



Are nuclear operators liable and insured in case of an Act of Terrorism on a Nuclear Installation or Shipment?

By Tom Vanden Borre, Dr. jur., *Counsellor, Prime Minister's Office (Belgium) Voluntary scientific collaborator at the Institute for Environmental and Energy Law (University of Leuven)*¹

I. Introduction

2001 would have been an average loss year for the insurance industry without the terrorist attacks on Washington DC and New York City. Estimates indicate that the insured losses due to the attacks of September, 11th, 2001 on the Twin Towers amount 19 billion USD in property and business interruption policies². This makes the terrorist attacks the highest property loss ever in the history of insurance. The estimates of the overall insured loss amount 50 billion USD. Those insured losses are much higher than the 21 billion USD insured losses incurred by Hurricane Andrew, the second largest insurance event in history and the 3 billion USD insured losses incurred by Piper Alpha – the largest man-made property insurance loss prior to the attacks on the Twin Towers. The total damage still is much higher than those figures; the estimate of the economic loss amounts 90 billion USD.

It goes without saying that the 11 September attacks have alerted the nuclear sector as well. Since the attacks, additional efforts were made by the International Atomic Energy Agency (IAEA)³ in order to combat nuclear terrorism.

According to the IAEA, the risk for nuclear terrorism can be divided into three categories:

- a. nuclear facilities: the primary risks associated with nuclear facilities would involve the theft or diversion of nuclear material from the facility, or a physical attack or act of sabotage designed to cause an uncontrolled release of radioactivity to the surrounding environment;
- b. nuclear material: this risk implies that terrorists would obtain nuclear weapons;
- c. radioactive sources: terrorists could develop a crude radiological dispersal device using radioactive sources commonly used in every day life.

The international legal framework of the IAEA addresses these various aspects of the risk of nuclear terrorism. Several international conventions have been drafted by the IAEA⁴: (a.o.) the Convention on the Physical Protection of Nuclear Material (1979), the Treaty on the Non-Proliferation of Nuclear Weapons (1968), the Convention on Early Notification of a Nuclear Accident and the Convention on Assistance in Case of a Nuclear Accident or Radiological Emergency (1986). The IAEA has also developed safety regulations such as the Nuclear Safety Standards (NUSS) for nuclear power plants as well as *Regulations for the Safe Transport of Radioactive Materials*⁵. Although all those measures existed prior to the 11 September attacks, the IAEA has approved, on March, 19th, 2002, an action plan designed to upgrade worldwide protection against acts of terrorism involving nuclear and other radioactive materials⁶. As Mr. Mohamed ElBaradei, IAEA Director General, said: "Many of our programs go to the heart of combating nuclear terrorism, but we now have to actively reinforce safeguards, expand our systems for combating smuggling in nuclear material and upgrade our safety and security services"^{7 8}.

In this paper, we will discuss the consequences of the events occurred on September, 11th, 2001, for the civil liability and insurance of nuclear incidents in nuclear installations^{9 10}. Hereby, we will only focus on the first category of the nuclear terrorism risk, being an attack or an act of sabotage on a nuclear installation or on a transport of nuclear material. Our analysis will be valid for the consequences of terrorism attacks on nuclear installations and on transport of nuclear material over land. We will not address the consequences on maritime transport of nuclear substances, for which separate conventions exist.

First, we will discuss the existing international nuclear civil liability conventions (II). Afterwards, we will analyse the reaction of the insurance industry (both the conventional and nuclear insurance industry) to the September 11th events (III). In section IV we will give a brief overview of some alternative ways for



finding additional coverage and/or capacity. Finally, we will make some concluding remarks (V).

II. international nuclear civil liability conventions

We will first give an overview of the existing international nuclear civil liability conventions (II.1). Afterwards the major principles of these conventions will be discussed (II.2). Thirdly, we will briefly indicate whether these principles apply only to nuclear installations for peaceful purposes or whether they also apply to military nuclear installations (II.3). Finally, the question will be answered whether, under the conventions, the nuclear operator is liable if a terrorist act caused a nuclear incident (II.4).

II.1. Overview

There are two international nuclear civil liability regimes: the regime of the Nuclear Energy Agency (NEA)¹¹ on the one hand and the regime of the International Atomic Energy Agency (IAEA) on the other¹².

The NEA regime consists of:

- the Convention on Third Party Liability in the Field of Nuclear Energy of July, 29th, 1960 ("Paris Convention") and
- the Convention of January, 31st, 1963 Supplementary to the Paris Convention of 29th July 1960 ("Brussels Supplementary Convention").

The NEA-regime has been slightly modified by two Protocols in 1964 and 1982¹³.

Whereas the Paris Convention states the principles of liability in case of a nuclear incident, the Brussels Supplementary Convention provides for additional compensation of damage in case the liability coverage of the operator under the Paris Convention is inadequate or insufficient¹⁴. The additional compensation provided for basically consists of State funds from the installation State and from the different Contracting Parties¹⁵.

In February 2002, the following 15 countries were member of the Paris Convention: Belgium, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Norway, Portugal, Slovenia¹⁶, Spain, Sweden, Turkey and the United Kingdom. Except for Portugal, Greece, Turkey all member countries of the Paris Convention are also member of the Brussels Supplementary Convention. Slovenia has indicated its intention to seek accession to the Brussels Supplementary Convention.

The IAEA regime consists of the Vienna Convention on Civil Liability for Nuclear Damage of May, 21st, 1963. As we will demonstrate in section II.2, the Vienna Convention basically contains the same principles as the Paris Convention.

In February 2002, the following 33 countries were parties to the Vienna Convention: Argentina, Armenia, Belarus, Bolivia, Bosnia Herzegovina, Brazil, Bulgaria, Cameroon, Chile, Croatia, Cuba, Czech Republic, Egypt, Estonia, Hungary, Latvia, Lebanon, Lithuania, Mexico, Niger, Peru, Philippines, Poland, Republic of Moldova, Romania, Saint Vincent&the Grenadines, Slovakia, Slovenia, the Former Yug. Republic of Macedonia, Trinidad and Tobago, Ukraine, Uruguay and Yugoslavia. Note that, from November 12th, 2002 onwards the Vienna Convention will cease to apply to Slovenia.

Mainly due to the Chernobyl accident, both regimes have been revised and modernised¹⁷. The first result of the modernisation process was the adoption of the Joint Protocol linking the two regimes. The second result was the modification of several provisions of the Paris Convention, the Brussels Supplementary Convention and the Vienna Convention.

Originally, the Paris and Vienna Conventions operated entirely independently from each other. If a victim suffered damage in the territory of Contracting Party to the Paris Convention as a result of a nuclear incident occurring in the territory of a Contracting Party to the Vienna Convention, the victim could not claim for compensation in the country where the incident occurred. The Joint Protocol of Vienna of 21 September 1988, which entered into force on 27 April 1992, solves this shortcoming by linking the territorial application of both Conventions. However, only a low number of countries have ratified the Joint Protocol, which considerably reduces the importance of the Protocol^{18 19}.



The revision process also aimed at modernising the nuclear civil liability conventions. Although the revision exercise is principally finished, none is in force yet. The negotiations of the revision of the NEA-regime ended only a couple of weeks ago: on a diplomatic conference to be convened, the contracting parties will adopt a Protocol to both the Paris and the Brussels Supplementary Convention. The revision of the IAEA-regime has already been formally ended – resulting in the adoption, on a diplomatic conference on September, 12th, 1997, of the Protocol to Amend the Vienna Convention on Civil Liability for Nuclear Damage and the Convention on Supplementary Compensation for Nuclear Damage²⁰. So far, nor the Protocol, nor the Supplementary Funding Convention have entered in force.

Although the revision of both regimes changes some important provisions of the Conventions, the basic principles as mentioned above remain the same. Those principles will be discussed below.

II.2. Basic principles

The Paris and the Vienna Convention have the same principles regarding the liability in case of nuclear incidents²¹:

- a. strict liability of the nuclear operator;
- b. channelling of all liability to the nuclear operator;
- c. limitation of liability in amount and in time;
- d. compulsory insurance coverage up to the liability limit;
- e. competence of only one court per country.

Article 3 of the Paris Convention holds the operator of a nuclear installation liable for all damage that it causes to persons or to property, with the exception of damage to the installation itself, to other nuclear installations located on the same site and to any property located on that same site used or to be used in connection with any such installation²². Due to the complex techniques used in respect of the production of nuclear energy, it was considered to be too difficult to prove the existence of fault²³. The victim will have to prove his damage as well as the causal link between his damage and nuclear incident. The conduct of the nuclear operator is irrelevant: he will be unable to escape liability e.g. by saying that he respected all safety regulations. Article 3 of the Paris Convention thus introduces what is commonly referred to as strict liability.

Article 6 of the Paris Convention channels all liability to the nuclear operator. It reads:

“The right to compensation for damage caused by a nuclear incident may be exercised only against an operator liable for the damage in accordance with this Convention [...]. Except as otherwise provided in this Article, no other person shall be liable for damage caused by a nuclear incident [...].”

This definition contains two elements²⁴. First, the operator can, in case of a nuclear incident as defined pursuant to the Paris Convention, only be held liable under the conditions of the Convention and, secondly, no one else but the operator²⁵ is liable for the damage. This means that the Paris Convention constitutes the *only* legal basis for a victim to claim compensation for damage suffered as a result of a nuclear incident.

Another consequence of channelling of liability is that the operator of a nuclear installation has in principle *no* right of recourse for the compensation paid by it or its insurer to victims of a nuclear incident. There are two exceptions to the channelling principle. Firstly, the operator possesses pursuant to Article 6(f) a right of recourse with respect to the person who by his or her conduct (act or omission) intentionally caused damage by a nuclear incident. Secondly, the operator has a right of recourse if and to the extent that it is so provided expressly by contract.

Under the Paris Convention, the liability of the nuclear operator is limited. The maximum operator's liability is limited to 15 million Special Drawing Rights (SDRs)²⁶ according to Article 7 of the Paris Convention²⁷. This limitation was considered to be necessary in order not to jeopardize the development of the nuclear industry²⁸. A Contracting Party can, however, decide within its national legislation either to increase or decrease this amount, provided that the minimum amount is not set lower than 5 million SDRs (7,15 million euro).



The liability of the operator is also subjected to a time limit. According to Article 8 of the Paris Convention, the right to claim compensation will be extinguished if an action is not brought within ten years from the date of the nuclear incident. The Contracting Parties have nevertheless the option to establish a period longer than ten years, provided that the operator's liability is insured²⁹.

An important element for the sake of our analysis, is the requirement of having an insurance coverage. According to article 10 of the Paris Convention, the operator is required to have and maintain insurance or other financial security up to the amount of his limited liability (so-called *congruence principle* meaning that all liability should be covered). Although the Convention clearly gives operators a choice as to the kind of financial security, the operators have opted for insuring their liability. This mandatory cover guarantees that the victim will be compensated for damage suffered – or through the limitation of the available amounts, part thereof. It is up to the national authorities to determine the nature and conditions of the insurance or other financial security that the operator needs to obtain.

Finally, jurisdiction over claims concerning nuclear incidents shall lie exclusively with the courts of the Contracting Party in whose territory the nuclear incident occurred (Article 13(a) of the Paris Convention). The main reason for establishing one exclusive competent court seems to be to ensure that the maximum amount of liability will not be exceeded: a fair distribution of the available amount for compensation would result in insoluble problems if the claims with respect to one nuclear incident could be made before different courts. The purpose was to ensure unity of jurisdiction in order to prevent the sum of awards of compensation by various courts from exceeding the operator's liability and also to promote equitable adjudication of various claims³⁰.

It is important to note that both the Paris and the Vienna Conventions are also applicable to the transport of nuclear substances (article 4 of the Paris Convention and article II.b of the Vienna Convention). So, basically the same principles apply to the transport of nuclear material. For the sake of this analysis, we will now only focus on the Paris Convention and on the consequences of terrorism on a nuclear installation.

The Contracting Parties of these Conventions have adopted a specific nuclear liability law in order to introduce these principles into their national legal system. So, one has to consult that specific law in order to know e.g. to what amount the operator is liable. The Conventions indeed offer some flexibility in the adoption of the principles.

Before analysing the liability of the nuclear operator in case of a nuclear incident caused by an act of terrorism, we will answer the question whether the principles discussed in this section apply only to nuclear installations for peaceful purposes or also to nuclear installations for non-peaceful purposes. This is relevant for our analysis since a terrorist attack might hit either type of nuclear installation.

II.3. Nuclear installations for peaceful *and* non-peaceful purposes?

Under both regimes there is some uncertainty as to whether the Conventions only apply to nuclear installations for peaceful purposes or whether they also apply to nuclear installations for non-peaceful purposes. The Paris Convention and the Vienna Convention are completely silent on this issue; the Conventions do not indicate that they do apply to nuclear installations for peaceful purposes nor do they indicate that they do not apply to nuclear installations for non-peaceful purposes.

In the NEA-regime, the Brussels Supplementary Convention does contain a specific provision in that respect. Article 2, (a), (i) reads that the Convention shall apply to damage caused by nuclear incidents, other than those occurring entirely in the territory of a State which is not a Party to this Convention: *for which an operator of a nuclear installation, used for peaceful purposes, situated in the territory of a Contracting Party to this Convention, and which appears on the list established and kept up to date in accordance with the terms of Article 13, is liable under the Paris Convention*³¹.

So, the Brussels Supplementary Convention explicitly states that it applies only to nuclear installations for peaceful purposes. This does however not mean that the same is true for the Paris Convention³². Indeed, the Paris Convention deals with the liability of the nuclear operator whereas the Brussels



Supplementary Convention introduces supplementary compensation (basically State funds). Given the different nature of these two Conventions, one can argue that the State funds may only be used for civil nuclear installations whereas the liability of the operator can apply to both civil and military nuclear installations. There is indeed no explicit provision in the text of the Paris Convention stating that the Convention *only* applies to nuclear installations for peaceful purposes. Moreover, a military nuclear installation falls within the scope of the definition of a “nuclear installation” under the Paris Convention³³.

The same conclusion is in fact valid for the IAEA-regime. The Vienna Convention does not explicitly deal with military nuclear installations either. But the Protocol to the Vienna Convention does add a specific provision in this respect. Article 3 of the Protocol introduces article I B in the Vienna Convention, according to which the Convention shall not apply to nuclear installations used for non-peaceful purposes.

Contrary to the IAEA-regime, the Contracting Parties of the Paris Convention decided on one of the first meetings concerning the revision of the Convention in April 1998, that there was no need to adopt a similar provision as in the Protocol to the Vienna Convention, excluding nuclear installations for non-peaceful purposes from the scope of the Convention. The Contracting Parties indeed decided that the scope of the Convention should not be restricted and that the Parties should be able to chose to include or exclude military nuclear installations from its national nuclear liability law. Therefore, under the Paris Convention, the Parties are free to make their nuclear civil liability provisions applicable to nuclear installations for non-peaceful purposes. Some countries as France and the Netherlands have indeed chosen to include military installations in their national nuclear liability law. The nuclear liability law of other countries (e.g. Belgium) is silent on this matter. One can assume that this implies that the law also applies to military nuclear installations – if that country has such installations.

In order to have a correct answer on the question whether the nuclear liability provisions also apply to nuclear installations for non-peaceful purposes, one should first look at the national nuclear liability law. This law can either say it shall only apply to nuclear installations for peaceful purposes, either say that it is also applicable to nuclear installations for non-peaceful purposes; the law can also be silent on this issue. In the latter case, one can argue that in the current state of the international nuclear liability conventions, the conventions (and the national law implementing them) also apply to nuclear installations for non-peaceful purposes. In future international nuclear liability law this conclusion will still be valid for the NEA-regime, whereas in principle the countries member of the revised Vienna Convention will exclude such installations from their national nuclear liability law.

II.4. Terrorism in the nuclear civil liability conventions

Important in answering the question whether the nuclear operator is liable in case of a nuclear incident caused by an act of terrorism, is article 9 of the Paris Convention. This article states that:

“The operator shall not be liable for damage caused by a nuclear incident directly due to an act of armed conflict, hostilities, civil war, insurrection or, except in so far as the legislation of the Contracting Party in whose territory his nuclear installation is situated may provide to the contrary, a grave natural disaster of an exceptional character.”

As article 9 gives a list of events exonerating the nuclear operator from liability, the textual interpretation of this provision seems to indicate that it is an exhaustive list. This means that the only exonerations allowed are those listed in the text. This interpretation is confirmed by the “Exposé des Motifs” of the Paris Convention. The Exposé des Motifs on this article reads³⁴:

“The absolute liability of the operator is not subject to the classic exonerations such as force majeure, Acts of God or intervening acts of third persons, whether or not such acts were reasonably foreseeable and avoidable. Insofar as any precautions can be taken, those in charge of a nuclear installation are in a position to take them, whereas potential victims have no way of protecting themselves.

The only exonerations lie in the case of damage caused by a nuclear incident directly due to certain disturbances of an international character such as acts of armed conflict and hostilities, of a political nature such as civil war and insurrection, or grave natural disasters of an exceptional character, which



*are catastrophic and completely unforeseeable, on the grounds that all such matters are the responsibility of the nation as a whole. No other exonerations are permitted. The national legislation of the operator liable may, however, provide that he is to be liable even in the case of a grave natural disaster of an exceptional character”.*³⁵

Also the “Exposé des Motifs” indicates that the only exonerations allowed are international war-like conflicts, national grave political disturbances and natural disasters.

In order to complete our analysis of the international civil liability conventions, we should also briefly discuss the meaning of article 6, (c),(i),(1) of the Paris Convention which says that nothing in the Convention shall affect “the liability of any individual for damage caused by a nuclear incident for which the operator, by virtue of Article 3(a)(ii)(1) and (2) or Article 9, is not liable under this Convention and which results from an act or omission of that individual done with intent to cause damage”. Thus, there are some scenarios, according to the Convention, where another person than the nuclear operator is liable for a nuclear incident. The scenarios referred to are: damage to the nuclear installation (Article 3 (a) (ii) (1)), on-site property (Article 3 (a) (ii) (2)) and cases of *force majeure* (Article 9). In other words, if e.g. a nuclear incident is directly caused by an insurrection, the nuclear operator will not be liable and the Paris Convention does not affect the liability of the persons having caused the incident.

Finally, brief attention should also be given to the provision of Article 6, (f) (i) of the Paris Convention according to which the operator shall have a right of recourse only: if the damage caused by a nuclear incident results from an act or omission done with intent to cause damage, against the individual acting or omitting to act with such intent. The right of recourse is limited to a right against the individual physical person who acts or omits to act with intent to cause damage. From a theoretical viewpoint, this scenario can be applied to the persons responsible for a terrorist attack on a nuclear installation or on a transport of nuclear material. Of course, it is highly questionable whether the person(s) will be identified; if it concerns a suicide attack like those on the Twin Towers and the Pentagon, the persons having caused the damage will most presumably be dead. If they are not dead and can be caught, it still is uncertain whether the person responsible for an attack has enough assets to pay for the damage. Therefore we can conclude that the right of recourse seems to be of limited help to the operator and his insurer in trying to recover the compensation they had to pay due to a nuclear incident caused by an act of terrorism.

It is thus clear that, under the existing nuclear liability conventions (Paris and Vienna Convention), terrorism is not a ground for exoneration, because the kind of terrorism like the events of September, 11th, 2001, cannot be considered as an armed conflict, hostilities, civil war or insurrection. Consequently, the operator of a nuclear installation is liable for damage due to acts of terrorism. This is certainly the case if a terrorist attack hits a nuclear installation for peaceful purposes (or a transport); if the national law explicitly provides for it or if it is completely silent on this matter, this conclusion will also be valid if a terrorist attack hits a nuclear installation for non-peaceful purposes.

This conclusion is not much different in countries that are not member of one of the Conventions. Indeed, several countries are not member of any of the Conventions, but still they have adopted more or less the same principles as the Conventions. Hereunder we will be discussing two countries that are not member of one of the Conventions: the United States and Switzerland.

In the United States nuclear liability is governed by the Price-Anderson Act; this imposes strict liability for nuclear incidents and limits the operator’s liability to 9,4 billion USD³⁶. The Price-Anderson Act covers anyone liable for public liability. Public liability is defined as “any legal liability arising out of or resulting from a nuclear incident or precautionary evacuation”³⁷. There are three exceptions to that rule: claims arising out of an act of war, worker’s compensation claims and claims for damage to on-site property at a licensed nuclear facility. Thus, also according to the Price-Anderson Act, a nuclear operator will be liable if a nuclear incident was caused by an act of terrorism.

In Switzerland, the liability of the nuclear operator is unlimited and almost absolute. Still, the Swiss nuclear liability Act contains a remarkable provision stating that a Swiss operator is not exonerated from liability if the nuclear incident is directly due to an armed conflict, a natural disaster or unlawful conduct by third parties. Even if the Swiss operator is liable, the damage caused by war or grave natural disasters is covered by the State.



It has also to be emphasised that compared to other civil liability mechanisms, the nuclear civil liability system is quite severe because it only gives limited defences to the nuclear operator. Given the restricted number of exonerations available to the operator, this liability is also referred to as “absolute liability”³⁸. E.g. in the proposed European Directive on environmental liability with regard to the prevention and remedying of environmental damage³⁹, the cases of *force majeure* are larger than those in the nuclear civil liability conventions⁴⁰. It seems that if a terrorist act would cause environmental damage, not the operator of the dangerous activity, but the different Member States should ensure that the damage is remedied. The proposed Directive will not be applicable to nuclear incidents covered by the nuclear civil liability conventions discussed above.

After having demonstrated that nuclear operators are liable if a nuclear incident is caused by an act of terrorism, we will now analyse the reaction of the insurance industry to the September 11th events.

III. Insurance

Before analysing the reaction of the (nuclear) insurance industry to the events of September, 11th, 2001 it is important to discuss first the way the nuclear risk is insured (III.1). After that, the reaction of the conventional insurance industry (III.2.) and of the nuclear insurance industry (III.3) will be analysed.

III.1. Insurance of the nuclear risk

As far as the insurance of the nuclear industry is concerned, one has to bear in mind the specific way the nuclear risk is insured⁴¹. Studies carried out in the fifties, early sixties indicated that the capacity of the insurance companies was insufficient for covering the nuclear risk. Similarly, there was no experience for covering these types of risks.

Therefore, insurance pools have been created on a national basis. This implies that in a given country several insurance companies have joined their forces in order to cover each a small part of the third party liability of an operator. As a consequence of the fact that those pools are organised on a national basis, a Belgian operator can only buy third party liability insurance with the Belgian nuclear pool, a Dutch operator with the Dutch pool etc.

Every pool member declares each year for which amount it is willing or able to provide insurance coverage. The capacity of the pool is therefore equal to the contributions of all its members. In case payments have to be made, each member of the pool will have to contribute a ratio of its participation as contractually agreed with the pool. Re-insurance of the nuclear risk will take place among pools; a separate member of the pool cannot take care of reinsurance itself. That is why a large number of insurance companies world-wide had to interfere as re-insurer in respect of the Three Mile Island accident in 1979⁴².

According to the insurers, this strategy results in a double advantage. Since every member of the pool knows exactly for which amount it will be responsible, members are willing to insure a much larger part of the nuclear risk than with respect to conventional industrial risks. Moreover, re-insurance is directly established between the different national pools without intervention of third parties, which minimizes the costs. Between the pools there is no commission for re-insurance; only a part of the costs will be calculated, which is on an average of 7.5% compared to a commission of an average of 30% on the conventional re-insurance market.

Those nuclear insurance pools are still effective today; they offer not only cover for the third party liability of the nuclear operator, but also for the property damage, worker's compensation etc.

For the insurance of property damage to nuclear installations, additional schemes exist. In the United



States and in Europe, the nuclear operators have created their own insurance formulas, basically to insure property damage (so called *captive*⁴³) – Nuclear Electric Insurance Limited (NEIL) in the US and European Mutual Association for Nuclear Insurance (EMANI) in Europe. However, both NEIL and EMANI also insure, directly or indirectly, the third party liability of nuclear operators. In doing so, they are able to offer additional capacity to the pools and they can also act as a competitor of the traditional pools.

The last few years several pools indeed lost a part of their market to the captives, although, certainly in the US, the American nuclear insurance pool (American Nuclear Insurers, ANI) works closely together with NEIL. Witness thereof is the fact that NEIL is an important re-insurer of ANI. Not only the captives are willing to take some of the market share of the nuclear insurance pools; also traditional insurers seem to be more and more willing to cover e.g. worker's compensation of nuclear operators.

III.2. Reaction of the “conventional” insurance industry to the events of September, 11th

Prior to the events of September, 11th, fire insurance policies covered fire and explosion damage, regardless of its cause. The only exception concerned cases where the damage was caused by (civil) war, or civil commotion. Indeed, in most countries terrorism was not mentioned in war exclusion clauses and therefore fire or explosion damage resulting from a terrorist attack was covered.

As insurance companies call upon reinsurance companies for spreading their risks, the attacks put a major pressure on the world's reinsurance market. The biggest reinsurance companies felt compelled to terminate the coverage of terrorism risk. As a consequence, also the insurance companies stopped covering the terrorism risk. Terminating those contracts, obliged the different parties involved to negotiate in order to find a solution to the problem. Insurers have reviewed their risk acceptance positions and have reduced and limited their coverages in order to safeguard their own positions. Basically, the reaction of the insurance industry can be summarised as follows: each insurer assessed whether and to what extent measures were needed in order to protect his own financial position.

The question as to whether terrorism risk is insurable at all, has been reviewed⁴⁴. The attacks on the Twin Towers and the Pentagon mainly influenced the assessment of the probability and severity of the risk. Note that several authors have indicated that problems in assessing the probability or a very high potential damage do not make a risk uninsurable as such⁴⁵.

Given the acute demand for covering terrorism risks, the insurance and reinsurance industry now seems to be ready to offer insurance for the terrorism risk to a certain extent. It seems that terrorism coverage is or will be made available on a limited, selective basis and against the payment of an additional premium reflecting the individual risk.

The major problem today is the lack of capacity for the coverage of such risks. E.g. in the US, the insurance industry says it will need four years in order to develop the necessary means to cover terrorism. Given the current lack of capacity on the one hand and the urgent and huge demands for terrorism coverage on the other, temporary solutions combining private and public resources have been set up. This is the case in the aviation industry. At this moment, the private insurance market offers an Airline Liability policy with a 50 million USD limit. In excess of this amount, the Member States of the European Union act as an insurer, up to 1 billion USD – the airlines have to pay a premium for this. The European Commission evaluates the need for State intervention on a monthly basis.

In the meantime solutions are being worked out in different countries. In France for instance, a pool for terrorism exposure was established : GAREAT (*Gestion de l'Assurance et de la Réassurance des Risques Attentats et Actes de Terrorisme*). This pool became effective as from January, 1st, 2002. The French State provides for a state guarantee for the pool. The business ceded to the pool consists of material damage and loss of profit from fire and engineering insurance. Here we thus see a solution combining a specific mechanism for generating more capacity (pooling) and a State guarantee. Also in other countries negotiations proceed on possible solutions.



III.3. Reaction of the nuclear insurance industry to the events of September, 11th

Due to the possible magnitude of a nuclear incident, the consequences of the terrorist attacks on nuclear installations or on transport of nuclear material can be even more troublesome than in the “conventional” insurance industry. In the nuclear industry, the position of both the insurance industry and the nuclear operators is quite difficult. As indicated, the nuclear operator is liable if a terrorist attack on a nuclear installation (or on a transport over land) causes a release of radiation and if this release causes damage to a third party. Should the nuclear insurers cancel terrorism risk in the existing liability policies, then the nuclear operators are in principal obliged to provide for another mean of financial security (bank guarantee, State guarantee,....), otherwise they would violate the congruence principle of the Paris Convention (and of the domestic law provision implementing this principle).

The reaction of the different nuclear insurance pools was somehow different. Some pools have argued that since they have their own reinsurance scheme (reinsuring each other in stead of reinsuring on the common reinsurance market), they were more or less able to continue providing coverage, including the terrorism risk. E.g. the American nuclear insurance pool (ANI) decided to continue providing coverage, but it imposed an industry wide aggregate limit of 200 million USD. By covering terrorism, ANI will be increasing its premium by 20%.

Other pools wanted to terminate the civil liability policies, but were unable to do so. It seems that the European nuclear pools have no alternative as to continue to provide terrorism liability coverage through 2002. Most nuclear reinsurance contracts run from January 1st of each year, but require a four or six months notice of changes. Therefore, it was not possible to change coverage as from January, 1st, 2002. So far, it is not clear how terrorism coverage will be addressed as from January, 1st, 2003.

Note that the traditional nuclear insurance pools are more and more under pressure due to the increasing competition on the market. Both traditional insurers active in insuring worker’s compensation as the nuclear captives become more and more real competitors of the pools⁴⁶. Therefore some of the pools were and are reluctant to terminate contracts or to change premiums dramatically.

The least one can say is that there is and was some nervousness on the market. In a first reaction after the attacks, the Swedish nuclear pool terminated the coverage of terrorism risks; only a few weeks later it reconsidered its position on this matter and provided coverage for terrorism risk. Similarly, it remains to be seen whether those nuclear pools who actually still provide coverage for terrorism risk, will continue to do so should a loss occur. Some pools indeed have indicated that they will seriously consider terminating covering terrorism risk in their third party liability policies, if a terrorist act would hit a nuclear installation causing a nuclear incident.

As far as the coverage of property damage is concerned, most pools have principally excluded terrorism risk from these policies, but they offer the possibility to provide coverage if an additional premium is paid.

EMANI, the European captive of nuclear operators, continues to provide coverage for terrorism in their property damage policy, up to 100 million euro. In EMANI’s view, an industrial captive must protect the interests of its members. The American captive of utilities covering all American nuclear insurance property, NEIL, imposed a single loss aggregate for terrorism claims in a twelve-month period.

The reaction of the different players on the nuclear insurance market is thus different from country to country. Currently, some of the players are working out self-insurance schemes covering only the nuclear terrorism risk; others seem to try to convince the national authorities to act as a re-insurer or guarantee,.... Whether the nuclear operators in the European Union will be able to convince the European Commission for the need of State intervention, is quite unlikely. Although the Commission approved that different member States would act as insurer of the civilian airline industry, it has been clear from the beginning that the Commission’s approval was limited in time.



IV. Possible alternatives

An alternative to problems in insuring a certain risk, is offered by the pooling of insurance companies. E.g. the pooling within the nuclear insurance pools⁴⁷, is to a certain extent an alternative way for insuring a risk. But pooling is not only used in nuclear liability insurance. As already indicated, GAREAT, a pool covering terrorism risk, was created in France. Note that GAREAT also applies to damage caused by a nuclear incident. Basically, those pools allow to generate more insurance capacity.

Also in covering environmental damage, similar pools exist. For instance in the Netherlands, the *Nederlandse Milieupool* (or Dutch environmental pool) is effective. Whereas this pool initially provided for environmental liability insurance, it now issues an environmental damage insurance (MSV or milieuschadeverzekering)⁴⁸. It provides an integrated coverage of all the environmental damage which occurs on or from the insured site. Prerequisite is that it concerns pollution of the soil or of the water. The whole idea is that this coverage constitutes a direct insurance. In other words, the insured site is insured, even when clean-up costs have to be made on the site of a third party. Coverage takes place, as soon as the site of a third party is polluted as the result of the insured risk, irrespective of who is or can be liable for the damage. The trigger for compensation under this policy is therefore no longer tort law, but the insurance policy. Therefore, this is called a first party insurance or a direct insurance. It is indeed not the victim who purchases liability insurance (although the insured may be the victim), but someone who has responsibility for a site on or from which water or soil pollution may occur. The policy hence benefits third parties as well.

An alternative to the pooling by insurance companies, is the risk pooling by plant operators. Faure and Skogh have proposed a risk pooling by nuclear operators, a risk sharing agreement as an alternative compensation scheme that could provide higher amounts of coverage to deal with the nuclear risk⁴⁹. It is interesting to note that a kind of pooling of nuclear operators already exists in the United States. According to the Price-Anderson Act, a nuclear operator is obliged to have an individual liability coverage of 200 million USD; but if the damage exceeds this amount, the nuclear operator needs to pay a retrospective premium of 83,6 million USD per nuclear installation. Thus, the total compensation available in the US consists of two layers: first the liability insurance of the individual nuclear operator and second the collective layer of all licensed nuclear utilities⁵⁰.

Also in other fields of liability risk sharing agreements are well-known. For instance, marine oil pollution is insured by the so-called Protection and Indemnity Clubs (P&I Clubs). They offer both liability and property coverage. The members of these clubs are the tanker owners. These P&I Clubs function as a mutual insurance company. Profits and losses are shared amongst the members⁵¹.

Such risk sharing agreements are often created by way of a *captive*. It might be worthwhile to consider the establishment of a nuclear captive covering only terrorism risk. In the airline industry, captive alternatives are being worked out. The US Air Transport Association (ATA) supports an alternative solution in creating a captive war risk insurance company, to be called Equitime. Also the International Civil Aviation Organisation (ICAO) proposed a scheme creating a non-profit special purpose insurance company providing war risk insurance. This proposal is being supported by the Association of European Airlines (AEA).

Another alternative is the creation of a so-called damage fund; the creation of such a fund is often proposed as a mean of covering environmental liability⁵². In fact, several types of funds can be distinguished: limitation fund, advance fund, guarantee fund and a fund replacing liability and insurance⁵³.

Other proposals tend to solve the capacity problems of the insurance market by looking for alternatives on the capital market. These so-called ART-Mechanisms (*Alternative Risk Transfer*) use insurance derivatives like swaps and options. One of these alternative mechanisms is the *Act of God Bonds* where the return payment of the investment highly depends on the realization of certain events (called catastrophic risks)⁵⁴. Some of these financial products are already effective, e.g. the CATEX (*Catastrophe Risk Exchange*) in New York where packages of catastrophic risks are being exchanged⁵⁵. Also concerning the nuclear risk a proposal has been made to address the capital market⁵⁶.

It would go beyond the purpose of this article to discuss the advantages and disadvantages of each of



these alternatives into detail. It is important to have in mind that a great variety of mechanisms already exist and that negotiations are going on, both in the conventional and nuclear insurance industry.

V. Concluding remarks

The major problem for nuclear operators is that under today's legal principles, they are liable for damage caused to third parties, even if the nuclear incident was caused by an act of terrorism. It seems very unlikely that the existing international nuclear civil liability conventions will soon be changed in that respect. The revision of the Vienna Convention has been terminated by the adoption, in 1997, of the Protocol to amend the Vienna Convention and of the Supplementary Funding Convention. According to both instruments, the nuclear operators are liable if a nuclear incident has been caused by an act of terrorism.

The revision of the Paris is just finished; shortly after the events of September, 11th the Contracting Parties of the Paris Convention considered it was not appropriate to address the issue of terrorism at that point. Consequently, the revision that already went on for several years, has been terminated without changing the fact that nuclear operators are liable if a nuclear incident is caused by an act of terrorism.

So, it will be quite difficult for the countries who are member of the Paris or Vienna Convention, to change their domestic law concerning terrorism. If they would want to change the national nuclear liability provisions by accepting terrorism as an exoneration for the nuclear operator, the provisions of the Conventions would be violated.

It is thus quite unlikely that nuclear civil liability principles will be changed. Theoretically, a country that is not member of the Conventions could do so more easily than member countries, but whether this will be politically acceptable remains to be seen. Even if the nuclear liability conventions would be changed by excluding the terrorism risk, the question would still have to be solved who will have to pay for the damage due to terrorism.

In the past, the cover of terrorism was not much of an issue in the (nuclear) insurance industry. The events of September 11th dramatically changed this situation. Some policies were or are to be cancelled; in other the cases the premium has gone up; similarly, several players have changed the magnitude of the cover they offer (lower amount insured, introduction of aggregate limit etc.). Therefore, the only solution for nuclear operators seems to be in trying to find additional cover for the terrorism risk.

As far as the nuclear insurance pools are concerned, it might be a good suggestion to verify their real capacity. In the recent past some of the nuclear pools have lost some market share (especially in covering property damage) to the captives (EMANI and NEIL). Consequently, they might have some free capacity available for covering the terrorism risk.

Apart from increasing the capacity of the nuclear insurance pools or by using all the available capacity, several other scenarios are possible: international pooling of terrorism risk amongst insurance companies, pooling of operators in captive insurance schemes, partial and/or temporary public funding, creation of damage funds etc. Which scenario will eventually prevail is impossible to tell.

Although it might be prudent not to dawdle for too long, it might take some time before alternative mechanisms are effective, given the complexity of the issues involved, and given the magnitude of the interests at stake. One should also have in mind the differences, even within the European Union, in insurance law, liability law as well as in the willingness of the State to act as an insurer or re-insurer. The different business approaches of the different insurance markets indeed do not make discussions easier. It is quite unlikely that there will be one "miracle solution"; it seems more reasonable to assume that a combination will eventually be worked out and become effective.

It also has to be clear that liability and insurance is only one aspect of dealing with nuclear terrorism. Measures preventing terrorist attacks on nuclear installations and transports (physical protection, safeguarding of nuclear material etc.) are at least equally important.



¹ The views and ideas expressed in the article represent the author's own and personal opinion and do not in any way reflect the position or policy of the Belgian Government. The facts contained and ideas expressed in this article are the responsibility of the author alone.

² "Terrorism – dealing with the new spectre", Focus Report, Swiss RE, 2002, and "Natural Catastrophes and man-made disasters in 2001: man-made losses take on a new dimension", available on www.swissre.com

³ The IAEA is a UN specialised organisation for scientific and technical co-operation in the peaceful use of nuclear technology. Its task is both to promote and control the use of those technologies. The IAEA Statute provides that "the Agency shall seek to accelerate and enlarge the contribution of atomic energy to peace, health, and prosperity throughout the world. It shall ensure, so far as it is able, that assistance provided by it or at its request or under its supervision or control is not used in such a way as to further any military purpose". More info on the website of the IAEA at www.iaea.org/worldatom.

⁴ For an overview, see El Baradei, M., Nwogugu, E. en Rames, J., "International law and nuclear energy: Overview of the legal framework", *IAEA Bulletin*, 3/1995, pp. 16-25.

⁵ The measures mentioned only give a very brief overview of the efforts of the IAEA over the years and are presented by way of example.

⁶ Press Release 2002/04, March, 19th, 2002.

⁷ Press Release, November, 1st, 2001.

⁸ For more details on the strengthened policy of the IAEA, see Nilsson, A., "Security of Material. The Changing Context of the IAEA's Programme", *IAEA Bulletin*, vol. 43, 2001/4, pp. 12-15; Goldschmidt, P., "Strengthened Safeguards. Meeting Present and Future Challenges", *IAEA Bulletin*, vol. 43, 2001/4, pp. 6-11; Bunn, M. and Bunn, G., "Nuclear Theft and Sabotage. Priorities for Reducing New Threats", *IAEA Bulletin*, vol. 43, 2001/4, pp. 20-29; Gonzalez, A.J., "Security of Radioactive Sources. The Evolving New International Dimensions", *IAEA Bulletin*, vol. 43, 2001/4, pp. 39-48.

⁹ We indeed use the word "nuclear incident" because this is exactly the phrase used in the civil nuclear liability Conventions.

¹⁰ About the proliferation of nuclear weapons, see inter alia Vanden Borre, T. and Carchon, R., "Preventing the Proliferation of Nuclear Weapons: 50 Years of Atoms for Peace", *Nuclear Law Bulletin*, vol. 57, 1996, pp. 23-52.

¹¹ The Nuclear Energy Agency (NEA) is a specialised agency within the Organisation for Economic Co-operation and Development (OECD), an intergovernmental organisation of industrialised countries, based in Paris. The mission of the NEA is to assist its Member countries in maintaining and further developing, through international co-operation, the scientific, technological and legal bases required for the safe, environmentally friendly and economical use of nuclear energy for peaceful purposes. For more information, see the website of the NEA at www.nea.fr.

¹² For a useful overview on nuclear law, see, *inter alia*, OECD/NEA, *Liability and Compensation for Nuclear Damage: An International Overview*, Paris, OECD-NEA, 1994.

¹³ The Protocol to the Paris Convention of 28 January 1964 adjusts some of the definitions and imposes liability on the operator for damage to the means of transport; the Protocol to the Paris Convention of 16 November 1982 changes the unit of account into SDR and increases the liability amounts of the three tiers from initial 120 million up to 300 million SDRs. In this respect, see, *inter alia*, Lagorce, M., "Bilan et analyse critique de la Convention de Paris et de la Convention complémentaire de Bruxelles après les Protocoles de 1982", in *Nuclear Third Party Liability. Status and Prospects*, Munich Symposium, Paris, 1985, pp. 24–42.

¹⁴ Bette, A., Didier, J.M., Fornasier, R., Stein, R.M., *La Réparation des Dommages Nucléaires en Europe. Régime instauré par la Convention de Bruxelles du 31 janvier 1963*, Brussel, 1965, p. 10 ; for a critical analysis see Doeker, G. en Gehring, T., "Private or International Liability for Transnational Environmental Damage – the precedent of conventional liability regimes", *Journal of Environmental Law*, vol. 2, n° 1, 1990, pp. 1-16.

¹⁵ According to Article 3 of the Brussels Supplementary Convention, the total amount of compensation for damage arising from a nuclear incident will be composed of different tiers. These are as follows: the first tier with a minimum of 5 million Special Drawing Rights (SDRs) will be provided by the operator's liability, the second tier between this amount and 175 million SDRs will be provided by the State on whose territory the installation of the liable person is situated; and finally, a third tier between 175 million SDRs and 300 million SDRs will be provided by the Contracting Parties to the Brussels Supplementary Convention *a ratio* of the GNP and the thermal capacity of the reactors.

¹⁶ The accession of Slovenia became effective on 16 October 2001.

¹⁷ See, *inter alia*, Lamm, V., "Status of the Revision of the Vienna Convention", in *Nuclear Accidents. Liabilities and Guarantees*, OECD, Paris, 1993, pp. 170-180; Reyners, P., "Le Régime International de Responsabilité civile Nucléaire. Perspectives d'évolution", in *L'option Nucléaire. L'Éthique et le Droit*, May 1994, Société Française d'Énergie Nucléaire, 1994,



pp. 245-269 ; Horbach, N.L.J.T., "Lacunae of International Nuclear Liability Agreements", in Horbach, N.L.J.T. (ed.), *Contemporary Developments in Nuclear Energy Law. Harmonising Legislation in CEEC/NIS*, Kluwer Law International, Den Haag, Boston, 1999, pp. 43-85.

¹⁸ In September 2001, the following 24 countries were Party to the Joint Protocol: Bulgaria, Cameroon, Chile, Croatia, Czech Republic, Denmark, Egypt, Estonia, Finland, Germany, Greece, Hungary, Italia, Latvia, Lithuania, the Netherlands, Norway, Poland, Romania, Saint Vincent&the Grenadines, Slovakia, Slovenia, Sweden and Ukraine.

¹⁹ See, *inter alia*, Pelzer, N., "Inadequacies in the Civil Liability Regime evident after the Chernobyl Accident: The Response in the Joint Protocol of 1988", in *Nuclear Accidents: Liabilities and Guarantees*, Paris, OECD, 1993, p. 162; Von Busekist, O., "Le Protocole commun relatif à l'application de la Convention de Vienne et de la convention de Paris: Une passerelle entre les deux Conventions sur la responsabilité civile pour les dommages nucléaires", *Nuclear Law Bulletin*, 43, June 1989, p. 16.

²⁰ See *inter alia*, Schwartz, J., "Diplomatic conference convened to adopt a protocol to amend the Vienna Convention on civil liability for nuclear damage and to adopt a Convention on supplementary compensation for nuclear damage", in *Le droit nucléaire: du XXe au XXIe Siècle. Nuclear Inter Jura '97*, Société de Législation Comparée, Paris, 1998, pp. 427-429 ; Lamm, V., "Le Protocole d'amendement de la Convention de Vienne de 1963", *Bulletin de Droit Nucléaire*, N° 61, 1998, pp. 7-26, Reyners, P., "Modernisation du régime de responsabilité civile pour les dommages nucléaires: révision de la Convention de Vienne et nouvelle Convention sur la réparation complémentaire des dommages nucléaires", *Revue Générale de Droit International Public*, 1998/3, pp. 747-763.

²¹ There are some difference between the texts of both regimes; the major difference however is that in the NEA-regime, the Brussels Supplementary Convention introduces an international layer providing additional compensation for victims. The latter Convention also offers the possibility to the installation States, to provide for additional funds.

²² This regime is applicable upon the condition that it can be proved that the damage was caused by a nuclear incident occurring at that installation, or by nuclear material originating in that installation involved in the incident. For the definitions of these concepts, see Article 1 of the Paris Convention.

²³ *Exposé des Motifs*, Motif 14.

²⁴ For a critical analysis on the concept of channelling, see Vanden Borre, T., "Channelling of Liability: a Few Juridical and Economic Views on an Inadequate Legal Construction", in Horbach, N.L.J.T. (ed.), *Contemporary Developments in Nuclear Energy Law. Harmonising Legislation in CEEC/NIS*, Kluwer Law International, Den Haag, Boston, 1999, pp. 13-39; Vanden Borre, T., *Efficiënte preventie en compensatie van catastroferisico's. Het voorbeeld van schade door kernongevallen*, Intersentia, Antwerpen, 2001, p. 225 ff.

²⁵ The operator is the person appointed by the competent authorities as the operator of a nuclear installation. See Article 1(a) of the Paris Convention.

²⁶ 21,46 million euro.

²⁷ Note that under the revised Paris Convention, the operator will at least be liable to 700 million euro.

²⁸ *Exposé des Motifs* of the Paris Convention of 16 November 1982, at Motif 45. The reason for this limitation was therefore purely economical: the liability of the operator was limited to the amount for which the insurance market was able to provide coverage. See also N. Pelzer, *Begrenzte under unbegrenzte Haftung im deutschen Atomrecht*, Baden-Baden, Nomos, 1982, p. 13.

²⁹ Also this article will be replaced once the Protocol to the Paris Convention will enter into force: a distinction will be made between damage to persons (30 years prescription period) and damage to property (10 years prescription period).

³⁰ Note that for the Member States of the European Union, there are currently some questions related to this principle, given the (similar) provisions of the Council Regulation N° 44/2001 of December, 22nd, 2000 on jurisdiction and the recognition and enforcement of judgments in civil and commercial matters, *OJ*, L 12/1, 16/01/2001. The Regulation entered into force on March, 1st, 2002.

³¹ Emphasis added.

³² See Bette, A., Didier, J.M., Fornasier, R., Stein, R.M., "La Réparation des Dommages Nucléaires en Europe. Régime instauré par la Convention de Bruxelles du 31 janvier 1963", *I.c.*, 24 ff.

³³ According to article 1, (a), (i) of the Paris Convention, a Nuclear installation means: "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; 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 radioactive material is held, be treated as a single nuclear installation".

³⁴ Motif n° 48.

³⁵ Emphasis added.



³⁶ 42 US Code Sections 2014, 2210.

³⁷ 42 US Code Section 2210(w).

³⁸ Boyle, A.E., "Nuclear Energy and International Law: An Environmental Perspective", *British Yearbook of International Law*, 1989, vol. 60, 303.

³⁹ European Commission, 23 January 2002, COM (2002), 17 final.

⁴⁰ Article 9, (1) of the Proposal reads: "Subject to Article 10, this Directive shall not cover environmental damage or an imminent threat of such damage caused by: (a) an act of armed conflict, hostilities, civil war or insurrection; (b) a natural phenomenon of exceptional, inevitable and irresistible character; (c) an emission or event allowed in applicable laws and regulations, or in the permit or authorisation issued to the operator; (d) emissions or activities which were not considered harmful according to the state of scientific and technical knowledge at the time when the emission was released or the activity took place".

Article 9, 3, (a) of the Proposal reads: "Subject to Article 10, an operator shall not be required to bear the cost of preventive or restorative measures taken pursuant to this Directive when the environmental damage or imminent threat of such damage occurring is the result of: (a) an act done by a third party with intent to cause damage, and the damage or imminent threat in question resulted despite the fact that appropriate safety measures were in place."

⁴¹ See, *inter alia*, W.E. Besler, "Über die Zweckmäßigkeit der Poolung von Atomrisiken", 18 *Versicherungswirtschaft*, 14 Jahrgang (September 1959), pp. 572-584; J.C. Dow, *Nuclear Energy and Insurance*, London, Witherby & Co., 1989; *Nuclear Power: Insurance and the Pooling System*, Special Edition of the Nuclear Pools' Bulletin, 1992; S.M..S. Reitsma, "Nuclear Insurance Pools: History and Development", in *Nuclear Accidents: Liability and Guarantees*, INLA Helsinki Symposium, 1992, p. 346.

⁴² J.C. Dow, "The Organisation and Development of International Liability Capacity and National Market Pools with Special Reference to New Nuclear Countries", in *Nuclear Third Party Liability and Insurance: Status and Prospects*, München Symposium IAEA/NEA 1984, Paris, IAEA/OECD, 1985, pp. 172-182.

⁴³ A captive is, in fact, a company aiming at insuring or re-insuring all or part of the risks of an affiliated company. See Bawcut, P.A., *Captive Insurance Companies. Establishment, Operation and Management*, 3th edition, Woodhead-Faulkner, New York, 1991.

⁴⁴ According to SwissRe, the criteria for the insurability of risks are: assessibility, randomness, mutuality and economic feasibility.

⁴⁵ Faure, M. and Hartlief, T., "Remedies for expanding liability", *Oxford Journal of Legal Studies*, vol. 18, 1998, 681-706; Faure, M., "The Limits to Insurability from a Law and Economics Perspective", *The Geneva Papers on Risk and Insurance*, 1995, n° 76, 454-462.

⁴⁶ For a critical analysis of these pools see Faure, M en Van den Bergh, R., "Restrictions of competition on insurance markets and the applicability of EC antitrust law", *Kyklos*, vol. 48, 1995, pp. 65-85.

⁴⁷ See above, III.1

⁴⁸ See *inter alia* Drion, P.J.M., "Milieu onder één dak: milieuschadeverzekering (MSV)", *Verzekeringsrechtelijke Berichten*, 1998/2, 19-21; Janssen, C.A., "Aansprakelijkheid voor milieuschade en financiële zekerheid baar toekomstig recht: nieuwe oplossingen. Nederlands recht", in Deketelaere, K. en Wiggers-Rust, L.F. (red.), *Aansprakelijkheid voor milieuschade en financiële zekerheid. Een vergelijking van Nederlands, Belgisch en Europees recht*, Die Keure, Vermande, Brugge, 1998, 111-112.

⁴⁹ Faure, M., en Skogh, G., "Compensation for damages caused by nuclear accidents: a convention as insurance", *The Geneva Papers on Risk and Insurance*, vol. 17, n° 65, 1992, pp. 499-513.

⁵⁰ For more details see Heimann, F.F., "The U.S. Liability protection system for nuclear power plants", in *Nuclear Accidents. Liabilities and Guarantees*, OECD/NEA-IAEA, Helsinki, 1993, 418-424; Brown, O. F. II, "Nuclear Liability Coverage Developments in the United States of America", *Nuclear Inter Jura '93*, AIDN/INLA, Rio, II.5.6-2; Brown, O.F., "Recent Developments from the Perspective of the United States", in Horbach, N.L.J.T. (ed.), *Contemporary Developments in Nuclear Energy Law. Harmonising Legislation in CEEC/NIS*, Kluwer Law International, Den Haag, Boston, 1999, pp. 481-488; Vanden Borre T., "Dekking van het nucleaire risico op nationaalrechtelijke basis of via internationale Verdragen: de Verenigde Staten versus Europa", Deketelaere, K., Faure, M. en Verhoossel, G. (red.), *Grensoverschrijdende milieuproblemen: uitdagingen voor de nationale en de internationale rechtsorde*, Intersentia, Antwerpen, Groningen, 1998, pp. 443-490.

⁵¹ See about the P&I Clubs: Aspden, P., "Oil Pollution Legislation and its consequences. A P&I Club View", *Shipping Law Faces Europe: European Policy, Competition and Environment*, Maklu, Antwerpen-Apeldoorn, Bruylant, Brussel, 1995, pp. 135-154; Coghlin, T.G., "Protection and Indemnity Clubs", *Lloyds Maritime and Commercial Law Quarterly*, 1984, pp. 403-416; Dieryck, C., Van Havre, P., "Les assurances P&I (Protection and Indemnity Clubs)", in *L'Assurance Mutuelle en Belgique*, Academia, Bruylant, Bruxelles, 1999, pp. 373-395.

⁵² Bocken, H., "Alternatives to liability and liability insurance for the compensation of pollution damages", *Tijdschrift voor Milieuaansprakelijkheid*, 1987/4, 83-87 and 1988/1, 3-10; Bocken, H., "Complementary compensation mechanisms. A general environmental damage fund? ", in Bocken, H. en Ryckbost, D. (ed.), *Verzekering van milieuschade*, Gent Story Scientia,



1989, 427-437; Bocken, H., "Systèmes alternatifs pour l'indemnisation des dommages dus à la pollution", *Revue Générale des Assurances et des Responsabilités*, 1990, 11.698 en 11.714.

⁵³ Faure, M.G., and Hartlief, T., "Compensation Funds versus Liability and Insurance for Remediating Environmental Damage", *Review of European Community & International Environmental Law*, vol. 5, nr. 4, 1996, pp. 321-327; Faure, M.G. and Hartlief, T., "Een schadefonds als alternatief voor aansprakelijkheid en verzekering?", *Rechtsgeleerd Magazijn Themis*, 1998/7, pp. 211-228.

⁵⁴ On these financial mechanisms, see Zech, J., "Will the International Insurance Market replace Traditional Insurance Products?", *The Geneva Papers on Risk and Insurance*, vol. 23, n° 89, 1998, pp. 492-495; Radetzki, M. en Radetzki, M., "Private Arrangements to Cover Large-Scale Liabilities Caused by Nuclear and Other Industrial Catastrophes", *The Geneva Papers on Risk and Insurance*, vol. 25, n° 2, 2000, pp. 180-195.

⁵⁵ For more details see Kieholz, W. en Durrer, A., "Insurance Derivatives and Securization: New Hedging Perspectives for the US Cat Insurance Market", *The Geneva Papers on Risk and Insurance*, vol. 22, n° 82, 1997, pp. 3-16; Smith, R.E., Canelo, E.A. en Di Dio, A., "Reinventing Reinsurance Using the Capital Markets", *The Geneva Papers on Risk and Insurance*, vol. 22, n° 82, 1997, pp. 26-37.

⁵⁶ Tyran, J.R. en Zweifel, P., "Environmental Risk Internalization through capital markets (ERICAM): the Case of Nuclear Power", *International Review of Law and Economics*, 1993, vol. 13, nr. 4, pp. 431-444.