Tort law makes a quantum leap: a review of the civil liability regime for nuclear operators in UAE law

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Abstract

Purpose – This study aims to illustrate the special liability regime applying to a nuclear operator for damage caused to individuals, property and natural resources, after the United Arab Emirates (UAE) implemented the Vienna Convention on Civil Liability for Nuclear Damage of 1963 through Federal Law No. 4 of 2012. This paper contrasts this special regime with the default regime of civil liability set out in the UAE Civil Code. The comparison helps clarify the legal nature of nuclear operator liability, the extent of protection it affords to the parties injured in a nuclear incident, the conditions under which it obtains, as well as the different damage headings it allows.

Design/methodology/approach – This paper is a desk-based legal research.

Findings – The main novelties enshrined in the special liability regime for nuclear facility operators are the adoption of an objective approach (strict liability) and the introduction of exceptions different from those contemplated in the default regime spelled out in the UAE Civil Code, thereby affording greater protection to victims of nuclear leakages.

Originality/value – This paper is a first in-depth commentary of UAE Federal Law No. 4 of 2012 Concerning Civil Liability for Nuclear Damage. Considering the UAE's dualistic approach to the implementation of international obligations, and the present lack of reliable alternative avenues towards compensation beyond private operator liability, the overview provided here will be of value to regional and international practitioners – including from neighbouring countries to the UAE (Oman, Qatar, Bahrain) – that are not currently signatories to any convention on nuclear liability.

Keywords United Arab Emirates, Radioactive release, Vienna Convention, Tort, Civil liability, Nuclear liability

Paper type Technical paper

1. Introduction

Since publication of its 2008 policy white paper on the evaluation and potential development of civilian nuclear energy (Government of the UAE, 2008), the United Arab Emirates (UAE) has been actively pursuing the development of peaceful nuclear capabilities, as part of a strategy to diversify its energy supply in the face of the demands posed by increasing population (e.g. water de-salinisation) and an expanding economy (Sim, 2012). This has been made possible, at an international level, by undertaking commitments to refrain from developing proliferation-sensitive capabilities (Fakhoury, 2020), such as uranium

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enrichment or spent fuel reprocessing (Blanchard and Kerr, 2010). These commitments were enshrined in a formal agreement with the United States, concluded in May 2009 [1], which has been described by one commentator as the "gold standard" of non-proliferation safeguards (Pelton, 2017). Since then, domestic legislation has been enacted to give implementation to the proposed civilian nuclear programme. Following the enactment of Law No. 6 of 2009, Concerning the Peaceful Uses of Nuclear Energy (hereinafter "Nuclear Law"), a Federal Authority for Nuclear Regulation (hereinafter "FANR") has been put in place. In December 2009, the executive arm of the programme (the Emirates Nuclear Energy Corporation) was set up to commission the proposed nuclear reactors from Korea Electric Power Corporation (Pelton, 2017).

The aforementioned background provides the motivation for this study, which looks at a key piece of (legal) infrastructure that has been put in place in the UAE, to establish appropriate *ex ante* incentives towards safety best practices, by nudging nuclear operators fully to internalise the risks inherent in their activities, and adequate *ex post* safeguards to mitigate the adverse effects of potential nuclear incidents on individuals, property and natural resources (Bizet, 2017). Since the beginning, the UAE contemplated joining the main international instruments dealing with nuclear liability, in the event its nuclear programme progressed to implementation (Government of the UAE, 2008). Among such instruments are the Vienna Convention on Civil Liability for Nuclear Damage of 1963 (hereinafter "Vienna Convention") [2] and the 1997 Vienna Protocol amending it [3]. Following its accession to the Vienna Convention and the 1997 Vienna Protocol, the UAE has given these instruments domestic implementation through Law No. 4 of 2012, Concerning Civil Liability for Nuclear Damage (hereinafter "Nuclear Liability Law").

The Vienna Convention establishes a *private* liability regime upon operators of nuclear facilities: "states bear no *public* liability if a private nuclear operator within their territory has an accident with cross-border implications" (Suttenberg, 2016, p. 211). Pursuant to Article 1 A of the Vienna Convention, as amended by the 1997 Vienna Protocol, even parties that suffer cross-border damage – including those found in a state that is not a signatory to a convention on nuclear liability – will have recourse to compensation from the operator. In relation to the UAE's decision to build peaceful nuclear energy capability, the liability of the nuclear operator therefore extends to parties located in neighbouring countries, such as Oman, Qatar and Bahrain, which are not signatories to any of the main conventions on nuclear liability [4]. Furthermore, the UAE adheres to a dualist approach in how it incorporates international obligations in its domestic legal order, meaning that international legal agreements ought to be "translated" in the domestic hierarchy of sources and do not automatically form part of the domestic legal order (Parolin, 2020) [5]. This provides at least regional relevance to a study such as this one, which illustrates how the obligations enshrined in the Vienna Convention and its amended protocol have been transposed into domestic law.

In view of this, the present study reviews the liability regime set out in the UAE Nuclear Liability Law, by clarifying its legal nature and the extent to which it departs from the general civil liability regime spelled out in UAE Law No. 5 of 1985, on Civil Transactions (hereinafter "UAE Civil Code"). To do so, Section 2 analyses the notion of "operator of a nuclear installation", which delimits the category of subjects to whom the norms on nuclear liability apply. Section 3 sets out the requirements of a claim for compensation for nuclear damage, namely, a radioactive release, nuclear damage and a causal connection between the two. The same section also teases out the connections between the entitlements to compensation set out in the Nuclear Liability Law and other applicable provisions on compensation for damage, whether based on the default regime of tort liability (i.e. compensation for moral damage) or on occupational safety laws. Section 4 presents an assessment of various features of the Nuclear Liability Law that substantiates a "quantum leap" compared to the current position of UAE tort law, and particularly the adoption of an objective approach (independent of the demonstration of specific harmful conduct by the tortfeasor) and of a restricted set of exceptions. Finally, Section 5 brings the main findings and practical implications of the paper into focus.

2. Liability of the nuclear installation operator

The liability of the operator of a nuclear installation (hereinafter "nuclear operator" or "operator") cannot be contractual in nature, owing to the lack of a contractual relation between him/her and the parties eventually injured by the nuclear installation. Rather, the legal basis for nuclear operator liability is to be found in tort and, specifically, in the infringement of the general legal obligation not to harm others (Al-Momani *et al.*, 2015), enshrined in Article 282 of the UAE Civil Code ("The author of any tort, even if not discerning, shall be bound to repair the prejudice") [6]. In the light of this, it should not be presumed that the nuclear operator manages an installation exclusively under the terms of the licence granted by the state, under a third, *ad hoc* liability regime. Rather, the operator's liability remains liability in tort, albeit modified by the special provisions set out in the Nuclear Liability Law, to ensure compliance of the UAE legal system with the key international obligations and principles on the subject.

2.1 Operator of a nuclear installation

Central to the application of the provisions of the Nuclear Liability Law is the qualification of "operator of a nuclear installation", describing who can be held liable for damage originating in a nuclear facility. To this end, Article 1 of the UAE Nuclear Liability Law stipulates that "The Operator is the person licensed by the Federal Authority for Nuclear Regulation (FANR) to operate a Nuclear Installation pursuant to Federal Law by Decree No. 6 of 2009 and designated as the Operator in such license" [7]. The UAE Nuclear Law provides further elucidation at Article 1, defining a nuclear operator as follows:

> Any authorized and/or responsible party for nuclear security, radiation, radioactive waste and transport safety upon implementation of activities related to nuclear facilities or any sources of radiation, including natural persons, governmental agencies, consignors or carriers, licensees, hospitals and self-employed persons.

Based on the above, it makes no difference whether the person authorised to operate a nuclear installation be a natural or legal person, a public or private entity and whether or not a national of the UAE. The above definition is also broad enough to extend beyond the principal operator of a given facility, since it can also include any alternative operators, such as the carriers of nuclear material or handlers of nuclear waste. On this matter, Article 6 of the Nuclear Liability Law makes it possible for the state regulator (FANR), upon prior written consent of the principal operator, also to engage with the carrier of nuclear material or handler of nuclear waste in the capacity of operators [8]. At the same time, FANR is not bound to accept the principal operator's designation of an alternative operator but has a right of review to verify the alternative operator's compliance with the requirements for insurance coverage and financial security set out in Article 8 of the Nuclear Liability Law.

2.2 Exclusive liability of the operator

Article 4 of the UAE Nuclear Liability Law charges the operator with sole liability for damage provoked by a nuclear incident, to the effect that any actions for compensation need to be brought solely against the operator or its insurers or guarantors, pursuant to Article 10 (1) of the Nuclear Liability Law.

By reference to Article II of the Vienna Convention, which is explicitly called up in Article 4 of the UAE Nuclear Liability Law, the operator of a nuclear installation is to be held liable in three main scenarios: if an incident occurs within the nuclear installation; if an incident occurs outside of the operator's facility but is caused by nuclear material coming from or generated therein (subject to the conditions enumerated in Article II(1) of the Vienna Convention); and if the incident occurs outside of the operator's facility and is caused by nuclear material destined to reach the operator's facility, whenever the material can be deemed to have passed under the operator's care or sphere of liability.

In sum, an operator is to be held liable for nuclear damage caused to individuals and property, when that damage stems from nuclear material that is deemed to be under the operator's "sphere of control" (whether by means of a contractual assumption of liability, or of material possession). The operator's liability shall cease when such nuclear material enters the sphere of another party, after it has been removed from his/her sphere of control.

3. Requirements of civil liability for nuclear damage

Civil liability for nuclear damage arises following a nuclear incident that results in damage, pursuant to Article 3 of the UAE Nuclear Liability Law. Specifically, three conditions must be verified for liability to obtain: a radioactive release, nuclear damage and a relationship of causality between the two.

3.1 Radioactive release

In a narrower sense, a radioactive release is a potentially damaging episode that involves radioactive products or waste, which Article 1 of the UAE Nuclear Liability Law defines as "Any radioactive material produced in, or any material made radioactive by exposure to the radiation incidental to, the production or utilization of nuclear fuel". However, the last paragraph in the definition of "nuclear damage" at Article 1 of the same includes the following in the list of materials that might give rise to a radioactive release:

> [I]onising radiation emitted from any source of radiation within a nuclear installation, or emitted from nuclear fuel, radioactive products or radioactive waste contained in a nuclear installation or of nuclear material coming from, originating in or sent to a nuclear installation, whether arising from the radioactive properties of such material or from a combination of radioactive properties with toxic, explosive or other hazardous properties of such material.

A radioactive release thus embraces a broad range of different episodes, indeed virtually all events in the field of nuclear operations that might produce damage [9]. A radioactive release activates the liability of the operator regardless of its origin: whether it stems from radioactive sources within the operator's nuclear installation or located outside of it but imported to or sent from that installation; and regardless of whether it comes from nuclear fuel, radioactive products or radioactive waste. Furthermore, liability obtains whether the release was caused by the operator directly, by its employees or by a third party (with a notable exception for acts of war, see Section 4 below). Finally, a radioactive release obtains, for the purposes of the UAE Nuclear Liability Law, irrespective of its particular mechanics of causation: whether it stems from a malfunction in the installation's machinery, from employee negligence, from a defect in the specifications of the raw material used, or from an error in the scientific estimates of quantities to be used.

3.2 Nuclear damage

Damage is generally defined as an injury to a person's right or legitimate interest, when such right or legitimate interest involves the person's financial assets, bodily integrity, liberty or honour (Abdel Rahman, 2002). Article 1 of the UAE Nuclear Liability Law uses an *ad hoc* definition of damage listing several items [10]. The most conspicuous instances of direct material damage will be: loss of life, all manner of bodily injury, but also malformations or loss of efficiency of some organs of the body, and finally destruction or impairment of property as well as any economic losses resulting therefrom, including the loss of tourism that might have once been peculiar to the affected area. A final catchall clause, at Article 1(7), closes the list, lending credit to the view that the different items listed under Article 1 merely constitute examples of compensable damage, rather than an exhaustive enumeration: *any* material damage, whatever its form, originating from a radioactive release shall be eligible for compensation (subject to the maximum ceilings discussed below in Section 4).

The many headings of nuclear damage under Article 1 span a number of possible distinctions. First, damage may be generalised, such as to towards the environment [11] and economic activity, or it may be personal. Personal damage will consist in loss of life, bodily injury and in the destruction and impairment of personal property. Second, damage may be actual, as exemplified in the case of bodily damage, in the event of destruction or impairment of property, in the cost of measures for the reinstatement of a damaged environment [12]. However, damage might also be potential, e.g. when the disruptive environmental effects of a radioactive release will manifest only after a period of time. Nuclear damage comprises expected and unexpected repercussions, especially in connection with the effects on future births occurring in an environment contaminated by nuclear radiation [13]. Finally, damage also includes the cost of mitigation measures that the operator will need to undertake in the event of a nuclear incident, to curb extant damage, or curtail further anticipated damage [14]. This comprehensive notion of nuclear damage still operates within the general rule that compensation ought to cover any losses, as well as any missed profits, whether with respect to the person him-/herself, to his/her property, to the environment in which he or she lives, to the loss of business opportunities in the economy of the area affected by a nuclear incident.

Eligible damage will need to bear some connection to the operator's installation found to be the source of a radioactive release. What amounts to a connection is clarified by Article II (1) of the Vienna Convention. The connection will be straightforward if the release occurs on the operator's premises. If the radioactive release occurs outside of them, it will have to be traceable to nuclear material that was either leaving the operator's facility, or reaching it, provided that the damage was incurred when the material was, respectively, still or already in the sphere of control of that particular operator. Further, the damage must be caused by ionising radiation emitted from any source, as well as from nuclear fuel, radioactive products or waste, within the operator's nuclear installation, or attributable to nuclear material coming from or destined to reach the operator's facility (i.e. the various instances of a radioactive release). Any damage that cannot show this manner of connection to a nuclear installation will not be treated as "nuclear damage" for the purposes of the UAE Nuclear Liability Law and will therefore be subject to compensation in accordance with the default regime of tort liability.

3.3 Connection with moral damage and occupational injury

Moral damage refers to an injury impacting a person's feelings and emotions, reputation, dignity or respect, which Article 293(1) of the UAE Civil Code explicitly acknowledges as being eligible for compensation. Along the same lines, the grief suffered due to the loss of a loved one is acknowledged as moral damage (Al-Momani *et al.*, 2015) and made susceptible of compensation by Article 293(2) of the UAE Civil Code.

The UAE Nuclear Liability Law does not explicitly mention moral damage as a separate heading, but neither does it explicitly exclude it. Hence, the general rule that the right to have damage made good covers both material and moral damage should remain applicable. Since moral damage signals a real injury, victims of nuclear incidents ought not to be denied compensation (Sarhan and Khater, 2009), nor would compensation for moral damage stand in contradiction with the provisions of the Vienna Convention, where it can straightforwardly fall under "loss of life or personal injury" (Ishtitat, 2015, p. 50), so that damages owed to the injured person ought to encompass both material and moral injuries. Moreover, any harm to a person's life or safety might cause moral damage to the injured person him-/herself, but also to others, who in some cases under UAE law will be entitled to claim for reflected (*al mortad*) moral damage [15].

In sum, whenever a person suffers death or other direct physical injury, moral damage connected to that injury will also be eligible for compensation. However, the existing UAE legal framework also supports a standalone award of moral damages, even when divorced from some form of direct material injury suffered by the person, e.g. with respect to the sheer psychological distress suffered in consequence of the disruption of one's living environment.

A similar question, in terms of investigating how damage headings recognised elsewhere in the UAE legal system might apply in the event of a nuclear incident, concerns the simultaneous applicability of legislation on occupational injuries [16] and the UAE Nuclear Liability Law. Article 14 of the Nuclear Liability Law has an explicit provision to that effect. This means that a worker will be entitled to combine compensation owed to him/her under the applicable legislation on occupational safety, with damages awarded under the Nuclear Liability Law. For this to occur, the one condition necessary is that the work injury also be susceptible to classification as nuclear damage, which will be the case when it has been caused by a radioactive release, in the sense discussed above. If the occupational injury stems from another event, e.g. a collision with a machine taking place in a nuclear facility, then it will not amount to nuclear damage and fall within the purview of occupational safety legislation only.

3.4 Causal relationship between radioactive release and damage

A nuclear operator shall be liable for damage caused by a nuclear incident, provided that a causal relationship between a radioactive release and damage can be established, pursuant to Article 3 of the UAE Nuclear Liability Law. For a causal relationship to hold, it is sufficient that the damage have been caused by the nuclear incident, either directly or indirectly, and liability will obtain in the face of damage that is either actual or anticipated, as it is known that nuclear damage can be inherited by later generations. In the latter scenario, expert assessments would play a crucial role in establishing the consequences of the incident.

Article 117 of the UAE Civil Code allocates the burden of proof in such a way that the injured person, acting as plaintiff, is bound to establish the grounds for his/her claim. In practice, this allocation of the burden of proof can cause the injured party to fail in having her right to compensation enforced, whenever causality might be hard to establish. This might be for lack of witnesses, for an excessive lapse of time between the harmful event and the manifestation of any damage, or for the interference of external factors hampering proof of a direct causal relationship (Zahra, 2002, p. 228). In view of these known difficulties, judicial practice has tended to protect the injured person by demanding only proof of the harmful event and the damage, so that – in the words of the Dubai Court of Cassation – "the causal relationship is assumed", [17] whenever a given type of event is normally expected to result in some form of damage.

Article 3 of the Nuclear Liability Law requires a causal relationship between a radioactive release and damage, but it fails to specify the burden of proof concerning causation. However, such a causal relationship can just as well be presumed, without demanding an explicit proof, as it already occurs for general tort cases. This interpretation is reinforced by Article 7 of the Nuclear Liability Law, which appears to assume the presence of a causal relationship, unless the operator prove the injured person's negligent or intentional contribution to the incident. In view of this, a claim for compensation under the Nuclear Liability Law will be established simply through proof of the event of the radioactive release and of the damage suffered, whenever expert opinion deems the connection between the two to be ordinarily present [18].

4. Absolute operator liability, available defences, compensation ceilings and joint/multiple responsibility

4.1 Absolute operator liability

A nuclear operator will be liable for the simple occurrence of a radioactive release, regardless of whether it occurred deliberately or unintentionally, and with or without negligence on his/her part. This is what "absolute liability" means, namely, that there is no need to prove wrongful conduct on the part of the operator: it will be sufficient to establish a radioactive release that causes damage unto others. The principle of absolute operator liability is stated in Article 3 of the UAE Nuclear Liability Law, as well as in Article IV(1) of the Vienna Convention [19]. This principle amounts to considering nuclear activity *per se* as hazardous and a potential source of harm, without requiring proof of negligent or otherwise intentionally harmful conduct on the part of the operator. This amounts to a significant innovation – indeed a veritable quantum leap – in the landscape of UAE tort law, as it represents the adoption of the "objective theory" of tort liability, whereby liability obtains merely against evidence of damage, rather than of a harmful act that be ascribable to a particular subject. Indeed, the default position of the UAE Civil Code is found at Article 282, which establishes that tort liability will ordinarily be found subject to proof of three elements: a person's harmful act, damage, and a causal relationship between the two. In contrast to this, the objective approach modelled in the UAE Nuclear Liability Law is capable of awarding damages, independently of the commission of a specific wrongful act by a particular tortfeasor [20].

Several theoretical proposals can be found in international legal scholarship, to justify the adoption of one such approach. For instance, some commentators from the field of law and economics have advanced the suggestion of tying compensation for the injured person to the likelihood of causation, in accordance with statistical estimates (Young *et al.*, 2004) requiring courts to resort to statistical and scientific evidence to establish liability. Another commentator has suggested that it is corrective justice [21] that demands that an injured person be compensated, so long as he/she has suffered a direct damage, regardless of the fault of the tortfeasor (Calabresi, 2007). Last, but not least, it has been argued that compensation for damage, regardless of fault, has its rationale in the assumption of a risk (Simons, 2015). Emerging orientations in the field of jurisprudence have even gone as far as arguing that the mere enhancement of risk could be construed as a form of damage to another's autonomy, potentially justifying a finding of liability (Oberdiek, 2008).

The foregoing considerations substantiate an approving attitude towards the "quantum leap" that Article 3 of the UAE Nuclear Liability Law has undertaken, against the existing background of UAE tort law. First, absolute operator liability is consistent with the needs of justice: given one party's earnings from a risky activity, he/she ought to made to internalise the costs faced by third parties damaged by that activity [22]. This is all the more so given the risks involved by a radioactive release, which can adversely affect all areas of current and future life even leading to the disappearance of life, and which might materialise after long periods of time. Following on from this, it is reasonable to compensate the damage suffered by an injured party, as a way of restoring the financial balance between the injured person's realised losses and the tortfeasor's liabilities. In sum, absolute liability provides greater protection to the injured person, making him/her deserving of compensation from the operator, without requiring an inquiry into whether and how the operator ultimately caused the damaging event.

4.2 Defences available to the operator

Another point where the UAE Nuclear Liability Law diverges from the default regime of tort liability is in the defences available to the alleged tortfeasor. Article 287 of the UAE Civil Code deems the causal link between the defendant's conduct and the plaintiff's damage to have been severed by the intervention of an "extraneous cause" in the form of "a natural disaster, unavoidable accident, force majeure, act of a third party, or act of the person suffering loss". In contrast to this, Article 7 of the UAE Nuclear Liability Law reduces the available headings of extraneous cause to just one, namely a fault committed by the injured party. This approach is consistent with the position enshrined in Article IV(2) of the Vienna Convention.

The Vienna Convention, in its version amended by the 1997 Vienna Protocol, contains one additional defence at Article IV(3/a) for "armed conflict, acts of aggression, civil war or civil disobedience". While this exception has not been transposed directly in the UAE Nuclear Liability Law, it should still be considered applicable on grounds of the Vienna Convention being mentioned – in Article 1(3) of the Nuclear Liability Law – as the source of any default rules concerning matters not expressly stipulated in the UAE law. The burden of proving a connection between the nuclear damage and the conflict shall lie with the operator, who will need to establish that the radioactive release was a direct consequence of one of the grounds given in the provision. Finally, the wording "armed conflict, acts of aggression, civil war or civil disobedience" is suitably broad to embrace all conflicts and hostilities [23]. While an operator cannot counter war acts or other hostilities that may occur in situations of armed insurrection and internal wars, a similar exception does not carry over in the same way to natural disasters. Pursuant to Article IV(3/b) of the amended Vienna Convention, these will need to be "grave" and "of an exceptional character", meaning that nuclear installations must ordinarily be equipped to withstand natural disasters, such as earthquakes.

Even with regards to the one grounds of exemption that has been retained from the general tort regime in UAE law, stricter conditions have been set. Indeed, the contribution of the injured person will not be sufficient, as such, to exempt the operator from liability, as it happens the case for the general tort liability regime [24], but only provided it results from gross negligence of the person suffering the damage, or from an act or omission of such person done with intent to cause damage. Proof that the act of the injured person is intentional or caused by gross negligence needs to be provided by the operator, for the exemption to be effective. This deviation is, of course, owing to the seriousness of a nuclear incident and its potential for damaging the environment as a whole, and the human beings in it.

The other types of extraneous cause valid for general tort liability will not be available to the operator of a nuclear installation, such as *force majeure*, or the act of a third party, e.g. in the case of a lorry crashing in the operator's facility, so as to cause the nuclear leakage. In such cases, the operator will still face liability, while being able to claim against the party who caused the damage under the right of recourse provided for in Article 11 of the UAE Nuclear Liability Law.

Article 3 of the same law allows for one instance in which the normal regime of tort liability and related exemptions based on the UAE Civil Code will apply, instead of the stricter provisions of the UAE Nuclear Liability Law. This is when the competent authority, [25] in view of the limited risks involved, exempts a nuclear installation or a small quantity of nuclear material from the domain of application of the Nuclear Liability Law. In this case, the exclusion is conditional on a case-specific assessment that the facility, or the material actually exempted, conforms to the conditions for minimal risk established by the international standard-setting body for atomic energy.

4.3 Compensation for damage caused by a nuclear incident

Article 5 of the UAE Nuclear Liability Law lays out an upper and a lower limit to the liability of a nuclear operator, which apply to each individual nuclear incident for which they might be in a position to face liability. The upper limit is set at 450 million Special Drawing Rights (SDRs) – which does not include, however, concurrent damage awards under different pieces of legislation, such as on occupational safety [26].

The setting of an upper limit to compensation ought to be read in conjunction with Article 8(4) of the UAE Nuclear Liability Law, which refers to Article VIII(2) of the Vienna Convention, in the amended version subsequent to the 1997 Vienna Protocol. These provisions apply when the damage to be compensated exceeds the maximum ceiling for the operator's liability and assign an order of priority in the distribution of that sum to claims relating to loss of life or personal injury. The wording of the Vienna Convention does not fully clarify whether the available compensation should be allocated between claims for loss of life and claims for personal injury (considered with an equal order of priority), or whether loss of life ought to take precedence over personal injury. A reasonable interpretation seems to be that claims for loss of life ought to be fulfilled first, followed by personal injury cases and then by other forms of damage.

Article 5(2) of the UAE Nuclear Liability Law also sets out a minimum liability. This is the threshold below which the operator's liability cannot be pushed, namely, 5 million SDRs. A lowering of the operator's liability (provided it remains above this minimum) can be authorised by the regulatory authority (i.e. FANR, pursuant to Article 13(2) of the same law) with respect to installations consisting of reactors used for research purposes, low-power reactors and installations that process or store nuclear material that entail a lower risk or a particular benefit (in terms of their research function). This notwithstanding, injured parties will remain entitled to claim up to the maximum amount of liability specified at Article 2(1), with the state taking up the difference between the reduced ceiling set for the specific installation that produced the damage, and the maximum threshold set at Article 5(1) of the UAE Nuclear Liability Law.

4.4 Several operators or several installations

The UAE Nuclear Liability Law does not explicitly regulate the cases of nuclear damage for which several operators may be responsible, or of damage caused by several installations of the same operator: in those cases, Article 3(2) of the UAE Nuclear Liability Law directs interpreters to the provisions of the Vienna Convention, which includes provisions applying to those cases at Article II(3)–(4).

In case a damage-causing radioactive release involves different installations for which different operators are responsible, then the operators involved shall be jointly and severally liable, insofar as the share of damage of each operator were not clearly separable. What this means is that victims may sue the involved operators jointly or individually for the total of the damage they have borne. In turn, each operator will have a right of recourse against the other operator, commensurate with the share of causation that can be attributed to that operator's installation. Joint and several liability offers an added guarantee of receiving compensation for victims, in those cases in which it might be difficult for them to determine the exact contribution that each party might have brought to the total damage (Salama, 1997). Pursuant to Article 291 of the UAE Civil Code, if it were not possible to ascertain the exact share of each operator's contribution to the total damage, then the total liability will be apportioned in equal shares between them. If that were not the case, then each shall be liable only in proportion to his/her share of damage (Salama, 1997). In the case of several operators' installations contributing jointly to the radioactive release, each operator's liability will be capped at the limits discussed in the previous section.

A further limitation is spelled out, when the radioactive release occurs from nuclear material that is either being carried in a single means of transport or being stored before or after transport in the same nuclear installation. In such case, even if more than one operator were liable, the total liability of *both* operators would be capped at the limits set out in Article 5 of the UAE Nuclear Liability Law.

Finally, if one nuclear incident involved several installations of the same operator, that operator would be liable for the maximum spelled out in the mentioned Article 5 with respect to *each* of the facilities involved in the incident.

5. Conclusion

This article has undertaken an overview of the UAE Nuclear Liability Law of 2012, implementing the Vienna Convention (in its version amended by the 1997 Vienna Protocol) in the UAE domestic legal system. This step constitutes an important piece in the legal infrastructure allowing for the development of peaceful nuclear capability in the UAE.

By reviewing the main requirements of liability (the definition of operator, radioactive release, and nuclear damage), it was possible to reveal two main innovations that the UAE Nuclear Liability Law undertakes, compared with the general regime for tort liability spelled out in the UAE Civil Code. First, where the UAE Civil Code necessitates three requirements for tort liability to obtain (damage, a harmful act, and a causal connection between the two), the UAE Nuclear Liability Law deems the mere existence of nuclear damage sufficient to trigger against a claim against a nuclear operator. This is the meaning of "absolute" liability as per Article 3 of the Nuclear Liability Law, in the sense that the specific conduct that led to the nuclear incident is ordinarily not relevant for the operator to be held liable, namely whether it was a deliberate act, an accidental mishap, and whether or not it was due to the operator's negligence.

A second relevant consequence of deeming the operator absolutely liable for nuclear damage is a more restrictive operation of the principle that the occurrence of an extraneous cause can sever the causal link between the operator's conduct and the damage, as it ordinarily applies to tort claims under the UAE Civil Code (Article 287). Indeed, the only means of denying liability are for the operator to establish not only a contribution by the victim of injury, but also that such a contribution was brought with a deliberate intent to cause damage, or out of gross negligence (which amounts to a further restriction compared to the general tort rules in the UAE Civil Code).

By reference to the applicable provisions of the Vienna Convention, the operator's liability will fail to obtain, in case of nuclear incidents caused by armed conflicts, on grounds of the operator's obvious inability to counter war acts or other hostilities that may occur in situations of armed insurrection and internal wars. Natural disasters are another limited cause of exemptions, subject to the limitation of the disaster being "grave" and "of an exceptional character", in consideration of the need for nuclear installations to be ordinarily equipped to withstand natural disasters.

A significant departure from Article 27 of the UAE Civil Code is the inadmissibility of the defence that a third party act caused the incident (save for cases in which that act occurs, for instance, because of armed conflicts). Still, in such cases the operator will have a right of redress against the responsible third party.

Finally, this article has also reviewed the maximum ceilings for compensation set out by the UAE Nuclear Liability Law and the Vienna Convention, suggesting priority for the following:

- loss of life cases;
- personal injury claims; and
- damages to property and environment in case of claims exceeding those maximum ceilings.

A significant practical implication of the adoption of the UAE Nuclear Liability Law is that it is an explicit instance of adoption of the so-called "objective theory" of tort liability. This theory is based on the reasoning that the party earning from risky activity ought to be made to internalise the costs of any damage that may arise from it onto third parties (Jadalhaq, 2019). This innovation could mark the beginning of a wider shift in the underlying justification for tort liability in the UAE. Such a shift would help address all those cases where it is difficult or impossible to establish a "harmful act" at the root of damage suffered by the victim, because damage is simply an externality of conduct that is not *per se* unlawful, i.e. does not cause damage intentionally or by failing to adopt mandatory standards of caution.

In view of this, a promising direction for future research would be an in-depth study of Emirati case law, gathering mounting evidence of instances in which a fault-based approach to tort liability leaves victims without compensation. This would prepare the ground for more widespread adoption of an objective approach to tort liability – beyond the sectorial domain of catastrophic risks, like those connected with a nuclear installation.

Notes

1. Agreement for Cooperation Between the Government of the United States of America and the Government of the United Arab Emirates Concerning Peaceful Uses of Nuclear Energy Pursuant to Secs. 123(b) and (d) of the Atomic Energy Act of 1954, as Amended (42 USC 2153(b), (d)), House Document 111-43 (21 May 2009).
2. Vienna Convention on Civil Liability for Nuclear Damage (adopted 21 May 1963, entered into force 12 November 1977) (Vienna Convention) 1063 UNTS 265.
3. Protocol to Amend the 1963 Vienna Convention on Civil Liability for Nuclear Damage (adopted 12 September 1997, entered into force 4 October 2003) (1997 Vienna Protocol) 2241 UNTS 270.
4. Enduring uncertainty remains on whether states affected by nuclear damage might be able to find an appropriate forum and legal basis in international law to bring a liability claim against the *state* in which a nuclear installation is located: a move that would make economic sense when coming up against caps in the liability, or limitations in the ability to pay, of the nuclear operator (Suttenberg, 2016, pp. 211-217).
5. International treaties ought to be ratified by federal decree, pursuant to Art. 47 para 1(4) of the UAE Constitution. Art. 125 subsequently creates a duty upon the governments of the federated Emirates to implement any treaties entered into by the Union (Peaslee, 195, p. 1720).

6. All English language translations of the UAE Civil Code are drawn from Whelan and Hall (2011).
7. The rules governing the granting, cancellation or suspension of a licence to operate nuclear facilities are set out in Articles 23–31 of the UAE Nuclear Law.
8. This article implements Art. II(2) of the Vienna Convention, providing for a carrier or handler of nuclear material to be considered, under certain conditions, as an operator of a nuclear installation situated within the territory of the signatory state.
9. However, according to Article 1 of the UAE Nuclear Liability Law, radioisotopes that have reached the final stage of manufacture for use in scientific, medical, agricultural, commercial or industrial applications do not substantiate a radioactive release.
10. This definition implements the notion of "nuclear damage" articulated at Article I(1/k) of the Vienna Convention, as amended by the 1997 Vienna Protocol.
11. For further discussion of environmental damage, see Hawass (2011, pp. 958–990).
12. A definition of "measures of reinstatement" was introduced at Article I(1/m) of the Vienna Convention by the 1997 Vienna Protocol.
13. The most glaring example of the unpredictable repercussions of nuclear damage comes from Iraq's exposure to nuclear radiation during the Gulf Wars of 1991 and 2003. The effects of that exposure are still enduring in the form of higher cancer figures and spontaneous abortions, which are three times higher than in 1989 (al-Mikdadi, 2005).
14. Indeed, Article 1 of the Nuclear Liability Law also defines "nuclear incident" as an event that might create "a grave and imminent threat of causing [. . .] damage only with respect to preventive measures", i.e. in terms of engendering the need to undertake efforts to secure a potential source of harm.
15. Reflected damage is harm caused to a person by the injury suffered by another person, which may be physical or moral. Each person who has suffered reflected physical harm is entitled to compensation, whereas compensation for reflected moral damage is limited to the spouse and relatives of the victim (Al-Momani, Jadalhaq and Abdul Sattar, 2015, p. 74).
16. The applicable legislation grants workers in the field of ionising radiation the right to conduct periodic medical examinations to ascertain any damage they might suffer because of exposure to such radiation. In the event of injury, they are also entitled to treatment and compensation (Al Helou, 2004).
17. Appeal No. 79/1995 of 10 June 1995 (December 1997) 6 Journal of Judiciary and Legislation 485.
18. For a discussion of the defences available to the operator of the nuclear facility, see Section 4 below.
19. The principle of absolute operator liability for nuclear damage was established through two previous treaty provisions. The first is Article 2/1 of the Brussels Convention on the Liability of Operators of Nuclear Ships (adopted on 26 May 1962) 57 AJIL 268. The second is the preamble of the Brussels Convention on Civil Liability in the Field of Maritime Transport of Nuclear Material (adopted 17 December 1971) 974 UNTS 255. For further background, see Salama (1997, pp. 479-480).
20. For a more in-depth treatment of the objective and subjective theories for calibrating the requirements of tort liability, see Jadalhaq (2019).
21. On the distinction between corrective justice and other notions of justice, see Zimmerman (2012).
22. France is one of the jurisdictions where the party benefitting from a given state of affairs is to be held liable for any expenses connected to it (see, e.g., the French Aviation Law of 1955). A similar approach can be found in Egypt, at Article 178 of the Civil Code of 1949, establishing

the liability of the person in charge of a machine, for damage caused by the latter (Salama, 1997, pp. 472–473, 481).

23. This is suitable to extend to terrorist attacks, which one commentator argues is problematic because it shifts the costs onto the victims (Currie, 2005).
24. Indeed, Article 290 of the UAE Civil Code allows the judge to reduce or deny an award for damages, if the injured person has "participated by his own act in bringing about or aggravating the damage".
25. In the UAE this will be FANR, pursuant to Article 13 of the Nuclear Liability Law.
26. SDRs are a unit of account managed by the International Monetary Fund and allocated between its member states to carry out the Fund's operations (see Article 1 of the UAE Nuclear Liability Law).

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