discretion, constitute an adequate and sustainable approach to the regulation of SMRs, or whether the governance of such technologies requires more specific and structurally adapted legislative frameworks. Using the Czech Atomic Act as a case study, the article examines the extent to which flexibility achieved through regulatory discretion can compensate for the absence of SMR-specific regulation, and where the limits of such an approach may lie. By situating the Czech exemption mechanism within this broader debate, the article assesses its implications for legal certainty, regulatory accountability, investor confidence, and long-term planning in the energy sector.

Methodologically, the article adopts a predominantly doctrinal and analytical approach. It is based on close analysis of statutory provisions of Czech nuclear law, with particular attention to their structure, underlying assumptions, and use of open-ended legal terms. This doctrinal analysis is complemented by a conceptual examination of regulatory techniques used to address technological innovation, especially exemption-based mechanisms and other forms of flexible regulation. The article also draws on general principles of administrative law to assess the implications of regulatory discretion for legal certainty, accountability, and long-term governance. The analysis proceeds by first situating SMRs within the existing legislative framework, then examining the exemption mechanism introduced by Section 228b, and finally assessing this approach in light of alternative regulatory models discussed in the context of innovation governance.

This combination of doctrinal analysis and normative evaluation allows the article to explore whether flexibility achieved through administrative discretion can serve as a sufficient regulatory response to SMRs, or whether more specific and structurally adapted legislative solutions are required.

2. Baseline regulatory paradigm of the Atomic Act

Before turning to exemption mechanisms, the analysis first addresses the internal logic, structure, and assumptions of the (Czech) Atomic Act itself. The way in which the Act conceptualizes nuclear installations, allocates regulatory responsibilities, and structures safety and licensing requirements forms the baseline against which the regulatory challenges posed by SMRs can be identified and evaluated. The Atomic Act establishes a comprehensive and internally coherent regulatory framework governing the peaceful use of nuclear energy. Its design reflects a regulatory paradigm developed primarily in response to the characteristics, risks, and operational realities of large, conventional nuclear power plants. While the Act is formally technology-neutral, its structure, procedural logic, and substantive requirements embed a set of implicit assumptions that define the baseline model against which all nuclear installations are regulated.

At the core of the Act lies a life-cycle-based regulatory structure that presupposes a single, long-lived nuclear installation progressing through clearly demarcated stages of siting, construction, commissioning, operation, and decommissioning^[5]. Each of these stages is subject to a separate permitting decision by the State Office for Nuclear Safety, and each subsequent phase is conditioned upon the successful completion and regulatory verification of the preceding one. This linear and sequential model reflects the traditional development trajectory of large nuclear power plants, characterized by extended construction periods, long operational lifetimes, and gradual end-of-life decommissioning. The Act does not provide mechanisms for design-level licensing detached from a specific site, nor does it contemplate serial deployment of standardized units; instead, each nuclear installation is treated as a unique regulatory object.

This project-centric logic is further reinforced by the central role accorded to the “project of the nuclear installation” in the safety and licensing process^[6]. The Act

requires that the project documentation comprehensively demonstrate compliance with safety objectives, defense-in-depth principles, safety functions, and resistance to both internal and external hazards throughout the entire life cycle of the installation. Safety is thus constructed as a property of an individually engineered system, tailored to the characteristics of a particular site and evaluated through bespoke documentation. This approach corresponds to the regulatory treatment of large, site-specific nuclear facilities and does not differentiate between technologies that might rely on standardized or factory-completed designs^[7].

A related and equally significant feature of the Act is its strong emphasis on site-specific risk assessment^[8]. The siting provisions require extensive evaluation of geological, hydrological, seismic, and environmental characteristics of the proposed location and establish absolute prohibitions on siting where certain thresholds are exceeded. These requirements presuppose a permanent and immobile installation whose safety profile is closely intertwined with the properties of the surrounding territory. The regulatory model thus assumes that site characteristics are a decisive determinant of overall nuclear safety, an assumption historically associated with large nuclear power plants. The Atomic Act's safety assessment regime further reflects this paradigm. Deterministic and probabilistic safety assessments are embedded as core regulatory tools, with probabilistic safety assessment forming a default requirement for nuclear installations with a reactor^[9]. Such assessments presuppose long operational lifetimes and the availability of extensive data for modelling accident sequences and failure probabilities^[10].

Taken together, these elements reveal a coherent large-reactor regulatory paradigm embedded in the Atomic Act. The Act primarily sees nuclear installations as unique, site-specific, long-lived facilities requiring bespoke design assessment, extended commissioning, continuous safety re-evaluation, and substantial end-of-life financial provisioning. This paradigm provides a baseline model for nuclear regulation in the Czech Republic, but it also defines the reference point against which any regulatory adaptation to novel reactor concepts (such as SMRs) must be understood and evaluated.

3. A regulatory challenge of SMRs

The relevance of the Atomic Act's design logic becomes particularly apparent when it is confronted with reactor concepts that depart from the assumptions on which that logic is based. SMRs represent such a departure^[11]. Although they fall within the category of nuclear installations and pursue the same fundamental safety objectives as conventional reactors, their technological and operational characteristics differ in ways that are legally significant. The analysis therefore focuses on the features of SMRs that are most relevant from a regulatory perspective, with the aim of illustrating why their deployment challenges the existing legislative framework and creates pressure for regulatory adaptation.

Recent developments in the global energy sector have brought SMRs to the forefront of nuclear energy policy debates. SMRs are increasingly viewed as a tool for decarbonization, energy security, and diversification of nuclear applications beyond traditional electricity generation. Unlike conventional reactors, which are typically custom-built on-site and designed for large, centralized power production, SMRs are conceived as modular, factory-manufactured units capable of deployment in a wide range of settings, including industrial facilities, remote regions, and multi-module installations. These characteristics are not merely a matter of reduced size. Rather, they reflect a different technological and operational paradigm that challenges many of the assumptions upon which existing nuclear regulatory frameworks were constructed. Enhanced inherent and passive safety features, novel design solutions, and the prospect of serial production within shorter and more predictable timelines make SMRs attractive from an energy-policy perspective. At the same time, these same features expose the limitations of regulatory systems that were developed for reactors with markedly different risk profiles, construction methods, and operational models.

Authoritative international analyses, particularly those published by the Nuclear Energy Agency (NEA)^[12] and the International Atomic Energy Agency (IAEA)^[13], consistently indicate that SMRs cannot be regulated as a simple downscaled variant of conventional nuclear power plants. Instead, their technical and operational specificities require careful reconsideration of existing licensing, safety, and oversight approaches. Against this background, the following section outlines the principal technical and operational differences between SMRs and

traditional nuclear facilities, forming the analytical basis for assessing whether and to what extent differentiated regulatory treatment is both justified and necessary.

Building on this premise, it is possible to identify a set of recurring technical and operational characteristics that distinguish SMRs from conventional large-scale nuclear reactors. NEA identified a representative sample of SMRD designs existing globally and identified several advantageous features that are shared by most of the mentioned designs^[14]. Simply Identifying characteristics of SMRs allows for an assessment of whether regulatory frameworks developed for standard nuclear power plants need to be adapted when applied to SMRs.

One of the most frequently cited distinguishing characteristics of many SMR designs, in particular integral light-water SMRs, is their integrated design^[15], whereby major primary system components are housed within a single pressure vessel^[16]. This design significantly reduces the number of large-bore pipes and external connections, thereby limiting the probability of certain loss-of-coolant accident scenarios traditionally addressed by prescriptive regulation^[17]. Closely linked to integration is the concept of inherent and passive safety^[18]. Its main characteristics include reduced reliance on active components and minimal need for human intervention for actuation and operation, which are among the defining features of SMRs^[19]. SMRs typically operate at lower thermal power, and their physical dimensions result in a higher surface-area-to-volume ratio. This does not necessarily mean that they are cooler, but they dissipate heat more easily than standard reactors, that is, smaller reactors can cool more efficiently per unit of volume because they have proportionally more surface area for heat to escape. This reduces reliance on active safety systems^[20]. At the same time, the combination of novel safety systems and multi-module plant configurations introduces new categories of system interactions, including the risk of cascading failures between modules, which are not fully reflected in legacy safety analyses.

Another core distinction lies in the modular nature of SMRs. Smaller reactor units are designed for serial production, often in factory environments, and subsequently transported to the deployment site. This contrasts with conventional reactors, which are largely custom-built on-site. The NEA highlights that modularity facilitates flexible deployment strategies, including cogeneration, direct industrial heat supply, and phased capacity expansion

through multi-unit installations. SMRs also differ with respect to fuel utilization and fuel cycles. Some SMR designs employ innovative fuels or cooling media, which necessitate the establishment of entirely new fuel cycle arrangements. Some SMRs may also feature longer refueling interval, which may have direct implications for regulatory oversight of fuel handling, waste management, and non-proliferation safeguards^[21].

The IAEA's publications, based on vendor submissions and design proposals, further systematize SMR-specific features^[22]. SMRs are typically associated with a reduced facility size, reflected both in a smaller plant footprint compared to conventional nuclear power plants and in a lower core power. The latter is linked to reduced decay heat loads, a smaller inventory of radionuclides, and, in some designs, increased core stability. Many SMR concepts rely on the use of novel or non-traditional technologies. These include passive cooling mechanisms, integral reactor designs in which major primary system components are incorporated into a single pressure vessel. A further distinguishing category relates to modular design. Modular and compact designs may practically eliminate certain severe accident scenarios, while introducing new operational considerations, such as module-to-module interactions, staffing of control rooms, and management of multi-module facilities. Finally, the IAEA points to deployment-related characteristics that differentiate SMRs from conventional reactors. These include a wider range of potential siting options, such as underground, floating, underwater, movable installations, or deployment in regions lacking essential infrastructure, as well as the transportation of reactor modules, whether during construction, during the operation of other modules at the same site, or, in some designs, for refuelling purposes^[23].

Taken together, these characteristics illustrate that SMRs cannot be regarded merely as a smaller or simplified variant of conventional nuclear power plants, as their modularity, standardization, and deployment models interact with regulatory requirements in ways that were not contemplated by the existing legal framework. As a result, the application of rules designed for large, bespoke installations to SMRs does not raise isolated technical questions, but exposes a more general tension between established regulatory assumptions and emerging technological models. Through this background, the Czech legislator's decision to introduce a mechanism allowing for exemptions from statutory requirements

must be understood as an attempt to address the growing gap between the structure of the Atomic Act and the realities of SMR development.

4. Exemption mechanism under Section 228b of the Atomic Act

As outlined earlier, the amendment of the Atomic Act introducing Section 228b (and partially also Section 228a^[24]) reflects a legislative attempt of the Czech legislator to respond to the growing tension between a static regulatory framework and rapidly evolving nuclear technologies. While both instruments are presented as complementary tools intended to facilitate the future deployment of new nuclear technologies, including SMRs, Section 228b represents the more far-reaching intervention. Unlike the mechanism of preliminary information, which primarily serves a consultative and anticipatory function, the exemption regime established by Section 228b directly affects the applicability of statutory requirements and thus alters the way in which the existing legal framework operates in practice^[25].

According to the explanatory memorandum, the rationale for introducing an exemption mechanism is closely linked to the pace and uncertainty of technological development in the nuclear sector. New reactor concepts, particularly SMRs, are still under development, and their precise technical parameters are not yet fully known. At the same time, their anticipated deployment timelines are significantly shorter than those of traditional nuclear projects, which limits the ability of the legislator to adapt statutory requirements through ordinary legislative processes. The exemption mechanism is therefore presented as a pragmatic solution to a structural problem: the inability of detailed and prescriptive legislation to respond quickly to technologies that are still evolving at the design stage. In this sense, Section 228b is explicitly framed as a means of preserving regulatory flexibility without compromising safety, rather than as an instrument for deregulation^[26].

From a legal perspective, Section 228b establishes a general possibility for persons who are subject to statutory requirements aimed at ensuring nuclear safety, radiation protection, technical safety, emergency preparedness, security, or non-proliferation to request an exemption from such requirements. The scope of the

provision is limited to material obligations relating to the performance of regulated activities and expressly excludes procedural rules, sanctioning mechanisms, and provisions defining regulatory competences. The decision-making authority is entrusted to the State Office for Nuclear Safety, which is characterized in the explanatory memorandum as the institution best equipped to assess the technical and safety implications of such exemptions.

The conditions under which an exemption may be granted are formulated cumulatively and reflect a combination of factual, justificatory, and safety-related criteria. First, the applicant must demonstrate that the statutory requirement in question cannot be fulfilled in a verifiable manner. This condition suggests that exemptions are not intended as a matter of convenience, but as a response to objective constraints linked to the characteristics of the technology or activity concerned. Second, the applicant must justify the alternative procedure proposed in lieu of the statutory requirement. The law does not specify the form or content of such justification, leaving it to be assessed on a case-by-case basis^[27]. Third, and most importantly, the approval of the exemption must not lead to a reduction in the achieved or required level of protection in any of the areas covered by the provision, and the alternative procedure must be in accordance with good practice. The explanatory memorandum clarifies that good practice is to be understood, *inter alia*, by reference to internationally recognized standards, including those developed by the International Atomic Energy Agency.

The emphasis on safety continuity is a central element of the exemption regime. The legislator explicitly rejects any lowering of safety standards and presents the exemption mechanism as compatible with the precautionary nature of nuclear regulation. At the same time, the formulation of the relevant criteria relies heavily on open-ended legal concepts, such as justification, good practice, and the absence of a reduction in safety levels. These concepts are intended to provide the regulator with sufficient flexibility to assess novel technologies whose risk profiles may not align neatly with existing regulatory categories. The explanatory memorandum underscores this point by stressing that the exemption mechanism is designed to accommodate technological novelty while maintaining a high level of protection, rather than to anticipate or codify specific technical solutions in advance.

Section 228b also provides for the possibility of revoking an approved

exemption^[28]. The regulator may withdraw the exemption if the beneficiary seriously violates statutory obligations, fails to remedy serious deficiencies identified by the regulator, if the conditions under which the exemption was granted cease to be fulfilled, or at the request of the beneficiary. The explanatory memorandum presents revocation not only as a corrective measure, but also as an expression of precaution, allowing the regulator to respond to changes in technological development or operational practice that render the exemption unnecessary or inappropriate. In this sense, the exemption is conceived as a deviation from the statutory standard that remains exceptional and reversible, rather than as a permanent alteration of regulatory requirements.

Taken as a whole, Section 228b represents a legislative choice to address the regulatory challenges posed by SMRs through an individualized, discretionary mechanism embedded within the existing statutory framework. Rather than redefining the underlying regulatory model or introducing SMR-specific rules, the legislator opted to empower the regulator to resolve potential mismatches between law and technology on a case-by-case basis. This approach reflects an explicit preference for flexibility and administrative adaptability in the face of uncertainty, while formally reaffirming the primacy of safety and international standards. The implications of this choice, and its relationship to other regulatory models used to govern emerging technologies, are examined in the following section.

5. Implications of the Czech exemption-based model

Exemption-based regulation can be considered an established technique in public law. By allowing departures from generally applicable rules in individual cases, exemption mechanisms offer a pragmatic way to accommodate atypical situations without reopening the legislative framework as a whole^[29]. From the perspective of the legislator, such mechanisms are particularly appealing in periods of rapid technological change, as they promise flexibility and speed. Rather than engaging in time-consuming and potentially premature legislative reform, the law can be preserved in its existing form while adaptation is delegated to administrative practice^[30]. The appeal of this solution to the legislator is quite understandable and can be attributed to what may be (*cum grano salis*) termed as

“legislative economy”. At the same time, however, while flexibility may resolve immediate mismatches between law and technology, it also reshapes the distribution of regulatory power, the structure of legal expectations, and the role of statutory norms^[31]. Whether an exemption-based model can serve not only as a temporary adjustment tool but as a sustainable approach to the regulation of SMRs therefore requires careful assessment. The following analysis examines the Czech model established by Section 228b by identifying its main advantages and systematically exploring the risks and limitations that arise when discretion becomes the central mechanism for managing innovation in nuclear law.

5.1. Flexibility and adaptability as the primary advantages

The principal strength of the exemption-based model lies in its flexibility^[32]. Section 228b enables the regulator to respond to technological developments that could not have been anticipated at the time of legislative drafting, without waiting for formal legislative amendment. In a field characterized by rapid innovation, long preparatory phases, and high economic stakes, such responsiveness is not a marginal benefit but a practical necessity. The exemption mechanism allows regulatory decision-making to take place closer to the technological reality of a specific project, drawing on up-to-date technical knowledge and international standards rather than on static statutory assumptions.

From this perspective, reliance on administrative discretion is not inherently problematic. Technical regulation has long depended on expert judgment, and nuclear regulation in particular requires continuous interaction between regulators and regulated entities. The explanatory memorandum explicitly frames Section 228b as a response to uncertainty and incomplete information, emphasizing that the parameters of SMRs are still evolving and cannot be adequately captured through prescriptive legal rules in advance^[33]. The exemption mechanism thus offers a way to accommodate innovation while formally maintaining a high level of safety and compliance with international obligations.

An additional advantage of the exemption-based model lies in the relative malleability of administrative practice when compared to statutory law.

Administrative approaches, internal methodologies, and interpretative frameworks can be adjusted incrementally and relatively quickly in response to new information, operational experience, or shifts in international standards. By contrast, legislative amendment is typically a slow and politically demanding process, even where there is clear recognition that existing rules are inadequate. Once enacted, statutory provisions tend to persist long after their underlying assumptions have been overtaken by technological or practical developments. From this perspective, reliance on administrative discretion allows the regulatory system to correct course more easily, abandoning approaches that prove ineffective or ill-suited without the institutional inertia associated with formal lawmaking. This temporal flexibility can be particularly valuable in the context of SMRs, where regulatory learning is likely to occur in parallel with technological deployment. The ability to refine regulatory expectations through practice, rather than through repeated legislative intervention, may therefore be seen as a rational response to uncertainty^[34].

5.2. Discretion and legal (un)certainty

The very features that make the exemption mechanism attractive from a flexibility standpoint also generate its most significant weaknesses^[35]. Section 228b of the Czech Atomic Act relies heavily on open-ended legal concepts and provides only minimal guidance as to how the conditions for granting an exemption are to be interpreted or applied. While the cumulative nature of the statutory conditions suggests a restrictive approach, their substantive content remains largely indeterminate. Concepts such as justification, good practice, or the absence of a reduction in achieved or required safety levels do not translate easily into predictable decision-making criteria.

Section 228b is drafted as a set of cumulative conditions, but the controlling concepts that determine whether those conditions are met are framed in vague legal language^[36]. The explanatory memorandum confirms that the point of the mechanism is to enable a very flexible approach in a context where the parameters of SMRs are not fully known and cannot be adequately prepared in advance, while insisting that the level of protection must not be reduced and that “good practice” includes, among other things, IAEA requirements. The combination of

a high-level safety aspiration with vague legal terms is not unusual in technical regulation, but in this setting it has an obvious structural consequence: it places the decisive content of the exemption test in the regulator's hands.

The first condition outlined by Section 228b (*«if the requirement cannot be demonstrably fulfilled»*)^[37] appears at first glance to impose an objective constraint, but its meaning depends on what counts as inability and what counts as proof. The text does not clarify whether this condition refers to physical impossibility, legal impossibility, disproportionate burden, incompatibility with the technology's design concept, or merely the absence of available methods to satisfy a prescriptive requirement within the relevant timeframe. In practice, the boundary between "cannot" and "can, but only with redesign, delay, or very high cost" is precisely where regulatory judgment becomes most consequential. Even the seemingly stricter adverb "demonstrably" does not solve the problem, because the provision does not specify the evidentiary standard or the type of evidence expected. Whether the applicant must establish impossibility beyond doubt, to a high degree of probability, or merely credibly is left implicit. The regulator therefore has substantial latitude to decide both what must be shown and how much showing is enough, especially in situations where the underlying facts are uncertain because the technology is still being developed.

The second condition (*«if the procedure [in question] is justified»*)^[38] is even more elastic. In Czech administrative-law usage, the justification (*odůvodnění*) often refers to the requirement of reasoning, but in this context this substantive criterion is addressed to the merits of the alternative procedure itself. The statute does not say what kind of justification is required: technical feasibility, economic rationality, proportionality, risk equivalence, international practice, or all of these combined, nor does it indicate whether "justified" means "necessary" (in the sense of the least restrictive means), "reasonable" (in the sense of plausibility), or "preferable" (in the sense of being the better solution). This indeterminacy matters, because the criterion is not anchored in a defined benchmark. A regulator could treat "justified" as requiring an extensive safety case and a structured alternatives analysis, but it could also accept a comparatively thin explanation that the exemption is needed to implement the chosen design concept. This creates a broad gateway for administrative valuation, and the breadth of that gateway is not narrowed elsewhere in the statute.

The third condition is the core safeguard and also the most difficult to operationalize: it is required that granting of an exemption should not lead to the reduction of the achieved and required level of nuclear safety, radiation protection, technical safety, monitoring, emergency preparedness, security, and non-proliferation, and that the procedure will be carried out in accordance with “good practice”^[39]. This formulation compresses several complex legal questions into a single sentence. It also extends across a wide set of protected interests, which increases the room for balancing and interpretive maneuvering rather than reducing it. The phrase «*no reduction of the achieved and required level*» presupposes a baseline against which reduction can be measured. Yet the statute does not define what constitutes the “achieved” or the “required” level in the context of a new technology. For an existing facility, “achieved level” may refer to an empirically established safety performance and a mature regulatory relationship. For SMRs, there may be no operational track record in the jurisdiction, and the achieved level becomes a largely hypothetical construct derived from design claims and analyses. The required level, in turn, could mean the statutory standard as interpreted in light of implementing regulations and international guidance, but Section 228b is explicitly designed for cases where the statutory requirement itself may be a poor proxy for the appropriate standard for the technology. This creates a conceptual loop: the exemption is needed because a prescriptive rule does not fit, yet the benchmark for “no reduction” is not clearly separated from the prescriptive architecture being departed from.

These indeterminate legal terms may therefore function either as a constraining reference point or as a flexible rhetorical device, depending on how rigorously the regulator defines it, cites it, and translates it into concrete requirements in individual decisions. For instance, a regulator inclined toward strictness could demand a detailed safety case demonstrating functional equivalence or superiority to the protection that would have resulted from literal compliance with the statutory requirement, supported by international benchmarks and a transparent reasoning chain. A regulator inclined toward accommodation could treat the clauses as satisfied once the applicant shows that the alternative approach aligns with selected external standards and is plausibly consistent with the regulator’s expert judgment. Since the statute does not articulate an explicit methodology, the decisive constraint becomes the regulator’s internal practice

rather than the legislator's predetermined criteria.

As a result, the exemption-based model offers limited ex ante legal certainty to potential applicants. Section 228b does not merely confer technical discretion of the kind inherent in applying complex safety standards, but also confers discretion over the definition of key evaluative benchmarks. Operators and investors cannot reliably anticipate whether a particular deviation from statutory requirements will be considered acceptable, nor on what basis similar cases will be assessed in the future^[40]. This uncertainty is particularly problematic in the nuclear sector, where projects require long-term planning, stable regulatory expectations, and significant upfront investment. The absence of predefined benchmarks means that legal certainty is effectively replaced by reliance on informal regulatory signals and evolving administrative practice, which may be difficult to access, interpret, or contest.

5.3. Concentration of power and accountability concerns

A further consequence of the exemption-based model is the concentration of normative decision-making power at the administrative level. By authorizing the regulator to approve deviations from statutory requirements on a case-by-case basis, the legislator effectively delegates not only technical assessment, but also a substantial degree of normative judgment^[41]. Decisions on whether a statutory requirement can be set aside, and under what alternative conditions, shape the practical content of the law even though they are formally adopted as individual administrative acts. This shift raises questions of accountability and control. Although exemption decisions are subject to general principles of administrative law and judicial review, the scope for effective external oversight is limited by the technical complexity of the subject matter and the breadth of discretion involved. Courts in many cases tend to defer to the regulator's expertise, particularly where safety assessments and international standards are concerned. As a result, the exemption mechanism risks creating a layer of quasi-normative decision-making that operates largely outside the traditional channels of legislative responsibility and democratic scrutiny^[42].

This model also raises a more fundamental issue concerning the allocation of regulatory power between the legislator and the executive. At its core, the

provision reflects a deliberate shift in where substantive regulatory choices are made. Instead of being resolved through generally applicable rules adopted by the legislature, key questions concerning the applicability, modification, or functional replacement of statutory requirements are transferred to the level of individualized administrative decision-making^[43]. In classical terms, this shift touches upon the boundary between legislation and administration. While modern administrative states necessarily rely on regulatory discretion, especially in technically complex fields, there remains an important distinction between discretion exercised within a predefined normative framework and discretion that effectively determines the content of that framework in practice. Section 228b belongs to the latter category. By authorizing the regulator to approve deviations from statutory requirements without articulating detailed substantive criteria, the legislator leaves it to the executive to decide, in concrete cases, which statutory norms remain applicable, which can be set aside, and under what alternative conditions.

This redistribution of normative authority is not merely a technical matter. Legislative regulation performs functions that administrative practice cannot easily replace, particularly in areas characterized by high public sensitivity and long-term societal risks. Statutory rules provide *ex ante* guidance, ensure generality and equal treatment, and serve as a focal point for democratic accountability. They also structure expectations beyond individual cases, allowing regulated entities, investors, and the public to understand the regulatory environment in which decisions are made. When exemptions become a primary regulatory tool, these functions are partially displaced by individualized assessments that are necessarily contextual, contingent, and less visible. From this perspective, Section 228b can be seen as a mechanism that enables the executive to engage in a form of *de facto* norm-setting. Although exemption decisions are formally individual administrative acts, their cumulative effect may be to reshape the operative content of the law. If certain statutory requirements are routinely deemed inapplicable to SMRs and replaced by alternative solutions approved through exemptions, the practical regulatory standard for this category of installations will emerge not from legislation, but from a body of administrative decisions. These decisions are adopted without the procedural safeguards, transparency, and political responsibility typically associated with legislative rule-

making.

5.4. Structural vulnerability to corruption and arbitrariness

The reliance on broad discretion in a sector characterized by high economic stakes also creates a systemic vulnerability to corruption and undue influence. Although this observation in no way implies any existing lack of integrity or that the exemption mechanism is intended to facilitate improper conduct, it reflects a general insight that corruption risks and perceptions of arbitrariness increase where three elements coincide: high economic stakes, individualized decision-making, and broadly framed evaluative criteria^[44]. All three elements are present in the context of exemptions from nuclear safety requirements.

Decisions on exemptions under Section 228b of the Atomic Act have far-reaching economic consequences: the ability to deviate from statutory requirements can significantly affect project feasibility, costs, timelines, and competitive positioning. In the case of SMRs, where investment decisions are closely linked to regulatory predictability and licensing risk, the granting or refusal of an exemption may determine whether a project proceeds at all. When such high-stakes outcomes depend on discretionary assessments rather than on clearly predefined criteria, the regulatory process becomes particularly sensitive to external pressure, lobbying, and informal influence, even if these do not take the form of overt illegality.

The vagueness of the statutory conditions amplifies this sensitivity. As discussed above, concepts such as justification, good practice, or the absence of a reduction in safety levels do not impose a clear decision-making algorithm. Instead, they require the regulator to engage in complex evaluative judgments that are difficult to verify from the outside. This makes it challenging to distinguish, in individual cases, between a legitimate exercise of expert discretion and a decision that reflects preferential treatment or unequal consideration. Where reasons are inherently contestable and benchmarks are fluid, suspicions of arbitrariness are difficult to dispel, even when decisions are taken in good faith.

From an institutional perspective, the problem is not limited to actual corruption, but extends to the perception of integrity^[45]. In sectors such as nuclear energy, public acceptance and trust in regulatory institutions are central

to the legitimacy of the entire governance system^[46]. A regulatory model that relies heavily on exemptions risks creating an impression that compliance with statutory requirements is negotiable, contingent on persuasive argumentation or institutional proximity, rather than governed by stable and generally applicable rules. This perception can undermine confidence not only among regulated entities, but also among the public and other stakeholders, particularly where exemption decisions are not accompanied by detailed and transparent reasoning. Moreover, the individualized nature of exemption decisions complicates the application of the principle of equality. Even if the regulator strives for consistency, differences in technological design, project maturity, or presentation of safety cases may lead to divergent outcomes that are difficult to compare. Without publicly articulated criteria or standardized assessment frameworks, it becomes nearly impossible for external observers to assess whether similar cases are treated similarly, or whether differences in outcome are objectively justified. Over time, this opacity may foster the belief that regulatory success depends less on compliance with objective standards than on the ability to navigate administrative discretion effectively.

5.5. Normalization of exceptions: en route to permanent improvisation?

Perhaps the most significant limitation of the exemption-based model (at least from the systemic point of view) lies in its long-term implications. Exemptions are, by definition, deviations from a general rule intended to address exceptional circumstances, and as such are traditionally conceived as instruments designed to address atypical situations that cannot be adequately regulated through general rules^[47]. Their legitimacy rests on their marginal character: they are justified precisely because they depart from a norm that remains, in principle, appropriate for the majority of cases. When exemptions are used to accommodate a novel technology on a systematic basis, this logic is reversed. The exception ceases to be peripheral and instead becomes a central mechanism through which the regulatory framework operates.

This dynamic of continuous reliance on exemptions and their normalization as a way of governance may lead to what can be described as “permanent

improvisation”^[48]. In the context of SMRs, the risk of normalization is particularly acute. The technological features that motivate the introduction of Section 228b are not transitional anomalies, but defining characteristics of a new category of nuclear installations. If these characteristics persist across projects, the need for exemptions will likewise persist. Over time, what was introduced as a mechanism to address unforeseen or exceptional circumstances may evolve into the default mode of regulatory adaptation for SMRs, with statutory requirements serving as a formal backdrop rather than as operative standards^[49]. This dynamic has important implications for the normative structure of nuclear law. Statutory requirements are intended to function as stable reference points that express collective decisions about acceptable levels of risk, safety margins, and regulatory priorities. When compliance with these requirements is routinely displaced by individualized exemptions, their normative force is weakened. The law remains formally in place, but its practical content is increasingly defined by a series of administrative adjustments that are contingent, project-specific, and only partially visible^[50]. In such a system, the distinction between law and its application becomes blurred, and regulatory coherence is maintained, if at all, through informal consistency rather than through explicit legal design. The normalization of exemptions also creates institutional incentives that reinforce improvisation. For the legislator, the availability of a flexible exemption mechanism reduces the immediate pressure to engage in systematic reform. Difficult questions about how nuclear law should be adapted to new technologies can be deferred, as concrete problems are addressed administratively on a case-by-case basis. Over time, this deferral risks becoming self-perpetuating: as administrative practice fills the gaps left by outdated legislation, the perceived urgency of legislative intervention diminishes, even though the underlying structural mismatch remains unresolved.

At the administrative level, reliance on exemptions can likewise shape regulatory culture. Instead of operating within a clear and evolving normative framework, regulators may become accustomed to managing innovation through ad hoc solutions tailored to individual projects. While this approach can be effective in the short term, it places a premium on improvisational skill and institutional memory rather than on transparent and generalizable standards. The resulting regulatory environment may function for insiders who are familiar with past

decisions and informal expectations, but it becomes increasingly opaque to new entrants, external observers, and the public^[51]. Permanent improvisation also complicates regulatory learning. Exemption decisions are typically justified by reference to the specifics of a particular case, which makes it difficult to extract general lessons or to translate experience into systematic rulemaking. Without a structured mechanism to aggregate and evaluate the outcomes of exemptions, regulatory knowledge remains fragmented. This fragmentation undermines the potential of exemptions to serve as a bridge toward more refined regulation, turning them instead into an endpoint that absorbs adaptive capacity without generating broader institutional progress.

In a sector such as nuclear energy, where regulatory stability and long-term planning are essential, this mode of governance carries particular risks. Projects span decades, safety cases evolve over long time horizons, and public trust depends on the perception that regulation is grounded in enduring principles rather than in situational accommodation. A regulatory framework that relies primarily on exemptions may struggle to provide the predictability and coherence required for such long-term commitments. The risk, therefore, is not simply that exemptions are overused, but that their overuse alters the character of the regulatory system itself. When improvisation becomes permanent, flexibility no longer serves as a transitional response to uncertainty, but as a substitute for preparedness. In this sense, the exemption-based model under Section 228b may resolve immediate regulatory challenges while simultaneously entrenching a form of governance that postpones the development of a structurally adapted framework for SMRs.

5.6. From flexibility to structural limits: exemptions as a transitional tool

Taken together, the aforementioned considerations suggest that the exemption-based model introduced by Section 228b is best understood as an interim response to regulatory unpreparedness rather than as a stable governance model for SMRs. Its flexibility and adaptability address genuine practical challenges, but they come at the cost of legal certainty, transparency, and a clear allocation of normative responsibility. As such, the exemption mechanism may be a useful

transitional tool, but its suitability as a long-term foundation for the regulation of nuclear innovation remains questionable. This conclusion invites a closer examination of alternative regulatory approaches that seek to reconcile flexibility with preparedness in a more structured manner.

Identified challenges are not unique to the Czech context. They reflect a broader structural challenge confronting regulatory systems across jurisdictions: the difficulty of governing emerging technologies within frameworks that were designed before those technologies existed. This challenge has attracted growing attention in regulatory theory under the concept of “agile regulatory governance”. Agile regulatory governance conceptualises the regulatory process as a shift from a static “regulate and forget” model to a dynamic “adapt and learn” cycle, accepting uncertainty about the effects of new technologies at the moment of creation of initial regulatory design^[52]. It emphasises iterative and flexible assessment cycles, early and continuous stakeholder engagement, and the establishment of learning-oriented feedback loops that allow regulatory frameworks to evolve in response to empirical evidence^[53]. At a more structural level, agile approaches are presented as a response to three interconnected problems: the pacing problem (regulatory frameworks change more slowly than the technologies they govern), the coordination problem (regulatory boundaries among agencies do not map neatly onto new technologies), and the responsibility problem (it is unclear who bears responsibility for the consequences of innovation)^[54]. Viewed through this lens, the exemption mechanism introduced by Section 228b can be read as a simple form of agile response - an attempt to build flexibility into an otherwise static framework. The following section examines whether alternative regulatory designs, in particular, SMR-specific legislation and structured experimental regimes, offer more comprehensive responses to these challenges.

6. Alternative regulatory approaches to SMRs

The critique of exemption-based regulation does not imply that flexibility should be abandoned or that the regulation of SMRs can be reduced to a single optimal model. On the contrary, the preceding analysis suggests that flexibility is indispensable in a field characterized by technological novelty and uncertainty.

The central issue is therefore not whether flexibility is needed, but how it should be institutionally embedded and normatively constrained. This section examines alternative regulatory approaches that seek to reconcile adaptability with legal certainty and preparedness more systematically than an exemption-based model relying primarily on administrative discretion.

6.1. Comparative overview of foreign regulatory approaches

As an initial step in the analysis of best regulatory approach, the authors examined the existing approaches of legislators from different jurisdictions. Given the relatively early stage of SMR deployment worldwide, regulatory experience remains limited. Nevertheless, international practice reveals several discernible trends regarding the adaptation of existing nuclear regulatory frameworks^[55]. Regulatory strategies for SMRs differ across states, reflecting the underlying philosophy of their nuclear legal and regulatory frameworks. Broadly, these frameworks can be categorized as either goal-setting (performance-based) and technology-neutral or rule-based (prescriptive) and technology-specific.

In countries with goal-setting, technology-neutral frameworks, SMRs can typically be regulated without major modifications to existing legislation^[56]. This flexibility stems from broadly formulated objectives, which are not tied to specific technical parameters or reactor designs. Canada and the United Kingdom exemplify this approach, where SMR deployment is facilitated under existing performance-oriented rules with minimal adjustments, emphasizing that the regulatory focus is on achieving outcomes rather than prescribing the means. By contrast, states with rule-based regulatory frameworks (which define detailed technical requirements and are less adaptable to new technologies) have reported the need for adjustments to accommodate SMRs or other innovative reactor types, such as high-temperature gas-cooled reactors (HTGRs) or floating nuclear power plants (FNPPs). These adjustments often occur at the level of secondary legislation, including regulations, technical standards, and equipment specifications. The Czech Republic, for instance, specifies maximum operating pressures and temperatures, nominal diameters, and detailed provisions for implementing the defence in depth (DiD) concept, requiring that physical safety barriers be supported by independent structures, systems, and components

(SSCs)^[57].

Overall, the experience of states suggests that goal-setting, technology-neutral approaches facilitate SMR regulation and reduce the need for extensive legal amendments, whereas rule-based, prescriptive systems often require targeted adjustments at secondary legislation or guidance levels to accommodate new reactor technologies. As SMR deployment progresses, many regulatory authorities are moving towards more flexible, performance-oriented, and technology-inclusive frameworks, balancing safety, security, and operational considerations while adapting to the novel characteristics of SMRs.

Several regulatory authorities have developed pre-licensing processes aimed at facilitating the introduction of SMRs by accommodating the varying levels of maturity among vendors and their technologies while remaining consistent with established regulatory approaches. Such mechanisms include the Generic Design Assessment (GDA) in the United Kingdom, the Vendor Design Review (VDR) in Canada, and Memoranda of Understanding (MOUs) in Argentina and China^[58]. These frameworks are designed to enhance regulatory flexibility and promote early engagement between developers and regulators. In the UK, applicants can leverage existing design submissions made to other regulatory bodies, supplementing them as necessary to meet UK-specific expectations. A notable aspect of the UK approach is the emphasis on early engagement and agreement on the scope of submissions throughout the pre-licensing process. A key innovation is the introduction of GDA statements, which provide a formal indication that the design (or a meaningful portion of it) aligns with UK regulatory expectations at various stages of the assessment. The UK has also developed a comprehensive suite of guidance for responsible parties, including detailed technical guidance and lessons learned, published in 2019.

In Canada, flexibility is embedded in the VDR process, allowing it to occur in parallel with license applications. For instance, vendors may engage in Phase 2 or Phase 3 of the VDR simultaneously with the regulatory body's review of a license application for site preparation. This parallel approach enables efficient regulatory review and helps align the design with Canadian expectations before formal licensing. Argentina has formalized its pre-licensing approach through MOUs, which establish the regulatory requirements and expectations for both the licensing process and the safety level that must be demonstrated by the plant

design. Compliance is assessed through the vendor's safety analysis, which is then submitted for review by the regulatory authority. In China, regulatory bodies also conduct pre-licensing activities prior to formal licensing. Given the specific design characteristics of SMRs, reviewers engage early in the safety review process, carrying out technical exchanges with designers to ensure that the proposed designs meet regulatory expectations before the commencement of the formal licensing process. Overall, these pre-licensing mechanisms across multiple jurisdictions demonstrate a shared recognition of the importance of early regulatory engagement, which facilitates alignment of innovative SMR designs with national regulatory requirements, reduces uncertainty for vendors, and enhances the efficiency and predictability of the licensing process.

The U.S. Nuclear Regulatory Commission (NRC) has evolved its licensing process to address the specific challenges of SMRs^[59]. Unlike large light-water reactors, SMRs currently lack widely agreed-upon design criteria, so applicants must present a detailed safety case demonstrating compliance with NRC requirements. Early pre-application engagement, public meetings, and structured technical discussions help guide the review process, link assessment phases, and ensure that the NRC can evaluate the safety of novel SMR designs. Canada regulates SMRs under a modern, robust, and technology-neutral framework established by the Nuclear Safety and Control Act (NSCA), overseen by the Canadian Nuclear Safety Commission (CNSC)^[60]. The framework, including supporting regulations and regulatory documents, is considered sufficient for SMR licensing without major changes. The CNSC uses a risk-informed, flexible approach, balancing prescriptive and performance-based requirements, and considers environmental impacts through the NSCA or the Impact Assessment Act (IAA). The IAA explicitly addresses SMRs in its thresholds for environmental review. Some related regulations are being reviewed: the Nuclear Liability and Compensation Act to reflect SMR-specific risk and insurance needs, and the Nuclear Security Regulations to account for evolving threats and new technologies. Pre-licensing engagement and international cooperation support regulatory readiness, ensuring SMR designs meet Canadian safety, security, and environmental standards.

France's nuclear legal framework, based on the Environmental Code, is technology-neutral and applies to all types of nuclear reactors, including

SMRs^[61]. Articles R.593-1 and L593-2 define reactors and classify them as basic nuclear installations, subject to the same requirements for licensing, operation, decommissioning, and regulatory oversight. As a result, no changes to the French legal framework are needed to accommodate potential SMR projects, similarly like Japan and South Korea. China has mitigated regulatory challenges by locating early SMRs at existing nuclear sites and relies on pre-application processes.

Overall, international practice suggests that most states currently attempt to integrate SMRs into existing nuclear legal and regulatory frameworks, with comprehensive legislative reform at the level of primary nuclear law remaining the exception. Regulatory responses typically consist of incremental and targeted measures (such as adjustments to secondary legislation, development of interpretative or technology-neutral guidance, use of graded and risk-informed approaches, and project-specific regulatory decisions) often implemented in parallel with licensing activities. This practice reflects both the limited deployment experience with SMRs and regulatory uncertainty as to which technologies will ultimately mature.

6.2. SMR-specific regulatory frameworks

Going from existing cases to more open-minded solutions, one of the most obvious responses to the regulatory challenges posed by SMRs would be the development of a specific legislative or sub-legislative framework tailored to their characteristics^[62]. Such an approach aims to internalize technological differentiation within the legal system itself, rather than accommodating it through individualized deviations from rules designed for other technologies. SMR-specific regulation may take the form of dedicated statutory provisions, implementing regulations, or binding regulatory guidance that adapts licensing stages, documentation requirements, and safety assessments to modular reactor designs.

The principal advantage of this approach lies in its capacity to provide ex ante legal certainty. By articulating regulatory expectations in advance, SMR-specific rules allow project developers, investors, and regulators to operate within a shared normative framework. This facilitates long-term planning, reduces reliance on

informal administrative signals, and limits the need for case-by-case negotiation over fundamental regulatory assumptions. From an institutional perspective, it also preserves the legislator's role in defining the core parameters of acceptable risk and regulatory policy.

At the same time, this approach has clear limitations. SMR technologies are still evolving, and premature codification risks locking regulatory requirements to design assumptions that may soon become obsolete. Frequent legislative amendments may be politically and institutionally difficult, particularly in nuclear law, where stability and caution are valued. SMR-specific regulation therefore requires careful calibration to avoid excessive technical detail and to preserve a degree of technological neutrality.

6.3. Structured experimental and sandbox regimes

A second alternative lies in the use of structured experimental regimes that explicitly acknowledge uncertainty and embed learning into the regulatory process. Unlike exemption mechanisms, which operate reactively and on an individual basis, experimental regimes are designed *ex ante* as temporary and bounded departures from standard regulation. They typically include predefined eligibility criteria, temporal limits, monitoring obligations, and mechanisms for evaluation and feedback into future rulemaking. In the context of SMRs, such regimes could allow regulators to authorize pilot projects or early deployments under controlled conditions, while systematically collecting data on safety performance, operational challenges, and regulatory adequacy. This approach offers a more transparent and accountable form of flexibility than *ad hoc* exemptions, as deviations from standard requirements are framed as part of an explicit regulatory experiment rather than as individualized accommodations.

Among all the structured experimental tools, regulatory sandboxes deliberately designed for controlled experimentation in the area of SMRs seem to offer the most coherent solution. Their defining feature is not merely flexibility, but the fact that such flexibility is embedded in a transparent, temporally limited, and normatively articulated structure. In this sense, sandboxes represent a shift from reactive accommodation toward proactive regulatory learning^[63]. At a minimum, a sandbox regime operating in real-world conditions involves a fixed-term

regulatory relief, whether in the form of a temporary license, a no-enforcement-action letter, or a formal waiver, coupled with an obligation on the part of participants to implement bespoke safeguards as a counterpart to the flexibility granted^[64]. Best practice in sandbox governance further requires a pre-agreed testing protocol that specifies the applicable safeguards, the communication arrangements with affected parties, and a dispute resolution mechanism, and that at minimum high-level information about admitted projects be published to enable public scrutiny of the regulator's choices^[65].

Regulatory sandboxes differ from exemption mechanisms in several legally significant respects. First, they are typically grounded in explicit legislative authorization that delineates the scope, purpose, and limits of experimentation. This authorization clarifies in advance which regulatory requirements may be relaxed, under what conditions, and for which categories of participants. In contrast to exemption regimes, where the boundaries of permissible deviation emerge gradually through administrative practice, sandbox regimes aim to define these boundaries *ex ante*, thereby reducing uncertainty and limiting discretionary drift^[66]. The key distinguishing feature of a well-designed sandbox, compared to an exemption mechanism such as Section 228b, is therefore not merely the existence of flexibility, but the existence of a structured governance architecture that makes the exercise of discretion transparent, time-limited, and oriented toward generating transferable regulatory knowledge. Regulatory sandboxes are also characterized by an explicit experimental purpose. Participation is not justified primarily by the inability to comply with existing rules, but by the expectation that controlled deviation will generate knowledge relevant for future regulation. This distinguishes sandboxing from exemption-based models, where deviation serves to resolve a specific regulatory mismatch but does not necessarily feed back into rule-making. Properly designed sandboxes incorporate mechanisms for monitoring, data collection, and evaluation, ensuring that experimentation contributes to institutional learning rather than remaining confined to isolated cases^[67]. Sandbox regimes are also inherently temporary and bounded. Temporal limitation is not an incidental feature, but a core design element that reinforces the exceptional nature of regulatory relaxation^[68]. By contrast, exemption mechanisms lack an internal time horizon and may persist as long as the regulator considers the conditions fulfilled. In the context of SMRs,

where deployment horizons span decades, this distinction is particularly important. A sandbox regime can authorize pilot projects or early deployments while simultaneously creating pressure for regulatory consolidation once sufficient experience has been gained. Exemptions, by comparison, risk becoming open-ended accommodations without a built-in transition toward general rules. Regulatory sandboxes also offer advantages in terms of transparency and accountability. Because sandbox regimes are typically established through publicly articulated criteria, they make visible both the reasons for regulatory deviation and the objectives pursued. This visibility helps mitigate some of the legitimacy concerns associated with discretion-heavy models. Stakeholders can understand why certain projects are admitted to a sandbox, what obligations remain in place, and how safety and public interests are safeguarded. In nuclear regulation, where public trust is essential, such transparency is not a marginal benefit but a central consideration.

Sandboxing, of course, is not a panacea. Designing a sandbox for SMRs raises difficult normative and institutional questions^[69]. Granting temporary regulatory relief in the nuclear sector may be politically sensitive, even if the sandbox is more structured and cautious than an exemption regime. Moreover, sandboxes require substantial regulatory capacity. Authorities must be able not only to assess safety on a case-by-case basis, but also to design experimental parameters, monitor compliance, and evaluate outcomes in a systematic manner. Without sufficient expertise and resources, sandboxing risks devolving into a rebranded form of ad hoc discretion.

A further structural tension, sometimes described as the *sandbox paradox*, concerns the relationship between innovation support and regulatory privilege. A sandbox must grant participants meaningful regulatory relief in order to be effective, yet that relief may simultaneously confer a government-granted competitive advantage over non-participants, including first-mover effects that are difficult to reverse^[70]. The personalization of regulatory treatment inherent in sandbox participation can improve the market position of admitted participants in ways that distort competition and undermine the level playing field, while also reducing the generalizability of the results: what succeeds within the protected conditions of a sandbox may not translate to broader market or sectoral conditions^[71]. In the context of nuclear regulation, these concerns are particularly

salient. Given the capital intensity and long lead times associated with SMR deployment, a sandbox regime that confers a first-mover advantage on an early participant could have lasting structural effects on the nascent SMR market.

Another limitation lies in the risk of fragmentation. If sandbox regimes are poorly integrated into the broader regulatory framework, they may create parallel tracks that complicate oversight and blur the distinction between experimental and standard regulation. This risk is particularly acute if sandbox participation is perceived as conferring competitive advantages or if the criteria for entry are insufficiently clear. To avoid this outcome, sandbox regimes must be carefully aligned with principles of equality, technological neutrality, and proportionality. Sandbox regimes also carry a heightened risk of regulatory capture. The close and often bilateral collaboration between the regulator and sandbox participants creates conditions in which the regulator is systematically exposed to the perspectives and interests of admitted firms, without equivalent engagement with non-participants, competitors, or broader public interests^[72]. The critical safeguards against this risk are transparency, reasoned justification, and independent evaluation of outcomes. In practical terms, these safeguards include open and objective eligibility criteria published in advance, stakeholder engagement at key decision points, a strict temporal limit on the relief granted, organizational separation between the experimental and enforcement functions of the regulator, and transparent publication of the terms of participation and the lessons learned^[73].

A related concern arises from the relationship between experimental regulatory regimes and the principle of legal certainty. The legitimacy of a sandbox is contingent on the existence of an explicit legislative mandate that defines its purpose, scope, duration, and evaluation criteria, and that makes it possible for affected parties to understand the applicable rules, the conditions under which the experiment will end, and the legal status of participants during and after the experimental period^[74]. Where the methodological design of the experimental regime is weak – characterized by unclear objectives, inadequate evaluation mechanisms, or non-transparent selection processes – it risks producing limited regulatory learning value while simultaneously undermining the principles of objectivity, transparency, and predictability that legal certainty requires. A poorly designed sandbox may, paradoxically, combine the disadvantages of both

regulatory models – the unpredictability of ad hoc discretion with the rigidity of case-specific precedents.

Despite these challenges, regulatory sandboxes can offer a conceptual advantage over exemption-based models in that they make the experimental nature of regulatory flexibility explicit.

Hence, experimental regimes are not without drawbacks. They require a high level of institutional capacity, clear political authorization, and a willingness to openly acknowledge regulatory uncertainty in a sector where public sensitivity is high. In nuclear law, the notion of experimentation may itself be controversial, even if the substance of the regime is more structured and cautious than exemption-based improvisation. Moreover, experimental frameworks must be carefully designed to avoid becoming parallel regulatory tracks that fragment oversight or undermine equal treatment. Ultimately, a sandbox regime represents an improvement over an exemption-based model only if accompanied by the broader institutional infrastructure that transforms experimental permission into genuine regulatory learning - clear objectives, monitoring capacity, evaluation mechanisms, and legislative feedback loops. Viewed through the lens of agile regulatory governance, the sandbox is not a self-sufficient instrument but one element within a wider toolkit that requires careful design and sustained institutional commitment to fulfil its promise.

6.4. Hybrid and staged approaches

In practice, the most realistic regulatory responses are likely to combine elements of the models described above. Hybrid approaches may use exemptions or experimental authorizations as transitional tools, while simultaneously committing to the gradual development of more structured regulatory frameworks as experience accumulates. Staged licensing processes, progressive codification of regulatory expectations, and the use of non-binding but transparent guidance can all contribute to balancing flexibility with preparedness. Such a solution may also take the form of performance-based or goal-oriented regulation^[75]. Instead of prescribing detailed technical solutions, this approach would define regulatory objectives, such as safety outcomes or risk thresholds, and leaves greater discretion to operators to demonstrate compliance.

For SMRs, this model offers a way to accommodate diverse designs and innovative safety concepts without constant regulatory revision.

From this perspective, exemptions need not be abandoned altogether, but their role should be carefully circumscribed. Rather than serving as a default mechanism for accommodating SMRs, exemptions can function as bridges that enable early deployment while explicitly triggering regulatory learning and subsequent normative clarification. Crucially, this requires an institutional commitment to move from individualized accommodation toward generalizable rules, rather than allowing administrative practice to substitute indefinitely for legislative or regulatory reform.

6.5. Context, administrative culture, and institutional capacity

The assessment of regulatory approaches to SMRs cannot be reduced to institutional design alone. Even the most carefully crafted regulatory model will function differently depending on the administrative culture in which it is embedded and the institutional capacities available to those charged with its implementation. Flexibility, discretion, and experimentation are not self-executing virtues; their effects are mediated by professional norms, organizational practices, and the broader relationship between regulators, regulated entities, and political institutions.

Administrative culture plays a particularly important role in determining whether discretion-based or experimental regulatory models enhance adaptability or instead generate legitimacy concerns. In systems characterized by strong traditions of transparency, consistency, and reason-giving, broad discretion may be perceived as a necessary and acceptable feature of technical regulation. Where regulators are accustomed to publishing detailed reasoning, engaging in structured dialogue with stakeholders, and maintaining internal coherence across decisions, discretionary flexibility may operate within relatively predictable bounds. In such contexts, trust in administrative expertise can partially compensate for the absence of highly prescriptive legal rules^[76]. By contrast, in administrative cultures where decision-making is less transparent or where informal practices play a significant role, the same degree of discretion may lead

to markedly different outcomes. The absence of clear external benchmarks may encourage reliance on informal understandings, negotiated solutions, or internal conventions that are not easily accessible to outsiders. Over time, this can deepen asymmetries between experienced participants and new entrants, and it may exacerbate concerns about arbitrariness, unequal treatment, or regulatory capture.

Institutional capacity is equally decisive. Models such as regulatory sandboxes or performance-based regulation presuppose a regulator that is capable not only of technical assessment, but also of meta-regulatory functions such as designing experimental parameters, monitoring compliance, collecting and evaluating data, and translating experience into normative guidance or legislative proposals. Where regulatory authorities are already operating at or near capacity, the introduction of such models may strain resources and undermine their intended benefits. In these circumstances, simpler tools such as exemptions may appear attractive precisely because they demand less upfront institutional investment, even if they are less satisfactory from a systemic perspective. The interaction between administrative culture and institutional capacity also affects the temporal dimension of regulatory choice. A system that relies heavily on discretion may function tolerably in the short term, particularly during early phases of technological deployment, but may struggle to sustain coherence over longer periods. As personnel change, institutional memory fades, and projects multiply, the absence of codified standards becomes increasingly problematic. Conversely, systems that invest early in structured experimentation and gradual codification may incur higher initial costs, but gain stability and predictability over time.

These considerations underscore that there is no universally “ideal” regulatory model for SMRs. The choice between exemptions, sandboxes, SMR-specific regulation, or hybrid approaches cannot be made in abstraction from the institutional environment in which they will operate. What can be said, however, is that reliance on broad discretion places particularly high demands on administrative culture and integrity, while structured experimental regimes demand significant institutional capacity and political commitment. Recognizing these trade-offs is essential if flexibility is to serve as a means of regulatory adaptation rather than as a substitute for preparedness. In this light,

the Czech experience illustrates a more general lesson. Exemption-based mechanisms may offer an expedient response to immediate regulatory challenges, but their long-term viability depends on contextual factors that are often taken for granted. Without sustained investment in transparency, capacity-building, and normative clarification, flexibility risks becoming fragile. Conversely, regulatory approaches that explicitly account for institutional limits and cultural conditions stand a better chance of supporting innovation while preserving the legitimacy and coherence of the legal framework.

7. Conclusions

As demonstrated above, the regulation of SMRs confronts legal systems with a structural dilemma that extends well beyond the specifics of any single jurisdiction. Legislators are required to respond to technologies whose contours are still evolving, while operating within legal frameworks that were designed for fundamentally different technological paradigms. The Czech amendment introducing Section 228b of the Atomic Act illustrates one way of addressing this dilemma: by preserving the existing regulatory architecture and introducing flexibility through an exemption-based mechanism centered on administrative discretion. The analysis conducted in this article suggests that such an approach offers tangible short-term advantages. Exemptions can mitigate the rigidity of legacy legislation, enable regulatory responsiveness, and allow administrative practice to adapt more quickly than formal lawmaking would permit. In this respect, Section 228b responds to a genuine practical problem and should not be dismissed as an irrational or purely opportunistic legislative choice. Flexibility remains an indispensable component of any regulatory response to SMRs. At the same time, the Czech case demonstrates the limits of relying on exemptions as a primary regulatory strategy. While the analysis has been conducted in the specific context of Czech nuclear law and SMR deployment, its implications are not confined to this sector nor the specific jurisdiction. The Czech case illustrates, in a particularly visible form, a broader regulatory tendency to address technological innovation through discretionary mechanisms embedded in legacy legal frameworks.

The authors argue that broad and open-ended formulation of the exemption

criteria places significant normative discretion in the hands of the regulator, affecting not only the application of the law but, in practice, its content. This concentration of discretion raises concerns relating to legal certainty, equality of treatment, accountability, and public trust, particularly in a sector characterized by high risks, long investment horizons, and strong public sensitivity. Over time, the routine use of exemptions creates a risk of normalizing deviation from statutory standards and entrenching a mode of “permanent improvisation” that substitutes administrative accommodation for structural preparedness. The comparison with alternative regulatory approaches reinforces this conclusion. While SMR-specific regulation, structured experimental regimes such as regulatory sandboxing, performance-based models, and hybrid approaches each entail their own costs and limitations, they share a common feature that distinguishes them from pure exemption-based governance: they seek to address technological novelty through generalizable frameworks rather than through individualized departures from existing rules. In doing so, they preserve a clearer allocation of normative responsibility between the legislator and the regulator and provide a more transparent basis for long-term planning and regulatory learning.

The key insight that emerges from this analysis is that flexibility and preparedness are not interchangeable. Flexibility can compensate for regulatory unpreparedness in the short term, but it cannot (and neither should it) replace the need for a legal framework that is structurally capable of accommodating new technologies. Exemption mechanisms such as Section 228b of the Czech Atomic Act may therefore play a useful transitional role, particularly in the early stages of SMR deployment, but they should not be regarded as a sufficient or stable endpoint of regulatory development. For the Czech Republic, this implies that Section 228b of the Atomic Act should be understood as a bridge rather than a destination, and its continued use should be accompanied by a conscious effort to translate regulatory experience into more systematic forms of legal adaptation, whether through SMR-sensitive regulation, structured experimentation, or other solutions. More broadly, the Czech case serves as a cautionary example for other jurisdictions facing similar challenges. The Czech experience thus highlights a more general lesson for regulatory theory: sector-specific responses to innovation often reveal underlying structural tensions that are shared across legal domains.

The temptation to rely on discretionary exemptions is understandable, but without parallel investment in a more conceptual and tailor-made solution, such reliance risks undermining the very objectives of legal certainty, safety, and legitimacy that nuclear regulation is meant to secure.

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2. Which is clearly emphasized by the fact that nuclear energy is mentioned among the very first priorities of the newly appointed government. See Policy Statement of the Government of the Czech Republic of 5 January 2026, available at: <https://vlada.gov.cz/cz/vlada/programove-prohlaseni/programove-prohlaseni-vlady-224629>, accessed on 12 December 2025. See also e.g. Gov. res. No. 806 of 22 October 2025, on ensuring the financing of adjustments to transport infrastructure for the transport of oversized and heavy components in connection with the construction of new nuclear power sources, including small modular reactors, at the Temelín site, or Gov. res. No. 334 of 27 April 2022, on the approval of the participation of the Czech Republic in the Small Modular Reactors Regulators' Forum (SMR Regulators' Forum) at the International Atomic Energy Agency).
3. L. n. 263/2016 coll. (the Atomic Act), as amended.
4. Introduced by l. n. 83/2025 coll., amending l. n. 263/2016 Coll. (the Atomic Act), effective from 1 July 2025.
5. See Explanatory Memorandum to l. n. 263/2016 coll. (the Atomic Act).
6. See Sec. 46 et seq. of the Atomic Act.
7. See also International Atomic Energy Agency, *Licensing Process for the Construction, Commissioning and Operation of Nuclear Power Plants*, IAEA, Vienna, 2023, or International Atomic Energy Agency, *IAEA Safety Standards: Licensing Process for Nuclear Installations for Protecting People and the Environment*, No. SSG-12 (Specific Safety Guide), IAEA, Vienna, 2010.
8. See inter alia Sec. 47 (1), (2) of the Atomic Act. See also d. n. 378/2016 coll. (the Siting of a Nuclear Installation).
9. See Sec. Sec. 48 (1), (2) of the Atomic Act.
10. See Explanatory Memorandum to l. n. 263/2016 coll. (the Atomic Act).

11. See e.g. R.E. Josephs, T. Yap, M. Alamooti, T. Omojiba, A. Benarbia, O. Tomomewo, H. Ouadi, *Regulation of Small Modular Reactors (SMRs): Innovative Strategies and Economic Insights*, in *Eng*, 6 (4), 2025, p. 61.
12. See Nuclear Energy Agency, *Small Modular Reactors: Challenges and Opportunities*, 2021, p. 29, available at: https://oecd-neo.org/upload/docs/application/pdf/2021-03/7560_smr_report.pdf, accessed on 20 December 2025.
13. See International Atomic Energy Agency, *Technology Neutral: Safety and Licensing of SMRs*, 2020, available at: <https://www.iaea.org/newscenter/news/technology-neutral-safety-and-licensing-of-smrs>, accessed on 20 December 2025.
14. Nuclear Energy Agency, *Small Modular Reactors: Challenges and Opportunities*, 2021, p. 19, available at: https://oecd-neo.org/upload/docs/application/pdf/2021-03/7560_smr_report.pdf, accessed on 20 December 2025.
15. See European Commission, *Small modular reactors explained*, available at: https://energy.ec.europa.eu/topics/nuclear-energy/small-modular-reactors/small-modular-reactors-explained_en, accessed on 20 December 2025.
16. Nuclear Energy Agency, *Small Modular Reactors: Challenges and Opportunities*, 2021, p. 19, available at: https://oecd-neo.org/upload/docs/application/pdf/2021-03/7560_smr_report.pdf, accessed on 20 December 2025. Also see USNRC Technical Training Center. Pressurized Water Reactor (PWR) Systems, p. 9, available at: <https://www.nrc.gov/reading-rm/basic-ref/students/for-educators/04.pdf>, accessed on 20 December 2025.
17. International Atomic Energy Agency, *Safety Reports Series: Applicability of IAEA Safety Standards to Non-Water-Cooled Reactors and Small Modular Reactors*, 2023, p. 53, available at: https://www-pub.iaea.org/MTCD/Publications/PDF/PUB2027_Web.pdf, accessed on 21 December 2025.
18. See Autorité de sûreté nucléaire et de radioprotection, *Information report: Small Modular Reactors*, 2021, available at: <https://research-assessment.asnr.fr/news/information-report-small-modular-reactors>, accessed on 20 December 2025.
19. Institut de radioprotection et de sûreté nucléaire, *Considerations on the performance and reliability of passive safety systems for nuclear reactors*, 2016, available at: https://research-assessment.asnr.fr/sites/en/files/2023-09/IRSN_Passive-safety-systems-for-nuclear-reactors_01-2016.pdf, accessed on 18 December 2025.
20. See Nuclear Energy Agency, *Small Modular Reactors: Challenges and Opportunities*, 2021, p. 19, available at: https://oecd-neo.org/upload/docs/application/pdf/2021-03/7560_smr_report.pdf, accessed on 20 December 2025.

21. Nuclear Energy Agency, *Small Modular Reactors: Challenges and Opportunities*, 2021, p 20, available at: https://oecd-neo.org/upload/docs/application/pdf/2021-03/7560_smr_report.pdf, accessed on 20 December 2025.
22. See International Atomic Energy Agency, *TECDOC Series: Lessons Learned in Regulating Small Modular Reactors – Challenges, Resolutions and Insights*, 2022, p. 3 et seq.
23. Ibid.
24. Sec. 228a of the Atomic Act provides that, upon request, the regulator shall provide preliminary information explaining the criteria it will use to assess an application or the conditions under which the application may be granted.
25. Sec. 228b (1) of the Atomic Act provides (translated by the author): «*A person, to whom a requirement laid down by this Act for the purpose of ensuring nuclear safety, radiation protection, technical safety, monitoring of the radiation situation, management of a radiological emergency, security, or nuclear non-proliferation applies, may apply to the Authority for approval of an exemption from such requirement*». Sec. 228b (2) further stipulates that «*The Authority may approve an exemption under paragraph (1) if [...] the requirement laid down by this Act referred to in paragraph (1) demonstrably cannot be fulfilled, [...] the procedure to be carried out on the basis of the requested exemption is justified, and [...] the approval of the exemption will not result in a reduction of the achieved and required level of nuclear safety, radiation protection, technical safety, monitoring of the radiation situation, management of a radiological emergency, security, or nuclear non-proliferation, and the procedure will be carried out in accordance with good practice*».
26. See note n. 261 of the Explanatory Memorandum to l. n. 83/2025 coll. amending l. n. 263/2016 coll. (the Atomic Act).
27. The legislator uses the so-called indeterminate legal concept (term), left vague on purpose to create room for interpretation, see further.
28. See Sec. 228b (3) of the Atomic Act.
29. See S.D. Croston, *An Important Member of the Family: The Role of Regulatory Exemptions in Administrative Procedure*, in *Admin. L. Rev.*, 64, 2012, p. 297 et seq.
30. This is linked closely to the nature of administrative discretion as such, see e.g. C. Harlow, R. Rawlings, *Rules and Discretion*, in *Law and Administration*, Law in Context, Cambridge University Press, Cambridge, 2009, pp. 190-232, or also G. Cartier, *Administrative Discretion and the Spirit of Legality: From Theory to Practice*, in *Can. J. L. & Soc.*, 24(3), 2009, pp. 313-335.
31. See also G. Scheffler, C. Coglianese, D.E. Walters, *Unrules*, in *Stan. L. Rev.*, 73, 2021, p. 885.
32. A.L. Nielson, *How Agencies Choose Whether to Enforce the Law: A Preliminary Investigation*, in *Notre Dame L. Rev.*, 93, 2018, p. 1517. See also S.D. Croston, Op. cit., 2012.
33. See Explanatory Memorandum to l. n. 83/2025 coll. amending l. n. 263/2016 coll. (the Atomic Act).

34. See also D.T. Deacon, *Administrative Forbearance*, in *Yale L.J.*, 125, 2016, p. 1551.
35. See e.g. S. Wade, C. Forsyth, J. Ghosh, *Abuse of Discretion*, in *Wade & Forsyth's Administrative Law*, Oxford University Press, Oxford, 2022, pp. 291-354.
36. In connection with the issue of indeterminate legal concepts, the Supreme Administrative Court of the Czech Republic repeatedly adjudicated that indeterminate legal concepts encompass «*phenomena or circumstances that cannot be successfully and completely defined with precision in legal terms*» (see e.g. the judgment of the Supreme Administrative Court of the Czech Republic of July 28, 2005, File No. 5 Afs 151/2004-73, No. 701/2005 coll.). Their content and scope may change and are often conditioned by the time and place in which the norm is applied. When interpreting an indeterminate legal concept, administrative authorities and courts must examine the specific factual circumstances as well as the other circumstances of the case, and must themselves at least in general terms clarify the content and meaning of the indeterminate concept used, from the perspective of whether the matter under review can be subsumed within the framework created by the scope of that indeterminate concept.
37. See Sec. 228b (2) a) of the Atomic Act.
38. See Sec. 228b (2) b) of the Atomic Act.
39. See Sec. 228b (2) c) of the Atomic Act.
40. Even in the light of Sec. 228a of the Atomic Act ensuring some degree of transparency.
41. See G. Scheffler, C. Coglianese, D.E. Walters, *Unrules*, in *Stan. L. Rev.*, 73, 2021, p. 885. See also S.D. Croston, *An Important Member of the Family: The Role of Regulatory Exemptions in Administrative Procedure*, in *Admin. L. Rev.*, 64, 2012, p. 303.
42. See G. Scheffler, C. Coglianese, D.E. Walters, *Unrules*, in *Stan. L. Rev.*, 73, 2021, p. 885.
43. This phenomenon is sometimes described as the extension of the executive power into the legislative power, although in the more traditional sense this refers to situations where the executive power issues general legal norms. See J. Boguszak, J. Čapek, A. Gerloch, *Theory of Law*, 2nd ed., Aspi, Prague, 2004, pp. 47-48.
44. See e.g. R. Klitgaard, *Controlling Corruption*, University of California Press, Berkeley, 1988. See also S. Rose-Ackerman, *The Economics of Corruption*, in *Journal of Public Economics*, 4, 1975, pp. 187-203, or S. Rose-Ackerman, B.J. Palifka, *Corruption and Government: Causes, Consequences, and Reform*, 2nd ed., Cambridge University Press, Cambridge, 2016.
45. See e.g. A.L. Nielson, *How Agencies Choose Whether to Enforce the Law: A Preliminary Investigation*, in *Notre Dame L. Rev.*, 93, 2018, pp. 1517-1562.
46. See S. Grimmelikhuijsen, F. de Vries, R. Bouwman, *Regulators as Guardians of Trust? The Contingent and Modest Positive Effect of Targeted Transparency on Citizen Trust in Regulated Sectors*, in *J. Pub. Admin. Res. & Theory*, 34(1), 2024, 136-149. See also OECD Nuclear Energy Agency, *Characteristics of a Trusted Nuclear Regulator*, OECD-NEA, Paris, 2024, available at: https://www.oecd-neo.org/upload/docs/application/pdf/2025-03/7618_green_booklet_-_characteristics_of_a_trusted_nuclear_regulator.pdf, accessed on 16 December 2025, or

- OECD Nuclear Energy Agency, *Investing in Trust: Nuclear Regulation and the Role of the Regulator*, OECD-NEA, Paris, 2019, available at: <https://www.oecd-neo.org/upload/docs/application/pdf/2019-12/3062-investing-in-trust.pdf>, accessed on 11 December 2025.
47. See e.g. F. Schauer, *Exceptions*, in *Univ. of Chicago L. Rev.*, 58(3), 1991, pp. 871-899. See also D.T. Deacon, *Administrative Forbearance*, in *Yale L.J.*, 125, 2016, p. 1551.
 48. This rather general trend is perhaps the most obvious in temporary measures that later “harden” into permanence, see e.g. M. Eyal-Cohen, *Unintended Legislative Inertia*, in *Ga. L. Rev.*, 55 (3), 2021, p. 1193, or F. Fagan, *After the Sunset: The Residual Effect of Temporary Legislation*, in *Eur. J. Law Econ.*, 36, 2013, pp. 209-226, or B. Ackerman, *The Emergency Constitution*, in *Yale L.J.*, 113 (2), 2004, pp. 1029-1091.
 49. See F. Fagan, Op. Cit., 2013.
 50. See e.g. G. Scheffler, C. Coglianese, D.E. Walters, *Unrules*, in *Stan. L. Rev.*, 73, 2021, p. 885.
 51. Although this factor can be partially mitigated through transparency mechanisms such as the one introduced in Sec. 228a of the Atomic Act.
 52. OECD, Recommendation of the Council for Agile Regulatory Governance to Harness Innovation, OECD/LEGAL/0464, 2025, p. 8, available at: https://www.oecd-neo.org/upload/docs/application/pdf/2025-03/7618_green_booklet_-_characteristics_of_a_trusted_nuclear_regulator.pdf, accessed on 12 April 2026.
 53. *Ibid.*, p 6.
 54. World Economic Forum, *Agile Regulation for the Fourth Industrial Revolution*, 2020, p. 6, available at: <https://www.weforum.org/about/agile-regulation-for-the-fourth-industrial-revolution-a-toolkit-for-regulators/>.
 55. See e.g. International Atomic Energy Agency, *TECDOC Series: Lessons Learned in Regulating Small Modular Reactors – Challenges, Resolutions and Insights*, IAEA, Vienna, 2022, p. 3 et seq.
 56. *Ibid.*, p. 4 et seq.
 57. D. n. 376/2016 coll. (Dual-Use Items in the Nuclear Field).
 58. International Atomic Energy Agency, *TECDOC Series: Lessons Learned in Regulating Small Modular Reactors – Challenges, Resolutions and Insights*, IAEA, Vienna, 2022, p. 19.
 59. *Ibid.*, p. 148.
 60. *Ibid.*, p. 91.
 61. *Convention on Nuclear Safety: National Report of France for the Combined 8th and 9th Review Meeting in 2023*, IAEA, Vienna, 2023.
 62. See also R.E. Josephs, T. Yap, M. Alamooti, T. Omojiba, A. Benarbia, O. Tomomewo, H. Ouadi, *Regulation of Small Modular Reactors (SMRs): Innovative Strategies and Economic Insights*, in *Eng*, 6 (4), 2025, p. 61.
 63. See H.J. Allen, *Regulatory Sandboxes*, in *Geo. Wash. L. Rev.*, 87(3), 2019, pp. 579-645, or

- B. Lim, C. Low, *Regulatory Sandboxes*, in J. Madir (ed.), *FinTech. Law and Regulation*, 2nd ed., Edward Elgar, Cheltenham, 2021, pp. 340-364.
64. World Economic Forum, *Agile Regulation for the Fourth Industrial Revolution*, 2020, p. 21, available at: <https://www.weforum.org/about/agile-regulation-for-the-fourth-industrial-revolution-a-toolkit-for-regulators/>.
65. Ibid, p. 22.
66. See also V. Sharp, G. Blahoudková, *Setting up the Legislative Framework for the Introduction of a Regulatory Sandbox: the Czech Perspective*, in *AUC Iuridica*, 70 (2), 2024, pp. 35-48.
67. See e.g. I. Jeník, S. Duff, *How to Build a Regulatory Sandbox: A Practical Guide for Policy Makers*, CGAP, Washington DC, 2020.
68. H.J. Allen, Op. Cit., 2019.
69. See e.g. I. Jeník, S. Duff, Op. Cit., 2020.
70. B. R. Knight, T. E. Mitchell, *The Sandbox Paradox: Balancing the Need to Facilitate Innovation with the Risk of Regulatory Privilege*, in *S. C. L. Rev.*, 72, 445, 2020, p. 19.
71. V. Vinci, S. Ranchordás, *Regulatory sandboxes and innovation-friendly regulation: Between collaboration and capture*, in *Italian Journal of Public Law*, 1., 2024, p. 133.
72. V. Vinci, S. Ranchordás, *Regulatory sandboxes and innovation-friendly regulation: Between collaboration and capture*, in *Italian Journal of Public Law*, 1., 2024, p. 110.
73. World Economic Forum, *Agile Regulation for the Fourth Industrial Revolution*, 2020, p. 26, available at: <https://www.weforum.org/about/agile-regulation-for-the-fourth-industrial-revolution-a-toolkit-for-regulators/>.
74. S. Ranchordás, *Experimental Regulations and Regulatory Sandboxes: Law without Order?*, in *Law and Method*, 2021. p. 3, <https://doi.org/10.5553/REM/.000064>.
75. As it is the case with some of the already existing regulation, see e.g. International Atomic Energy Agency, *TECDOC Series: Lessons Learned in Regulating Small Modular Reactors – Challenges, Resolutions and Insights*, IAEA, Vienna, 2022, p. 3 et seq.
76. See e.g. B. Bugaric, *Openness and Transparency in Public Administration: Challenges for Public Law*, in *Wis. Int'l L.J.*, 22, 2004, pp. 483-520, and R. Schmidt, C. Scott, *Regulatory Discretion: Structuring Power in the Era of Regulatory Capitalism*, in *Legal Studies*, 41, 2021, pp. 454-473.