

Liability for Nuclear Damage

(Updated March 2021)

- Operators of nuclear power plants are liable for any damage caused by them, regardless of fault. They therefore normally take out insurance for third party liability, and in most countries they are required to do so.
- The potential cross-boundary consequences of a nuclear accident require an international nuclear liability regime, so national laws are supplemented by a number of international conventions.
- Liability is limited by both international conventions and by national legislation, so that beyond the limit (normally covered by insurance) the state can accept responsibility as insurer of last resort, as in all other aspects of industrial society.
- The international Convention on Supplementary Compensation for Nuclear Damage (CSC) has entered into force, and will largely replace other conventions.

The structure of insurance of nuclear installations is different from ordinary industrial risks. Insurance (direct damage and third party civil liability insurance) is placed with either one of the many national insurance pools which brings together insurance capacity for nuclear risks from the domestic insurers in the local country, or into one of the mutual insurance associations such as Nuclear Electric Insurance Limited (NEIL) or Overseas NEIL based in the USA, or EMANI and ELINI based in Europe*. These are set up by the nuclear industry itself. Third party liability involves international conventions, national legislation channelling liability to the operators, and pooling of insurance capacity in more than 20 countries. The national nuclear insurance pool approach was particularly developed in the UK in 1956 as a way of marshalling insurance capacity for the possibility of serious accidents. Other national pools that followed were modelled on the UK pool – now known as Nuclear Risk Insurers Limited, and based in London. The mutualization of insurance risks began with the forerunner of NEIL in 1973.

* European Mutual Insurance for Nuclear Installations (EMANI), focused on physical damage; and European Liability Insurance for the Nuclear Industry (ELINI), focused on liability. Both have members outside Europe.

Ever since the first commercial nuclear power reactors were built, there has been concern about the possible effects of a severe nuclear accident, coupled with the question of who would be liable for third party consequences. This concern was based on the supposition that even with reactor designs licensable in the West, a cooling failure causing the core to melt would result in major consequences akin to those of the Chernobyl disaster in 1986 and confirmed at Fukushima Daiichi in 2011. It was supposed that damage caused could be extensive, creating the need for compulsory third party insurance schemes for nuclear operators, and international conventions to deal with transboundary damage. On the other hand it was realized that nuclear power makes a valuable contribution to meeting the world's energy demands and that in order for it to continue doing so, individual operator liability had to be curtailed and beyond a certain level, risk had to be socialized. The state needs to accept responsibility as insurer of last resort, as with everything else in industrial societies, though attempts have been made to represent this as a specifically nuclear subsidy. Experience has shown the fear of catastrophe to be exaggerated, though the local impact of a severe accident or terrorist attack was shown at Fukushima Daiichi in 2011 to be considerable, even with no direct human casualties from the nuclear accident (contrasting with about 19,500 deaths from the tsunami which caused it). Prior to that, the Three Mile Island accident in 1979 was taken as being indicative, with virtually all radioactive consequences being fully contained in the structure.

It is possible to internalize all costs from an accident, given that the global non-life insurance market is very large, and received \$2,033 billion in premiums in 2013 to cover all accidents everywhere. Insurers have suggested that beyond current third party insurance cover and some mutual arrangements such as in the USA, further obligatory catastrophic accident cover of \$10-15 billion cover could be provided for a cost of 0.1 to 0.2 cents/kWh. The trigger for this could be above an INES category 5 event or some other definitive measure of a catastrophic accident, such as specified radiation levels, and it would be independent of

international conventions described below. It would also however need to define nuclear damage more tightly and not extend to the 30-year period in some conventions for bodily injury, since that would be commercially uninsurable. Premiums would relate to sophistication and intrinsic safety of the technology, e.g. late-generation reactors would be cheaper to insure.

Beyond the actual plant, the Chernobyl and Fukushima Daiichi accidents raised the question of what actually is damage from radioactive releases, giving rise to liability. Both accidents resulted in radioactive contamination of surrounding (notably downwind) areas, but the effect of this depended on government edicts extending or relaxing the evacuation of people. Those government decisions in turn depended on assessment of likely health effects of radiation exposure, with both science and populist sentiment feeding into that assessment, which became ultimately a political decision. The cost of both accidents in both human and monetary terms was hugely increased by applying radiation exposure limits set for ideal normal circumstances relating to nuclear and medical activities. These limits are well below the levels that many people experience naturally. An alternative would be to apply limits which were 'as high as reasonably safe' (and below some natural exposure levels giving rise to no discernible health effects). So the operators, notably at Fukushima, were liable for huge costs not because of damage or health effects from radioactive releases, but because of government decisions regarding maintaining the evacuation of significant areas for years, with generous compensation, even where contamination would give low exposure levels.*

* Japan's tsunami victims have minimal compensation and most want to return home, but cannot because their homes are gone. Meanwhile, many of the Fukushima evacuees can return home but choose to stay away and prosper from huge government-mandated personal and property compensation. As of January 2021 the Fukushima accident evacuees had received ¥9.7 trillion in personal and property compensation. These payments are promised to continue until 2021, but cease a year after residents return to their homes. Of the approximately 300,000 tsunami victims however, one-third has moved to other parts of Japan and the rest have received less than half the total sum awarded to the nuclear accident evacuees, though most do not need to remain away from their homes.

Nuclear liability principles

Most conventions and laws regarding nuclear third party liability have at their heart the following principles:

- Strict liability of the nuclear operator
- Exclusive liability of the operator of a nuclear installation
- Compensation without discrimination based on nationality, domicile or residence
- Mandatory financial coverage of the operator's liability
- Exclusive jurisdiction (only courts of the State in which the nuclear accident occurs have jurisdiction)
- Limitation of liability in amount and in time

Strict liability means that the victim is relieved from proving fault. In the case of an accident the operator (power plant, enrichment/fuel facility, reprocessing facility) is liable whether or not any fault or negligence can be proven. This simplifies the litigation process, removing any obstacles, especially such as might exist with the burden of proof, given the complexity of nuclear science. In layman's terms: strict liability means a claimant does not need to prove how an accident occurred.

Exclusive liability of the operator means that in the case of an accident, all claims are to be brought against the nuclear operator. This legal channelling is regardless of the accident's cause. By inference suppliers or builders of the plant are protected from public litigation in the case of an accident. Again this simplifies the process because claimants do not have to figure out who is responsible – under law it will be the nuclear operator.*

* It is assumed that in contrast to buying a car or a TV set, the operator has been involved in building the plant over 4-5 years in such a way that it is fully party to the construction, and one cannot simply talk about a 'supplier' as if the whole thing was an off-the-shelf purchase. From the time it starts commercial operation, monitoring every detail of its function is an operator responsibility (very different to owning and operating a car). Therefore, in any circumstances, attributing blame to the supplier would likely be a political more than a legal feat.

Mandatory financial coverage means that the operator must maintain insurance cover, and it ensures that funds will be made available by the operator or their insurers to pay for damages. The minimum amount of protection required is set by national laws which in turn often depend on international treaty obligations. Over time the amount of this mandatory protection has increased, partially adjusting for inflation and partially allowing for an increased burden of responsibility to be passed on to nuclear operators.

Exclusive jurisdiction means that only the courts of the country in which the accident occurs has jurisdiction over damages claims. This has two effects; firstly it prevents what is known as jurisdiction shopping, whereby claimants try and find courts and national legislation more friendly to their claims, thus offering nuclear operators a degree of certainty and protection.

Secondly it locates the competent court close to the source of damage meaning that victims do not have to travel far in order to lodge claims. This combined with exclusive liability ensures that relevant courts are accessible, even when the accident is transport-related and the relevant company based far away.

Limitation of liability protects individual nuclear operators and thus is often controversial. By limiting the amount that operators would have to pay, the risks of an accident are effectively socialized. Beyond a certain level of damage, responsibility is passed from the individual operator either on to the State or a mutual collective of nuclear operators, or indeed both. In essence this limitation recognizes the benefits of nuclear power and the tacit acceptance of the risks a State takes by permitting power plant construction and operation, as with other major infrastructure.

Altogether these principles ensure that in the case of an accident, meaningful levels of compensation are available with a minimal level of litigation and difficulty.

International Framework

Governments have long recognized the risk of a nuclear accident causing transboundary damage. This led to the development of international frameworks to ensure that access to justice was readily available for victims outside of the country in which an accident occurs, so far as the countries are party to the relevant conventions. The number of different international instruments and their arrangements often give rise to confusion. Many of the major instruments, outlined below, have been amended several times and not all countries party to the earlier version have ratified the latter. The result is a patchwork quilt of countries and conventions and work towards harmonization of these regimes is ongoing.

Before 1997, the international liability regime was embodied primarily in two instruments:

- The IAEA's Vienna Convention* on Civil Liability for Nuclear Damage of 1963 (entered into force in 1977).
- The OECD's Paris Convention on Third Party Liability in the Field of Nuclear Energy of 1960 which entered into force in 1968 and was bolstered by the Brussels Supplementary Convention in 1963**.

* Parties to Vienna Convention are mainly outside of Western Europe, including: Argentina, Armenia, Belarus, Brazil, Bulgaria, Chile, Czech Rep, Egypt, Hungary, Kazakhstan (2011), Lithuania, Mexico, Poland, Romania, Russia, Saudi Arabia (2011), Slovakia, Ukraine, United Arab Emirates (2011). See also:

[Vienna Convention on Civil Liability for Nuclear Damage](#)

** The Paris convention includes all Western European countries except Ireland, Austria, Luxembourg and Switzerland. Parties to both the Paris and Brussels conventions are: Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Norway, Slovenia, Spain, Sweden, UK. Paris only: Greece, Portugal, Turkey. See also:

[Paris Convention on Nuclear Third Party Liability](#)

[Brussels Supplementary Convention](#)

These Conventions were linked by the **Joint Protocol** adopted in 1988 (see below) to bring together the geographical scope of the two*. They are based on the concept of civil law and adhere to the principles outlined above. Specifically they include the following provisions:

- a. Liability is channelled exclusively to the operators of the nuclear installations (legal channelling means exclusive liability of operator, and protects suppliers).
- b. Liability of the operator is absolute, *i.e.* the operator is held liable irrespective of fault, except for "acts of armed conflict, hostilities, civil war or insurrection".
- c. Liability of the operator is limited in amount. Under the Vienna Convention the upper ceiling for operator liability is not fixed**; but it may be limited by legislation in each state. The lower limit may not be less than \$5 million. Under the 1960 Paris convention, liability is limited to not more than 15 million Special Drawing Rights*** (SDRs – about \$21 million in March 2021) and not less than SDR 5 million (about \$7 million).
- d. Liability is limited in time. Generally, compensation rights are extinguished under both Conventions if an action is not brought within ten years. Additionally, states may not limit the operator's liability to less than two years under the 1960 Paris Convention, or three years under 1960 Vienna Convention, from the time when the damage is discovered.
- e. The operator must maintain insurance or other financial security for an amount corresponding to his liability or the limit set by the installation state, beyond this level the Installation state can provide public funds but can also have recourse to the operator.
- f. Jurisdiction over actions lies exclusively with the courts of the contracting party in whose territory the nuclear incident occurred.
- g. Non-discrimination of victims on the grounds of nationality, domicile or residence.

h. Definition of nuclear damage covers property, health and loss of life but does not make provision for environmental damage, preventative measures and economic loss. This greatly reduces the total number of possible claimants, but increases the level of compensation available to the remainder.

* Parties: see Joint Protocol Relating to the Application of the Vienna Convention and the Paris Convention

** The Paris Convention set a maximum liability of 15 million Special Drawing Rights (SDRs), but this was increased under the Brussels Supplementary Convention up to a total of 300 million SDRs, including contributions by the installation state up to SDR 175 million and other parties to the convention collectively on the basis of their installed nuclear capacity for the balance.

***An SDR is a unit of account defined by the International Monetary Fund, approximately equal to 1.4 US dollars in March 2021.

The 1963 Brussels supplementary convention created a system of three tiers to provide for damages. Parties of the Brussels convention must also be party to the Paris convention which provides for the first tier of funds via the nuclear operator's liability. Tier two requires the state to pay the difference between the operator's liability (which is set under national law) and SDR 175 million. Tier three calls upon all parties to the convention to supply up to SDR 125 million. The maximum total amount available for compensation is therefore SDR 300 million.

Following the Chernobyl accident in 1986, the IAEA initiated work on all aspects of nuclear liability with a view to improving the basic Conventions and establishing a comprehensive liability regime. In 1988, as a result of joint efforts by the IAEA and OECD-NEA, the **Joint Protocol** Relating to the Application of the Vienna Convention and the Paris Convention was adopted. Parties to the Joint protocol are treated as if they are Parties to both conventions. If an accident takes place in a country bound by the Paris convention which causes damages in a country bound by the Vienna convention, then victims in the latter are subject to compensation as per the Paris convention. The reverse is also true. Generally, no country can be a party to both conventions because the exact details are not consistent, leading to potential conflict in their simultaneous application. The Joint Protocol was also intended to obviate any possible conflicts of law in the case of international transport of nuclear material. It entered into force in 1992.

The Vienna convention has been amended once in 1997, while the Paris convention and associated Brussels convention have been amended three times; in 1964, 1982 and 2004, though the latest amendment has not yet been ratified by enough countries to pass into force (see below). As of March 2021, the Paris Convention's liability regime applied to 103 reactors in operation located in nine states. Once the 2004 Paris Protocol enters into force, Swiss nuclear reactors will also fall within the scope of this Paris regime. The Vienna regime in March 2021 covered 81 nuclear reactors in operation.

In 1997 governments took a significant step forward in improving the liability regime for nuclear damage when delegates from over 80 States adopted a **Protocol to Amend the Vienna Convention**. The amended IAEA Vienna Convention sets the possible limit of the operator's liability at not less than 300 million SDRs and entered into force in 2003 but with few members*. It also broadens the definition of nuclear damage (to include the concept of environmental damage and preventive measures), extends the geographical scope of the Convention, and extends the period during which claims may be brought for loss of life and personal injury. It also provides for jurisdiction of coastal states over actions incurring nuclear damage during transport.

* As of March 2021, Argentina, Belarus, Poland, Romania, Saudi Arabia and United Arab Emirates were among the signatories.

There was no change in the liability caps provided for under either of the 1964 Paris or Brussels amendments or the 1982 Paris amendment. However, under the 1982 Brussels amendment, the second tier of finance (made available by the country in which the accident occurs) was raised to the difference between the operator's liability and SDR 175 million (i.e. between SDR 160 million and 170 million), while the third tier called upon all contracting countries to contribute up to SDR125 million so that the total amount currently available is SDR 300 million.

In 2004, contracting parties to the OECD Paris (and Brussels) Conventions signed **Amending Protocols** which brought the Paris Convention more into line with the IAEA Conventions amended or adopted in 1997. The principal objective of the amendments was to provide more compensation to more people for a wider scope of nuclear damage. They also shifted more of the onus for insurance on to industry. Consequently new limits of liability were set as follows: Operators (insured) €700 million, Installation State (public funds) €500 million, Collective state contribution (Brussels) €300 million => total €1500 M. The definition of "nuclear damage" is broadened to include environmental damage and economic costs, and the scope of application is widened. Moreover the 2004 amendment removed the requirement for a state to restrict the maximum liability of a nuclear operator, allowing for the first time states with a policy preference for unlimited liability to join the convention.

These Paris/Brussels amendments were expected to be ratified by the contracting parties once they had consulted with industry stakeholders and then drafted the necessary amending legislation, but as of March 2021 had not entered into force. The Paris Protocol, having been ratified only by Norway and Switzerland, is not yet in force, and the old limits still apply (about €360 million, including up to €210 million from the installation state).

Also in 1997 IAEA parties adopted a Convention on Supplementary Compensation for Nuclear Damage (CSC). This defines additional amounts beyond the Vienna Convention's first-tier 300 million SDRs to be provided through contributions by States Parties collectively on the basis of installed nuclear capacity and a UN rate of assessment, basically at 300 SDRs per MW thermal. The CSC is an instrument to which all States may adhere regardless of whether they are parties to any existing nuclear liability conventions or have nuclear installations in their territories, though in the case where they are not party to either Paris or Vienna they must still implement national laws consistent with an annex to the CSC. The CSC increases the amount of compensation for nuclear damage and establishes an international fund, to which contracting parties will be expected to contribute in the event of a nuclear accident. Jurisdiction of claims is to courts in the country concerned, as with other conventions.

In order to pass into force the CSC had to be ratified by five countries with at least 400 GW thermal of installed nuclear capacity. By August 2020 Argentina, Canada, India, Morocco, Romania, United Arab Emirates and the USA had ratified the CSC. Japan ratified it in early 2015, which took the total beyond 400 units of installed capacity and enabled the CSC to enter into force in mid-April 2015. It is not clear how India's ratification relates to the country's nuclear liability law. Its Ministry of External Affairs said in a statement that India's ratification of the CSC marked a "conclusive step in the addressing of issues related to civil nuclear liability in India." It entered into force for India in May 2016.

Table 1: Nuclear power states and liability conventions to which they are party

Countries	Conventions party to	Countries	Conventions party to
Argentina	VC; RVC; CSC; (JP)	Lithuania	VC; RVC; JP; (CSC)
Armenia	VC;	Mexico	VC
Belgium	PC; BSC; (RPC); (RBSC); (JP)	Netherlands	PC; BSC; JP; (RPC); (RBSC)
Brazil	VC	Pakistan	
Bulgaria	VC; JP	Romania	VC; JP; RVC; CSC
Canada	CSC	Russia	VC
China		Slovakia	VC; JP
Czech Republic	VC; JP; (CSC); (RPC)	Slovenia	PC; BSC; JP; (RPC); (RBSC)
Finland	PC; BSC; JP; (RPC); (RBSC)	South Africa	
France	PC; BSC; JP; (RPC); (RBSC)	Spain	PC; BSC; (RPC); RBSC; (VC); (JP)
Germany	PC; BSC; JP; (RPC); (RBSC)	Sweden	PC; BSC; JP; (RPC); (RBSC)
Hungary	VC; JP	Switzerland	PC; RPC; BSC; RBSC; (JP)
India	CSC	Ukraine	VC; JP; (RVC); (CSC)
Iran		UAE	RVC; JP; CSC
Japan	CSC	UK	PC; BSC; (RPC); (RBSC); (VC); (JP)
Kazakhstan	VC, RVC	USA	CSC
Korea			

PC = Paris Convention (PC). RPC = 2004 Revised Paris Convention, not yet in force.

BSC = Brussels Supplementary Convention. RBSC = 2004 Revised Brussels Supplementary Convention, not yet in force.

VC = Vienna Convention. RVC = 1997 Revised Vienna Convention (in force 2003)^{[1][2]}.

JP = 1988 Joint Protocol.

CSC = Convention on Supplementary Compensation for Nuclear Damage, in force from 15 April 2015.

() = signed but not yet ratified.

Beyond the provision of the above-mentioned instruments there is at least a tacit acceptance that the installation state will make available funds to cover anything in excess of these provisions, just as is the case with any major disaster – natural or other (the main industrial ones have been chemical plants). This has long been accepted in all developed countries. In the event of government payout to meet immediate claims however, the operator's liability is in no way extinguished, and taxpayers would expect to recover much or all of the sums involved. The Nuclear Energy Agency provides a document detailing nuclear operators' third party liability amounts and financial security limits.

However, several states with a significant current or planned nuclear capacity such as China are not yet party to any international nuclear liability convention, so far relying on their own arrangements. The Fukushima accident in 2011 provided a reminder that this situation is unsatisfactory, with over half the world's reactors outside of the Paris and Vienna conventions. Lack of progress is caused by the two major nuclear powers (USA and France) championing different approaches. France is a proponent of Paris and Joint Protocols, the USA supports the CSC – another bridging mechanism. Both sides are entrenched, and countries outside the regimes have tended to wait to see which would prevail. However, in line with the IAEA Action Plan on Nuclear Safety, in August 2013 the USA and France issued a joint statement aimed at resolving this disagreement and encouraging more countries to sign up to the revised Paris and Brussels conventions or the revised Vienna Convention, the Joint Protocol, and the CSC in particular. An 'initial step' envisaged was entry into force of the CSC, which is now achieved thanks to Japan.

Beyond the international conventions, most countries with commercial nuclear programs also have their own legislative regimes for nuclear liability. These national regimes implement the conventions' principles, and impose financial security requirements which vary from country to country. There are three categories of countries in this regard: those that are party to one or both of the international conventions and have their own legislation, those that are not parties to an international convention but have their own legislation (notably USA, Canada, S. Korea), and those that are not party to a convention and are without their own legislation (notably China).

In 2010 both France's CEA and the IAEA called for an overhaul and rationalization of the several international conventions. In particular, the Paris Convention open only to OECD countries was unsatisfactory when reactor vendors and utilities from those countries were building plants in non-OECD countries. Partly due to the US channelling situation described below, the CSC is seen as a possible basis for an all-encompassing international regime.

The European Commissioner for Energy gave notice of EU legislation in 2013 to bring the EU's nuclear accident insurance regimes into harmony, pending full harmonization of the international liability regimes.

US Framework

The USA takes a somewhat different approach, and having pioneered the concept is not party to any international nuclear liability convention, except for the CSC. The Price-Anderson Act – the world's first comprehensive nuclear liability law – has since 1957 been central to addressing the question of liability for nuclear accidents. It now provides \$13.6 billion in cover without cost to the public or government and without fault needing to be proven. It covers power reactors, research reactors, enrichment plants, waste repositories and all other nuclear facilities.

It was renewed for 20 years in mid 2005, with strong bipartisan support, and requires individual operators to be responsible for two layers of insurance cover. The first layer is where each nuclear operator is required to purchase US\$ 450 million liability cover (from 2017) for each reactor which is provided by a private insurance pool, American Nuclear Insurers (ANI). This is financial liability, not legal liability as in European liability conventions. Reactors under 100 MWe have a lower primary insurance requirement.

The second layer or secondary financial protection (SFP) programme is jointly provided by all US reactor operators. It is funded through retrospective payments if required of up to \$121 million per reactor per accident* collected in annual instalments of \$19 million (and adjusted with inflation). Combined, the total provision in 2014 came to over \$13.6 billion paid for by the utilities. (The Department of Energy also provides \$10 billion for its nuclear activities.) Beyond this cover and irrespective of fault, Congress, as insurer of last resort, must decide how compensation is provided in the event of a major accident.

* plus up to 5% if required for legal costs. Figures were adjusted for inflation in mid-2013.

More than \$150 million has been paid by US insurance pools in claims and costs of litigation since the Price-Anderson Act came into effect, all of it by the insurance pools. Of this amount, some \$71 million related to litigation following the 1979 accident at Three Mile Island.

The Nuclear Regulatory Commission (NRC) requires all licensees for nuclear power plants to show proof that they have the primary and secondary insurance coverage mandated by the Price-Anderson Act. Licensees obtain their primary insurance for third party liability through American Nuclear Insurers (ANI), and ANI manages the secondary insurance program also. Licensees also sign an agreement with NRC to keep the insurance in effect. American Nuclear Insurers also has a contractual agreement with each of the licensees to collect the retrospective premiums if these payments become necessary. A certified copy of this agreement, which is called a bond for payment of retrospective premiums, is provided to NRC as proof of secondary insurance. It obligates the licensee to pay the retrospective premiums to ANI if required.

American Nuclear Insurers is a pool comprised of some 60 investor-owned stock insurance companies, including the major ones. About half the pool's total liability capacity comes from foreign sources such as Lloyd's of London. The average annual premium for a single-unit reactor site in 2019 was approximately \$1 million. The premium for a second or third reactor at the same site is discounted to reflect a sharing of limits. The average site premium for 2019 was approximately \$1.3 million.

The nuclear operators' mutual arrangement for insuring the actual plants against accidents is Nuclear Electric Insurance Limited (NEIL) which is well funded (a \$5 billion surplus) and cooperates closely with the American Nuclear Insurers pool. It was founded in 1980 and insures operators for any costs associated with property damage, decontamination, extended outages and related nuclear risks. For property damage and on-site decontamination, up to \$2.75 billion is available to each commercial reactor site. The policies provide coverage for direct physical damage to, or destruction of, the insured property as a result of an accident ["accident" is defined as a sudden and fortuitous event, an event of the moment, which happens by chance, is unexpected and unforeseeable. Accident does not include any condition which develops, progresses or changes over time, or which is inevitable]. The policies prioritize payment of expenses to stabilize the reactor to a safe condition and decontaminate the plant site.

The Price-Anderson Act has been represented as a subsidy to the US nuclear industry. If considered thus, the value of the subsidy is the difference between the premium for full coverage and the premium for \$10 billion in coverage. On the basis of data obtained from two studies – one conducted by the Nuclear Regulatory Commission (NRC) and the other by the Department of Energy (DOE) – the Congressional Budget Office (CBO) estimated that the subsidy probably amounts to less than 1 percent of the levelized cost for new nuclear capacity.

The Price-Anderson Act does not fully align with international conventions in that legal channelling is forbidden by state laws, so the Act allows only economic channelling, whereby the operator is economically liable but other entities may be held legally liable. This is a complication regarding any future universal compensation regime, though a provision was written into the CSC to allow the USA to join despite this situation. Hence the CSC may prove the most realistic basis for any universal third party regime.

Under the US Energy Independence and Security Act 2007, if an accident occurred outside the USA, nuclear suppliers would be required to reimburse the federal government for the amount allocated to the USA under the CSC's formula for second-tier coverage, and it estimated by the DOE that suppliers could have contingent liability of up to \$150 million.

Japan

Japan has not been party to any international liability convention but its law generally conforms to them. Two laws governing them are revised about every ten years: the Law on Compensation for Nuclear Damage and Law on Contract for Liability Insurance for Nuclear Damage. Early in 2015 Japan ratified the CSC, bringing it into line with international nuclear damage compensation systems.

Plant operator liability has always been exclusive and absolute, and power plant operators must provide a financial security amount of ¥120 billion (\$1.12 billion) – half that to 2010. The government may relieve the operator of liability if it determines that damage results from "a grave natural disaster of an exceptional character", and in any case where liability is unlimited. After review, the provision was maintained at the same level in 2012. However, a report from the Atomic Energy Commission's Special Committee on the Nuclear Damage Compensation System in 2016 had indicated a need to increase the ¥120 billion cover in the light of the Fukushima experience where ¥6 trillion was needed. It remains unclear how the national government and power utilities should share responsibility for the unlimited liability.

For the Fukushima accident in 2011 the government set up a new state-backed institution to expedite payments to those affected. The body receives financial contributions from electric power companies with nuclear power plants in Japan, and from the government through special bonds that can be cashed whenever necessary. The government bonds total ¥5 trillion (\$62 billion). The new institution includes representatives from other nuclear generators and will also operate as an insurer for the industry, being responsible to have plans in place for any future nuclear accidents. The provision for contributions from other nuclear operators is similar to that in the USA. The government estimates that Tepco will be able to complete its repayments in 10 to 13 years, after which it will revert to a fully private company with no government involvement. Meanwhile it will pay an annual fee for the government support, maintain adequate power supplies and ensure plant safety.

In January 2012 Tepco deposited with the Tokyo Legal Affairs Bureau ¥120 billion (about \$1.56 billion) as insurance coverage for the company's nuclear energy facilities. The utility was formerly covered by the Japan Atomic Energy Insurance Pool, an industry organization established by 23 non-life insurers. However, the pool said in August 2011 that it would not renew Tepco's contract after it expired in mid January 2012. (Japanese nuclear utilities are required by law to secure ¥120 billion in accident liability coverage.) Tepco sought coverage from private-sector insurers.

In relation to the 1999 Tokai-mura fuel plant criticality accident, insurance covered ¥1 billion and the parent company (Sumitomo) paid the balance of ¥13.5 billion.

In November 2013 the Minister for Foreign Affairs said: "Recognizing the importance of participating in the establishment of an international nuclear damage compensation system, the Japanese government has decided to conclude a 'Convention on Supplementary Compensation for Nuclear Damage (CSC)' so as to provide an environment that facilitates involvement of foreign companies with expertise regarding the decommissioning and contaminated water measures of the Fukushima Daiichi nuclear power plant. I will work to submit the CSC and related bills to the cabinet at an appropriate time next year." The bill to ratify the CSC was passed by both houses of parliament in November 2014, along with amended domestic compensation laws. The Ministry of Foreign Affairs then filed a formal document with the IAEA so that Japan became the sixth member country of the CSC, enabling it to enter into force globally in mid-April 2015.

India

In 2008 the Indian government undertook to "take all steps necessary to adhere to the Convention on Supplementary Compensation (CSC)", which it has since signed (in October 2010) and now ratified (in February 2016). However, it is not clear how it relates to the country's 2010 nuclear liability law, though the Ministry of External Affairs said in a statement that ratification of the CSC marked a "conclusive step in the addressing of issues related to civil nuclear liability in India."

The government passed the Civil Liability for Nuclear Damage Act related to third party liability in August 2010. It brought the country's nuclear liability provisions broadly into line internationally, making operators primarily liable for any nuclear accident, but without protecting third party suppliers. One clause (17b) giving recourse to the supplier for an operational plant is contrary to international conventions and undermines the channelling principle fundamental to nuclear liability.

The 2010 Act limits total liability to 300 million SDR "or such higher amount that the Central Government may specify by notification." Operator liability is capped at Rs 1500 crore (15 billion rupees) or such higher amount that the Central Government may notify, beyond which the Central Government is liable.

In June 2015 the Rs 1,500 crore India Nuclear Insurance Pool (INIP) was announced by GIC Re, which will manage it. The UK pool, Nuclear Risk Insurers, helped to set up INIP but is not part of the consortium, which has 11 domestic insurers. One of the consortium members, state-controlled New India Assurance, will issue policies and manage coverage for operators and suppliers, initially for third party liability. It will require NPCIL to pay affected parties in the event of an accident. GIC Re as a pool manager aims to develop INIP into a one-stop facility for covering all nuclear risks.

Further details on the 2010 Act and its implications are in the *Nuclear liability* section of the [Nuclear Power in India](#) information page. Plans for building reactors from Russian, French and US suppliers are impacted, and India's private sector suppliers are also affected.

China

China is not party to any international liability convention but is an active member of the international insurance pooling system, which covers both first party risks and third party liability once fuel is loaded into a reactor. China's 1986 interim domestic law on nuclear liability issued by the State Council contains most of the elements of the international conventions and the liability limit was increased to near international levels in September 2007, though it is quoted at only CNY 300 million (€44 million) in 2015. Where damage exceeds this amount, state indemnity up to CNY 800 million (€118 million) is provided. It is also setting up a reinsurance arrangement with Russia, which seems more symbolic than substantial.

[For insurance of the plants themselves, Hong Kong-listed Ping'an Insurance Company accounts for more than half of China's nuclear power insurance market, with its clients including nuclear power plants in Guangdong, Jiangsu and both first- and second-phase projects of Qinshan Nuclear Power Station in Zhejiang. Four Chinese insurance companies provided \$1.85 billion worth of insurance to Tianwan Nuclear Power Station in Jiangsu, most of which will be reinsured internationally. About RMB 40 billion (\$5.85 billion) insurance for the first two EPR units of the Taishan nuclear plant in being provided by Ping'an, All Trust, CPIC, PICC and others. In late 2009 seven insurance companies and China Power Investment Corporation (CPI) signed a RMB 100 billion insurance cooperation agreement with China Guangdong Nuclear Power Co (CGNPC, now CGN) to insure the ten CPR-1000 units that CGNPC planned to build in the next three years. In December 2007 Ningde Nuclear Power had announced a \$2 billion insurance agreement with Ping An Insurance Corp for its four-unit CPR-1000 nuclear power project in Fujian Province. All this is first party cover only.]

Europe

In the **UK**, the Energy Act 1983 brought legislation into line with earlier revisions to the Paris/Brussels Conventions and set a new limit of liability for particular installations. In 1994 this limit was increased again to £140 million for each major installation, so that the operator is liable for claims up to this amount and must insure accordingly. The majority of this insurance is provided by a pool of UK insurers comprising eight insurance companies and 16 Lloyd's syndicates – [Nuclear Risk Insurers](#). Beyond £140 million, the current Paris/Brussels system applies, with government contribution to SDR 300 million. The government made an order in May 2016 which would require operators' insurance of €1.2 billion. It was proposed that the level would initially be set at €700 million specified under the 2004 Paris/Brussels Protocol (when it enters into force) and then increased by €100 million annually. As of March 2021 the change in liability regime had not been brought into force. Also, proposals allow for the government to provide waivers, indemnity, and government-provided insurance to nuclear operators in cases where commercial insurance or other financial security measures are unavailable in the private market. A [public consultation on this](#) took place early in 2011.

In mainland **Europe**, individual countries have legislation in line with the international conventions and where set, cap levels vary. **Germany** has unlimited operator liability and requires €2.5 billion security which must be provided by the operator for each plant. This security is partly covered by insurance, to €256 million. German utilities are 100% insured through EMANI/ELINI. **France** requires financial security of €700 million per plant. **Belgium** requires power plants to be insured to €1.2 billion.

Switzerland passed a new law on civil liability in 2008, and in 2009 ratified the Paris and Brussels conventions. Early in 2015 the Nuclear Third Party Liability Act was amended so that the state covers damages over CHF 500 million and up to CHF 1 billion, with its own premiums. Then in March 2015 the minimum coverage was raised from CHF 1 billion to €1.2 billion. The amendments were made necessary by the inability of the international reinsurance pool to provide the coverage.

Finland has ratified the 1988 Joint Protocol relating to Paris and Vienna conventions as well as the 2004 Amending Protocol and in anticipation of this coming into force it passed a 2005 Act which requires operators to take at least €700 million insurance cover. Also operator liability is to be unlimited beyond the €1.5 billion provided under the Brussels Convention. "Nuclear damage" is as defined in revised Paris Convention, and includes that from terrorism. A 2014 agreement with Russia stipulates that both Paris and Vienna conventions are reciprocally applicable between Finland and Russia. In effect it thus substitutes for the 1988 Joint Protocol relating to both Conventions, which Russia has not ratified.

Sweden has ratified the 1998 Joint Protocol relating to Paris and Vienna conventions as well as the 2004 Amending Protocol. The country's Nuclear Liability Act requires operators to be insured for at least SDR 1000 million, beyond which the state will cover to SEK 6 billion per incident.

The **Czech Republic** is moving towards ratifying the amendment to the Vienna Convention and in 2009 increased the mandatory minimum insurance cover required for each reactor to CZK 8 billion.

From January 2016 **Slovakia** increased the minimum insurance cover from €75 to €300 million. It is a party to the Vienna convention and is considering the 2004 protocol to the Paris convention.

In **Europe** there are two mutual insurance arrangements which supplement commercial insurance pool cover for operators of nuclear plants. The European Mutual Association for Nuclear Insurance ([EMANI](#)) was founded in 1978 and the European Liability Insurance for the Nuclear Industry ([ELINI](#)) created in 2002. ELINI's members comprise most EU nuclear plant operators. EMANI has some 55 members and covers about 100 sites, mostly in Europe.

Canada

In **Canada** the Nuclear Liability and Control Act is also in line with the international conventions and establishes the licensee's absolute and exclusive liability for third party damage. Suppliers of goods and services are given an absolute discharge of liability. The limit of C\$75 million per power plant set in 1976 as the insurance cover required for individual licensees was increased to C\$650 million in January 2017. This limit is planned to increase by C\$100 million each year until it reaches C\$1 billion or a higher amount set by regulation. Only half the \$1 billion will have to be covered by traditional insurance, the remainder will be with other forms of security. Cover is provided by a pool of insurers, and claimants need not establish fault on anyone's part, but must show injury. Beyond the cap level, any further funds would be provided by the government.

Canada signed the CSC in December 2013 and ratified it in June 2017.

Russia & Ukraine

Russia is party to the Vienna Convention since 2005, with an unlimited liability limit, according to the NEA. It has a domestic nuclear insurance pool managed by the [Russian Association of Nuclear Insurers](#) (RANI) comprising 23 mostly insurance companies covering liability of some \$350 million. It started out with reinsurance arrangement with Ukraine and with China, but

since 2009 the Russian Pool has been a member of the International Pooling System involving now 28 countries.

SOGAZ is a major Russian industrial insurer, and in 2014 it won the tender to insure the first floating nuclear power plant, covering it for RUR 22.6 billion, and also covering third party liability to RUR 500 billion. It also won the tender to insure all Rosenergoatom's nuclear power plants, covering them for RUR 1.2 trillion (\$34 billion). The reinsurance of risks under the policy will be carried out among the members of the Russian and international nuclear insurance pools, and Russian reinsurers. Coverage for civil liability for nuclear damage from Rosenergoatom's plants has been provided by the Russian Nuclear Insurance Pool (RNIP) since 1998.

Ukraine adopted a domestic liability law in 1995 and has revised it since in order to harmonize with the Vienna Convention, which it joined in 1996. It is also party to the Joint Protocol and has signed the CSC. Operator liability is capped at SDR 150 million.

Other countries

The **United Arab Emirates** (UAE), for its Barakah nuclear plant, has passed legislation in line with the revised Vienna convention so that civil liability lies solely and exclusively with the plant operator. It sets a limit of SDR 450 million, 50% higher than the Vienna convention minimum, so that the operator needs to insure to this level. The state accepts responsibility as insurer of last resort.

In **South Korea**, since mid-2015 the operator of all nuclear plants is required to take out at least KRW 2000 billion (\$2 billion) in third party liability insurance. The NSSC is increasing the amount from KRW 50 billion per site to KRW 500 billion, for up to six units on the site.

Notes & references

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