

# **Liability for Nuclear Transport: a pragmatic case study approach, including SMRs**

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## **Abstract.**

Nuclear new build and the deployment of SMRs in the wake of climate change will increase global transport of nuclear substances.

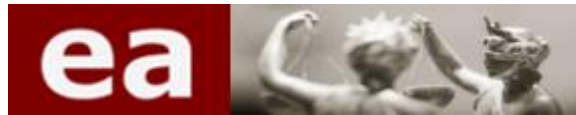
The present article pragmatically answers two questions:

- (1) **Who** is liable in case of an incident during nuclear transport?
- (2) **Where** is this company liable in case of an incident during nuclear transport?

It explores how the international conventions interact to allow for the necessary flexibility of transport while guaranteeing legal certainty of civil nuclear third party liability in case of an incident occurring during transport of nuclear substances.

It is key for all stakeholders to know in advance of any business involving transport of nuclear substances across various countries which party is liable towards third party victims in case of an incident and in which country this party will be held liable, i.e. before which courts.

The issue is important irrespective of policy considerations given that both operating and decommissioning nuclear power plants and SMRs involve multiple cross-border transport transactions, e.g. the transport of nuclear fuel, nuclear spare parts, nuclear spent fuel or nuclear waste.



In the present article, various scenarios are depicted in order to illustrate the main rules that apply at international level in an attempt to depict a highly complex issue in a pragmatic fashion. It is therefore not meant as an exhaustive, in-depth analysis of the wide range of complex legal entanglements that may arise but as basic guidance on liability scenarios in case of nuclear transport.

Finally, special attention is paid to the transport of small and modular reactors (SMRs). Given their small physical size and modular production in factories, SMRs will involve more nuclear transport than nuclear power plants have done to date (e.g. when SMRs are used to replace diesel generators on mining sites in remote regions).

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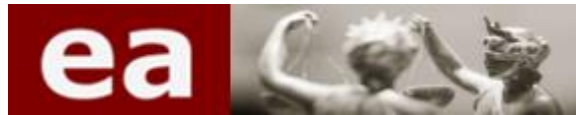
Abstract.

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## **1. Nuclear Transport Incidents: who is liable? where is this company liable?**

When engaging in business involving transport of nuclear substances, the issue of liability for nuclear incidents is one of the main deterrents given the exposure to high liability risks. Even though lower liability limits are usually foreseen for incidents that occur during the transport of nuclear substances as compared with incidents that occur on site of nuclear power plants<sup>1</sup>, liability still remains at a high level.

Legal certainty on two questions is therefore key for business.

The first question is “*Who is liable?*”

The second question is “*Where is this company liable?*”

Those two questions are not easy to address. However, legal certainty on the responses to both questions is crucial for commercial decision-making.

## **2. Who is liable when an incident occurs during transport of nuclear substances?**

### **2.1 Which legal document provides the answer?**

The answer to this question lies in the international nuclear liability conventions.

Indeed, world-wide, third party liability stemming from nuclear damage is characterised by the coexistence of various international conventions and different legal regimes. Some States are party to the Paris Convention of the OECD’s Nuclear Energy Agency (the Paris Convention)<sup>2</sup>. Other States are party to the IAEA’s Vienna Convention (the 1963 Vienna Convention)<sup>3</sup>. Other States are party to the free-standing Convention on Supplementary

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<sup>1</sup> See below, in section 2.1.

<sup>2</sup> The Paris Convention on Third Party Liability in the Field of Nuclear Energy of 29 July 1960, [http://www.nea.fr/html/law/nlparis\\_conv.html](http://www.nea.fr/html/law/nlparis_conv.html). The original 1960 version of this convention is not in force anymore. Only the 2004 revised Paris Convention is in force (since 1 January 2022). See footnote 5.

<sup>3</sup> The Vienna Convention on Civil Liability for Nuclear Damage of 21 May 1963, <http://www.iaea.org/Publications/Documents/Infcircs/1996/inf500.shtml>



Compensation for Nuclear Damage (Convention on Supplementary Compensation)<sup>4</sup>. This medley is commonly called the international nuclear liability conventions.

This medley is amplified by numerous supplementary conventions and protocols amending these conventions. Moreover, some States are not a party to any international nuclear liability convention. Those States either abide by domestic nuclear liability laws or have no nuclear liability rules at all.

Regarding the liability amounts, lower liability limits are usually foreseen for incidents that occur during the transport of nuclear substances as compared with incidents that occur on site of nuclear power plants. The 2004 revised Paris Convention<sup>5</sup>, for example, provides for liability amounts of minimum 80 million € for nuclear incidents during transport (instead of minimum 700 million € for incidents occurring on site of nuclear power plants). Even though the 1963 Vienna Convention, the 1997 revised Vienna Convention<sup>6</sup> and the Convention on Supplementary Compensation do not foresee lower liability limits for nuclear incidents during transport, they provide for a reduced liability amount for low-risk activities of 5 million IMF special drawing rights. In addition many national laws, transposing the international nuclear liability conventions into national law, expressly introduce lower liability limits for nuclear incidents during transport. The present article does not address liability amounts, which involves complex considerations of national laws transposing the limits of the conventions, as well as State funds (e.g. the Convention on Supplementary Compensation or the Brussels Supplementary Convention<sup>7</sup>). It limits itself to “who is liable?” and does not address “for how much is the company liable?”

Regarding “who is liable?”, the rule of thumb is that, when it comes to incidents arising from nuclear transport, international transport conventions defer to the international nuclear

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<sup>4</sup> The Convention on Supplementary Compensation for Nuclear Damage of 12 September 1997, <http://www.iaea.org/Publications/Documents/Infcircs/1998/infcirc567.pdf>

<sup>5</sup> A Protocol amending the Paris Convention was adopted on 12 February 2004 and entered into force on 1 January 2022, [https://www.oecd-nea.org/jcms/pl\\_20361/2004-protocol-to-amend-the-paris-convention](https://www.oecd-nea.org/jcms/pl_20361/2004-protocol-to-amend-the-paris-convention)

<sup>6</sup> A Protocol amending the Vienna Convention was adopted on 12 September 1997 and entered into force on 4 October 2003, <https://www.iaea.org/publications/13633/the-1997-vienna-convention-on-civil-liability-for-nuclear-damage-and-the-1997-convention-on-supplementary-compensation-for-nuclear-damage-explanatory-texts>

<sup>7</sup> The Brussels Supplementary Convention to the Paris Convention of 31 January 1963, [https://www.oecd-nea.org/jcms/pl\\_20318/brussels-convention-supplementary-to-the-paris-convention-on-third-party-liability-in-the-field-of-nuclear-energy-brussels-supplementary-convention-or-bsc](https://www.oecd-nea.org/jcms/pl_20318/brussels-convention-supplementary-to-the-paris-convention-on-third-party-liability-in-the-field-of-nuclear-energy-brussels-supplementary-convention-or-bsc)



liability conventions. The 1971 Convention relating to Civil Liability in the field of Maritime Carriage of Nuclear Material of the International Maritime Organisation (IMO)<sup>8</sup>, for example, expressly states that a person liable for a nuclear transport incident under maritime transport conventions is exonerated if the sending or receiving nuclear power plant operator is also liable for the same nuclear transport incident under the international nuclear liability conventions (the 2004 revised Paris Convention, the 1963 Vienna Convention, the 1997 revised Vienna Convention or the Convention on Supplementary Compensation) or national law similar in scope. Similarly, the 1970 international railway convention on the carriage of goods (CIM) annexed to the Convention on the International Carriage by Rail (COTIF)<sup>9</sup> recognizes the primacy of the international nuclear liability conventions in case of transport incidents involving nuclear substances.

## **2.2 The overarching principle.**

The international nuclear liability conventions set out an overarching principle for liability in case of incidents during nuclear transport. This overarching principle is called “channelling”.

In a nutshell, “channelling” implies that, in case of an incident involving nuclear substances, only the operator of the nuclear installation (i.e. the license-holder<sup>10</sup>) is liable for damage to third parties. Liability is channelled towards the operator regardless of the incident's cause. Irrespective of their possible contribution to the incident, none of the other players – nuclear plant designers and constructors (architects-engineers), suppliers of nuclear material or fuel, transporters of nuclear material or fuel to and from the nuclear power plant, subcontractors, test operators, consultants, etc. – bears any responsibility towards third parties in the event of

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<sup>8</sup> The Convention relating to Civil Liability in the Field of Maritime Carriage of Nuclear Material of 17 December 1971, <https://www.imo.org/en/About/Conventions/Pages/Convention-relating-to-Civil-Liability-in-the-Field-of-Maritime-Carriage-of-Nuclear-Material->

[https://www.imo.org/en/About/Conventions/Pages/Convention-relating-to-Civil-Liability-in-the-Field-of-Maritime-Carriage-of-Nuclear-Material-\(NUCLEAR\).aspx#:~:text=The%201971%20Convention%20provides%20that,Field%20of%20Nuclear%20Energy%3B%20or](https://www.imo.org/en/About/Conventions/Pages/Convention-relating-to-Civil-Liability-in-the-Field-of-Maritime-Carriage-of-Nuclear-Material-(NUCLEAR).aspx#:~:text=The%201971%20Convention%20provides%20that,Field%20of%20Nuclear%20Energy%3B%20or)  
<sup>9</sup> Art. 39 of the Uniform Rules Concerning the Contract of International Carriage of Goods by Rail (CIM) of 9 June 1999, Appendix B to the Convention concerning International Carriage by Rail (COTIF), [https://www.cit-rail.org/secure-media/files/documentation\\_de/freight/cim/cim\\_1999\\_2010-12-01\\_fr-de-en\\_rev\\_ns.pdf?cid=306960](https://www.cit-rail.org/secure-media/files/documentation_de/freight/cim/cim_1999_2010-12-01_fr-de-en_rev_ns.pdf?cid=306960)

<sup>10</sup> The operator of a nuclear installation is defined as the person designated or recognized as the operator of that nuclear installation by the competent public authorities. Where there is a system of licensing or authorization, the operator is the licensee or person duly authorized. In all other cases he will be the person required by the competent public authority to hold the necessary financial protection to meet third party liability risks. See Art. 1(a)(vi) of the 2004 revised Paris Convention. Art. 1(1)(c) of the 1963 Vienna Convention and the 1997 revised Vienna Convention. Art. 1(1)(d) of the Annex to the Convention on Supplementary Compensation.



a nuclear incident. The latter are protected from third party litigation in the case of an incident.

Channelling is an oddness of nuclear liability law. It deviates from the nuts and bolts of ordinary tort law provided for by both civil law and common law systems<sup>11</sup>. This is the most glaring exception of nuclear law: it generally allows suppliers and designers of defective reactors to escape any responsibility in case of a nuclear incident. This implies that, even if a meltdown is due to a defective reactor design, the designer will never bear any liability for an ensuing nuclear incident. Or if a supplier provides defective emergency equipment, he will not be held liable if these technological flaws lead to a nuclear incident. In both cases, the nuclear power plant operator will be exclusively liable for a nuclear incident<sup>12</sup>.

Channelling of civil<sup>13</sup> nuclear third party liability has been recognised as “*the most characteristic concept of nuclear law*”<sup>14</sup> by the renowned Polish Professor Tadeusz Gadkowski.

Legal channelling<sup>15</sup> has been incorporated in nearly all nuclear laws world-wide. This is because most countries have adhered to the above-mentioned international nuclear liability conventions and because all these international conventions provide for legal channelling:

- Article 6(f) of the 2004 revised Paris Convention: “*The operator shall have a **right of recourse only**: (i) If the nuclear damage caused by a nuclear incident results from an act or an omission done **with intent to***

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<sup>11</sup> E. AMEYE, “Channelling of Nuclear Third Party Liability towards the Operator: Is it Sustainable in a Developing Nuclear World or is there a Need for Liability of Nuclear Architects and Engineers?” (2010), 19, *European Energy and Environmental Law Review*, Issue 1, pp. 33-58,

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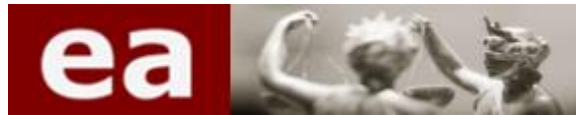
<sup>12</sup> E. AMEYE, “United States and India: two nuclear states with legislation that truly holds responsible parties liable in case of a nuclear accident” (2014), *Journal of Risk Research* 18(8), pp. 1070-1082, <https://doi.org/10.1080/13669877.2014.971421>.

<sup>13</sup> Channelling only concerns civil liability and does not affect criminal law proceedings.

<sup>14</sup> T. GADKOWSKI “International Liability of State for Nuclear Damage” (1989), Delft, p.83.

<sup>15</sup> There are two forms of channelling, namely **legal channelling**, on the one hand, where victims can only sue the operator, who cannot, in turn, reclaim the disbursed compensations from other parties who caused the incident, e.g. a reactor designer or uranium supplier (this regime is applicable in most of the EU); and **economic channelling**, on the other hand, where victims can sue both the operator and any other party who caused the incident, e.g. a reactor designer or uranium supplier, but where the operator – whose insurance needs to be an *omnibus coverage* or *umbrella insurance* covering these other parties’ third party liability as well – ultimately needs to indemnify the said parties (this regime is applicable in the US). For more details, see <sup>15</sup> E. AMEYE, “Channelling of Nuclear Third Party Liability towards the Operator: Is it Sustainable in a Developing Nuclear World or is there a Need for Liability of Nuclear Architects and Engineers?” (2010), 19, *European Energy and Environmental Law Review*, Issue 1, pp. 33-58,

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*cause damage, against the individual acting or omitting to act with such intent; (ii) If and to the extent that it is so provided by contract.”*

- Article X of the 1963 Vienna Convention and the 1997 revised Vienna Convention<sup>16</sup>: *“The operator shall have a **right of recourse only** - (a) if this is expressly provided for by a contract in writing; or (b) if the nuclear incident results from an act or omission done **with intent to cause damage**, against the individual who has acted or omitted to act with such intent. The right of recourse provided for under this Article may also be extended to benefit the Installation State insofar as it has provided public funds pursuant to this Convention.”*
- Article 10 of the Convention on Supplementary Compensation: *“National law may provide that the operator shall have a **right of recourse only**: (a) if this is expressly provided for by a contract in writing; or (b) if the nuclear incident results from an act or omission done **with intent to cause damage**, against the individual who has acted or omitted to act with such intent.”*

## **2.3 A pragmatic analysis of various scenarios.**

### **2.3.1 Preliminary remarks.**

The response to the question of “who is liable?” for transport incidents involving nuclear substances from one State to another State (possibly through one or more transit States) is set out in the international nuclear liability conventions.

However, as set out above, there is a medley of international nuclear liability conventions.

In addition, some States are not a party to any international nuclear liability convention.

The response to “who is liable?” will therefore differ when nuclear substances are transported to and from States that are a party to the international nuclear liability conventions, on the one hand, and when nuclear substances are transported to and from States that are not a party to any international nuclear convention, on the other hand.

The scenarios below summarise the common rules regarding liability in case of a nuclear incident during transport<sup>17</sup>.

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<sup>16</sup> The original 1963 Vienna Convention is still in force, in parallel with the revised 1997 Vienna Convention, which entered into force the States that acceded to it or ratified it.

<sup>17</sup> Given the complexities involved in real nuclear liability cases, the present article should not be relied upon as legal opinions of any kind as to how liability would play out for actual nuclear incidents.





These common rules concern liability for transport incidents involving nuclear substances. Due to the lower risks involved, liability is excluded in case of transport incidents involving, on the one hand, natural or depleted uranium and uranium ores and, on the other hand, radioisotopes which have reached their final stage of fabrication so as to be usable for scientific, medical, agricultural, commercial or industrial purposes (e.g. radiography).

To ensure legal certainty on the contents of the shipment, the international nuclear liability conventions require operators of nuclear power plants to provide certificates of financial security (CoFS) to carriers and transporters<sup>18</sup>, comprising detailed information regarding the shipment, namely the type of nuclear substance contained in the shipment, details of the operator of the nuclear installation, a declaration of the competent public authority confirming the name of the operator, and the amount, type and duration of liability.

Importantly, when the scenarios that I will describe in section 2.3.2 address transport “from a Convention State to a Convention State”, it implies the *same* Convention, e.g. transport from a Paris Convention State to another Paris Convention State or transport from a Vienna Convention State to another Vienna Convention State. In other terms, if nuclear substances are transported from a Paris Convention State to a Vienna Convention State, this is not considered as transport from a Convention State to a Convention State, but transport from a Convention State to a Non-Convention State because the States are not parties to the *same* Convention. However, there is an exception as regards the Paris and the Vienna Convention. The exception is that, if both States are parties to the 1988 Joint Protocol<sup>19</sup>, then Vienna Convention States are considered “Convention States” in their relations with Paris Convention States for transport liability purposes and, *vice versa*, Paris Convention States are considered “Convention States” in their relations with Vienna Convention States for transport liability purposes. Hence, the 1988 Joint Protocol plays an invaluable role in transport liability.

Liability under the international nuclear liability conventions also depends on the geographic coverage of these conventions. Whether conventions apply or not depends on whether the

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<sup>18</sup> Art. 4(d) of the 2004 revised Paris Convention. Art. III of the 1963 Vienna Convention and the 1997 revised Vienna Convention. Art. 3(1) of the Annex to the Convention on Supplementary Compensation.

<sup>19</sup> The Joint Protocol on the application of the Paris and Vienna Conventions of 31 September 1988, <https://www.iaea.org/sites/default/files/infcirc402.pdf>





damage caused by the nuclear transport incident falls within their geographic scope. They only apply in scenarios where nuclear transport incidents cause damages “in a Convention State”. One therefore needs to understand what is meant by damage “in a Convention State”. Is it in the territory of the State or also in its territorial waters? What about a ship registered with a Convention State navigating on high seas? What about reciprocity bridging different Conventions? This is set out in precise rules for each Convention. However, each Convention has different rules when it comes to the geographic scope of their coverage. The 2004 revised Paris Convention has a broad scope<sup>20</sup>. So does the 1997 revised Vienna Convention<sup>21</sup>. The geographic scope of the 1963 Vienna Convention is unclear<sup>22</sup>. Importantly, the 1988 Joint Protocol bridges the geographic scope of the 2004 revised Paris Convention with the Vienna Conventions (both the 1963 Vienna Convention and the 1997 revised Vienna Convention)<sup>23</sup>. It provides a reciprocal application of the advantages of their respective regimes and the elimination of the conflicts arising from the simultaneous application of both conventions to the same nuclear incident. This means that Paris Convention State operators are liable under the Paris Convention rules for damage suffered in the territory of a Vienna Convention State and *vice versa*. Finally, given its complementary nature the Convention on Supplementary Compensation logically has a narrow scope<sup>24</sup>.

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<sup>20</sup> The 2004 revised Paris Convention applies if nuclear damage is suffered in the territory (including the maritime zones, i.e. territorial sea, contiguous zone, exclusive economic zone and continental shelf) of or on board a ship/aircraft registered in either (i) a Paris Convention State or (ii) a State that is not a party to the Paris Convention, if it is a party to the 1963 Vienna Convention/1997 revised Vienna Convention and the 1988 Joint Protocol or it is a non-nuclear State (it has no nuclear installations on its territory) or it is a nuclear State (it has nuclear installations on its territory) but offers reciprocal benefits in its nuclear liability law, which is based on the same principles as the Paris Convention (Art.2(a)(iv) and Points 7(a) to 12 of the Exposé des Motifs).

<sup>21</sup> The 1963 Vienna Convention does not expressly define its geographic scope. According to the 1964 Standing Committee on Civil Liability for Nuclear Damage, its geographic scope covers nuclear damage suffered within the territory of a Vienna Convention State and on or over the high seas and excludes nuclear damage suffered within the territory of a State that is not a party to the Vienna Convention. However, during the negotiations of the 1997 revised Vienna Convention, it was pointed out that the view expressed by the 1964 Standing Committee is not binding and that the 1963 Vienna Convention may instead be interpreted as also covering damage suffered in States that are not a party to the Vienna Convention. (Explanatory Texts to the 1997 revised Vienna Convention, [https://www-pub.iaea.org/MTCD/Publications/PDF/P1906\\_web.pdf](https://www-pub.iaea.org/MTCD/Publications/PDF/P1906_web.pdf), point 2.2.3 Geographical Scope, p. 29-30)

<sup>22</sup> The 1997 revised Vienna Convention applies to nuclear damage wherever it is suffered, unless national law excludes damage suffered in a nuclear State (it has nuclear installations on its territory) that does not offer reciprocal benefits (this exception cannot be made for damage suffered on board of a ship/aircraft) (Art. IA).

<sup>23</sup> Art II. However, either the Paris Convention or the Vienna Convention (1963 or 1997 revised version) applies to a nuclear incident to the exclusion of the other (Art. III).

<sup>24</sup> Given that the Convention on Supplementary Compensation (CSC) is complementary to the 2004 revised Paris Convention, the 1963 Vienna Convention, the 1997 revised Vienna Convention and States that follow identical principles as said conventions set out in the Annex of the CSC, its geographic scope is logically mainly restricted to CSC States. Its geographic limitation is two-fold in parallel with its two-tier system. It applies to nuclear damage for which an operator of a CSC State is



The geographic scope of the conventions is particularly important when it comes to SMRs because they are movable and because they are not located on traditional sites like ordinary nuclear installations, but on less usual sites, e.g. in territorial seas, exclusive economic zones or continental shelves. Legal issues will likely arise in case of marine SMRs or SMRs on artificial islands, and even more so when the 1963 Vienna Convention applies, given that its geographic scope is not crystal-clear (e.g. the already operative floating Russian SMR, Akademik Lomonosov, may raise legal issues because it is a floating SMR and because Russia is a party to the 1963 Vienna Convention but neither to the 1997 revised Vienna Convention nor the 1988 Joint Protocol).

**Practical example 1.** Damage is suffered on the high seas by a French passenger ship because nuclear substances are released by an explosion of a Dutch SMR operated on a fixed installation site in Dutch territorial seas. The 2004 revised Paris Convention applies to this scenario<sup>25</sup> (France and the Netherlands are Paris Convention States). However, if the Dutch SMR is replaced by an SMR in a nuclear State without reciprocity, the 2004 revised Paris Convention does not apply. The French passenger ship could then claim damages from the SMR vendor or designer under ordinary tort law.

### **2.2.2 Possible scenarios.**

#### **(a) Nuclear transport from a Convention State to a Convention State.**

The rule under the international nuclear liability conventions is that nuclear transport liability is borne by the nuclear power plant operator and not by the transporter or carrier.

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liable under the 2004 revised Paris Convention, the 1963 Vienna Convention, the 1997 revised Vienna Convention and the national law of States that follow identical principles as said conventions set out in the Annex of the CSC for the 1<sup>st</sup> tier. The 2<sup>nd</sup> tier is restricted to damages suffered in the territory of CSC States. This includes damages suffered in or above maritime areas beyond the territorial sea of a CSC State (i) on board or by a ship/aircraft registered in a CSC State, or on or by an artificial island, installation or structure under the jurisdiction of a CSC State, or (ii) by a CSC State national, but expressly excludes damage suffered in or above the territorial sea of States that are not a party to the CSC. The 2<sup>nd</sup> tier also includes damages suffered in or above a CSC State's exclusive economic zone or on a CSC State's continental shelf in connection with the exploitation or the exploration of the natural resources of that exclusive economic zone or continental shelf (Art. II(2) and Art. V).

<sup>25</sup> Given that the Brussels Supplementary Convention is complementary to the Paris Convention, its geographic scope is logically restricted to its contracting states. This might impede its application when damage arises in non-contracting states. The Paris Convention would then apply but the Brussels Supplementary Convention would not apply to a nuclear transport incident causing damages in non-contracting states (Art. 2).



The international nuclear liability conventions allow parties to contractually determine when the liability is transferred from one operator to another operator in a written agreement<sup>26</sup>. If there is a written agreement, the sending operator is liable until the agreed moment of liability transfer to the receiving operator<sup>27</sup>.

However, the international nuclear liability conventions rule that, if there is no written agreement, transport liability is channelled towards the sending operator until the receiving operator takes charge of the nuclear substances (including transit in transit States)<sup>28</sup>.

**Practical example 2.** Spent nuclear fuel is sent from a French nuclear power plant to a Dutch reprocessing plant by a French carrier and there is no written agreement. Given that France and the Netherlands are Paris Convention States, the French operator will be liable for incidents during transport by the French carrier (including for transit through Belgium) until the Dutch operator of the reprocessing plant takes charge of the nuclear substance. However, the French operator and the Dutch operator could have concluded a written agreement whereby liability is transferred from the French operator to the Dutch operator at an earlier stage, e.g. as soon as the French carrier enters Belgian territory.

**Practical example 3.** Spent nuclear fuel is sent from a French nuclear power plant to a Slovak reprocessing plant by a French carrier and there is no written agreement. France is a Paris Convention State, whereas Slovakia a Vienna Convention State (1963 Vienna Convention). However, given that the 1988 Joint Protocol entered into force in both States, the French operator will be liable for incidents during transport by the French carrier (including for transit through Germany and Czechia) until the Slovak operator of the reprocessing plant takes charge of the nuclear substance.

**(b) Can companies deviate from the rule?**

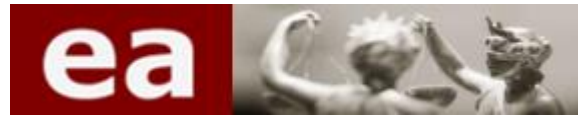
Under the international nuclear liability conventions, companies are allowed to deviate from the rule that transport liability is channelled towards the nuclear power plant operator. The

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<sup>26</sup> Art. 4 of the 2004 revised Paris Convention. Art. II(1)(b) and (c) of the 1963 Vienna Convention and the 1997 revised Vienna Convention. Art. 3(1) of the Annex to the Convention on Supplementary Compensation.

<sup>27</sup> The 2004 revised Paris Convention conditions this to the fact that the receiving operator has a direct economic interest in the nuclear substances (Art. 4(c)).

<sup>28</sup> Art. 4 of the 2004 revised Paris Convention. Art. II(1)(b) and (c) of the 1963 Vienna Convention and the 1997 revised Vienna Convention. Art. 3(1) of the Annex to the Convention on Supplementary Compensation.



transporter or carrier can be held liable if the transporter or carrier so requests, if the sending or receiving nuclear power plant operators consent to the deviation and if the possibility of this exception to channelling is expressly provided for by national legislation (e.g. Belgian law allows for carrier liability)<sup>29</sup>. Transporters usually only invoke this possibility when risks are small and as a commercial tool to attract customers.

**Practical example 4.** Nuclear fuel is sent from a Belgian fuel production facility to a French nuclear power plant by Belgian rail transport. At his request, the Belgian rail carrier may bear the liability for incidents during transport if the French operator agrees to it, given that Belgian legislation expressly provides for this possibility.

**(c) Nuclear transport from a Convention State to a Non-Convention State.**

The rule under the international nuclear liability conventions is maintained that nuclear transport liability is borne by the nuclear power plant operator and not by the transporter or carrier.

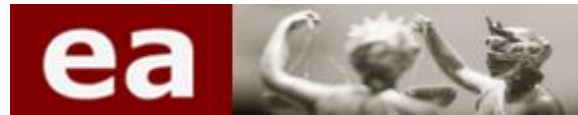
The international nuclear liability conventions provide that the sending operator is liable until unloading by the carrier in the Non-Convention State (including transit in transit States)<sup>30</sup>. The definition of “unloading” is therefore key. Different points of transfer may be identified. However, “uploading” is not defined in the international nuclear liability conventions. Is it, for example, when the ship arrives at the shore, when the crane unloads the ship or when the shipment reaches the outer gate of the nuclear power plant? This legal gap may cause exposure for the nuclear transporter or carrier. Clear contractual arrangements in this regard are therefore fundamental.

**Practical example 5.** Nuclear fuel is shipped from a French production facility to a Chinese nuclear power plant by a French maritime carrier. Given that France is a Paris Convention State but that China is not a party to any international nuclear liability convention, the French operator will be liable for incidents during transport by the French maritime carrier (including

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<sup>29</sup> Art. 4(e) of the 2004 revised Paris Convention, which adds that the deviation from channelling require a decision by the competent public authority. Art. II(2) of the 1963 Vienna Convention and the 1997 revised Vienna Convention. Art. 3(2) of the Annex to the Convention on Supplementary Compensation.

<sup>30</sup> Art. 4 of the 2004 revised Paris Convention. Art. II(1)(b) and (c) of the 1963 Vienna Convention and the 1997 revised Vienna Convention. Art. 3(1) of the Annex to the Convention on Supplementary Compensation.



for transit through numerous transit States) for the entire journey until the French carrier unloads the nuclear substances in China.

**Practical example 6.** Nuclear fuel is sent from a Spanish production facility to a Slovak nuclear power plant by a Spanish road carrier. Spain is a Paris Convention State, whereas Slovakia is a Vienna Convention State. Given that Spain has not ratified the 1988 Joint Protocol, Slovakia is considered as a “Non-Convention State” for transport liability purposes in relation to Spain. Therefore, the Spanish operator will be liable for incidents during transport by the Spanish truck (including for transit through France, Germany and Czechia) for the entire journey until the Spanish truck unloads the nuclear substances in Slovakia.

**(d) Nuclear transport from a Non-Convention State to a Convention State.**

The rule under the international nuclear liability conventions is maintained that nuclear transport liability is borne by the nuclear power plant operator and not by the transporter or carrier.

The international nuclear liability conventions provide that the receiving operator is liable after uploading by the carrier in the Non-Convention State (including transit in transit States)<sup>31</sup>. Again, the definition of “uploading” is crucial but is not provided by the international nuclear liability conventions, creating a grey zone for legal interpretations. Clear contractual arrangements in this regard are therefore fundamental.

**Practical example 7.** Nuclear fuel is sent from a Chinese production facility to a French nuclear power plant by a Chinese maritime carrier. Given that France is a Paris Convention State but that China is not a party to any international nuclear liability convention, the French operator will be liable for incidents during transport by the Chinese maritime carrier (including for transit through numerous transit States) for the entire journey as soon as the Chinese carrier has uploaded the nuclear substances in China.

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<sup>31</sup> Idem.



**(e) What about mixed loads?**

The international nuclear liability conventions provide that if various nuclear power plant operators send nuclear substances with a single carrier, both operators are jointly and severally liable. This implies that victims can either sue one or the other operator indistinctly. However, the maximum total amount for which a single operator is jointly and severally liable cannot exceed his maximum individual liability<sup>32</sup>.

**Practical example 8.** Nuclear spent fuel is sent from two French nuclear power plants A and B to a Spanish reprocessing plant by a French rail carrier. France and Spain are Paris Convention States. French operator of nuclear power plant A and French operator of nuclear power plant B are jointly and severally liable for incidents during transport by the French rail carrier until the Spanish operator of the reprocessing plant takes charge of the nuclear substances. Victims can choose to sue French operator A for the transport incident. Alternatively, victims can choose to sue French operator B for the transport incident. The maximum amount of joint and several liability of A or B is capped at their respective maximum individual liability.

**(f) What about temporary or incidental storage?**

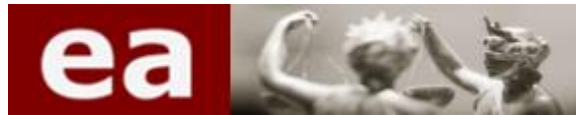
According to the international nuclear liability conventions, a temporary or incidental storage facility does not constitute a nuclear installation. Indeed, temporary or incidental storage facilities are assimilated to means of transport. Hence, when a sending or receiving nuclear power plant operator is liable because transport liability is channelled towards him, this liability also covers incidents at temporary or incidental storages<sup>33</sup>.

**Practical example 9.** Nuclear spent fuel is sent from a French nuclear power plant to a Spanish reprocessing plant by a French road carrier but is temporarily stored in a French facility close to the Spanish border. Given that France and Spain are Paris Convention States,

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<sup>32</sup> Art. 5(d) of the 2004 revised Paris Convention. Art. II(3)(a) and (b) of the 1963 Vienna Convention and the 1997 revised Vienna Convention. Art. 7(2) of the Annex to the Convention on Supplementary Compensation. Except for the 2004 revised Paris Convention, the other international nuclear liability conventions state that this applies in so far as the damage attributable to each operator is not reasonably separable.

<sup>33</sup> Art. 1(a)(ii), Art.4, Art.5(b) and (d) of the 2004 revised Paris Convention. Art. I(1)(j)(iii), Art. II(1) *in fine*, Art. II(3)(b) of the 1963 Vienna Convention and the 1997 revised Vienna Convention. Art. 1(1)(iii), Art. 3 *in fine*, Art. 7(2) of the Annex to the Convention on Supplementary Compensation.



unless otherwise agreed in writing, the French operator will be liable for incidents during transport by the French road carrier (including for its temporary storage at the Spanish border) until the Spanish operator of the reprocessing plant takes charge of the nuclear substances.

**(g) What about incidents of transportable small modular reactors (SMRs)?**

The international nuclear liability conventions do not contain specific provisions on liability for transport of SMRs<sup>34</sup>. The only certainty provided by the international nuclear liability conventions is that, when SMRs produce energy during transport for the very purpose of enabling the transport, they are excluded from the conventions: i.e. they do not fall within the scope of the liability rules applying to nuclear power plants under the conventions and do not fall within the scope of the liability rules applying to transport of nuclear substances under the conventions. SMRs that are used to propel a means of transport or to produce energy for any purpose related to their transport are excluded from the conventions<sup>35</sup>. This implies that, in such cases, liability is not channelled towards the operator. The transporter or carrier is liable and ordinary tort law applies.

For all other SMRs, there is a variety of scenarios because there is a variety of SMRs. The NEA SMR Dashboard identifies 98 SMR technologies around the world<sup>36</sup>.

SMRs will usually be transported from the production site to the installation site or, after their operating life, from the installation site to the decommissioning site.

In my opinion, 3 main liability scenarios relating the transport of SMRs need to be distinguished:

**(1) A SMR does not contain nuclear substances during transport.**

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<sup>34</sup> SMRs are smaller, both in terms of power output and physical size, than conventional gigawatt-scale nuclear reactors. SMRs are nuclear reactors with power output less than 300 megawatts electric (MWe), with some as small as 1-10 MWe. SMRs are designed for modular manufacturing, factory production, portability, and scalable deployment. SMRs use nuclear fission reactions to create heat that can be used directly or to generate electricity. NEA (2024), The NEA Small Modular Reactor Dashboard: Second Edition, OECD Publishing, Paris, [https://www.oecd-nea.org/jcms/pl\\_90816/the-nea-small-modular-reactor-dashboard-second-edition](https://www.oecd-nea.org/jcms/pl_90816/the-nea-small-modular-reactor-dashboard-second-edition), p.18.

<sup>35</sup> Art. 1(a)(ii) of the 2004 revised Paris Convention and Point 18(a) of its Exposé des Motifs. Art. I(1)(j) of the 1963 Vienna Convention and the 1997 revised Vienna Convention. Art. I(1)(b)(i) of the Convention on Supplementary Compensation.

<sup>36</sup> NEA (2024), The NEA Small Modular Reactor Dashboard: Second Edition, OECD Publishing, Paris, [https://www.oecd-nea.org/jcms/pl\\_90816/the-nea-small-modular-reactor-dashboard-second-edition](https://www.oecd-nea.org/jcms/pl_90816/the-nea-small-modular-reactor-dashboard-second-edition), p.11.





The international nuclear liability conventions do not apply. The transporter is liable under ordinary tort law for an incident occurring during transport.

It is important to note that, when such SMR has been installed and fuelled on the installation site and remains fixed on the site to produce energy, it is assimilated to a nuclear installation. The official interpretations of the international nuclear liability conventions<sup>37</sup> state that, when SMRs remain fixed and produce electricity for land-based uses - even after having been transported by truck, train or ship – they are assimilated to nuclear installations. This would be the case, even if the SMR is incorporated in a truck, train or ship and is not unloaded from that truck, train or ship in order to produce energy, as long as transport has stopped and the SMR is fixed on an installation site. The SMR is considered fixed on an installation site, even when it is installed as a platform at sea, immersed and anchored to the seabed or moored to shore and connected to shore by power cables<sup>38</sup>. The SMR produces energy for commercial uses in the same way as an ordinary nuclear power plant. Hence, in such cases, liability is channelled towards the SMR operator according to the liability rules for nuclear installations of the international nuclear liability conventions.

**Practical example 10.** Non-fuelled SMR parts are transported from a Belgian production site to a Spanish installation site, where they will be assembled and fuelled to produce energy<sup>39</sup>. No energy is produced during transport. Whilst the SMR parts are being transported and not yet installed and fixed, an incident occurs. Nuclear transport liability rules of the conventions do not apply. Liability is not channelled towards the Spanish SMR operator. The Belgian transporter is liable according to ordinary tort law. However, if the incident occurs once the

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<sup>37</sup> 18th meeting (15–17 May 2018) and 19th meeting (14–16 May 2019) of IAEA’s International Expert Group on Nuclear Liability (INLEX) referred to in footnotes 85 and 91 of IAEA(2020) The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage - Explanatory Texts IAEA International Law Series No. 3 (Rev. 2). See also, IAEA (2022) Nuclear Law: The Global Debate, S. McINTOSH, Chapter 12 “Nuclear Liability and Post-Fukushima Developments”, 12.4.3 Transportable Nuclear Power Plants; [https://www.researchgate.net/publication/357505888\\_Nuclear\\_Law\\_The\\_Global\\_Debate\\_The\\_Global\\_Debate](https://www.researchgate.net/publication/357505888_Nuclear_Law_The_Global_Debate_The_Global_Debate), p. 260-261.

<sup>38</sup> 18th meeting (15–17 May 2018) and 19th meeting (14–16 May 2019) of IAEA’s International Expert Group on Nuclear Liability (INLEX) referred to in footnotes 85 and 91 of IAEA(2020) The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage - Explanatory Texts IAEA International Law Series No. 3 (Rev. 2). See also, IAEA (2022) Nuclear Law: The Global Debate, A. POPOV, Chapter 3 “Russian Vision of the Problems and Prospects of the International Legal Framework in the Context of Small Modular Reactors and Transportable Nuclear Power Units”, 3.6 Floating SMRs and Civil Liability for Nuclear Damage; [https://www.researchgate.net/publication/357505888\\_Nuclear\\_Law\\_The\\_Global\\_Debate\\_The\\_Global\\_Debate](https://www.researchgate.net/publication/357505888_Nuclear_Law_The_Global_Debate_The_Global_Debate), p. 51.

<sup>39</sup> This scenario also encompasses the scenario where a SMR without nuclear substances is transported from its installation site to a decommissioning site.



SMR has been installed on the Spanish installation site and fuelled, the SMR will be assimilated to a nuclear installation. In such case liability is channelled towards the Spanish SMR operator according to the liability rules for nuclear installations of the international nuclear liability conventions.

**(2) A SMR contains nuclear substances during transport (e.g. fuel or spent fuel) but produces no energy during transport.**

The nuclear transport rules of the international liability conventions apply. Liability is channelled towards the operator. The transporter or carrier is exonerated from liability. As set out above in section (e), the conventions address the issue of liability of various operators for nuclear transport incidents. A specific problem arises when SMRs, that have not been designed to be unloaded from their means of transport, are sent to Non-Contracting States, given that the act of “unloading” determines who bears liability for nuclear transport incidents.

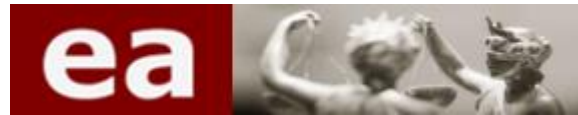
Similarly to scenario (1), when such fuelled SMR has been installed on the installation site and remains fixed there to produce energy, it is assimilated to a nuclear installation and liability is channelled towards the SMR operator according to the liability rules for nuclear installations of the international nuclear liability conventions.

**Practical example 11.** A factory-fuelled SMR is sold and sent from its Belgian production site to a Spanish installation site buying the SMR for the production of energy<sup>40</sup>. Given that Belgium and Spain are Paris Convention States, unless otherwise agreed in writing, the Belgian SMR producer will be liable for incidents during transport of the SMR by the Belgian transporter until the Spanish SMR client takes charge of the SMR. As set out above in section (b), at his request, the Belgian transporter may bear the liability for incidents during transport if the Belgian SMR producer agrees to it, given that Belgian law expressly provides for this possibility.

**Practical example 12.** A floating fuelled SMR is sold and sent from its Chinese production site to a UK installation site buying the SMR for the production of energy. Given that the UK

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<sup>40</sup> This scenario also encompasses the scenario where a SMR containing nuclear substances (e.g. spent fuel) is transported from installation to decommissioning site.



is a Paris Convention State and that China is not a party to any international nuclear liability convention, the UK SMR producer will be liable for incidents during transport of the SMR as soon as the SMR is uploaded on the ship. As set out above in section (d), it is fundamental that the term “uploading” is clearly defined in contractual arrangements.

**Practical example 13.** A floating fuelled SMR is sold and sent from its UK production site to a Chinese installation site buying the SMR for the production of energy. Given that the UK is a Paris Convention State and that China is not a party to any international nuclear liability convention, the UK SMR producer will be liable for incidents during transport of the SMR by the UK ship until unloading. As set out above in section (d), it is fundamental that the term “unloading” is clearly defined in contractual arrangements. A problem arises if such SMR is designed to remain on the ship when it is fixed in China and produces energy, given that, in such case, the SMR will strictly speaking never be “unloaded” in China.

### **(3) A SMR contains nuclear substances during transport and produces energy during transport.**

It is presently unclear under the international nuclear liability conventions whether a fuelled SMR that produces energy during its transport qualifies as a nuclear installation and the liability rules applicable to nuclear installations apply, or whether nuclear transport rules of the international liability conventions apply. It seems clear, however, that ordinary tort rules do not apply and that liability is channelled towards the operator under either rules.

The international nuclear liability conventions are ambiguous in their wording. The 2004 revised Paris Convention offers the possibility to cover other installations, which could be interpreted to comprise SMRs.<sup>41</sup> However, the 1963 Vienna Convention does not foresee to

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<sup>41</sup> Art. 1(a)(ii) of the 2004 revised Paris Convention. It defines nuclear installations as “reactors other than those comprised in any means of transport; factories for the manufacture or processing of nuclear substances; factories for the separation of isotopes of nuclear fuel; factories for the reprocessing of irradiated nuclear fuel; facilities for the storage of nuclear substances other than storage incidental to the carriage of such substances; installations for the disposal of nuclear substances; any such reactor, factory, facility or installation that is in the course of being decommissioned; and such other installations in which there are nuclear fuel or radioactive products or waste as the Steering Committee for Nuclear Energy of the Organisation (hereinafter referred to as the “Steering Committee”) shall from time to time determine; any Contracting Party may determine that two or more nuclear installations of one operator which are located on the same site shall, together with any other premises on that site where nuclear fuel or radioactive products or waste are held, be treated as a single nuclear installation.”



extend the concept of nuclear installations to other installations<sup>42</sup>. Similarly, the Convention on Supplementary Compensation does not provide the possibility to include other installations in the definition of nuclear installations<sup>43</sup>. Yet the 1997 revised Vienna Convention adds the possibility to cover other installations, which could be interpreted to cover SMRs<sup>44</sup>. What is sure is that, to date, fuelled SMRs producing energy during transport have not been excluded from the international nuclear liability conventions even though the conventions expressly foresee this possibility.

### 3. Where is a company liable for an incident during nuclear transport?

Once it is clear which company is liable for a nuclear transport incident, the question arises in which country this company is liable, i.e. before which courts victims can sue this liable company. Again, the answer to the jurisdictional question of “where a company is liable” for transport incidents involving nuclear substances from one State to another State (possibly through one or more transit States) is to be found in the international nuclear liability conventions.

Again, the response to this jurisdictional question will differ when the nuclear transport incident occurs in a Convention State, on the one hand, and when the nuclear transport incident occurs in a Non-Convention State, on the other hand.

Importantly, again, by providing a bridge between the Paris Convention States with the Vienna Convention States (both the 1963 Vienna Convention and the 1997 revised Vienna Convention), the 1988 Joint Protocol prevents conflicts of jurisdiction by ensuring that only

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<sup>42</sup> Art. I(1)(j) of the 1963 Vienna Convention. A nuclear installation is defined as “(i) any nuclear reactor other than one with which a means of sea or air transport is equipped for use as a source of power, whether for propulsion thereof or for any other purpose; (ii) any factory using nuclear fuel for the production of nuclear material, or any factory for the processing of nuclear material, including any factory for the re-processing of irradiated nuclear fuel; and (iii) any facility where nuclear material is stored, other than storage incidental to the carriage of such material; provided that the Installation State may determine that several nuclear installations of one operator which are located at the same site shall be considered as a single nuclear installation.”

<sup>43</sup> Art. 1(1)(b) of the Annex to the Convention on Supplementary Compensation. It defines nuclear installation as follows: “(i) any nuclear reactor other than one with which a means of sea or air transport is equipped for use as a source of power, whether for propulsion thereof or for any other purpose; (ii) any factory using nuclear fuel for the production of nuclear material, or any factory for the processing of nuclear material, including any factory for the re-processing of irradiated nuclear fuel; and (iii) any facility where nuclear material is stored, other than storage incidental to the carriage of such material; 26 provided that the Installation State may determine that several nuclear installations of one operator which are located at the same site shall be considered as a single nuclear installation.”

<sup>44</sup> Art. I(1)(j) of the 1997 revised Vienna Convention. It adds the following to the definition of nuclear installation of the 1963 Vienna Convention: “(iv) **such other installations in which there are nuclear fuel or radioactive products or waste as the Board of Governors of the International Atomic Energy Agency shall from time to time determine**”.



one convention is applied to any one nuclear incident, either the Paris or the Vienna Convention (in its original and revised version)<sup>45</sup>. If a Paris Convention SMR causes nuclear damage in a Vienna State and *vice versa*, if a Vienna Convention SMR causes nuclear damage in a Paris State, the 1988 Joint Protocol determines the competent court and the applicable law provided the 1988 Joint Protocol is in force in the States involved. It applies both to nuclear damage caused by incidents occurring on site of nuclear installations and during the transport of nuclear substances between them.

The scenarios below summarise the common rules regarding jurisdiction in case of a nuclear incident during transport.

**(a) Nuclear transport incidents in Convention States.**

The rule under the international nuclear liability conventions is that, when a nuclear transport incident occurs in a Convention State, the Convention State where the nuclear transport incident occurs has jurisdiction<sup>46</sup>.

Importantly, nuclear transport incidents “in a Convention State” comprise incidents that occur in that Convention State’s territorial sea and in its exclusive economic zone.

**Practical example 14.** Nuclear spent fuel is sent from a French nuclear power plant to a Dutch reprocessing plant by a French truck. The French truck has an accident in the Netherlands. Dutch courts have jurisdiction. The French operator is liable for the incident during the road transport by the French transporter before Dutch courts.

**(b) Nuclear transport incidents in Non-Convention States.**

The rule under the international nuclear liability conventions is that, when a nuclear transport incident occurs in a Non-Convention State, the State where the nuclear installation is located has jurisdiction<sup>47</sup>.

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<sup>45</sup> Art. III.

<sup>46</sup> Art. 13 of the 2004 revised Paris Convention. Art. XI of the 1963 Vienna Convention and the 1997 revised Vienna Convention. 18<sup>th</sup> meeting (15–17 May 2018) and 19<sup>th</sup> meeting (14–16 May 2019) of IAEA’s International Expert Group on Nuclear Liability (INLEX) referred to in footnotes 85 and 91 of IAEA(2020) The 1997 Vienna Convention on Civil Liability for Nuclear Damage and the 1997 Convention on Supplementary Compensation for Nuclear Damage - Explanatory Texts IAEA International Law Series No. 3 (Rev. 2). Art. XIII of the Convention on Supplementary Compensation.

<sup>47</sup> *Idem*.



Importantly, nuclear transport incidents “in a Non-Convention State” comprise incidents that occur outside a Convention State’s exclusive economic zone, on high seas or when it is not possible to determine with certainty the place of the nuclear incident (e.g. when the incident is due to continuous radioactive contamination in the course of the transport). However, issues are likely to arise in cases where no transport is involved but where SMRs are operated to produce energy from a fixed installation on artificial islands or other structures outside of the territory of any State, as it will be difficult to determine which State is the SMR installation State for jurisdictional purposes.

**Practical example 15.** Nuclear fuel is sent from a Chinese uranium supplier to a French nuclear power plant by a Chinese maritime carrier. The Chinese carrier has an accident on the high seas. French courts have jurisdiction. The French operator is liable for the maritime incident caused by the Chinese carrier before the French courts.

#### **Conclusion.**

Nuclear transport is likely to increase in the forthcoming years. Corollary to such transport, risks of nuclear transport incidents are likely to increase too.

Nuclear new build, especially the deployment of SMRs, depends on the commercial appetite of investors. This appetite is partly conditioned by the level of legal risks.

The international nuclear liability conventions play an invaluable role in providing legal certainty on the two main questions related to risks of nuclear transport liability, namely “*Who* is liable in case of an incident during nuclear transport?” and “*Where* is this company liable in case of an incident during nuclear transport?”. These conventions also appear to allow for the necessary flexibility in order to include new risks created by the transportable SMRs. Risks will depend on whether or not SMRs contain nuclear substances during transport and, if SMRs do contain nuclear substances during transport, whether they produce energy after transport has stopped or whether, by contrast, they produce energy during transport. Only the latter scenario, i.e. when SMRs produce energy during transport, seems to be a cause for legal uncertainty.

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